



2019

ENVIRONMENT AND  
SUSTAINABILITY  
REPORT



# ABOUT KUMTOR MINE

Kumtor mine is one of the largest western-operated gold mines in Central Asia. It has been operating since May 1997 and has produced approximately 12.6 million ounces of gold to December 31, 2019. Kumtor Gold Company CJSC (KGC) is the concession holder for the Kumtor deposit and is responsible for the entire production cycle.

The Kumtor open pit mine is located approximately 350 kilometers southeast of the capital of the Kyrgyz Republic, Bishkek, and 60 kilometers north of the border with the People's Republic of China. It is at an altitude of 4,000 meters above sea level in a partially glaciated permafrost zone in the Central Tien Shan Mountains. The current life of the Kumtor mine is until 2026.

## About Centerra

Centerra Gold Inc. (Centerra) is the parent company, which owns 100% of Kumtor Gold Company. Centerra is a publicly listed, Canadian-based gold mining company engaged in operating, developing, acquiring, and exploring gold properties in North America, Asia and other emerging markets worldwide. The Company is one of the largest Western-based gold producer in Central Asia and its shares trade on the Toronto Stock Exchange (TSX) under the symbol CG.

Centerra operates two flagship assets: the Kumtor gold mine in the Kyrgyz Republic and the Mount Milligan gold-copper mine in British Columbia, Canada.

Centerra also owns late-stage development properties: the Oksut Gold Project in Turkey, the Kemess Project in British Columbia, Canada, which includes the Kemess Underground and the Kemess East gold-copper projects, and a 50% interest in the Greenstone Gold Property which includes the Hardrock Gold Project in northwestern Ontario, Canada. Centerra through its acquisition of Thompson Creek Metals Company in 2016, also owns a well-established, fully integrated Molybdenum Business consisting of an operating metallurgical processing facility and two primary molybdenum mines, which are currently on care and maintenance.

The Company also has active exploration joint ventures and exploration properties in Canada, Finland, Mexico, Sweden, Turkey and the United States. Kyrgyzaltyn OJSC, a state-owned entity, is Centerra's largest shareholder, owning 77,401,766 shares.

Additional information on Centerra is available at SEDAR ([www.sedar.com](http://www.sedar.com)) and on the Company's website ([www.centerragold.com](http://www.centerragold.com)).

## About this Report

This document is the Kumtor Annual Environment and Sustainability Report for the 2019 financial year (ending December 31, 2019) except where otherwise noted. This report is focused on the Kumtor mine in the Kyrgyz Republic. Performance data include only Kumtor's own operations, unless noted otherwise, although the policies of Centerra and Kumtor apply to both employees and contractors. Financial metrics are reported in US dollars (USD) unless otherwise stated. This report has been prepared in accordance with GRI Standards: Core option. In addition the Report addresses the key reporting requirements centered in Kumtor's Environment Management Action Plan (EMAP). For each specific sector various indicators set in GRI's Mining and Metals Sector Supplement (see [www.globalreporting.org](http://www.globalreporting.org)) are disclosed. In determining the scope, content, and boundaries of this report, we considered an importance evaluation process described in the Governance Section of this Report. Please

note our Cautionary Note regarding the forecast information on the inside back cover. This report will also be available in the Russian and Kyrgyz languages. As we continue to further improve our systems and approaches, we welcome your comments and suggestions on how we can further improve our annual environmental and social reporting and practices. You can find contact details on the back cover of this report.



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# MESSAGE FROM THE PRESIDENT



The progress we have achieved, as well as the challenges we faced in 2019, are described in this report.

Our team can be proud of its operating performance. We have exceeded almost all performance results in gold production, maintenance, ore processing and reduction of total costs.

**ZERO INCIDENTS** remain our number one target which means we will continue to prioritize our Work Safe | Home Safe program, as well as tools such as Reliable Control and Visible Felt Leadership principle.

In late 2019, the Strategic Agreement on Environmental Protection and Investment Promotion with the Government of the Kyrgyz Republic concluded and came into force. This agreement provided additional incentive for the Company's development and created additional opportunities for the Kyrgyz Republic.



## Contribution to the Country Economy

KGC remains an enterprise that makes a significant contribution to the economy of the Kyrgyz Republic. In 2019, our production activity accounted for 20.8% of industrial output and 9.8% of GDP. Payments in the Kyrgyz Republic

in 2019 (including taxes, refinery fee, local procurement of goods and services, infrastructure, donations, etc.) amounted to \$366 million, making the total of payments since 1994 more than \$4.0 billion. KGC is the largest taxpayer and largest employer in the private sector of the Kyrgyz Republic. By the end of 2019, the company employed 2,631 Kyrgyz citizens, or 99% of the total number of the full-time workforce.



# KGC remains an enterprise that makes a significant contribution to the economy of the Kyrgyz Republic

## Increasing Local Procurement

We believe that a strategic approach to procurement in the local market will not only benefit our company, but also contribute to the development of local communities by creating jobs and developing the economy of the Issyk-Kul region. We continue to promote and support local business and in 2019 our company spent about \$71 million on local procurement. Starting from 2008, 100% of goods are purchased in the local market.

## Interaction with Stakeholders

As an international company, we respect the different needs and values of people and their cultures and operate with a high level of transparency to ensure stakeholder confidence.

The company management on a regular basis conducts a constructive dialogue with representatives of local communities, such as public and youth leaders, local authorities and representatives of small business. At regular meetings, the company reports on plans, listens to requests and makes decisions. The company constantly increases cooperation with all interested parties.

## Investing in Communities

In this Report, we note some of the activities that we voluntarily initiated, and their results. Moreover, since 2009 the company contributes 1% of gross revenue to the Issyk-Kul Development Fund. In 2019 our contribution to the Fund was \$8.5 million, making the total \$75.9 million since 2009.

## Geotechnical Safety

The Kumtor mine ore body and related infrastructure are located under the moving glaciers or subjected to their impact. Since the approval of the Kumtor project in 1994, plans for the management of ice (necessary for the safe operation of the mine) have become an integral part of the annual mining plans that are subject to approval by the relevant authorities of the

Kyrgyz Republic. As further described in the report, we involve leading local and international experts and use advanced technologies for monitoring and assessing geotechnical safety and implementing the activities necessary to ensure the proper level of safety of Kumtor mine.

## Health and Safety

On December 1, 2019, a rockslide occurred at the Kumtor Lysyi waste rock dump. As a result, two employees of the Company who worked at this work area were considered missing. The Company immediately notified all relevant government authorities and the families of the missing employees.

The first priority of Centerra and KGC was to locate the missing employees through a search and rescue operations in cooperation with the Kyrgyz Republic Ministry of Emergencies, which began immediately after the incident and ended on January 9, 2020. The decision to end the search was made with the agreement of the relatives of the Kumtor missing employees.

We all deeply regret this incident and express our condolences to the families, friends and colleagues of the deceased employees. The company has been working closely with representatives of the relevant government agencies to investigate the causes of the rockslide, get a clear understanding of what triggered the rock failure, and develop recommendations for the use additional work methods to prevent similar tragic incidents in the future. KGC has taken serious steps to improve safety at our world-class enterprise and continues to focus on the issues related to the life and health of its full-time staff, as well as all contractors at all work places.

Ensuring safety at work places and protecting life and health of employees are the main principles we adhere to in our daily activities. This tragic incident has further strengthened our belief in the need to enhance safety measures at all work places of the Company.





## Environment and Biodiversity

We consider a responsible approach to environmental management as one of the most important components of our activities. So, in 2019, we spent about \$7.5 million for environmental assessment and protection. This includes the costs of monitoring (both at the mine and in the region) the quality of water, air, biodiversity, soil and sediment, radiation and waste management.

## Life of Mine

The total amount of proven and probable gold reserves at the Kumtor mine as of December 31, 2019 is 3.2 million ounces (43.3 million tonnes at 2.31 g/t). The current mine plan indicates that operations will cease in 2026, however KGC's exploration program is aimed at extending the life of the mine.

## Looking Forward

Kumtor successfully implements various initiatives for the purpose of continuous improvement. It is important for KGC to meet our production targets, requirements of safety, environmental and social responsibility. Kumtor mine gold production in 2020 is expected to be 520,000-560,000 ounces or 16.17-17.42 tonnes of gold. We remember the past, but think about the future. We continue to improve, and this thought gives us strength and faith in the future. Our objective is to understand the importance of our core values, such as: Win as a Team, Strive for Continuous Improvement, Deliver Results and Be Responsible Miners.

*Daniel Desjardins, President,  
Kumtor Gold Company*



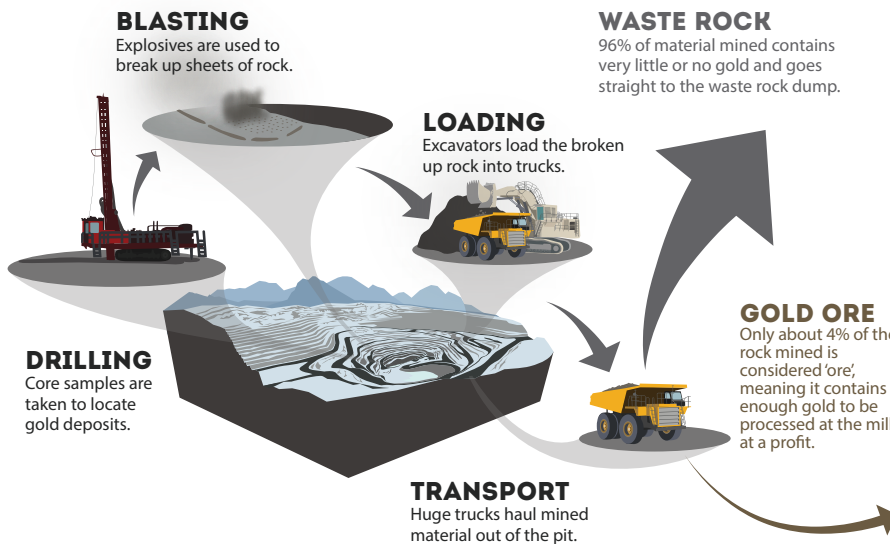




# OPERATIONS OVERVIEW

## MINING PROCESS

Gold is found in the territory of the deposit in the form of finely disseminated pyrite. The development at the Kumtor mine is performed through open-pit mining, that is, with the use of standard methods of drilling, blasting, loading and transportation in the open pit.



The Kumtor mine is equipped with a modern mining fleet. The open pit has 99 Caterpillar trucks with a lifting capacity of from 125 tons to 185 tons, 9 drilling rigs and 14 excavators operating regularly. To maintain the infrastructure in the open pit, there is support equipment: 16 crawler dozers and 6 wheeled dozers, as well as 11 graders. All mining equipment is equipped with modern communication modules, a real-time tracking and control system. Workers travel to the open pit in KamAz trucks; known colloquially as bus trucks.

## DRILLING



Drilling is a very important stage in metal mining, since geologists should accurately determine the average gold grade in the ore before the commencement of the large scale works at a site. Depending on the results, the further process will determine whether to perform the gold ore production or not. The drilling rigs operating in the open pit are able to drill to a depth of up to 12.5 meters. Nearly 200 holes are drilled in the open pit during one shift. The drilling process in the mine is not only a part of geological exploration

works aimed at determining gold grade but the first stage of blasting in the open pit as well.

## BLASTING



Blasting in the open pit breaks apart the topmost rock. After assessing where to blast, the zone is closed off. A network of holes are drilled, and explosives connected to a detonator are placed inside. Meeting safety requirements when firing the charge is of paramount significance for all employees involved

in the works in the open pit. Before the explosion, the mine foreman ensures the withdrawal of employees and heavy vehicles from the open pit to a safe distance.

## LOADING

After clearing roads, the excavators drive up to the scene of blast. Two types of excavators operate in the mine. The biggest one is Hitachi EX3600-6. The excavators load the ore onto the mining trucks.



## TRANSPORTATION



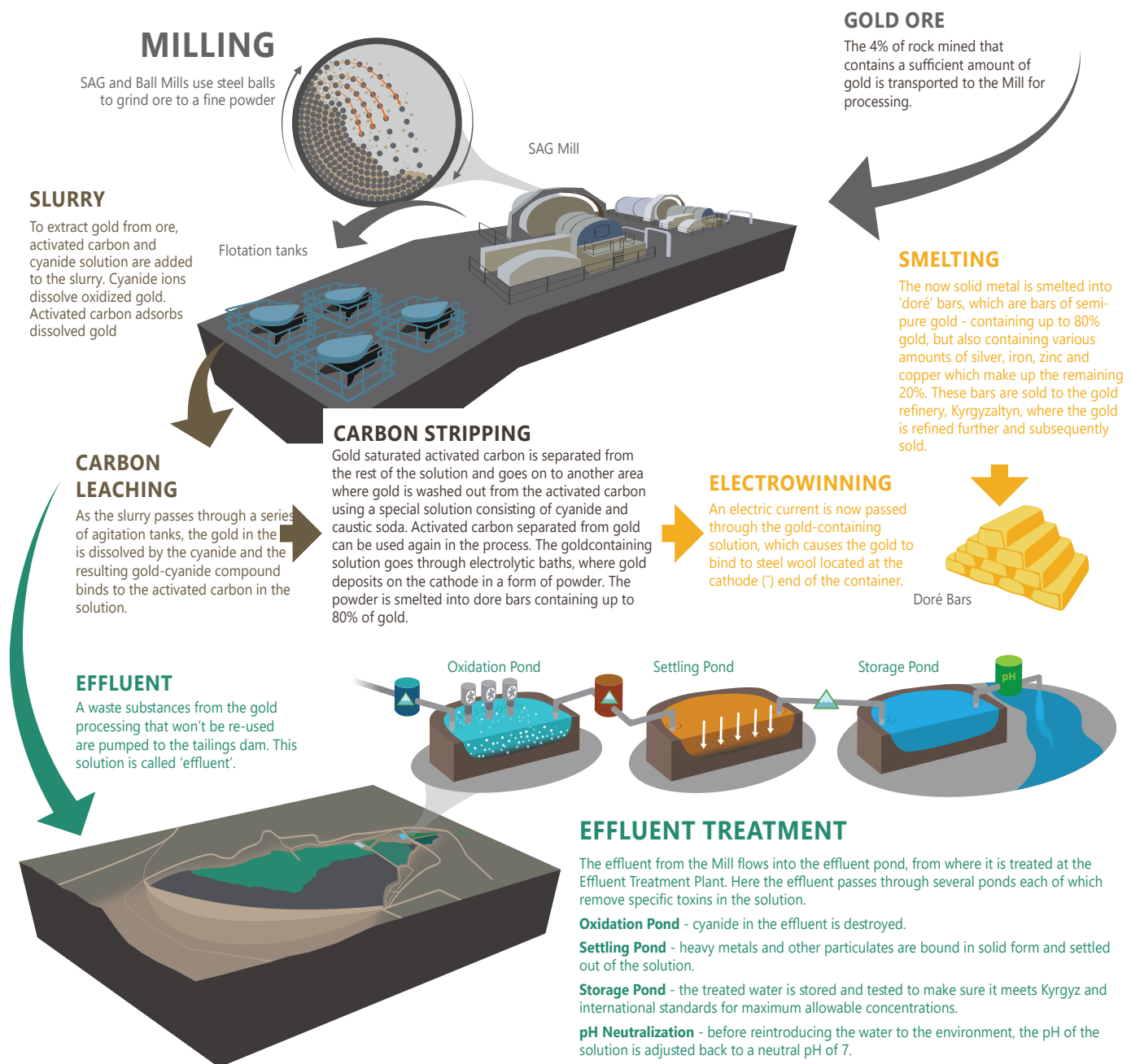
To reach gold bearing ores, it is required to remove the bare rock layer. This process is called stripping. The trucks which transport waste rock unload it on the special dumps. The trucks containing gold bearing ore transport the ore to the large crusher where it is ground to suitable sizes and delivered to the Mill by conveyor.

## GOLD EXTRACTION

Gold is extracted from the ore of the processing factory called the 'Mill' using key stages including grinding, carbon leaching (with cyanide), carbon stripping, electro winning, and smelting. Each of these steps is described further in the diagram below.

The Mill's rated throughput is between 17,000 to 19,000 tons of ore per day. The entire production process is automated involving just 16 people per shift to operate the entire Mill. When ore processing is finished, it is smelted into dore bars containing up to 80% gold.

*The doré bars produced in the Kumtor mine are purchased by Kyrgyzaltyn OJSC for further processing at Kara-Balta refinery, as stipulated by the Amended and Restated Gold and Silver Sales Agreement concluded by Kumtor Gold Company, Kyrgyzaltyn OJSC and the Government of the Kyrgyz Republic. The exclusive right to sell refined gold and silver both in the Kyrgyz Republic and abroad is held by Kyrgyzaltyn alone.*



# ENVIRONMENTAL AND SUSTAINABILITY SNAPSHOT

Pillar	2019 Targets
Project Benefits	<ul style="list-style-type: none"> <li>■ Achieve All-In Sustaining Cost Per Ounce to 666-703 (US\$/oz)</li> <li>■ Produce 535,000-565,000 oz</li> </ul>
Health and Safety	<ul style="list-style-type: none"> <li>■ Total Reportable Injury Frequency Rate (TRIFR) of 0.21</li> <li>■ Implement Work Safe   Home Safe (WS   HS) Phase II</li> <li>■ Complete Visible Felt Leadership (VFL) Program for supervisors</li> <li>■ Implement Critical Controls Management Standard for all critical risks</li> </ul>
Environment	<ul style="list-style-type: none"> <li>■ No Reportable Spills &gt; Level 2</li> <li>■ Upgrade treatment systems (ETP&amp;STP)</li> <li>■ Update Conceptual Closure Plan</li> </ul>
Community	<ul style="list-style-type: none"> <li>■ Zero days of material business interruptions</li> <li>■ Approve Stakeholder Engagement Plan and Community Development Plan</li> </ul>



## Actual Target Outcome and Comment on Target

## 2020 Targets

- All-In Sustaining Cost per Ounce equalled to 598 (US\$/oz)
- 600,201 ounces of gold produced in 2019

- Achieve All-In Sustaining Cost Per Ounce to 750-800 (US\$/oz)
- Produce 520,000-560,000 oz

- Actual TRIFR was 0.12
- WS | HS Phase II completed
- VFL program implemented for Managers only

- TRIFR less than 0.13
- Conduct WS | HS Phase III Refresher Training
- Improve VFL training program for all KGC supervisors
- Commence implementation of Critical Controls Management Standard for all critical risks

- No Reportable Spills > Level 1
- STP construction completed
- ETP upgrade completed
- The annual average ammonia discharge from the ETP was compliant with MAD discharge limits
- Conceptual Closure Plan (CCP) updated and supplemented

- No Reportable Spills > Level 2
- Increase ETP capacity
- Implement CCP recommendations

- Zero days of material business interruptions
- Stakeholder Engagement Plan and Community Development Plan approved

- Zero days of material business interruptions
- Improve grievance mechanism and keep register of social obligations

BUILDING A **TEAM  
BASED CULTURE**  
OF EXCELLENCE  
THAT **RESPONSIBLY  
DELIVERS**  
**SUSTAINABLE VALUE**  
AND **GROWTH.**

We believe that how we conduct business and how all employees act in fulfilling their job responsibilities are fundamental to achieving our vision to build a team based culture of excellence that responsibly delivers sustainable value and growth.

While KCG's ultimate objective is to deliver value to our shareholders, integrity and ethics will be the foundation for everything we do. In endeavouring to achieve our vision we will follow our core values:



## BE RESPONSIBLE MINERS

- Meet all government regulations and internal governance standards.
- Ensure we actively and transparently engage our people and the communities around us.
- Minimize the potential for adverse impacts that may arise from our operations to levels as low as reasonably achievable, taking into account social and economic factors.



## DELIVER RESULTS

- Strive for operational excellence, safe production and be accountable for our results.
- Be a leading performer among our peers with regard to shareholder value, business ethics, workplace safety, environmental protection and community economic development.



## STRIVE FOR CONTINUOUS IMPROVEMENT

- Continually improve the management of our operations so we may respond to the economic, environmental and social expectations of our stakeholders, including our employees, communities, shareholders, governments and the public.
- Challenge the status quo, embrace change and search for new ways to grow our business.



## WIN AS A TEAM

- Committed and highly engaged.
- Results focused.
- Recognize contributions and efforts of each team member.

We believe our strong commitment to our vision and these values will continue to make Kumtor the employer of choice and the business partner of choice by governments, state-owned enterprises and special interest groups in the countries we operate in.

As an international company, we respect the different needs and values of people and their cultures and operate with a high level of transparency to ensure stakeholder confidence.

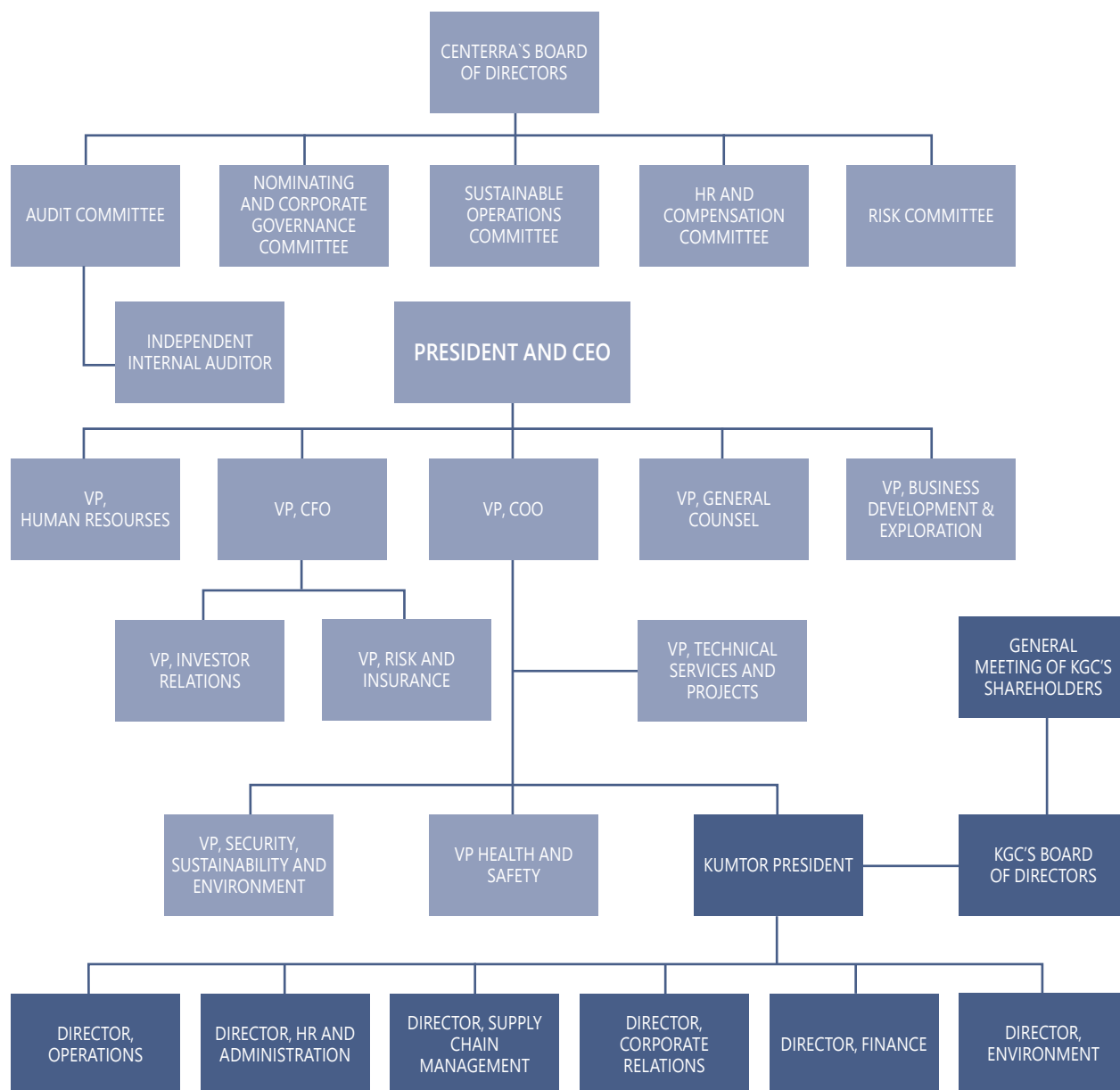




# 1. GOVERNANCE

## 1.1 GOVERNANCE MODEL

### 1.1 Corporate Governance Structure



KGC operates under the governance and standards set by its parent company Centerra, which believes that sound and effective corporate governance is essential for all of its activities. We have adopted practices and procedures to ensure that Centerra's governance principles are followed at KGC. We expect directors, management, officers, and employees to conduct themselves in accordance with the highest ethical standards. These are detailed in three key policies:

1. Code of Ethics for officers and employees;
2. Code of Ethics for directors;
3. International Business Conduct (anti-corruption) Policy for all directors, officers and employees.

KGC develops formal Policies and Procedures for setting performance with internal and external standards, meeting legislative responsibilities and promoting the long-term success of the Company. The policies support KGC values and specifies the framework within which KGC operates in the following areas:

- Operational Health and Safety:** KGC ensures provisions for safe performance and operation at all stages of our activities. KGC recognizes the protection of the health and safety of its employees, contractors, and the public along with responsible environmental management as being its highest corporate priorities. We are committed to the safety motto that **“no job is so important that we cannot take the time to do it safely.”** Key commitments in our policy include: Compliance with applicable laws and regulations of the jurisdictions in which we operate, and generally accepted international industry practices;
- Providing employees and contractors with a working environment free of uncontrolled hazards Identifying and eliminating or controlling potential risks to health and safety of employees, contractors, and the public to levels as low as reasonably achievable, taking social and economic factors into account;
- Achieving continual awareness of and improvement to our overall Health, Safety, and Environment (HSE) performance.
- Environmental Management:** KGC is committed to complying with applicable laws, regulations and standards and minimizing potential environmental impacts due to company operations. KGC has established an Environmental Management System (EMS) designed to monitor the effects of operations on the environment and to ensure compliance with permits and other requirements. The system provides for scheduled monitoring, engineering controls, performance requirements in line with good international mining practice and local regulations.
- Compliance:** KGC has a comprehensive system to ensure compliance with laws, regulations and company policies, which is described further in the section.

**Transparency and Reporting:** Actual results and company activity is reported regularly through the parent company Centerra Gold Inc. as well as on the company website ([www.kumtor.kg](http://www.kumtor.kg)). Centerra is a publically traded company with shares listed on the Toronto Stock Exchange. It is subject to rigorous regulations regarding transparency and reporting. Starting in 2017, in compliance with Canadian regulation “Extractive Sector Transparency Measures Act”, Centerra discloses on an annual basis payments made to Governments in its operations. Centerra’s filings can be found at its website (<https://www.centerragold.com/responsibility/estma-reports>).

- Operational Excellence:** KGC has Standard Operating Procedures that describe the activities necessary to complete tasks in accordance with standards and regulations for running the

operation. Policies stand as control measures for known or potential risks. However, in today’s changing risk environment, KGC uses an Enterprise Risk Management System to support its business activities and safeguard shareholder value. The risk management systems designed to ensure the risks are systematically identified, rigorously assessed, prioritized consistent with KGC’s risk appetite and effectively managed to eliminate unwanted impacts. Our external memberships and commitments provide an opportunity to learn from, and align our activities with, good international industry practice. Centerra became a supporting Company of the Extractive Industries

The EITI is a coalition of governments, companies, civil society, investors, and international organizations. It promotes improved governance in resource-rich countries through the verification and publication of all company payments to governments, as well as government-reported revenues from oil, gas, and mining. Centerra has played an active role in promoting the EITI in the Kyrgyz Republic and Mongolia. Our operations were among the first to establish, report, and help improve EITI infrastructure in their respective countries. For more information on Centerra’s submissions, visit [eiti.org/Kyrgyz-Republic](http://eiti.org/Kyrgyz-Republic)

Centerra is also a member of the World Gold Council (WGC). We have adopted the World Gold Council’s Responsible Gold Mining Principles (“RGMP”) upon their introduction in September 2019. The RGMP is an important new industry framework that sets out clear expectations for consumers, investors and the downstream gold supply chain as to what constitutes responsible gold mining. The RGMPs consist of 10 umbrella principles and 51 criteria that focus on Environmental, Social and Governance (“ESG”) best practices. The RGMPs were developed (through a specific ESG taskforce) through a lengthy engagement and consultation process with key industry stakeholders including financiers, investors, non-governmental organizations and civil society. We have been a member of the ESG Taskforce since 2018, offering practical, on-the-ground experience and expertise on a variety of topics, including the development of the external assurance process. In April 2019, Centerra road tested the then draft RGMPs at its Kumtor Mine.

In 2020, we begun the implementation roadmap of the RGMPs across our operating sites. In 2020, we will focus on remediating areas for improvement identified from the road test at Kumtor, and undertake readiness reviews and self-assessments at our Öksüt Mine and Mount Milligan Mine.

Centerra is a signatory to the International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold (Cyanide Code). This Cyanide Code was developed by a multi-stakeholder steering committee under the guidance of the United Nations Environmental Program and the predecessor of the International Council on Mining and Metals. The objective of the Cyanide Code is to improve the management of cyanide used in gold mining and assist in the protection of human health and the reduction of environmental impacts/ KGC is certified for transportation of cyanide in accordance with the International Cyanide Management Code.

## Compliance

The Compliance and Projects department (C&P) was established by the Company in 2012 to ensure compliance with the requirements of the KR legislation, with international standards of the industrial operation and in order to provide continuous and safe operation of the Kumtor mine.

The C&P Department has 10 staff members under the supervision of the Director, who reports directly to the Director, Operations. The C&P department interacts with all KGC structural departments and is guided by acting KR legislation, EEU regulations, generally accepted international standards, and the Agreements for the Kumtor Mine.

Specialists of the C&P department monitor changes in the KR legislation and identify the risks that can potentially affect the Company's activities. In accordance with the KR legislation, the C&P department ensures that all required permits and licenses for all Company activities, except for procurement and logistics, are obtained in a timely manner and properly maintained. Other activities of the C&P department include the following:

- Assists other structural departments of the Company in preparing materials required to conclude service contracts with contractors;
- Obtains all necessary permits for the design and construction of mine site infrastructure facilities;
- Obtains approvals of the design documentation and organizes commissioning of newly constructed facilities upon their completion;
- Assists design companies in obtaining approvals/ expert opinions for Mine Development Plans/ Designs and for the standards of pollutants emissions/ discharges and wastes disposal for the mine site and BMY;
- Provides technical assistance during update and/ or introduction of new internal documentation for the Company in accordance with requirements of the KR legislation and international regulations; and
- Organizes calibration of measuring equipment used at the mine site or BMY.

The C&P Department ensures uninterrupted operations of the mine and other KGC facilities through maintaining regular communication with the authorized state bodies in the field of subsoil, natural resource use, construction, sanitary and epidemiological control, technical supervision, as well as with KR Ministry of Economy, Ministry of Interior, State Communication Agency under KR Government, Ministry of Emergency and Ministry of Labor and Social Development.

The C&P Department regularly updates the following permits issued by different KR ministries and agencies:

- Permit to carry out blasting operations in the pits;
- Permit to carry out blasting operations from the State Enterprise "Kyrgyzaeronavigation";
- Permit to use explosive materials;
- License for production and selling of the explosive materials;
- License to use mineral resources for the purpose to collect fresh ground water from BMY wells;
- Permit to carry out mining operations within the Concession area;
- Permit to store the weapons used for site security purposes at the Kumtor mine site;
- Permits to transport oversize and heavy cargo;
- Permit to import, purchase, store and use reagents;
- License for the disposal, storage, burial, destruction of toxic waste materials and substances, including radioactive waste;
- Permit to dispose waste into the environment, including toxic waste;
- Permit for emission of waste products from the stationary sources of pollutant into the atmosphere;
- Permit for the discharge of treated industrial and domestic effluents;
- Permit to operate radio sets, radio frequencies to ensure reliable communication between KGC facilities;
- Sanitary and Epidemiological expert opinions on the use of X-Ray devices and equipment with sources of ionizing radiation.

KGC has all permits and approvals required by the KR legislation for the Technical Designs for the Development of the Central, Sarytor and Southwest Areas of the Kumtor mine during the entire life of the mine (LOM), as well as approval of the Environmental Passport and Mine Site Master Plan.

At the end of 2019 - the beginning of January 2020, all other permits and approvals for 2020 were also obtained:

- Mine Plan for the development of the Central Pit;
- Mine Plan for the development of the pebble deposits at the Lysyi Creek Alluvial Cone;
- Waste disposal into the environment at the Kumtor mine and BMY;
- Emission of waste products from the stationary sources of pollutants into atmosphere at the Kumtor mine and BMY.



## Audits, Inspections, Claims

Our Company is subject to regular audits by the KR and international companies and experts. We are also inspected by relevant national authorities and by the audits retained by Centerra.

## Environmental claims

In 2019, KR regulatory authority submitted four claims to KGC relating to alleged environmental damages at the Kumtor Mine. Two claims were submitted for compensation of alleged damage caused to land resources, and another two claims were submitted for compensation of alleged damage caused to water resources. KGC resolved all issues related to these claims through the pre-trial process without admission of liability.

## Environmental incidents

Kumtor maintains a system for reporting environmental and safety-related incidents. It is based on a five-tier classification and reporting a system, which allows the Company to classify environmental incidents and spills into reportable and non-reportable. This classification system takes into account the magnitude of environmental impact and the requirements of national laws and other regulations. Senior environmental staff are immediately notified of all incidents; upon receiving such notice, senior environmental staff classify the incident as per the five tiers above. Tier I and Tier II incidents are considered insignificant in terms of scale and severity of impact; therefore, there are no external reporting requirements. There is no requirement to immediately notify KGC President and Centerra's Board

of Directors on such minor significance incidents. Incidents classified as Tiers III through V are reported to the Board of Directors and, in many cases, trigger external reporting requirements to relevant local regulatory agencies. In 2019, 4 non-reportable incidents were recorded (Tier I). These included 2 fuel spills and 2 process water spills onto pipelines. The spills were immediately contained and eliminated, and did not result in any serious consequences. For comparison: 9 non-reportable incidents in 2018 and 15 non-reportable incidents in 2017.

## 1.2 Environmental incidents and spills

	2017	2018	2019
Non-reportable spills and environmental incidents (Type I)	15	9	4
Non-reportable spills and environmental incidents (Type II)	0	0	0
Reportable spills and incidents (Type III-V)	0	1	0



## 1.2 SUSTAINABILITY MANAGEMENT

While Centerra's ultimate objective is to deliver value to our shareholders, we remain committed to the principles of sustainable development. In endeavoring to achieve our strategic objectives we aim to:

- Be a leader among our peers with regard to business ethics, workplace safety, environmental protection, socio-economic development of communities, and shareholder value;
- Minimize the adverse impact potential of our operations, taking into account social and economic factors;
- Continually improve the management practices at our operations, so we may respond to the economic, environmental and social expectations of our stakeholders, including our employees, communities, shareholders, government authorities and the public;
- As an international company, respect the different needs and values of people and their cultures, and operate with a high level of transparency to ensure stakeholder confidence. We believe our strong commitment to these principles will continue to make Centerra the employer and the business partner of choice wherever we operate.



## 1.3 RISK MANAGEMENT AND CONTINUOUS IMPROVEMENT



KGC is committed to enhancing and protecting its tangible (physical or financial) and intangible (employee, stakeholder or organizational) assets through the principles of risk management and continuous improvement:

- Advanced, comprehensive identification and management of all risks with a proactive approach to ensure the achievement of Company objectives. Implementation of tools and the allocation of internal and independent resources to identify, manage, monitor and track risks.
- Risk management culture including risk informed decision making incorporated in all operational activities and processes of the Company.

Risk management in KGC is the process of identifying and analyzing risks, prioritizing and implementing strategies and actions to reduce the negative impact of these risks to ensure more favorable results. The KGC Risk Management and Continuous Improvement team is integrated into the day-to-day activities of the Company alongside department representatives to ensure proactive rather than reactive risk management strategies and measures.



All identified risks are recorded in the Company's risk register and classified/prioritized based on an assessment of each risks impact and likelihood. Appropriate measures are undertaken in accordance with the risk classification and are regularly discussed with all levels of management, during various meetings including daily tool-box meetings, weekly management meetings, monthly and quarterly risk review meetings, and annual meetings as part of the budget process. The key risk events dealt with in 2019 related to workplace injuries, improvement of occupational health and safety, geotechnical conditions of the pit and waste dumps as well as compliance with all permits/approvals, including the Strategic Agreement.

- **Prevention of incidents and improvement of occupational health and safety.** The management of this risk is an integral part of KGC operations. For many years, the Company has continuously focused on safe working conditions and implemented various initiatives in the field of safety and occupational health improvement. In 2019, Phase III of the Work Safe | Home Safe Safety Leadership Program was delivered to improve the Company's safety culture, building upon the results achieved during this Program's first two phases.

Also during 2019, KGC initiated the implementation of a critical control management program for 10 key Safety risks, introduced the Visible Felt Leadership Program for supervisors and encouraged effective communication amongst all staff on health and safety issues.

The Company also pays special attention to the prevention of occupational diseases of its employees, which reduces the likelihood of illness and workplace injuries.

- **Geotechnical issues.** The geological and geotechnical characteristics of the Kumtor Mine requires constant vigilance because of the potential risk posed to mining operations. Geotechnical issues can have an impact on gold produced, through delays from revisions in the site Mine Development Plan, the Waste Dump Placement Plan and the Dewatering Plans. These may lead to an increase in expenditures for unloading, as well as relocation and reconstruction of the existing infrastructure. The Company undertakes extensive efforts to incorporate appropriate measures in the adjusted plans to prevent and forecast further ground movement, such as a constant monitoring system. The Company also engages independent third party geotechnical consultants to review and recommend improvements to existing risk control measures.
- **Strategic Agreement on Environmental Protection and Investment Promotion of September 11, 2017.** At the end of August 2019, all parties of the Strategic Agreement (the Government of the Kyrgyz Republic, Centerra Gold Inc., Kumtor Gold Company CJSC, Kumtor Operating Company CJSC) reached the Second Completion Date (as specified in the Strategic Agreement). As a result, all obligations under the Strategic Agreement entered into force, including settlement and release from liability, as well as obligation of the Kumtor Gold Company to make contributions to various environmental and social funds of the Government of the Kyrgyz Republic.

The management of risk in gold mining involves not only a thorough approach to addressing threats, but also exploiting the opportunity side of risk. As such risk management processes are linked and integrated with the continuous improvement activities that are an important aspect of our daily operations.



Continuous improvement is a focus for the Company as one of the four Corporate Values and it is a vital component of continued success. We promote a culture and philosophy of continuous improvement enabling all employees to systematically drive out inefficiencies and embrace advanced innovation opportunities within the Company. KGC strives for operational excellence evaluating every opportunity to improve and enhance all aspects of its business, while focusing on safe operation, reduced environmental impact, production optimization, a cost-effective business model and favorable work environment.



Continuous Improvement tools and techniques such as brainstorming sessions, cross functional project teams and detailed project plan documentation and status reporting were successfully adopted to positive results and demonstrable achievements.

In 2019, numerous cross functional project teams were initiated to implement a variety of risk management and continuous improvement projects aimed at sustainable development and, hopefully, extending the life of the mine.

One of the most successful initiatives was the introduction of a more advanced environmentally friendly technology to extract gold from tailings. This project included the installation of reservoirs before commencement of the wastewater treatment plan. The activated carbon that was planned to be disposed of will be used to absorb gold, cyanide wad, total cyanide, and nickel ions from the processed water.

Moreover, in June 2019, an operation review team including the company's management conducted an annual analysis and review of operating activities to identify potential opportunities to improve the current operating processes. In addition to other programs, the company also continues to implement a number of recommendations on international standards from our insurers.



## 1.4 MATERIALITY ASSESSMENT

In accordance with the GRI Standards, KGC is required to identify and report on material issues – defined as issues that have a significant impact on KGC's business and are important to multiple stakeholder groups. In order to assess which issues are material, we considered a number of various sources. We based materiality assessment on interviews with Senior management:

- Opinions of Senior Management and Departments Heads – via several internal meetings and workshops;
- Opinions of local communities in Issyk-Kul;
- Risks that were rated as High or Extreme as per the KGC Risk Register;
- Relevant legal obligations of the Company;

- Data from the KGC community relations online database, where we document our engagements with key stakeholders in the region to record all concerns and issues raised, as well as record and track grievances and requests from local communities;
- Internal policies, values, goals and targets;
- Incoming correspondence - to identify key issues raised by Stakeholders via official requests;
- Media coverage of the Company.

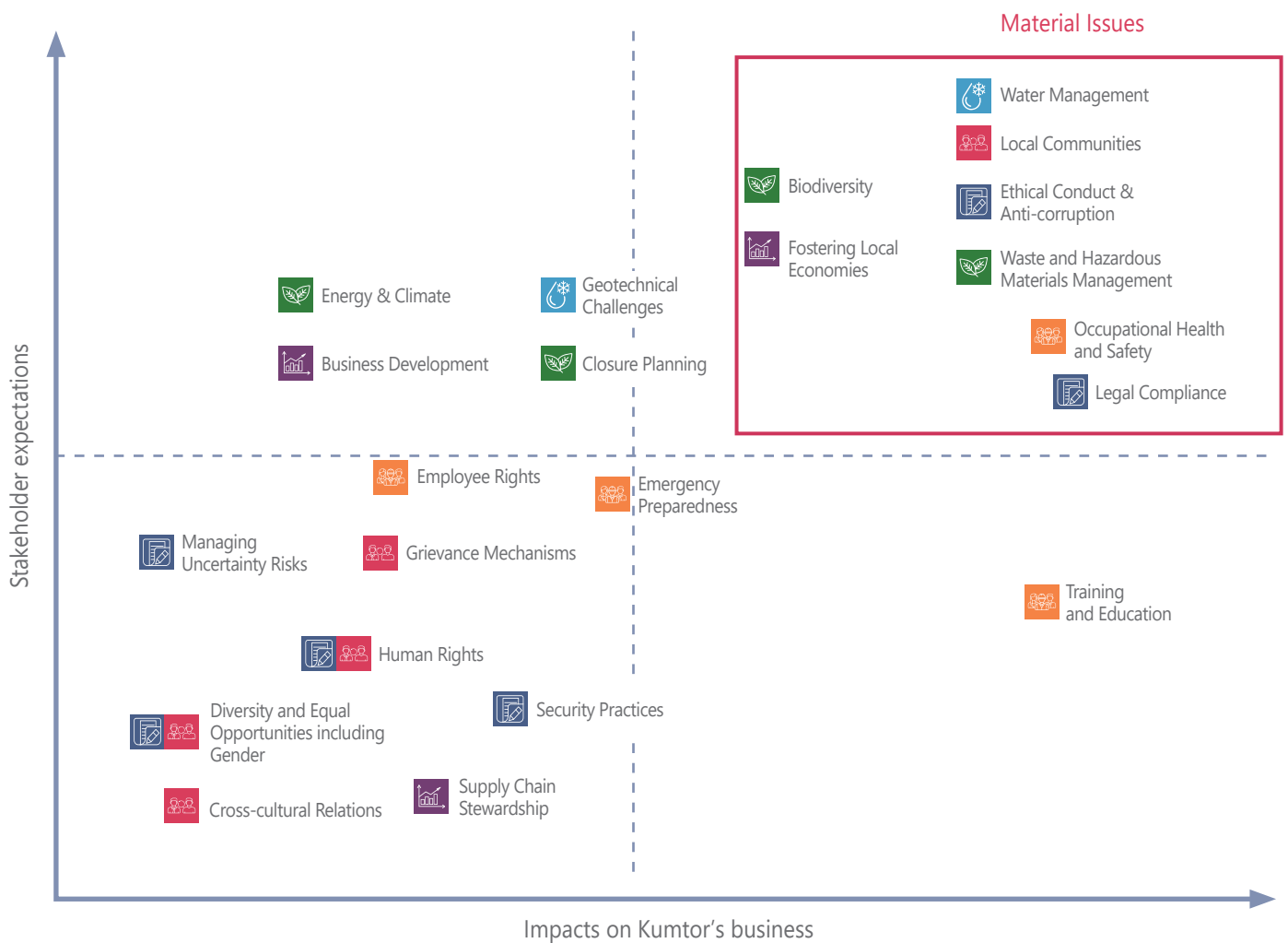
As shown on Figure 1.3 overleaf, the issues shaded red were considered material.

## United Nations Sustainable Development Goals

There are 17 Sustainable Development Goals (SDGs) defined by the international community under the leadership of United Nations in 2015 and which will be valid until 2030. In order to achieve these goals, companies are equally accountable as well as NGOs and governments. As a responsible miner, KGC has defined SDGs related to our operations and impacted communities. We will continue to support the following SDGs in our operations:

- Clean Water and Sanitation;
- Responsible Consumption and Production;
- Good Health and Well-being;
- Decent Work and Economic Growth;
- Industry, Innovation and Infrastructure;
- Partnership for the Goals..

## 1.3 Materiality matrix



### Legend: Areas of Impact

- |                              |                               |
|------------------------------|-------------------------------|
| Environmental responsibility | Economic responsibility       |
| Health and safety            | Governance                    |
| Social responsibility        | Glaciers and water management |





## 1.4 List of identified material aspects and boundaries

Material aspects	Impact inside organization	Impact outside organization	Relevance outside organization
Water Management	×	×	Minimizing impact of our operations on the environment at the mine site is one of the KGC's main objectives. We comply with the Kyrgyz Republic (KR) and international standards and follow the Good International Industry Practice (GIIP) in our operations.
Biodiversity	×	×	
Waste and Hazardous Materials Management	×	×	
Legal Compliance	×	×	KGC complies with KR legislation and is working closely with the KR Government to resolve number of outstanding matters.
Ethical Conduct and Anti- Corruption	×	×	According to the Transparency International Corruption Perception Index the KR is ranked high among the countries most prone to corruption. KGC has a zero tolerance policy for unethical behaviour and has always been committed to fair and transparent operation.
Fostering Local Economies		×	Our economic performance plays significant role in the Kyrgyz economy, providing 9.8% of GDP in 2019, jobs for more than 3,600 people, supporting local producers and investing into local communities.
Local Communities	×	×	Constructive dialogue with the local communities is a key to our successful cooperation and uninterrupted operations.
Occupational Health and Safety	×		Our employees receive regular health checks and support, are provided with high quality personal protective equipment, and receive health and safety training to protect themselves and co-workers. Our motto is "No job is so important that we cannot take time to do it safely".



## 1.5 BUSINESS ETHICS

Recent high-profile cases of corruption and bribery in the industry and increasing diligence on the part of regulatory agencies means that corruption in many developing countries has increased the risks of noncompliance with the existing anti-corruption standards, which can entail significant protection costs and cause serious damage to our reputation. This risk exists despite significant efforts undertaken by Centerra and KGC to ensure that we operate in accordance with all applicable regulations and internal policies. According to Transparency International Corruption Perception Index, Kyrgyzstan is ranked high among the countries most prone to corruption.

KGC has a zero-tolerance policy for unethical behavior and has always been committed to fair and transparent operation, upported by our Code of Conduct, Code of Ethics and International Business Conduct Policy (collectively, the "Policies"). The Code of Conduct provides an ethical framework for employee decisions, actions and behavior. It outlines the principles for appropriate conduct and explains the standard of behavior expected at KGC. Important concepts include:

- preventing conflicts of interest that may impede an employee from performing the work properly and in the best interests of the Company;
- and keeping the company's information confidential.

International Business Conduct Policy is anti-corruption and regulates KGC's business conduct with Government Officials and prohibits any employee from doing or offering anything of value, including cash, to Government Officials to obtain benefits for KGC or Centerra.

These Policies contribute to creating a workplace

culture that encourages and supports staff to act in a transparent, ethical, legal and fair way. To highlight the importance of our commitments, our employees provide formal acknowledgment of awareness on these Policies and undergo regular in-person and online training on an annual basis.

The Company has also established internal financial and other controls to (a) prevent corrupt payments from being made, (b) detect any such payments that are made, and (c) outline KGC actions if challenged by enforcement authorities. KGC requires accurate documentation from all of our partners. KGC maintains records that accurately reflect all transactions — payments, expense reimbursements, gifts, business entertainment, commission payments, fees and other dealings with prospective clients, agents, subsidiaries and other affiliates.

Centerra has established a Compliance Hotline to allow employees and other stakeholders to anonymously submit in good faith allegations of noncompliance with our Policies.

The Compliance Hotline is available in English, Russian, Kyrgyz, and the languages of the countries where Centerra operates and can be accessed at [www.clearviewconnects.com](http://www.clearviewconnects.com).

The Hotline is confidential and available 24 hours a day and is operated by a third party provider.

### Training on International Business Conduct Policy, Code Of Ethics and Anti-Corruption Programs

In 2019, Centerra recorded and released an online anti-corruption training video to provide selftraining and raise employee awareness. The training objective is to raise employee awareness regarding Anti-Corruption legislation and Centerra's Anti-Corruption programs including the International Business Conduct Policy and the Code of Ethics. The video is available to all Kumtor employees.

#### Centerra's Policies on Code of Ethics & International Business Conduct

- Conflict of interest
- Confidentiality
- Compliance with Laws
- Compliance with good disclosure practices

- Anti-bribery & accounting provisions
- Prohibited & allowed payments
- Due diligence in third-party relationship
- Indication of corruption ("Red Flags")

- Risks and potential impact to the Company, its employees and partners
- Compliance Hotline reporting
- Annual certification of compliance



# HONESTY & INTEGRITY

HOW WE CONDUCT BUSINESS IS IMPORTANT TO US



As Kumtor employees you agreed to comply with two important policies\*, discussed below.

Non-compliance with these policies can result in **disciplinary actions**, including reprimands, demotions, suspensions and **dismissal of employment**.

Non-compliance with these policies may be contrary to applicable laws.

## 1. CODE OF ETHICS AND GIFT REGISTRY POLICY:

### Conflict of Interest

A conflict of interest can occur when an employee has a private interest in the outcome of a business decision.



✓ If there is any doubt whether a conflict of interest exists, talk to your supervisor, any member of management, or submit questions anonymously and confidentially via the Compliance Hotline (see below).

If you have an actual conflict of interest, disclose it in writing to the Vice President, Human Resources.

✗ Don't make any actions or decisions that may create a conflict of interest between you and Kumtor.

### Confidentiality

As a Kumtor Company employee, you receive a lot of information about it.



✗ Don't disclose any confidential information about the Company to any member of the public, whether orally or in writing.

Don't speak to the media in the name of Kumtor without permission to do so.

## 2. INTERNATIONAL BUSINESS CONDUCT POLICY:

### Improper Payments

Don't pay, offer, promise any money or thing of value to any Public Official (Government members, employees of any gov. department, ministry/agency, etc., see the full definition in the Policy) in order to obtain/retain contracts, business or any other advantage for Kumtor. This includes money, gifts, entertainment, kickbacks, loans, rewards, the provision of facilities or services at less than full cost, and an advantage or benefit of any kind (whether from corporate funds or assets, or personal or other funds or assets).



✓ Report immediately, if asked to make an Improper Payment. No one will suffer a demotion or penalty for refusing to make an improper payment, even if it results in adverse consequences to Kumtor.

### "Books & Records" Provisions

Kumtor is required to make and keep books, records and accounts which accurately and fairly reflect the transactions and dispositions of its assets, and to devise and maintain a system of internal controls.



✓ Record transactions in conformity with accepted methods of financial recording.

Record transactions in ways that permit the preparation of statements in accordance with international financial reporting standards.

✗ Don't misrepresent, conceal or falsify financial books or records.

## HOW TO REPORT IF YOU HAVE A CONCERN?

### YOUR SUPERVISOR

#### @ HR DIRECTOR

deon.badenhorst@centerragold.com

#### @ CENTERRA GOLD (for concerns

beyond Kumtor management)  
yousef.rehman@centerragold.com



### COMPLIANCE HOTLINE

[www.clearviewconnects.com](http://www.clearviewconnects.com)

Within North America (toll-free):

1-866-841-8609

Outside North America:

1-647-438-1938



### clearview-centerra

(audio only)



ClearView Connects™

P.O. Box 11017  
Toronto, Ontario  
M1E 1N0  
Canada



### AUDIT COMMITTEE CHAIR

To Centerra Gold headquarters. In a sealed envelope marked "**Private and strictly Confidential - Attention: Chair of the Audit Committee of Centerra Gold Inc.**"



Our Compliance Hotline is available in English, Kyrgyz (on-line only) and Russian.







## 2. ECONOMIC VALUE

### 2.1 ECONOMIC PERFORMANCE

KGC is the largest private sector employer and taxpayer in the Kyrgyz Republic. In 2019 KGC operations accounted for 9.8 % of GDP and 20.8% of aggregate industrial output.

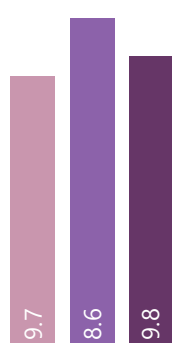
In 2019, payments made within the Kyrgyz Republic (including taxes, refining fees and payments for goods and services to local suppliers, payments for infrastructure, charitable support, etc.) exceeded \$366.9 million.

Total payments within the Kyrgyz Republic since 1994 have now exceeded \$4.1 billion. Our strategic community investment programs in 2019, described in the Social Responsibility section, were \$1.4 million. We continue to contribute 1% of gross revenue to the Issyk-Kul Development Fund for support of social and community projects. The Fund is controlled by the government and is under supervision of local authorities with the aim to develop social infrastructure such as schools, clinics and kindergartens in Issyk-Kul Oblast. However, realizing the importance and relevance of implementing sustainable socio-economic projects that will contribute to economic growth, the

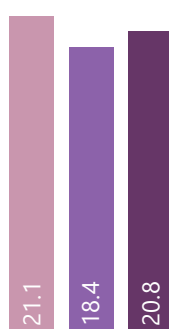
Development Fund has started to provide interest-free financing of budget-forming business projects aimed at creating jobs and developing the Issyk-Kul region. In 2019, financial support was provided to entrepreneurs from Balykchy, Jeti-Oguz and Ton districts. In 2019, we paid \$8.5 million to the Fund.

In addition, the Kyrgyz government, through the state owned mining company Kyrgyzaltyn OJSC, remains the largest single shareholder of Centerra Gold, owner of KGC. By the end of 2019, KGC employed 3,033 people, including contractors, with Kyrgyz nationals making up more than 99% of full-time staff, which is detailed further in the People section.

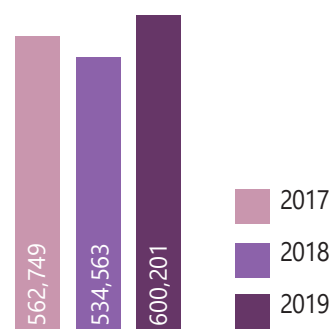
#### 2.1 Kumtor's share of GDP, %\*



#### 2.2 Kumtor's Share of Total Industrial Output (%)\*



#### 2.3 Gold production (ounces)



\* Kumtor's macroeconomic impact in the Kyrgyz Republic SOURCE: Kyrgyz Republic National Statistics Committee (preliminary data).



## 2.4 Direct economic value generated and distributed<sup>1</sup>

Indicator	2017	2018	2019
Economic value generated			
Revenues from Gold sales	685,163,279	660,058,489	827,537,641
Other income <sup>2</sup>	4,069,740	1,126,089	2,302,370
Economic value distributed			
Operating costs (goods and services) <sup>3,5</sup>	206,804,840	222,831,431	209,404,804
Corporate administration costs	-	-	-
Exploration costs		6,090,617	11,302,849
Capital expenditure <sup>4</sup>	78,745,280	60,429,073	54,642,620
Other operating costs	2,469,333	3,097,024	12,155,184
Employee and contractor wages and benefits	117,237,524	117,800,253	120,699,331
Payments to providers of funds (shareholders)	400,000,000	100,000,000	188,000,000
Taxes and royalties	96,729,304	92,988,345	116,416,807
Community donations and investments	1,035,343	2,603,835	1,644,367
Payments to Cancer Support Fund <sup>6</sup>	7,000,000		
Payments to Nature Development Fund <sup>6</sup>			61,100,000
Payments to Social Partnership for Regional Development Fund <sup>6</sup>			5,951,665
Economic value retained	(220,788,605)	55,344,000	48,108,760

### Notes:

1. Data has been prepared on an accrual basis and non-cash costs have been omitted.

2. Other income includes income from financial investments, sale of assets, and other services.

3. Includes capitalized overburden stripping costs.

4. Excludes capitalized overburden stripping costs.

5. Includes by-product sales (silver).

6. Payments to the Nature Development Fund, Cancer Care Support Center and Social Partnership for Regional Development Fund are made in accordance with the Strategic

Agreement signed among the Government of the Kyrgyz Republic, Centerra Gold Inc, Kumtor Gold Company CJSC and Kumtor Operating Company CJSC as of September 11,

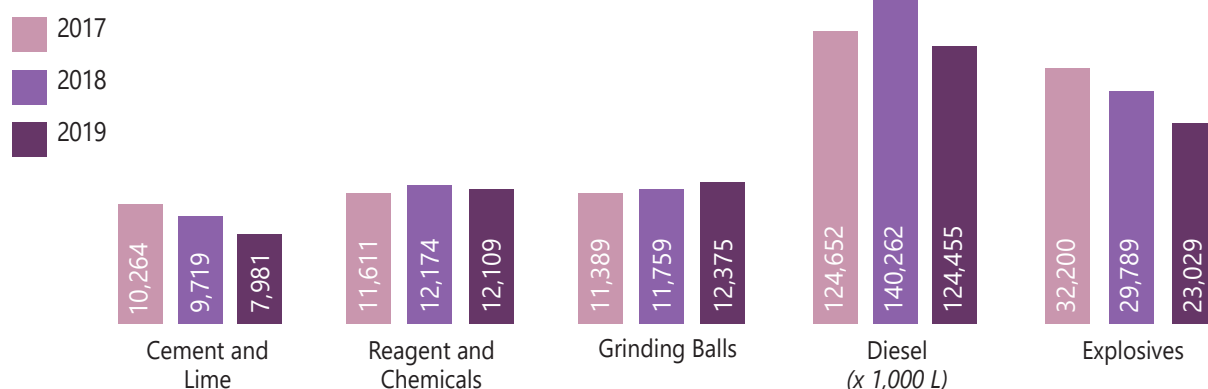
2017, and as part of the unilateral obligation of Kumtor Gold Company CJSC as of August 7, 2019.

## Consumption of materials

Mines are large consumers of supplies and materials for both the operations and the working community. Efficient use of materials is essential for both economic and environmental reasons. The major raw materials consumed include diesel fuel, explosives, lime, reagents and chemicals (including cyanide) used in the milling and leaching processes, and grinding balls to crush the ore.

We also consume significant quantities of other non-renewable materials such as fuel, lubricants, grease and explosives.

## 2.5 Major Consumables (tonnes)





## 2.2 LOCAL PROCUREMENT

One of KGC priorities is to procure goods in the local market. The goods and services should meet strict criteria, which we bear in mind when considering such factors as market stability, quality and price.

We are convinced that KGC strategy for local procurement creates significant economic benefits for Kyrgyzstan at the local, regional and national levels. Procuring goods and services in the local market results in new jobs and sources of income, acquisition of new skills and technologies and helps in establishing vital local enterprise networks as well. Thus, local procurement provides direct possibilities for creating common benefits for both KGC and the communities where the Company operates. About 2/3 of active KGC suppliers are residents of the Kyrgyz Republic. For more detailed information on local procurement strategy, see the company website in the section "Procurement and logistics" ([www.kumtor.kg/en/procurement\\_logistics/](http://www.kumtor.kg/en/procurement_logistics/)).

To maintain a continuous production, we procure more than 11,000 goods and services supplied by nearly 600 enterprises operating in the territory of the Kyrgyz Republic. Since 2008, 100% of food products are procured in the local market. We will discuss our partners - the local producers - below. Throughout 2019, KGC continuously engages contracting organizations, the majority of which is based in the Issyk-Kul province. This is about 1,100 employees of various trades and qualifications.

We actively inform potential suppliers of goods and services, explain our requirements and advise on the criteria that should be met in order to get a higher chance of entering into partnership with KGC. The Company actively participates in seminars and sessions organized by the International Business Council, the Chamber of Commerce and Industry and other business associations to establish direct contacts with suppliers. In particular, during 2019, representatives of Procurement department participated in the round table "Entry into force of the Strategic Agreement on Environmental Protection and Investment Promotion among Centerra Gold Inc. and the Government of the Kyrgyz Republic: strategic importance for the socio-economic development of Kyrgyzstan" in Karakol, the forum "Eurasian week", presentation sessions for students of higher educational institutions of the Kyrgyz Republic, etc. In November 2019, a large-scale presentation was held in Bishkek for suppliers in order to expand the base of suppliers and increase the categories of goods and services purchased in the Kyrgyz Republic.

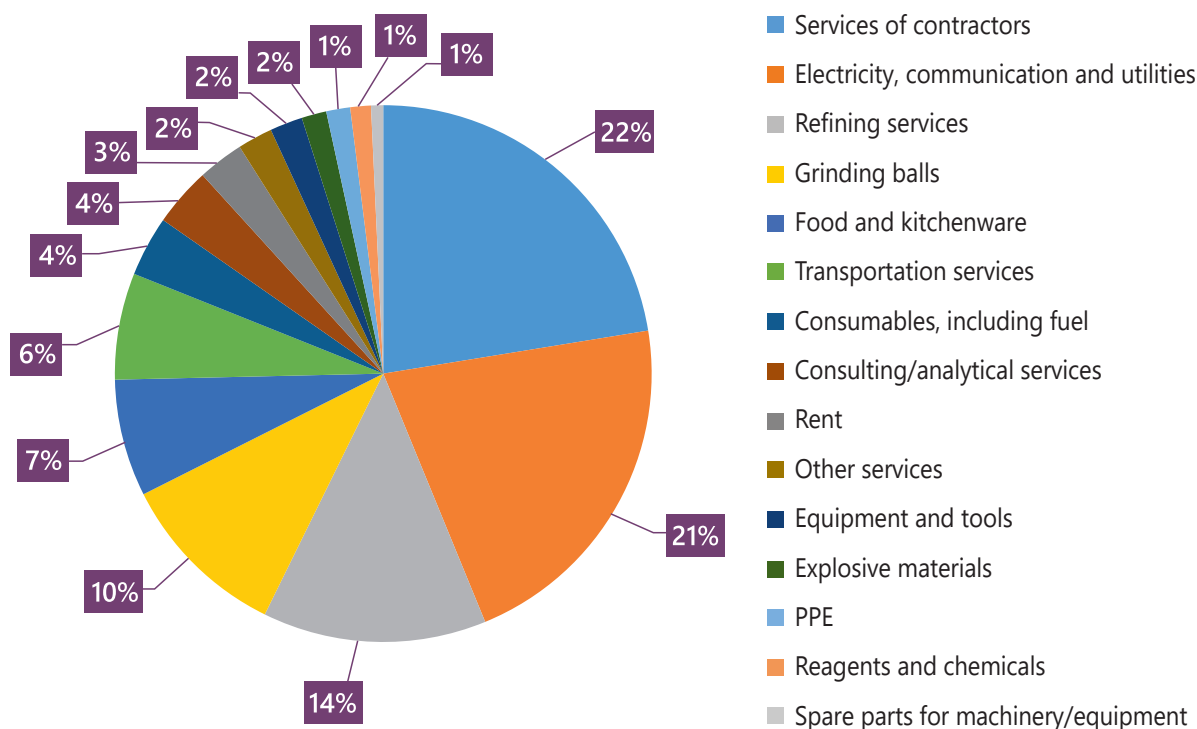
### 2.6 Local procurement in context

	Units	2017	2018	2019
Total Payments for Goods and Services	USD	266,126,258	317,703,765	285,090,753
Local Payments for Goods and Services	USD	60,385,333	81,176,660	70,760,657
Local Payments for Goods and Services as % of Total	%	23	26	25

As always, the largest part in total expenses for goods and services purchased in the Kyrgyz Republic consists of payment for services of contractors, payment for electricity, communications and utilities, transport

services, payment for refining services, payment for food, grinding balls. Most of contracting organizations are based in the Issyk-Kul region.

## The main categories of expenses for local purchases



Making purchases from the local market provides significant benefits not only for the Company but for the local market as well. This is one of the most efficient ways for the Company to retain its social license to operate, strengthen relationships with the Kyrgyz Government and improve the efficiency of the Company's supply chain. The primary objective of KGC Procurement department is to increase volumes and range of goods and services procured by KGC in the local market, which pursues common benefits for both the Company and the country as a whole. Examples of successful cooperation are enterprises of Issyk-Kul region such as Aiko- Seiko, Ak-Jalga, Sut-Bulak, Issyk-Kul Resource, Avtovneshtans LLCs, etc.

Many of our suppliers highlight that the contract to supply KGC with products is a mark of quality that makes their production more attractive to other customers. It is very important for the Company to ensure that all its projects and initiatives that are currently supported by Kumtor become independent, sustainable and profitable for local budgets and local communities by the end of LOM in 2026.





# LOCAL PROCUREMENT

## CHALLENGES OF PROCURING GOODS LOCALLY:

### Businesses are informal

- not registered
- not paying taxes
- not keeping good records
- not using bank facilities

### Poor health and safety practices

- danger of food-borne illnesses
- products do not comply with international standards
- no certification

### Small production capacity

- unable to supply large business demand
- no export potential

### High production cost

- unable to compete with bigger, more efficient enterprises abroad

### Low cash-flow

- unable to survive if they get paid 30 days after invoicing (standard for big businesses)

## HOW KUMTOR IS HELPING:

### Requires good business practices

- licensing and registration
- paying taxes
- record keeping
- use of bank facilities
- compliance with international health and safety standards & provide training

### Helping businesses development

- fostering relationships with other development partners such as EBRD, who can help finance businesses
- helping businesses to harness national resources
- participating in meetings of International Business Council, Association of local businesses JIA, GIZ Office in KR

### Pays more for local goods in the short run

- allows small businesses to compete for lucrative contracts
- provides stable revenue for businesses to grow and improve

### Flexible Supplier Payment System

- paying faster, sometimes even in advance

## EFFECT ON THE LOCAL ECONOMY:

### Formalization of business practices

- reduces corruption
- provides government revenue to pay for roads, schools, etc...
- job creation

### Implementation of Health and Safety Standards

- lower risk of food borne illnesses
- access to new markets which have similar standards

### Bigger production capacity.

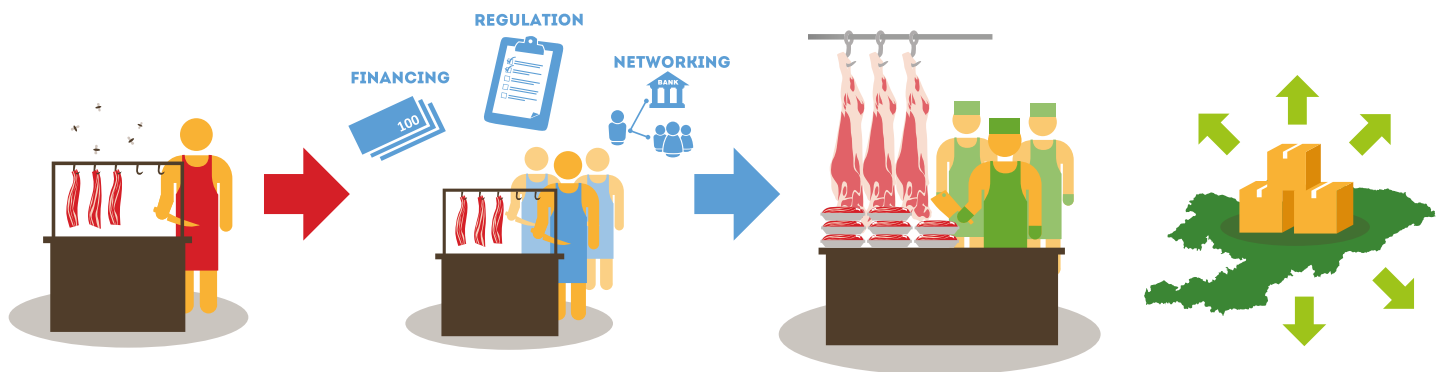
- ability to supply larger companies
- potential to export surplus products
- ability to support themselves after mine closure

### Business Growth

- stronger, more self-sustaining economy

### Competitiveness

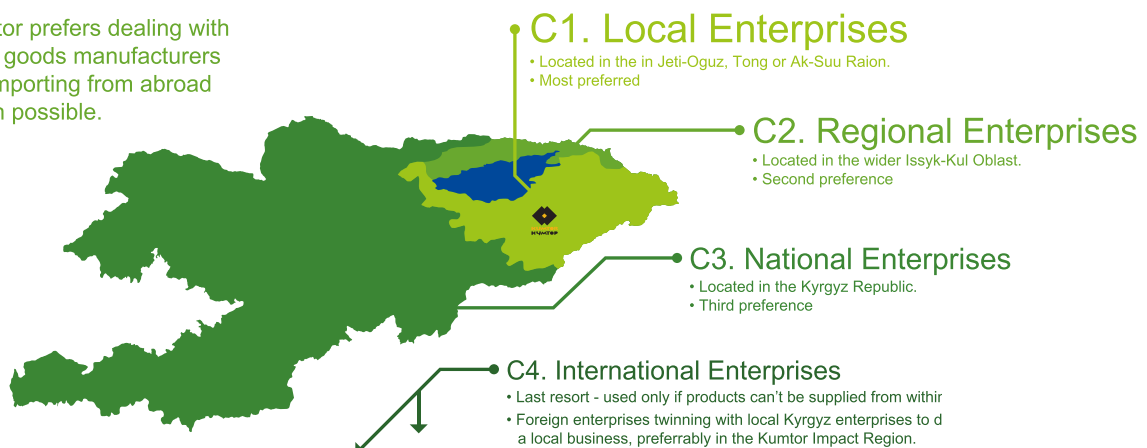
- ability to compete with larger, more affluent enterprises for Kumtor contracts



## Who is eligible to be a supplier?

- Businesses who meet Kumtor's health and safety standards;
- Businesses who are licensed by the government and approved by Kumtor;
- Businesses who are not likely to have a conflict of interest, of any kind, with Kumtor.
- Businesses who can provide competitively priced goods and services on a sustainable basis.

Kumtor prefers dealing with local goods manufacturers vs. importing from abroad when possible.





Since the regions have little experience in cooperation with large-scale projects or modern mining enterprises, we face a number of difficulties with supplying goods and rendering services like most international mining companies that operate in them. Nevertheless, we support potential suppliers in the local market that cooperate with us and help them overcome these barriers. Because of Kyrgyzstan's entry into the Eurasian Economic Union, in 2018 a number of goods and services items previously procured in the international markets was replaced with domestic goods. Thus, proportion of goods and services procured in the local market has significantly increased.

Despite the constant effort we make to improve the local market, there are still many goods and services that are not produced or not available in the Kyrgyz market. Specialist operational equipment and related services, large dump trucks, spare parts from the manufacturer, tires, main consumables and chemicals may serve as an example. In spite of our being a major consumer of fuels and lubricants, we have to import a major part of them.

Our total expenditures on goods and services in 2019 made up nearly \$285 million. About \$71 million of this sum was spent on procurement in the territory of the Kyrgyz Republic.

## Leaving a positive legacy

The current estimated life of the Kumtor mine is until 2026. We want our positive impact on the Kyrgyz economy to continue after this. We do everything possible to ensure that the local suppliers use our cooperation to develop their business and diversify their customer base. We also set a goal for ourselves – to leave a positive legacy, which in future will become a driving force of the extractive sector and related industries. Therefore, we help the entrepreneurs to develop their business and not rely on KGC as their sole client.

We want our suppliers to become more successful and keep creating new jobs and possibilities for the local communities.

## Balykchy marshalling yard

Balykchy Marshalling Yard (BMV) is a central transport hub intended for transit storage of materials, which are delivered by train and trucks. The materials are delivered to the Kumtor mine by KGC trucks and the vehicles of contracting organizations (as required).

- On average, 204 rail cars and 58 haul trucks deliver goods to BMV each month.
- Every day BMV sends approximately 22 haul trucks with goods and materials to the mine. Usually each convoy consists of 11 trucks with fuel, 6 trucks with ammonium nitrate, 1 truck with lime, while the remaining haul trucks transport sectional containers with the equipment and chemicals.
- Our own fleet includes 46 trucks. Moreover, we typically utilize 1-2 trucks per day from contractors.
- The distance from BMV to the mine is 250 km, which means that the total distance the Company's trucks cover each month is 341,000 km. The total volume of fuel transported is about 10 million litres each month.

BMV has a fuel farm with a truck filling station, six tanks with a volume of 12,000 m<sup>3</sup>, two tanks of 100 m<sup>3</sup> to fill the trucks with fuel oil, and one tank with a volume of 200 m<sup>3</sup> for gasoline. Moreover, there are warehouses, vehicle repair shops, administrative buildings and one guesthouse as well. Two hundred and one people work at BMV. The Company's strategy is to recruit the employees who reside in Balykchy and nearby villages. We procure materials and goods in Balykchy, consume maintenance services and the services required to meet daily production requirements of BMV and guesthouses.



## 3. PEOPLE

### 3.1 WORKPLACE PRACTICES

We value each of our employees and their professionalism, and strive to maximize the development of their abilities, talent, and energy in a working environment that allows them to make a personal contribution to the company objectives.

#### Employment of personnel

KGC plans staffing requirements and improves the professional level of its employees to ensure effective operation of the enterprise. KGC seeks to hire employees, who meet the established qualification criteria for production expertise, as well as theoretical and practical training. We continue to increase the percentage of the Kyrgyz Republic citizens among the Company staff, raising it from 95% in 2011 to 99% by the end of 2019.

#### Labour compensation

The Company establishes a system of labour remuneration that allows attracting and retaining highly qualified personnel, as well as ensuring decent payment for individual and collective labour of employees.

Staff salaries far exceed the average for Kyrgyzstan: in 2019, the minimum wage in the KGC was approximately ten times higher than the minimum wage in Kyrgyzstan. The desire of many local employees to stay with our Company for a long time demonstrates that they are satisfied with their wages.

#### Employee benefits

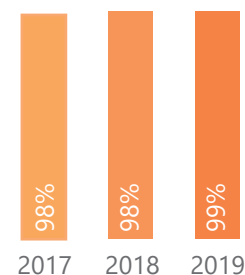
Our employees enjoy the following benefits:

- Funds for health improvement (vouchers to resorts, material assistance for treatment, membership cards to gym halls, etc.);
- Allowances for the celebration of employee anniversaries, in connection with retirement, when entering into the first marriage, at the birth/adoption of the child;
- Home improvement loans;
- Vacation pay for health improvement of employees;
- Funeral allowances and many other benefits.

#### 3.1 Standard National Entry Level Wages and Those Paid by Kumtor

	Units	2017	2018	2019
Kyrgyz minimum wage per hour	KGS	7.14	10.06	10.58
Kumtor entrylevel wage per hour	KGS	94.62	99.35	109.18
Kumtor entrylevel to Kyrgyz minimum wage ratio		13:1	10:1	10:1

#### 3.2 Proportion of Kyrgyz Citizens as Full-time Staff







## Leading from Within Program

One of the core values of Centerra is: "Win as a Team". To achieve this, we must provide each member of our team the opportunity to contribute to the development of the Company by maximizing employees potential. The program "Leading from within" is the starting point in the journey to unite different, special and valuable personalities. We know that in the mining industry, men represent the majority of the workforce, and that women often face certain difficulties. Therefore, over the next few years we will work together to eliminate these difficulties, regardless of whether they are objective or subjective. The program is a first bold step in this direction.

The program was developed by consulting company Davis Pier. The program is available to all female KGC employees, at all levels, with participation based on a voluntary basis.

Centerra strives to ensure gender diversity and equal opportunities for all its employees. The management team understands that improving the quality of work, production indicators, safety, as well as improving the effectiveness of innovation takes place only when each employee feels valued and supported in striving to achieve the best results. That's what this program was designed for. "Leading from Within" aims to

develop the leadership qualities of female staff, which was created with the active assistance of the management and employees of Centerra; especially women.

The facilitation of this program is carried out through an internal group of women, called "Regional Champions". They were taught how to effectively present the material so that recipients can understand and implement it more easily. These women represent the various positions and levels, as well as all the regions in which Centerra operates. They contributed to the development of the program and will act as "champions" in implementing the program within the company.

In 2019, 71 women of the Company completed the course of the "Leading from Within" Program, 94 women completed the first two modules. In 2020, the Program will be continued at all KGC locations.



## 3.2 INTERNATIONAL WOMEN IN MINING PROFILE



### Nazgul Oskoeva:

"It is not about being a man or woman: it is about being a human being (treat everybody as you want to be treated); it is about dedicating yourself to what you do, acting to add value, continuously improving, knowing where you want to be, never giving up - and it is about choice."

In her 21 years with Kumtor Gold Company (Centerra Gold Inc.), **Nazgul Oskoeva** progressed from humble beginnings in Security and Training to a technical role as the Mill Operations Administrator. She then completed Six Sigma certification and has had opportunities to understand and work in almost all processes of the operation (Mine, Maintenance, Camp, Exploration, Drill blast) within the Continuous Improvement and Risk Management departments. She has held the role of Procurement and Logistics Manager since 2018.

#### Please describe your current role.

I am so grateful to my colleagues that they challenged me to take my current Procurement and Logistics Manager position. There is still such a wide sphere for me to discover, although I have been in this role for more than a year. I have a very different view of this function compared with what I thought from 20 years of being an end-user. Procurement covers everything horizontally from manufacture through compliance and shipment to the consumer, and vertically through the necessity to understand detailed mining processes to supply a correct pump or reagent. At the same time, you have to be good psychologist to build bridges between suppliers and end-users, and smooth the path to match all parties' wants and needs. We compare our activity with that of a genie, but, in his case, Aladdin had to work out exactly what he wanted: in our case, end-users often do not know exactly what they want. So our objective is to be able to understand the request, source it from all around the world at adequate price and quality, arrange optimal ways to deliver it, ensure that it is compliant, and arrange its availability within a click of a mouse. My role is to make sure the process goes smoothly and continuously improves with a motivated procurement and logistics team, satisfied end-users, and responsible suppliers forming a compliant base.

#### What is your experience of being a woman working in the mining sector?

I am proud to be part of such wide-scale production. Proud to be a woman among a male-dominant operation. Proud to be in a team exploring new challenges. Proud that I achieved where I am currently by merit. With my current mind-set, I would not even feel a tiny hint that females and males can be differently perceived in mining and cannot provide another example of an enterprise where such equality permeates throughout the organization.

But, if I had been asked this question few years ago, especially at the beginning of my career, I had the 180° opposite opinion. I would agree that, for a woman, it would be more comfortable to be a teacher or a doctor. I have to note that, in addition to the concept that "mining is a male business", our Asian culture places women in secondary roles and this was more difficult to cope with early in my career, particularly given my young age at that time. Yes, I can tell you that I was making the lunch table for those in the office and washing dishes after them!

Moving from one position to another and growing in experience and promotion, I heard a lot of "how can such a young girl teach and tell us what to do?...how does she dare to ask questions?" and I felt disdain and disparagement from the "adults". But I had a goal – to learn, know, and become proficient in what I was doing. I love challenges—and challenges love me. Every new position I took on was new for the company. I worked hard to understand it so I that could equally talk to anyone, whether it was a Mine Engineer, Mill Manager, or Maintenance Planner.

It is not about being a man or woman: it is about being a human being (treat everybody as you want to be treated); it is about dedicating yourself to what you do, acting to add value, continuously improving, knowing where you want to be, never giving up, and it is about choice. You choose to either give up or continue finding alternative ways: it makes you stronger. With such, all negatives become redundant and your surroundings build your path to the goal.

#### What are you passionate about in your work?

Challenges and Changes! I own challenges and changes for the achievements I have won. Development cannot happen without ups and downs. I mentioned above that I was lucky to be a leading part of teams bringing new programs to our company. Unknowns motivate me to stay late, to work during weekends, to delve in and work on solutions, even if you find that these solutions are not what you actually wanted.

It is surely better to try and regret than not to try and regret.

#### What challenges have you experienced by virtue of working in an industry that is predominantly male? Do you feel you have had to adapt to 'fit' the industry?

Again, with my current mind and age (42), if I went to work for any other western mine I would need to adapt to the processes and to the male environment. Here in Asian countries with a conservative culture, you have to adapt to the male-dominant culture; you have to be careful with your words and actions, you have to prove that you merit respect, that you are capable of doing the same job.

#### Do you believe women in mining groups can help to change the image of the industry and make the sector more attractive to women?

100%. I am ready to share my experience, prove more, and motivate women to be brave, to be self-assured, work on themselves, and be part of the movement that is changing the world.

#### Any advice to young women starting out in their careers? What do you wish you'd known when you were 25?

Do not be afraid to go and learn historically male subject specialties. It is challenging, but you will be surprised that you are easily able to do it. Go and study metallurgy, mining, engineering. Be brave, do not be shy to express your opinion if not in among the crowd, but find a person you can trust, share your ideas, ask for tasks, take on more challenges. When you are young – you can move rocks! You always have a choice: keep feeling sad and complaining, or look for solutions and open up new opportunities.

Source:

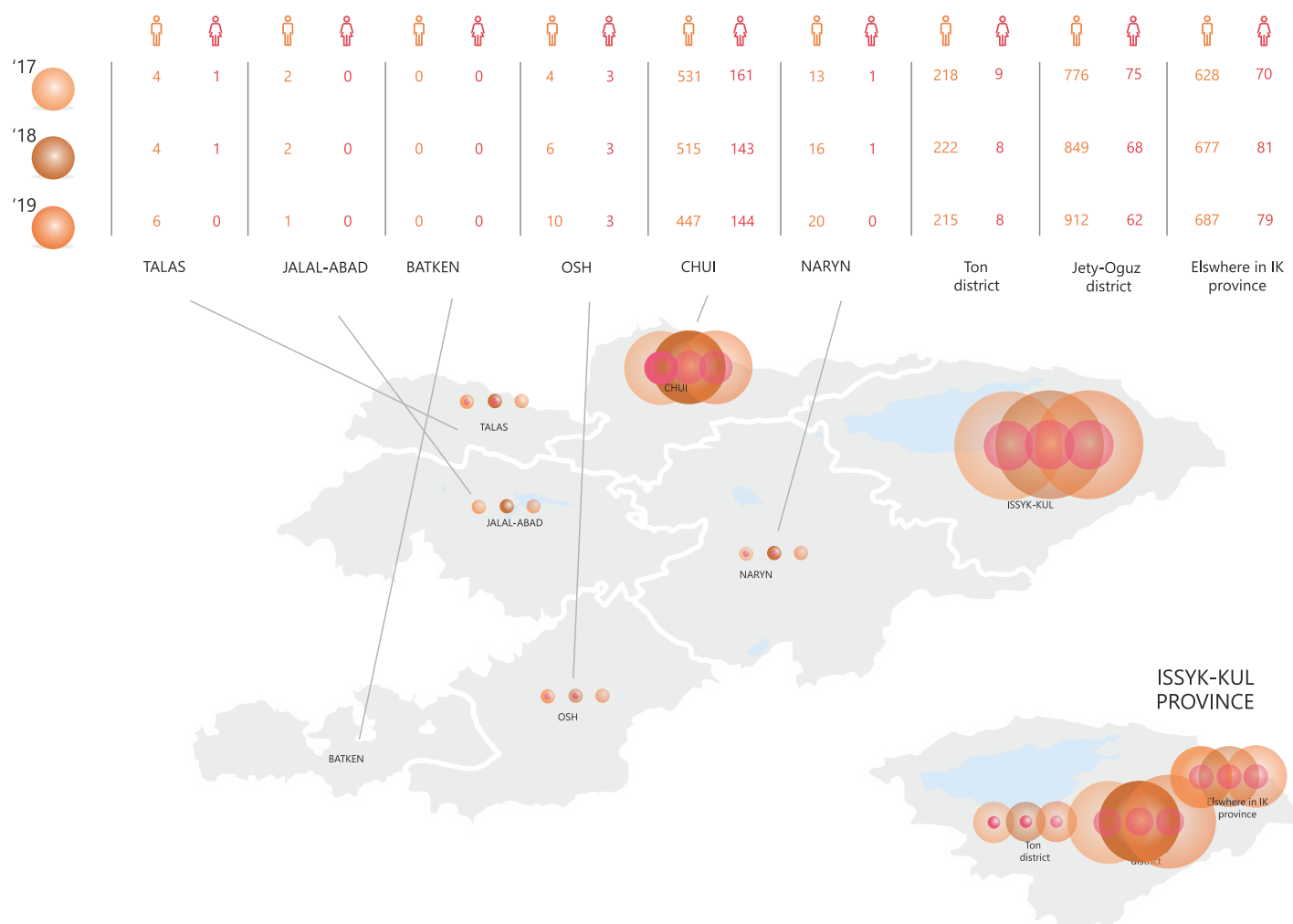
<https://internationalwim.org/nazgul-oskoeva/>



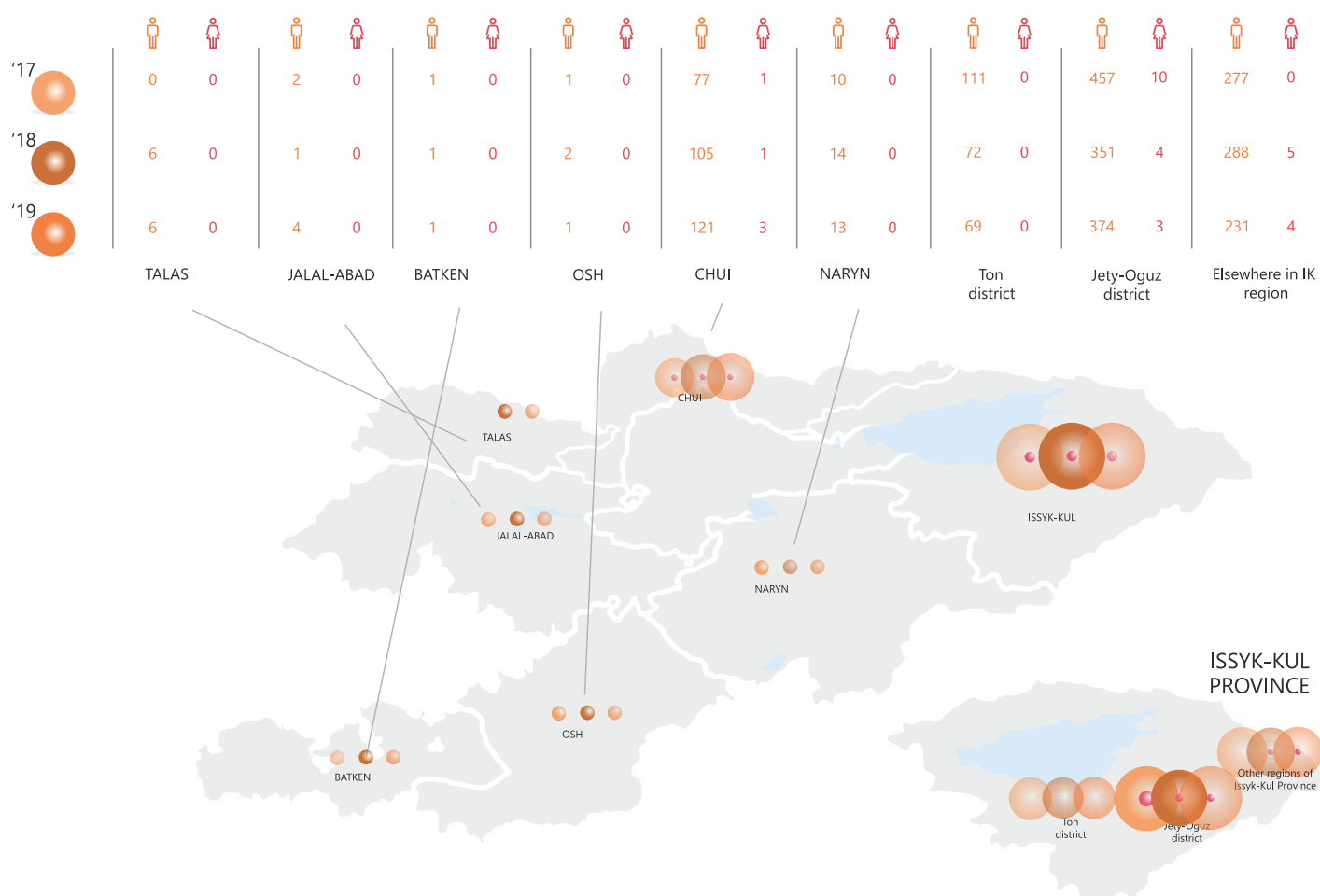
### 3.3 Employee demographics at KGC



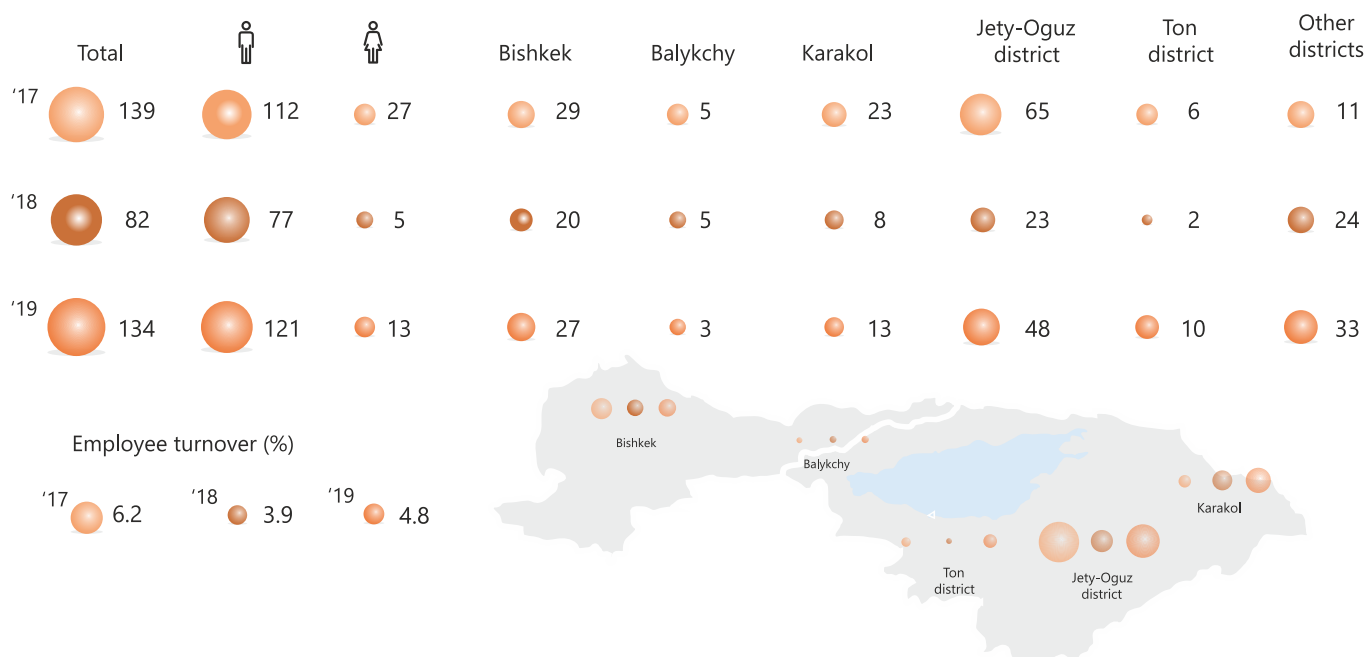
### 3.4 Total workforce by region and gender



### 3.5 Number of contractors by region and gender



### 3.6 Total number and rates of new employee hires and employee turnover by gender and region



# KUMTOR HIRING PROCEDURE

The Company has adopted the following procedure for selecting candidates:

## FIND INTERNAL CANDIDATES

We give current employees, who are interested, the chance to apply for an open position first.

**WHEN QUALIFIED INTERNAL CANDIDATES CANNOT BE IDENTIFIED, A FORMAL RECRUITMENT CAMPAIGN IS HELD.**

## EMPLOYMENT OPPORTUNITY ANNOUNCEMENT

Advertising for an open position is done through media (newspaper, TV, web). If necessary, position announcements are distributed in local communities. The Sustainable Development department uses all possible channels to notify the community through local administration.

## APPLICATION

Application forms are available at all Company offices - located in Bishkek, Karakol and Balykchy.

Applicants must have the minimum required qualifications, skills, and experience to be considered.

## INTERVIEW

The top candidates whose skills, education, and experience best fits the position will get interviewed.

## SELECTION

Based on the selection process results, the most suitable candidate's applications are provided to the management for approval.

Before employment, a successful candidate must undergo a medical examination and training on occupational health and safety.



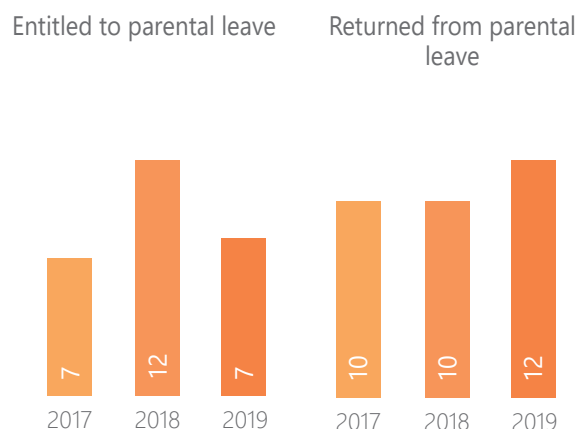
**ATTENTION!**

**Employment at Kumtor is not for sale.**

**You should not have to pay anyone.**

Please contact 0800 223-23-23 or 0312 90-07-07 if you are approached with a job for money offer. Such offers are illegal and go against Kumtor policy.

### 3.7 Return to work and retention rates after parental leave (female employees)



### Recruitment process

The Company seeks to ensure consistent and successive staffing of the business through the recruitment of individuals in accordance with the required qualifications, inclusive of education, academic and practical training, working experience, personal qualities, etc.

The selection and hiring of staff for the Company is coordinated and administered by the Human Resources Department, subject to prior approval from the KGC management, in conformance with the principles of efficiency, due diligence, fairness and good corporate ethics. Our recruitment process is covered in the infographic on the previous page.

### Employee training

The Company is focused on the development of professional knowledge, skills and qualifications of employees required to ensure safe and efficient fulfillment of their duties, as well as on the development of their leadership potential. In 2019, 3,845 employees completed various types of training. The total training hours for all types of training was 133,026 hours. Compulsory training is arranged in three KGC training centers in Bishkek, Balykchy and Karakol. Compulsory training hours:

- Induction briefing and initial safety orientation – 20,681 hours
- Annual safety refresher sessions – 25,358 hours.
- First aid training – 9,256 hours.

The company also retains external trainers that provide various types of training.

KGC provides employees with the opportunity to participate in various programs, short-term courses, seminars, conferences and other events, both on the territory of the Kyrgyz Republic and abroad. These programs are related to the employee's professional specialization, business and management, technological processes, and development of professional skills. This training would normally be a part of the employees' individual development plan and a part of the overall KGC succession plan.

In 2019, KGC continued its work on personal development of employees and supervisors as part of the Corporate Business Training Program, aimed at creating a team spirit, developing emotional intelligence, time management, conflict management, etc. This training is provided by both external suppliers and a business coach to develop leadership skills.

Recognizing the importance of investing into the younger generation and training of professionals, KGC implements a Graduate Internship Program and a Summer Student Program for the Kyrgyz University students. These programs are aimed at achieving professional goals by young professionals, identifying and developing the talents of young people, providing a high-quality personnel reserve for the Company, and establishing a basis for further career growth of interns and summer students. The Regional Scholarship Program plays an important role in the development of the younger generation, as it provides an opportunity for students completing high schools to get a primary vocational education. The successful applicants are under full scholarship that includes tuition, accommodation, meals and monthly allowance while they attend Technical Vocational School #27 or Technical School #91 in Bishkek. Graduates of the Technical School #91 acquire a specialty of a "Cook/Baker" and after graduation have the opportunity to immediately start working in public catering enterprises. Graduates of the Technical School # 27 acquire a specialty a "Car Service Technician". Educational plan of the Technical School #27 includes a combined type of training – theoretical training is conducted at the school, and practical training is conducted in KGC Mega Shop at the Kumtor mine.





In 2019, KGC continued the work under its Work Safe | Home Safe Leadership Program in the occupational health and safety area. The program goal is to create the persistent culture of health and safety compliance, to be responsible for personal safety and safety of people around, to win as a Team. STOP Conversations is one of the program's key tools, which is used when someone is committing unsafe acts. In this way, every employee shows his/her concern for colleagues, family, friends. In 2019, KGC arranged repeated trainings under the Work Safe | Home Safe program in the amount of 5,035.5 hours.

"Leading the Values" trainings was arranged in 2019 for the KGC senior management staff, which allowed deep understanding and application of the company values: Win as a Team and Responsible Miners. The number of training hours under this program totaled to 5,184 hours. The following events were arranged, as well:

### Kumtor Family Day

A grand festive event for more than a thousand residents and guests of the Balykchy Town in Issyk-Kul Province was arranged for the first time by KGC in July 2019. The outdoor festive event for adults and children was arranged as a part of the Work Safe | Home Safe Program and the special attention was paid to safety issues. Through a game and entertainment process of the interactive, the participants realized that safety is not just boring rules and restrictions, but a very important aspect of life. The grandeur, fascination and edutainment of the event indicate to unity of the KGC team and its commitment to the principles of the Responsible Miner value.

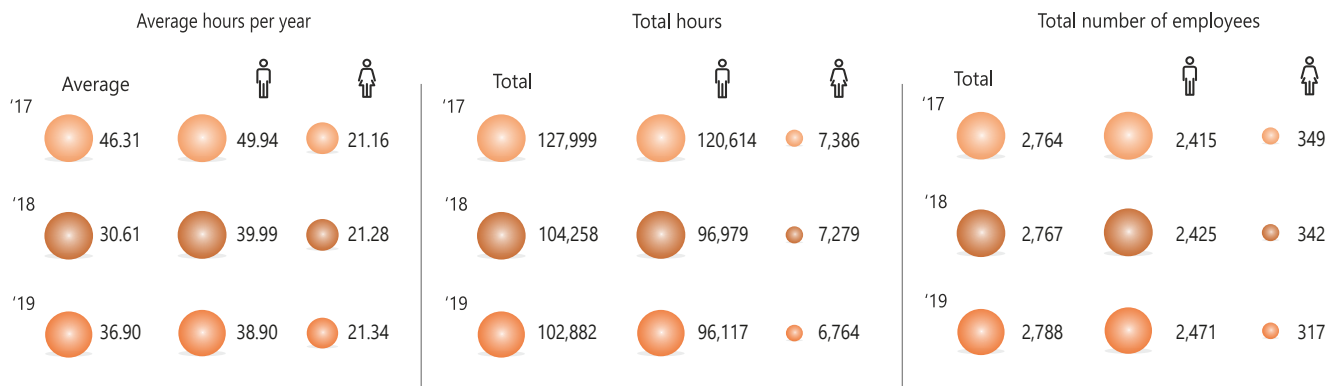
### 2019 Central Asia HR Brand Award

In October 2019, KGC was recognized as one of the best employers in Central Asia, and took a prize among 30 companies in one of the best known and widely reputed award ceremony established for HR professionals of Kyrgyzstan, Kazakhstan and Uzbekistan. KGC has submitted a Work Safe | Home Safe program for a nomination. The projects were evaluated in two stages: individual review of projects and panel voting. The expert panel and jury were composed of HR professionals and of CIS largest companies' presidents. Winning the Central Asia HR Brand Award granted us the status of "Best Employer" as well as the opportunity to share experience with a professional community.

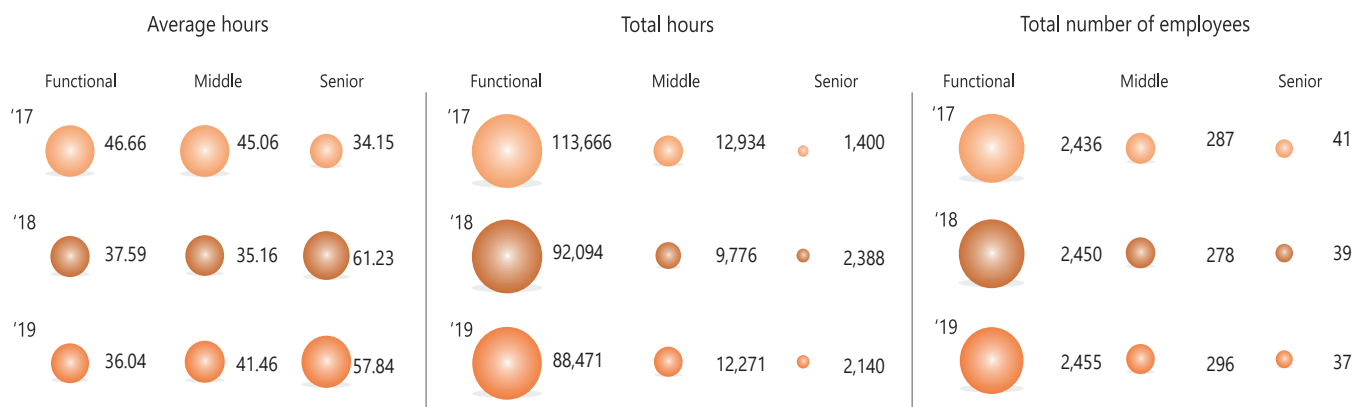


### 3.8 Average hours of training per year per employee by gender, and by employee category (KGC full-time staff)

Training hours by gender



Training hours by employee category



In 2019, professional development opportunities for employees included:

- Educational financial assistance and leave is available to employees to obtain higher education degrees at institutes of higher learning, some examples of this are roles requiring technical diplomas, or where a second higher educational would be beneficial for an employee to advance their career in the company.
- Overseas short program learning opportunities in business, management, employee development and other role-specific programs are arranged for employees allowing them to increase skills and to perform more effectively in their roles. This training would normally be a part of the employees' individual development plan and a part of the overall KGC succession plan;
- Overseas technical learning opportunities in skills development specific to operational departments designed to equip employees with the technical skills to keep up with a changing technological environment;

- In 2019 Professional Development training of KGC Supervisors and Managers continued to be a focus for the company to further develop and enhance managerial skills within the leader team. Several local businesses offering supervisory skills development, effective management techniques and the coaching and mentoring process were utilized;
- Team building and coaching/mentoring sessions for mid-level and senior-level managers providing a venue to build comradery and a sense of working together to achieve the company's business plan. These workshops and sessions are facilitated by a local Professional Development coach under contract with KGC.

Apart from investing in the education and training of current employees, KGC has programs designed for the younger generation – our potential future workers. In agreement with Technical School #27 and Technical School #91, KGC sponsored Red Crescent First Aid Training for Regional Scholarship recipients.





After completing the eight-hour training session, each participant is awarded a First Aid Certificate that is valid for 2 years.

The Regional Scholarship Program for students completing high school and keen to pursue a vocational career, has been running since 2000.

More information about the Scholarship program is available in the Social Responsibility Section of the Report.

## Introduction of the STELLAR HSE system

On November 1, 2019, a STELLAR HSE Management and Tracking online system, a product of ABCanada Canadian developer was officially introduced to the Kumtor project. Kumtor will use the STELLAR HSE program to:

Provide information and track incidents that occur in the course of our production activities;

Provide information and track identified risks arising in the course of production activities;

Keep records and track leading safety indicators, including results of workplace inspections, safety meetings, and training hours.

A key feature of the STELLAR HSE system is assigning responsibility and tracking corrective actions for any incident that is reported, making it easier to identify and resolve issues within a reasonable time frame. In addition, the STELLAR HSE system can produce various statistics, charts and data spreadsheets that will allow KGC to identify safety trends and make improvements where required.



## 3.3 OCCUPATIONAL HEALTH AND SAFETY

When mining at the high altitude of 4,000 meters, the major challenges are living and working in a cold climate and reduced oxygen levels. Average annual temperature is  $-8^{\circ}\text{C}$  with a minimum as low as  $-38^{\circ}\text{C}$ .

KGC employees receive regular health checks and support. They are provided with high quality safety clothing, and receive health and safety training to protect themselves and co-workers. We record and analyze incidents and near misses. The Company has an emergency response team that performs regular training exercises. The motto of the Company is: **"No job is so important that we cannot take time to do it safely"**.

### Medical screening and wellness

Employees of the Company undergo annual medical examinations in various medical institutions of our republic, where they receive an analysis of their health, on the basis of which they are issued a permit to work in the at high altitude. To assist with these examinations, KGC has several contracts with local state hospitals in Bishkek and Issyk-Kul regions. Employees are not allowed to work without the annual medical examination and work permit, which is issued for a period of 12 months. In 2019, 2,226 employees passed annual medical examinations, 115 passed pre-employment screening, 151 employees were referred for special medical examinations and 50 employees were classified as medically unfit to work at the high altitude mine site.

The KGC Medical Department every year conducts partner seminars with doctors from medical institutions engaged in medical examinations of employees. The purpose of these meetings is to receive feedback, improve the quality of medical examinations, eliminate problems, complaints and seek rational proposals. Professionals from the National Center for Cardiology and Therapy are invited to such meetings to advise regional doctors on the tactics of treating altitude sickness, as well as diagnosis and therapy of cardiac patients.

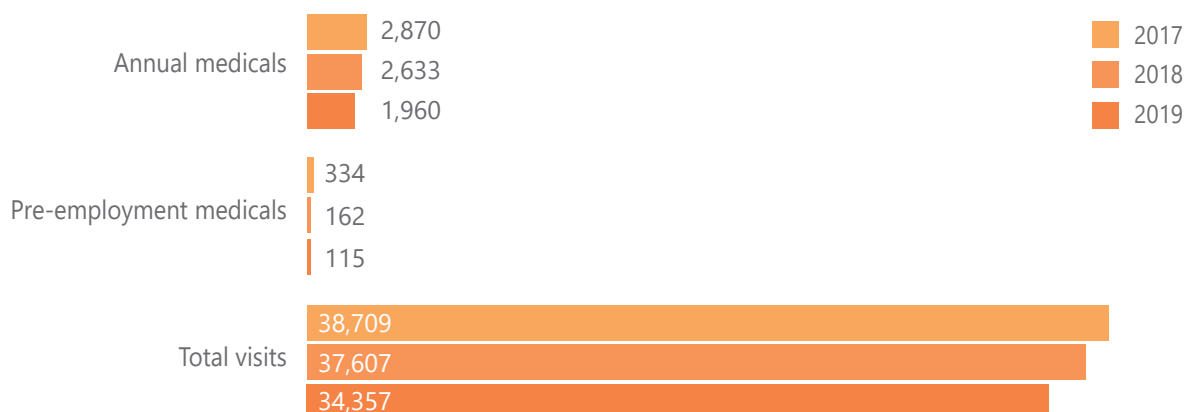
Doctors from the Occupational Diseases Department and narrow specialists of the National Hospital, heads of the Sanitary and Epidemiological Station of Issyk-Kul region attend the seminars to discuss common issues and improve the quality of cooperative work. Thus, by holding such seminars that improve the quality of medical examinations, the medical department contributes to the health of employees.

KGC maintains medical clinics in Bishkek, at the Balykchy Marshaling Yard and at the mine site, with trained medical staff. Doctors with high qualifications regularly undergo training both at local and international advanced training courses. They provide medical care not only to the company's employees, but also to contractors, and individuals/people who have arrived for short-term visits to the mine site.

All visitors receive medical checks at the Bishkek clinic to verify their fitness to work at the mine. On arrival at site, they receive a further check, and if necessary, treatment is given if any symptoms of acute mountain sickness (AMS) arise.

Our monitoring shows that upper respiratory tract infections remain the principal cause of illness and work absence. Every year, preventive health programs are implemented to motivate our employees to strengthen their health and improve their overall well-being. Thus, as part of the flu prevention vaccination program, in 2019, 400 employees voluntarily underwent influenza vaccination.

### 3.9 Medical screening and visits







Since 2017, a hygienic occupational physician who oversees the hygiene of nutrition and work has been recruited in the staff. For every meal, a wide choice of high quality, freshly prepared food is available, providing for personal and cultural preferences, and entirely sourced from the local companies. In cooperation with the regional

representatives from the Department of State Sanitary and Epidemiological Supervision, a thorough work was conducted to identify the list of professions involving harmful and dangerous substances, as well as production factors in the production environment.

## Work Safe | Home Safe Leadership Program

Centerra seeks to become a world leader in safety performance. Centerra has established a corporate culture, in which the value of employees and their contribution to achieving the Company's goals and objectives is recognized, and seeks to ensure that everyone returns home safely after every shift. To do this, all Centerra employees, contractors and other business partners shall take ownership of their personal safety and the safety of those working around them. According to the industrial statistics, Centerra is a leader in the field of safety. However, to our regret, accidents and serious injuries continue to occur. In 2016, after reviewing the feedback and the results of discussions at all levels of the Centerra global operational locations, we concluded that safety leadership had to be transformed. Centerra collected and integrated different points of view and, using the safety consultant's recommendations, Work Safe | Home Safe program was developed which became the Centerra's safety initiative. The recently adopted Centerra concepts and values were also included in the Program, the introduction and implementation of which started in the 2016 autumn at Kumtor. The program phase I consisted of one-

and two-day training sessions. The one-day training session was intended for employees and the two-day session, called Leadership training, was intended for supervisors and managers. Both trainings were developed to provide information in order to change behavior, provide an emotional element for building a commitment to changes, and conduct a series of interactive group exercises that collect data to ensure constant vigilance and feedback from management groups. This data are then analyzed to manage changes, improve safety leadership and culture.

In 2019, KGC continued its work as part of the Work Safe | Home Safe Leadership Program. The program is aimed at a culture of safety compliance, responsibility for personal safety and safety of others, team unity and cohesion. One very important tool from the program is the "STOP Conversation", which is used when someone is seen to be doing something unsafe or in an unsafe situation. In this way, each employee shows their concern for their colleagues, relatives, and friends.

## Accident Reporting

The Company implements a program that identifies, records, assesses and controls accidents, risks, hazards and near misses. When any employee observes or identifies a risk, a hazard or a near miss in an operational area, they are required to complete an industrial hazards or near miss form and submit it to the Occupational Health and Safety Administrator and Coordinator on risk management. Experts assess the degree of risk and take the required measures to eliminate a source of a hazard or a near miss to reduce the degree of risk and exclude the likelihood of an accident in the future.

Our key health and safety statistics are shown in the table 3.10. We have a Joint Occupational Health, Safety, and Environment Protection Committee, which includes representatives from various departments, organizational units, services and contractors employees by various locations of the Company.

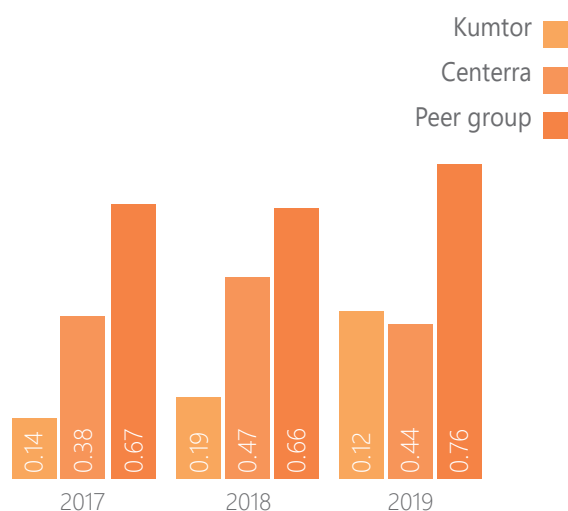
### 3.10 Key health and safety statistics#

	Units	2017	2018	2019
Hours worked	Hours	5,882,917	6,334,208	6,518,416
Lost Time Injuries (LTIs)	Number	1	2	2
Restricted work injuries	Number	1	2	0
Medical aid	Number	1	2	1
First aid	Number	13	9	4
Days lost to injury	Days	6,026	107	12,041
LTI frequency rate*	No. of LTIs per 200,000 hours worked	0.03	0.06	0.09
LTI severity rate*	No. of LTIs per 200,000 hours worked	205	3.38	369.45
Total Reportable Injury Frequency Rate (TRIFR)	No. of LTIs per 200,000 hours worked	0.14	0.19	0.12
Incidents with Property damage	Number	28	16	14

# See Glossary for definitions of key terms.

\*\* The number of lost days due to injuries with lost time incidents (LTI) for 2019 compared to 2018 is significantly higher, because in 2019 there were one lost time injury and one fatal incident involving deaths of two employees. In accordance with international norms, an automatic calculation of 12,000 lost person-days due to a fatal incident (2 deaths, 6,000 days each) and 41 lost persons-days due to lost time injury was made.

### 3.11 Reportable injury frequency rate: KGC/Centerra vs peer group



Centerra is a member of the global Mining Safety Round Table group (Peer Group) consisting of other global mining companies that are all mostly based in North America but do business across the globe. Peer group members meet 3 to 4 times a year to exchange and share mine safety best practices as well as research and test innovative technologies for the mining industry. In addition, if/when one of the members is having difficulty with a particular issue, possible solutions are discussed and shared. TRIF Rates are shared on a bi-yearly benchmarking exercise.



## Reducing vehicle incidents

Work at hazardous production facilities represents the risk of incidents and lost time injuries, which can adversely affect the health of employees, reputation, morale and financial results of the Company. To ensure prevention of incidents at KGC, the Work Safe | Home Safe program has been implemented phase by phase. Additional programs and measures were implemented for the critical controls - light vehicles, heavy duty equipment, stored energy, working at heights, ground control, hazardous materials, monitoring at the forefront, incorrect behavior, leading indicator analysis. Safety specialists visit other Centerra mines to exchange experience. Measures are being implemented to increase the involvement of front line employees in labor protection and safe behavior promotion. As part of the "Visible Felt Leadership" training program, the interaction of managers with employees of other departments and at work areas is being implemented.

The idea of safety leadership is being promoted among the line supervisors.

A special focus for employee awareness continues to be on vehicle incidents with collisions and over-turning vehicles in the mine pit being considered one of the most significant risks to our employees. Our goal is to achieve a zero incident rate. The below table shows the key vehicle accident statistics for the past three years, which we post on information boards around the mine site alongside photographs of recent incidents as a regular reminder of the constant need for care when driving. We also continue to improve driver skills and awareness through job assessments and training. Currently, we are in the process of implementing critical control measures for light vehicles in an effort to reduce the risk of vehicle incidents.

### 3.12 Vehicle incident reduction program (total number of incidents)

	2017	2018	2019
Overall vehicle accidents	14	17	5
High-potential injury risk - light vehicle accidents	1	2	0
In-pit heavy versus light vehicle collisions	0	1	0
Injuries due to vehicle accidents	1	2	0



## Cyanide transport and handling

Cyanide is an essential chemical for gold extraction, which must be transported to site. In 1998, there was a cyanide spillage incident during transportation from the Balykchy Marshalling Yard to the mine site. An independent International Scientific Commission review was carried out shortly afterwards. The report concluded there were no serious or lasting environmental impacts, including no short or long-term damage to Lake Issyk-Kul, and there were no reported deaths that could be attributed to cyanide exposure. The full report can be downloaded from the Kumtor website [www.kumtor.kg](http://www.kumtor.kg). In April 2012, Kumtor was initially certified by the International Cyanide Management Institute (ICMI) for transportation of cyanide from the Balykchy Marshalling Yard to the mine site in accordance with the International Cyanide Management Code. The company was re-certified in 2015 and 2018 for transportation of cyanide.

## Emergency prevention and response

We have a Joint Environment and Occupational Health and Safety Committee, consisted of 326 representatives from management, employees, and contractors from various locations of the Company. Our voluntary emergency response team consists of three teams at the Kumtor mine and one team at the BMY. The 24-hour mine team includes a medical doctor, is equipped with an ambulance, an emergency car, a fire-fighting equipment and extensive emergency response equipment at the mine site. The BMY team consists of a mobile emergency rescue vehicle, an ambulance, and extensive emergency response equipment. We review and update our emergency response plans annually, provide training and conduct periodic drills. Our mine rescue practices and training programs are aligned with best international industry standards.







## Emergency Response Training

The emergency response team members from Kumtor mine site go through Emergency Response Training sessions and exercises every Sunday, between 2 p.m. and 7 p.m. (5 hours) and two times per month at the Balykchy Marshaling Yard (3 hours).

In 2019, we conducted 52 training sessions at the mine, and 26 sessions at BMJ, totalling 260 and 78 hours respectively, as well as special circumstance sessions at the mine site simulating various types of emergencies: cyanide and chemicals spills and dispersal, vehicle accidents, injuries, fires, etc (six sessions at the mine site and five sessions at the BMJ).

Additionally, every year, team members are trained in a specialized Training Center under the Ministry of Emergency Situations of the Kyrgyz Republic where they receive special certificates upon successful completion of the training. Command-post exercises for threats and emergencies are held at the district level with participation of the Kumtor emergency response team every third year. Our team also participates in the republican annual competition of rescuers and most often performs at a very high level.

Our voluntary emergency response team consists of three teams at the Kumtor mine and one team at BMJ









## 4. ENVIRONMENT

### 4.1 ENVIRONMENTAL RESPONSIBILITY

*We consider responsible environmental management an important part of our business.*

#### Environmental expenditures

We operate a full-time Environment Department of 22 people at the mine site. Total annual expenditure on environmental management (including capital expenditure) was about \$7.16 million in 2019 for a range of activities including monitoring, laboratory analyses, external consultants, waste disposal, emissions treatment, water treatment and environmental impact prevention/minimization.

#### Focused environmental studies and projects

In 2019, we continued a range of focused environmental projects aimed at improving our environmental management practices, as well as our understanding of the natural ecosystem and our impact of operations upon it. These studies involved staff of the KGC Environment Department working with international consultants, scientists from the Kyrgyz National Academy of Sciences, postgraduates and specialists from the Kyrgyz National Agrarian University and other higher educational institutions of the country.

These projects included:

- Continued monitoring of traffic and dust concentrations in the Barskoon Valley in accordance with international standards;
- A variety of fauna surveys and hydro biological researches within the KGC concession area including observations of population of Marco Polo sheep, mountain goats, wolves, and foxes;
- Continued studies into the potential risk of cyanide impacts on biodiversity around the tailings management facility - as part of demonstrating compliance with the International Cyanide Management Code;
- Continued activities to improve biodiversity conservation and management measures in the Sarychat-Eertash State Nature Reserve (SCER);
- Continued research into appropriate rehabilitation techniques for disturbed lands, including expansion of rehabilitation trial plots and development of strategies to increase storage life and viability of stripped topsoil;
- Continued study of wetland facility to reduce concentrations of ammonia and heavy metals in the waste rock dump run-offs and the ETP discharge;
- Continued investigation and implementation opportunities to reduce waste management costs and the amount of waste landfilled at the mine site;
- Monitoring of glaciers and meteorological conditions on the KGC concession area and in the basins of the Arabel and Uchkol Rivers;
- Controlled lowering of the water level in Petrov Lake to prevent a Glacial Lake Outburst Flood (GLOF).





|
●
**Total expenditure on environmental management was nearly \$7.16 million in 2019**

#### 4.1 KGC environmental protection expenditures and investments (USD)

	2017	2018	2019
Waste disposal, emissions treatment	4,593,077	3,483,179	2,692,413
Pollution Prevention & Environmental Management Costs	2,633,312	2,285,734	2,846,332
Environmental Capital Projects	0	0	1,622,050
<b>Overall annual expenditure on environment protection</b>	<b>7,226,389</b>	<b>5,768,913</b>	<b>7,160,796</b>



## 4.2 ENVIRONMENTAL MONITORING

Our monitoring programs follow both national and international standards, and include:

- Water quality and flow;
- Effluent quality and flow;
- Biodiversity;
- Air quality;
- Waste streams;
- Acid rock drainage;
- Meteorology.

### 4.2 Description of water quality sampling points

Station name	Location description
W1.1	Petrov Lake outflow – Kumtor River Head Waters (alpine glacier fed lake – elevated Al, Fe)
W3.4	Lysyi Creek before joining Kumtor River
W3.1	Kumtor River after confluence of Lysyi Creek and just before ETP discharge
TPX	End of tailings spigot – discharge into Tailings Management Facility (TMF) pond. Discharge point moves along dam wall
T8.1	Tailings Pond (feed to ETP)
T8.4	ETP discharge point into Kumtor River (MAD limits apply)
W1.4	Between Kumtor bridge and flume 1km downstream from ETP discharge
SDP	Treated sewage discharge point into Kumtor River (MAD limits apply)
W4.1	Head water of Arabel-Suu diversion ditch (background level)
W4.2	Lower Diversion Ditch (LDD)
W4.2.1	New Lower Diversion Ditch
W4.3.1	Discharge of Upper Diversion Ditch (UDD) sediment pond to Kumtor River
W2.6.1	Chon-Sarytor Creek from under the Central Valley waste dumps before joining Kumtor River
POR1 Sump	Pit water collection sump before discharge to Kichi-Sarytor Creek
SWS.3.1	Kichi-Sarytor Creek before joining Kumtor River
SWW1	Meltwater from Sarytor glacier
W1.5.1	Kumtor River, just downstream from Kumtor Concession Area (voluntary compliance point)
W6.1	Arabel-Suu River, 6 km from Kumtor Concession Area (background level)
W1.6	Kumtor River, 17 km from Kumtor Concession Area (before confluence with Taragay River)
W1.7	Taragay River, 40 km from Kumtor Concession Area (Kumtor + Kashka-Suu + Maitor Rivers)
W1.8	Naryn River in Naryn City, approximately 230 km downstream from Kumtor Concession Area
P5.2N, P5.3	Potable (treated drinking) water - Camp and Mill
PZ's	Piezometers at the Tailings Dam



4.3 Environmental monitoring locations





## Meteorological monitoring

We have a mutually beneficial arrangement with the agency of Hydrometeorology under the KR Ministry of Emergency Situations. the Kumtor meteorological station is a part of the national weather network, which provides weather forecasts, important for safe and efficient operation in the extreme climatic conditions on site. At the end of 2016, a new automatic meteorological station was built and commissioned, and the old one, installed in 1999, was dismantled in 2017. The new station collects and exports meteorological data to MP5 database, in accordance with Canadian Atmospheric Environment Services protocols. The Saskatchewan research Council in Canada is contracted to calibrate sensors and ensure they function correctly.

## Hydrological flow monitoring

We track hydrological flows of the main water bodies within the concession area: Kumtor River and its principal tributaries (including Chon-Sarytor, Kichi-Sarytor and Lysyi Creeks), Petrov Lake, and the Upper and Lower Diversion Ditches that divert the Arabel River around the tailings management facility. The Kumtor River flow generally peaks between May and September each year. In 2019, a peak of 46.74 m<sup>3</sup>/s was recorded on August 10. The total annual flow in the Kumtor River recorded at the flume within the concession area was 127.68 million m<sup>3</sup> and the flow at the End of Mixing Zone (also called W1.5.1), the KGC's main water quality compliance point,

was estimated to be 176.98 million m<sup>3</sup>. These variations are not considered significant in the context of normal year-to-year fluctuations (see Fig. 4.4). We also monitor water levels in Petrov Lake, which serves as the fresh water source for Kumtor mine site. The highest recorded level was 3,733.56 m above sea level in August 2019 (compared to 3,733.82 m in 2018) and the lowest was 3,731.52 m in January 2019 (compared to 3,731.305 in 2018). As the Kumtor River flows downstream after leaving the concession area, it receives additional flow from many tributary streams and rivers. At the nearest town Naryn, located approximately 230 km downstream of the mine, the flow increases to an estimated 2,340 million m<sup>3</sup> per year. Our water use at the mine site has no measurable impact on river flows at Naryn since the volume extracted each year from Petrov Lake represents just approximately 0.2% of average annual flow at Naryn. The treated effluents discharged back to the Kumtor River also reduce the net extracted volume.

## Water quality monitoring

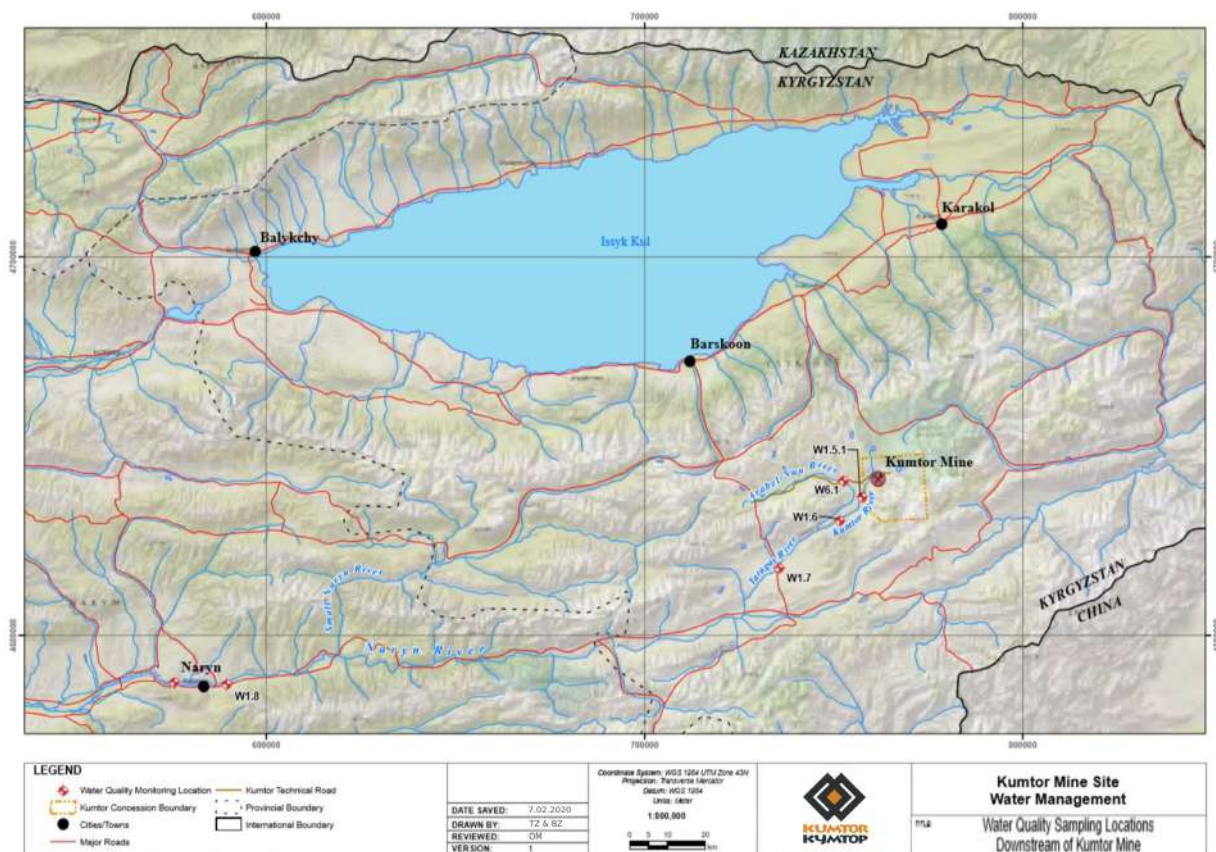
We follow a comprehensive program of sampling and analyses for water quality based on a network of more than 30 stations. The key stations are listed and described in Table 4.2 in this section, with locations shown on an aerial photograph of the concession area (Fig. 4.3 and 4.5). Water quality results and associated discussion are in a separate section of this report: Water Quality and Compliance.



### 4.4 Kumtor River flow

Monitoring station	Units	2017	2018	2019
Annual Flow in Kumtor River at flume (W1.4)	m <sup>3</sup> /year	118,264,372	102,872,002	127,681,497
Annual Flow in Kumtor River at compliance point (W1.5.1)	m <sup>3</sup> /year	180,911,331	146,251,965	176,982,930
Annual Peak instantaneous flow in Kumtor River at Flume	m <sup>3</sup> /s	30.67	21.16	46.74
Peak daily flow in Kumtor River at Flume (W1.4)	m <sup>3</sup> /day	2,649,888	1,828,224	3,355,050

## 4.5 Water quality sampling stations downstream of Kumtor mine



### Quality assurance and control

Most of our analyses are contracted to a professional external laboratory, Stewart Assay and Environmental Laboratories LLC (SAEL), part of the international ALS group. SAEL is located in Kara-Balta in the Kyrgyz Republic. We also maintain an on-site laboratory to support operational control. We routinely review our sampling program and processes, updating them as appropriate. Our monitoring program includes a formal Quality Assurance and Quality Control (QA/ QC) program for collection and handling of samples. This includes

duplicate samples, blind samples, and blank samples, as well as calibration and documentation of instruments and procedures. As part of quality control, samples are sent to expert local and international laboratories including SAEL in Kyrgyz Republic, Saskatchewan Research Council (Canada), and Lakefield Research Laboratories (Canada). Lakefield Research specializes in cyanide chemistry and analysis.

### Environmental data management system

To minimize the risk of human error and ensure quality control of data, since 2014 we have used a comprehensive and integrated Environmental Data Management system, MP-5. This helped to automate the data collection process as much as possible. Field data is now entered directly using iPads and synchronized later in the office. External laboratory reports are directly imported into the database. Some environmental monitoring instrumentation (river and creek flows, weather, etc.) imports data directly into the MP5 database. The system helps to analyze

and integrate data quickly and accurately, and report on compliance against environmental standards. Warning and compliance levels have been established in the system to ensure any data, which is outside of specified ranges, leads to an alert emailed to responsible employees and management. The majority of environmental data is now entered directly into the system, minimizing the risk of human error and leading to the removal of most paper templates and spreadsheets from use.





## 4.3 BIODIVERSITY

### Our commitment

We are committed to our obligations to preserve natural biodiversity, reduce negative impact of operations on the environment during operation of the mine and cooperate with our partners to increase biodiversity. We understand that in order to successfully address these challenges, we need to consult and work with local, state and international partners.

### Regional context

The Tien Shan mountain range is one of the longest in Central Asia, stretching approximately 2,800 km through mostly the Kyrgyz Republic and China. The peculiarity of the region is in its unique biodiversity. Moreover, it is home to a number of endangered animals, including snow leopards and the Marco Polo sheep (Argali).

The snow leopard is an important cultural symbol in Central and South Asia and features widely in local folklore. Like the snow leopard, an aquatic plant in the Ranunculus family (*Hedysarum kirgizorum*), endemic species of dandelion (*Taraxacum syrtorum*) and a tulip (*Tulipa tetraphylla*) are included in the Kyrgyz Red Data book.

Glacier-fed rivers, including the Kumtor River, which originates from the Petrov Lake, form part of an important ecosystem for a broader range of

communities in the Kyrgyz Republic and for the Kumtor mine itself. The Tien Shan region also contains significant grasslands, which provide carbon storage and sequestration services.

### Ecosystem services

Ecosystem services are the benefits that people and businesses derive from ecosystems. Kumtor mine is remote, with no villages close to its boundaries that could be impacted by operations at the mine site. The nearest village, Ak-Shyirak, with a population of approximately 120, is located approximately 80 km from the mine in another valley. Agricultural activities for the Ak-Shyirak community, such as crop growing, are very limited due to the harsh high altitude climate. Their livelihoods rely on grazing sheep, goats, and other livestock, in addition to government-funded support. There is also seasonal sheep grazing in the valleys leading to the Kumtor mine site. While there is little scope for KGC's operations to negatively impact ecosystem services of Ak-Shyirak, our support - alongside contributions by other key nature conservation players - for biodiversity conservation (see next page) is expected to generate positive benefits for the wider region.

Glacier-fed rivers, including the Kumtor River flowing from the Lake Petrov, form part of an important ecosystem service for most of the Kyrgyz population and the Kumtor mine itself.





## Wildlife monitoring on the Tailings Management Facility

In 2019, the daily wildlife census monitoring program continued on the KGC Tailings Management Facility (TMF). The program was developed to identify and count all avian and mammalian wildlife on the TMF and its immediate surrounds, and confirm that the facility was not having an adverse effect on wildlife. The daily monitoring is undertaken by trained KGC environmental personnel, with regular review and supervision by a recognized expert in the Kyrgyz Republic. The monitoring data is also reviewed by an independent internationally recognized ornithologist. Observations around the TMF were completed on 362 days out of possible 365 days in 2019 - which equates to 99% daily coverage.

Table 4.6 presents a summary of the daily wildlife observations. The information is presented as 'bird-days' and 'mammal-days' which provide a comparative parameter and quantitative measure of the TMF usage or occupancy by wildlife. It is calculated by multiplying the number of animals (birds or mammal) seen by the number of days on which they were seen. This is

valuable in the context of the TMF as it presents a broad measure of potential contact of wildlife with the tailings and supernatant water and exposure to their cyanide content.

In 2019, four mammal species were recorded on the TMF (Grey Marmot, Red Fox, Wolf and Argali) and 24 species of birds - predominantly made up of wildfowl and waders.

Taking into account the extreme weather conditions and low food resources at the high altitude, TMF continues to present a low-visitation and unsuitable habitat for birds and other wildlife. For most of the year, the TMF pond remains frozen, preventing wildlife exposure to the supernatant water. Monitoring indicates that the Kumtor TMF system continues to present a relatively low cyanosis risk to avian or other wildlife despite the periodic elevated cyanide concentrations in the tailings. The daily wildlife census monitoring program will continue in 2020.

### 4.6 Summary of wildlife observations on the TMF

Indicator	2017	2018	2019
No. of days no wildlife was observed	180/362	199/363	223/362
No. of days mammals observed	85/362	69/363	54/362
No. of mammal days	196	181	133
Max. mammal group size seen	11	10	15
No. of days birds observed	127/362	135/363	109/362
No. bird days	1,444	1,444	1,440
Max. bird flock size seen	150	100	120



## Study of vertebrate animals and birds at the Kumtor mine and adjoining areas

During 2019, a study of vertebrate animals and birds of Kumtor and adjoining areas was completed. Objectives of the study included the following: assessment of quantity of animals and birds, identification of species composition of vertebrate animals and birds, distribution by habitats, characteristics of behaviour at the habitat, abundance of species (population density), common species, population trends (natural dynamics), assessment of impact of the mine's activity on vertebrate animals and birds, especially on protected species - rare, endemic, endangered, listed in the Red Book species, identification of especially valuable habitats - areas of mass reproduction of specially protected species, foraging areas, rest areas of migratory species, migration routes, identification of animal species especially sensitive to the mine's operations.

Wildlife census was conducted on the pre-determined transects where the location (start and end of transect)

was recorded by the GPS-navigator. 10-zoom binoculars and 60-zoom telescope were used to identify to the species level and count animals.

When signs of activity of mammals (burrows, tracks, excrements, etc.) were found, mammals were identified to species level. But in many cases, the presence of mammals on site was visually observed. The presence of individual species of animals was recorded by various signs of their stay - paw prints on the snow or ground, food remnants, flocks or feathers, paths, burrows and lairs, etc. Also, an aerial census was conducted with the use of a quadcopter DJI Inspire 2, X5S. The apparatus flew around the areas of possible wildlife habitats and subsequently made photo and video recordings of the identified habitats.

### 4.7 Map of census route (transect) within the mine



During the entire period of observations in 2019, 10 species of mammals with 1,514 individuals and 43 species of birds with 6,702 individuals were recorded at the mine and on adjacent area.

As part of the mountain sheep (*Ovis ammon*) biology study, in June 2018, the first satellite collar was put on the mountain sheep caught at the mine area in cooperation with the Institute of Biology of KR National Academy of Sciences, the Institute of Mountain



Ecosystems of the Shinshu University (Japan) and KGC.

Aziza is a female mountain sheep (argali), approximately 5 years old and weighing 70 kg. Collar frequency is 146.150 MHz. Collar serial number is ID 16675 (Vectronic - Iridium), Iridium, Vectronic Aerospace (Germany) [www.vectronic-aerospace.com](http://www.vectronic-aerospace.com)).

According to the satellite collar records and regular signals about the location of the mountain sheep,



the following was recorded. By the time of this report preparation, Aziza covered 957 km, moving at the altitudes from 3,600 to 4,262 m above sea level, most of the time staying at the altitudes from 3,604 to 3,750 m above sea level. On average, Aziza covered 18 km per day, with the average speed 1.6 km/h. It preferred staying on a slope - 3.6% -3.5%, the maximum slope was 15.4%. Generally, it inhabited 152 km of area between the Sarytor Gorge and the Lysyi River on an area of 152 km. The satellite collar records confirm the belief that female mountain sheep prefer staying in a certain territory, since migrations, movements over long distances in high mountains negatively affect the physical condition of animals. Females do not move to large distances to maintain energy reserves in order to bear the fetus. According to scientists, males more often perform pronounced migration processes for the purpose of genetic exchange between populations (with the exception of inbreeding), which confirms their high mortality after rutting.



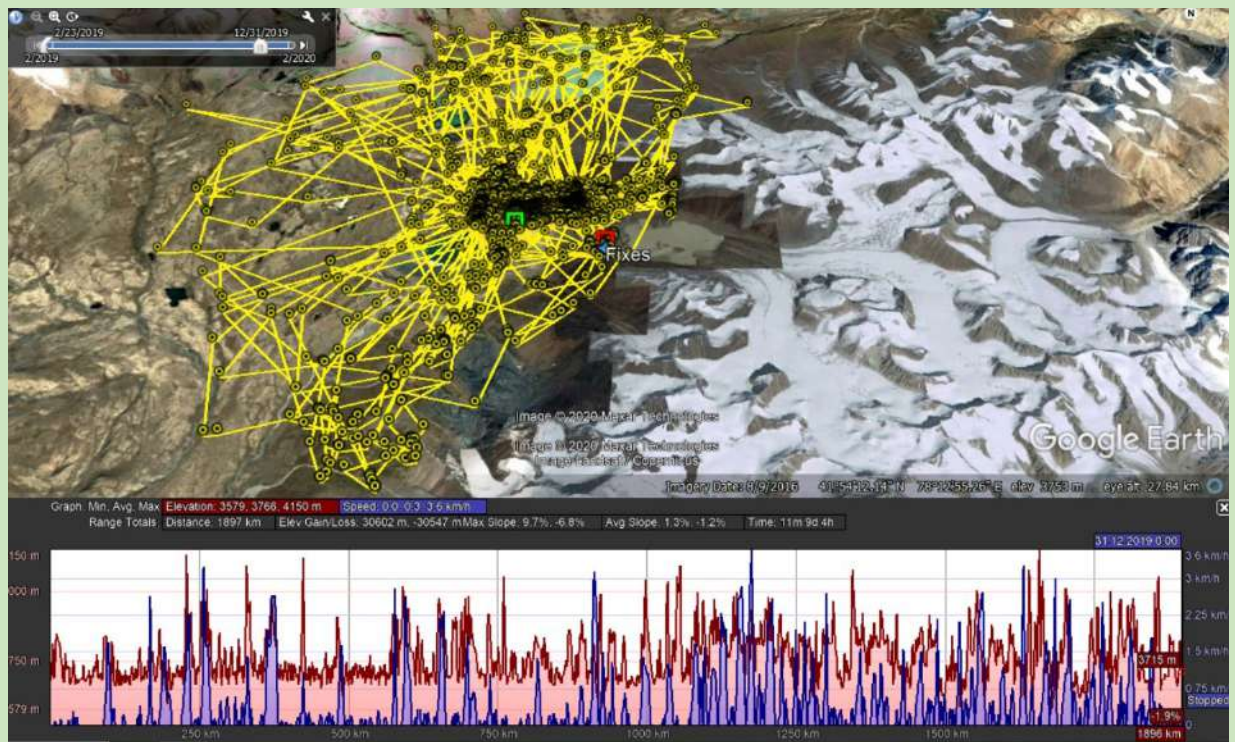
Map of the movement of the male argali called Aziza

On February 22, 2019, the second satellite collar was put on the mountain sheep. The mountain sheep was called Kuldja and marked as M1 "Temirbek", weighing 180 kg. Age is 8 years. Iridium collar frequency, collar serial number is ID 32753 (Vectronic aerospace GmbH, Germany - [www.vectronic-aerospace.com](http://www.vectronic-aerospace.com)). Coordinates of the collar launch: 41.532222 C and 78.090959 V, altitude 3,640 m, "lower mine area". After examining the health status of the mountain sheep and launching the satellite collar, by 12:20 p.m. Kuldja safely left the area.

After the collar was put on the animal, we daily received 12 signals about the location of the mountain sheep. By October 2019, Temirbek covered 400 km, moving at the altitudes between min. 3,600 and max. 4,067 m above sea level. In October 2019, signals began to come from one place, which indicated the death of the animal (perhaps the animal was attacked by a predator, such as leopard or wolf).







*Map of the movement of the wolf Olga*

In addition, as part of the Wolf (*Canis Lupus*) Behavior Study at the mine area, on February 23, 2019, the third satellite collar was put on the grey wolf in cooperation with KGC employees, the Institute of Biology of KR National Academy of Sciences and the Institute of Mountain Ecosystems of the Shinshu University (Japan).

Female wolf, marked as F2 "Olga", weighing 20 kg. Age: 2.5 years. The Globalstar collar frequency, collar serial number ID 19367 (Vectronic Aerospace GmbH, Germany – [www.vectronic-aerospace.com](http://www.vectronic-aerospace.com)). Coordinates of the collar launch: 41.544137 N and 78.103478 E, elevation of 3,690 m, trap # 2. After examining the health of the female wolf and launching the satellite collar, the wolf safely left the area at 00:07 a.m.

After the collar has been launched, we daily receive 12 signals indicating location of the wolf. Since February 2018, the wolf traveled 1,897 km, moving between the altitudes of min. 3,500 and max. 3,800 above sea level. This species inhabits exclusively the Kumtor mine concession area. Satellite signal records received from the female wolf confirm research data on the biology of young-aged wolves, which adhere to a certain territory and can not compete with wolf species of a higher status. We hope that



our further observations will show what processes will take place in the biology of this individual.







Map of the movement of the male argali called Temirbek



Industrial development of the Kumtor deposit is an example of one of the most advanced industries where animals are strictly protected and not exposed to any anthropogenic impact. Despite the fact that heavy equipment constantly operates at the mine's area, animals, especially ungulates and predators, are not afraid of the presence of human

activity, i.e. animals do not have any disturbance factor. On the contrary, in some cases during the hunting season wild animals move from the nearby hunting farms to the mine's area where they are in safety. This indicates that the Kumtor mine operations does not have any adverse impact on wildlife.







## Hydrobiological studies at the Kumtor mine and on the adjacent area

In 2019, hydrobiological studies continued in the water streams and reservoirs at the Kumtor mine area and on the adjacent area, as a result of which the species composition as well as the abundance of zooplankton and zoobenthos were identified.

A total of 23 species, 15 genera, 12 families, 9 orders, 6 classes, 3 types were identified in the Kumtor River during the entire study period (from June to September). Numbers of chironomid larvae belonging the subfamily Diamesinae prevail in the bottom-living community. Other aquatic invertebrates such as larvae of stoneflies, mayflies, simuliids, caddisflies, and fully aquatic organisms, such as worms, mollusks, ostracods, springtails were observed in the samples. Bottom-living invertebrates reached its mass development in August and September.

In general, the number of bottom-living invertebrates in the Kumtor River in 2019 is lower than in 2018. In 2019, some species were not observed in the samples, but springtails, mollusks, ostracods that had not been previously encountered in the Kumtor river were observed. Larvae of caddisflies were also observed. Poor species composition is explained by moving of adult amphibious insects into the air. This occurs during the vegetation season (June-August), and different species undergo this process at different periods. This also explains the appearance of new species in the samples, previously not encountered in the Kumtor river.

The total list of aquatic bottom-living invertebrates in the Kumtor river has been expanded by 7 species and including the previously obtained data, a total of 43 species was recorded.

29 species of zoobenthos were recorded in the Taragay River, 22 species in the Arabel-Suu River, and 29 species in the Kashka-Suu River. In general, zoobenthos composition in the studied watercourses is represented by widespread species of mountain rivers and streams.

Among standing water reservoirs, a small lake located not far from the Biodegradable Waste Processing Plant was studied in 2019, same as in 2018. In this reservoir, 16 species of zooplankton and 10 species of zoobenthos were recorded. The zoobenthos composition in standing reservoirs differs from the river bottom-living community. The most widespread species is the amphipod (*Gammarus* sp). Mollusks, springtails and ostracods are also recorded in the samples. Larvae of Chironomids are rare.

Based on results of the fauna studies in flowing and standing water reservoirs, it can be concluded that the species composition of invertebrates is not rich. This is due to the high mountain extreme conditions. In 2019, several fish of Severtsov's Osman (juvenile stages) were collected in the Taragay River (August) and in the Arabel-Suu River (September).

It should be noted that none of the aquatic invertebrates and fish observed in the studied streams and reservoirs are listed in the red book of the Kyrgyz Republic.



## 4.10 Wildlife of the Central and Inner Tien Shan with Conservation Status at the National and International Levels Identified Within the Study Area\*

Common Name	Latin Name	Kyrgyz Red Book (2006)	IUCN Red Book	Kumtor Concession	SCER
Mammals					
Snow leopard	Uncia Uncia	Critically endangered	CR	Yes	Yes
Brown bear	Ursus Arctos	Lower risk/least concern	LC	Near	Yes
Mountain sheep	Ovis Ammon	Near Threatened	NT	Yes	Yes
Pallas's cat	Otocolobus Manul	Near Threatened	NT	Near	Yes
Stone marten	Martes Foina	Least Concern	LC	Yes	Yes
Ermine*	Mutfela erminea	Least Concern	LC	Yes	Yes
Eurasian lynx	Lunx lunx	Near Threatened	LC	Near	Yes
Birds					
Smee	Mergellus albellus	Least Concern	LC	Yes	No
Golden eagle	Aquila Crysaetos	Near Threatened	LC	Yes (M)	Yes
Lammergeyer	Gypaetus Barbatus	Near Threatened	NT	Yes	Yes
Saker falcon	Falco Cherrug	Endangered	EN	Yes	Yes
Black stork	Ciconia Nigra	Near Threatened	LC	Yes	Yes
Whooper swan	Cygnus cygnus	Least Concern	LC	Near	Yes
Eurasian black Vulture	Aegypius monachus	Near Threatened	NT	Yes	Yes
Himalayan griffon	Gyps himalayensis	Least Concern	NT	Yes	Yes
Deamysel Cranes	Anthropoides virgo	Near Threatened	LC	Yes	Yes
Eastern imperial eagle	Aquila heliaca	Vulnerable	VU	M	M
Eurasian eagle owl	Bubo bubo	Least Concern	LC	Near	Yes
Ibisbill	Ibidorhyncha	Vulnerable	LC	Near	Yes

**Note:** SCER is Sarychat - Eertash Nature Reserve; IUCN is the International Union for Conservation of Nature.

\*In 2016, KGC improved the technical equipment of specialists conducting wild animals and birds monitoring near the mine. More powerful optical surveillance equipment was purchased, photo and video equipment updated. Moreover, the frequency and duration of animal observation was increased. This allowed to detect and register six species of animals (rendered in bold) included in the red book and the IUCN list.

# M - marked on a span (seasonal migrant).  
 Extinct (disappeared) EX  
 Extinct in the Wild (extinct in the wild) EW  
 Critically Endangered species (in critical danger) CR

Endangered (in danger) EN Vulnerable (vulnerable) VU  
 Near Threatened (close to vulnerable) NT Least Concern  
 (least threatened) LC Data Deficient (not enough data) DD  
 Not Evaluated (threat is not evaluated) NE



## 4.4 ENERGY USE AND CARBON EMISSIONS

### Energy consumption

Our large-scale mining operation is a significant consumer of fuel and electricity. Fuel represents over 20 percent of our commodity and service-related purchases. However, wherever feasible, we use electricity. The most energy intensive operation is the Mill, representing approximately 80 percent of our electricity consumption. The use of fuel to generate electricity at the mine is less than 1%.

The Kyrgyz Republic generates more than 85 percent of its electricity through hydropower. In fact, the Kyrgyz Republic is a leading producer and exporter of hydroelectric energy in the Central Asia region, due to its mountainous terrain and abundant water resources. The major source of the power supplied to KGC is from

the Toktogul Reservoir located on the Naryn River. This means that our specific GHG footprint generated from electricity is relatively low. It also means that efforts that reduce or replace our fuel consumption with grid power offers the greatest value in terms of reducing our GHG emissions. We continue to calculate and monitor our greenhouse gas (GHG) emissions, and explore ways to reduce them as part of energy conservation measures. Our calculations include our three main sites: the Kumtor mine, Balykchy Marshalling Yard, and Bishkek head office. However, the mine represents around 99.6 percent of energy use, and the only site using explosives.

We include explosives in our GHG emission calculations as it was determined to be a significant component of the total emissions.

### 4.11 Electricity, Fuel and Explosive Consumption (Mine site, BMY, Bishkek)



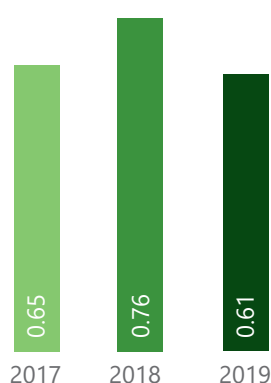
## GHG emissions and intensity

Scope 1 (direct) - total GHG emissions in 2019 are lower by 11.3% compared to 2018. This is due to the suspension of mining operations in December.

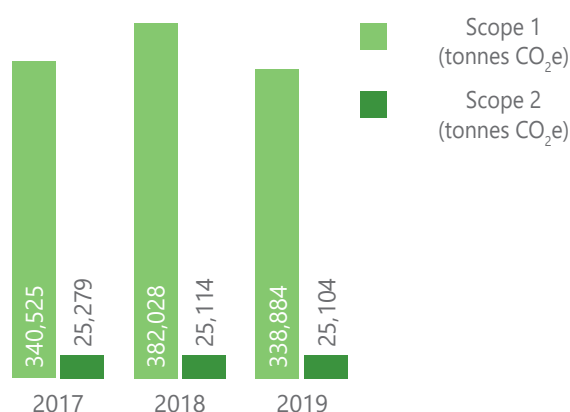
Scope 2 (indirect) - the total amount of greenhouse gas emissions in 2019 remained almost unchanged compared to 2018.

Accordingly, the GHG emission intensity (an indicator that normalizes greenhouse gas emissions per ounce of produced gold) at Kumtor, due to a decrease in the total amount of GHG emissions, was lower in 2018, but at the level of 2017- 2016.

### 4.12 GHG Intensity Ratio (tonnes CO<sub>2</sub>/ounce Gold)



### 4.13 GHG Emissions



## Energy conservation measures

We aim to reduce our GHG intensity by reducing our specific energy consumption and by increasing energy efficiency. We switch from diesel generators to grid electricity, wherever and whenever feasible, for such uses as mine-site lighting, dewatering pumps, and other equipment. This reduces both costs and our GHG footprint. After the Mill, our truck fleet is the largest energy consumer. Our program of reducing vehicular-related fuel consumption has the benefit of reducing use of energy and carbon-intensive consumables. For example, we are transitioning to more fuel-efficient engines and have a proactive program to reduce the need for, and occurrence of running engines on parked vehicles. We have also implemented energy conservation measures ranging from the installation of low wattage, high efficiency lighting systems, better insulation in camp buildings, and encouraging behavior changes. However, such activities do not make a material difference to our GHG footprint due to the fact that these energy uses are very small, compared to major operational energy use, and because electricity already has a low GHG intensity. We continue to explore approaches that may help reduce our energy and GHG intensity but because electricity is already mostly from renewable sources, the scope is limited.

## External reporting

As in previous years, KGC's carbon footprint is reported through Centerra's participation in the CDP. This is an independent international not-for-profit organization that tracks and reports corporate information pertaining to climate change. The data for individual companies is publicly available.





## 4.5 AIR EMISSIONS

Road dust, dispersed by moving cars and trucks, is the main source of observed and measurable air emissions along the access road passing through the Barskoon Valley. Concerns have also been raised about mine dust being deposited on nearby glaciers.

### Air quality at the mine

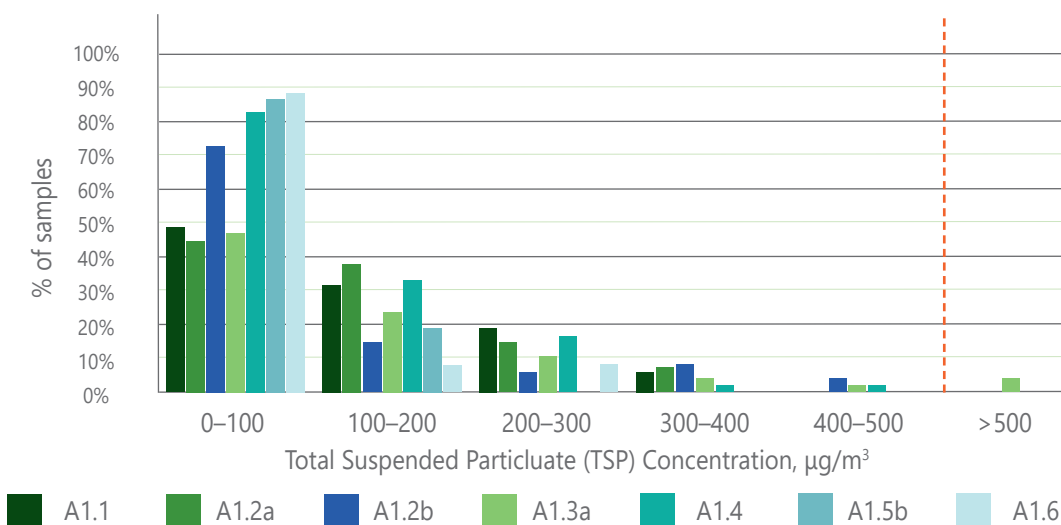
We constantly monitor the air quality at the mine using six large-volume samplers located around the site to measure total suspended particles in the air (TSP). In 2019, the TSP concentration at the monitoring stations was below the Kyrgyz 24-hour limit of 500  $\mu\text{g}/\text{m}^3$  for industrial zones, except for two exceedances at the station A1.3a. Immediate measures were taken to reduce dust level at this area. Our analysis of the historical data indicates that in spring, the increase in the level of TSP is generally related to commencement of tailing dam works. Selected TSP samples are also analyzed for cyanide, sulphur, arsenic, nickel, selenium, zinc, uranium, radium-226, and strontium-90. Consistent with previous results, the 2019 monitoring data, which are presented in the Appendix, demonstrate that the indicators are below the relevant threshold limit values. KGC has maximum allowable emission (MAE) limits for pollutants emitted into the atmosphere.

Actual emissions are compared against the MAE limits in the table 4.15 and calculated using instrumental measurements of stationary emissions based on a variety of operational data, including:

- Volume of ore mined and deposited at waste rock dumps;
- Annual average consumption of all types of explosives (ANFO, emulsion);
- Total number of days for processing;
- Specific consumption of ANFO and emulsion per 1  $\text{m}^3$  of processed rock;
- Size fraction of rock in the waste rock dumps and ore in the ore stockpiles;
- Average humidity of rock in the pit;
- Number and types of pit machinery and equipment;
- Total volume of consumed diesel fuel and gasoline (lead free), including stationary sources;
- Average operating efficiency of dust-gas collecting units at the Mill, Crusher, Assay Laboratory, Mobile Batch Plant (instrumental measurement data);
- Average concentration of pollutants in emissions from the Mill, Crusher, Emulsion Plant, Assay Laboratory, instrumental measurement data);
- Work hours of emission sources of on-site main and auxiliary facilities;
- List of areas and volumes of dumped mine rock in waste rock dumps and ore stockpiles etc.

### 4.14 High Volume Sampler Air Quality Results

KR Industrial Zone  
Compliance Limit =  
500  $\mu\text{g}/\text{m}^3$



**Note:** TSP is total suspended particulates. Kyrgyz 24-hour TSP compliance limit for industrial zones is 500  $\mu\text{g}/\text{m}^3$ .

Monitoring station locations change occasionally along with changing footprint of the mine.

Annual average results are shown for locations with more than 6 months of data. A1.2A station was relocated and renamed into A1.2b.

According to the composition and the volume of pollutants emitted into the atmosphere, the mine site is classified as the first category of hazard. Emissions of non-stationary sources are calculated according to methodological instructions based on actual data (operational factors) of the previous period. As shown in the table 4.15, in 2019 a total of 795.42 tons of pollutants were released into the atmosphere from the mine sources, mainly due to pit operations. The major pollutant is dust (73.42%). Inorganic dust from hauling and loading operations in the Central Pit is a major contributor to the atmospheric air pollution.

Maximum ground level concentration of dust emissions is 10 times of MAE standard within the mine site. The maximum concentration of the remaining pollutants does not exceed 0.3 of the MAE standard.

According to the calculations, the Kumtor mine impact on the atmosphere is estimated as moderately significant. To reduce this impact, work zones are watered down during mining and other operations at the mine, including hauling and loading operations. The stoping faces are also watered down before and after blasting.

## 4.15 Comparative emission data at the Kumtor mine and MAE (t/year) Pollutant

Pollutant	MAE Standard 2019	Actual 2019
Dust that contains SiO <sub>2</sub> 20-70%	689.8808	584.0288
Hydrocyanide (hydrogen cyanide)	0.0026	0.00014
Sodium hydroxide (sodium hydrate)	0.054513	0.05081
Calcium oxide dust (lime)	2.4135	2.0487
Carbon (soot)	2.1175	1.3595
Lead and its inorganic compounds	0.000565	0.000666
Sulfur dioxide	15.02429	12.2179
Welding aerosol	0.5053	0.4408
Manganese oxide	0.0688	0.0598
Hydrofluoride (hydrogen fluoride)	0.0593	0.0518
Hydrocarbon	15.14902	11.29739
Nitrogen dioxide	143.4017	94.4088
Carbon oxide	67.0756	49.1953
Tetrafluorosilane (fluorides)	0.0222	0.0199
Ammonia	1.2834	1.7941
Silicon compounds	0.0222	0.0199
Hydrochloride (hydrogen chloride)	0.0061	0.0224
Nitrogen oxide	0.1154	-
Hydrocarbons (as kerosene)	2.2164	-
Formaldehyde	0.4563	0.3098
Benzpyrene	0.00004224	0.000032
Ammonium nitrate	1.677	0.0188
Carbon dust	0.0552	0.0522
Suspended solids	0.2418	0.7201
Carbon dioxide	36.424	37.2973
Total	978.27353	795.4149

Taking into account the fact that the Sarychat-Eertash State Reserve is adjacent to the mine site, regular monitoring of air is conducted in the northeastern part of the concession area and in the northwestern part of the reserve.

## Dust level in the Barskoon Valley

Transportation of employees to the workplace, as well as delivery of consumables and other materials is carried out on a technological road that passes through the Barskoon Valley and is served by KGC. The route leads to several settlements, including the village of Ak-Shyirak, summer pastures and hunting farms in high-mountain valleys, Sarychat-Eertash nature reserve, various tourist routes. Local residents, researchers, hunters and tourists also use the road.

In order to avoid an increase in the dust level in the Barskoon Valley, we continued watering the road with more than ten water trucks, servicing the road on a daily basis. As in previous years, to determine the total concentration of suspended particles in air (TSP) in the summer of 2019, three large volume samplers were installed. In the Barskoon gorge, there was no exceedance of the maximum permissible emission limit of 100  $\mu\text{g}/\text{m}^3$ . To confirm that company vehicles are not responsible for emitting all of the dust, a sensor was installed in the gorge, which records any vehicles passing at a speed of more than 10 km/h above the speed limit. In addition, along the entire technological route, dust counters, instruments for measuring the dust content in the air, were installed before the mine site, and since 2015, the data have been monitored. In 2019, a total of 65,174 vehicles were recorded over the monitoring period: 49,026 (75%) of the vehicles were cars or motorcycles and 16,148 (25%) were trucks.

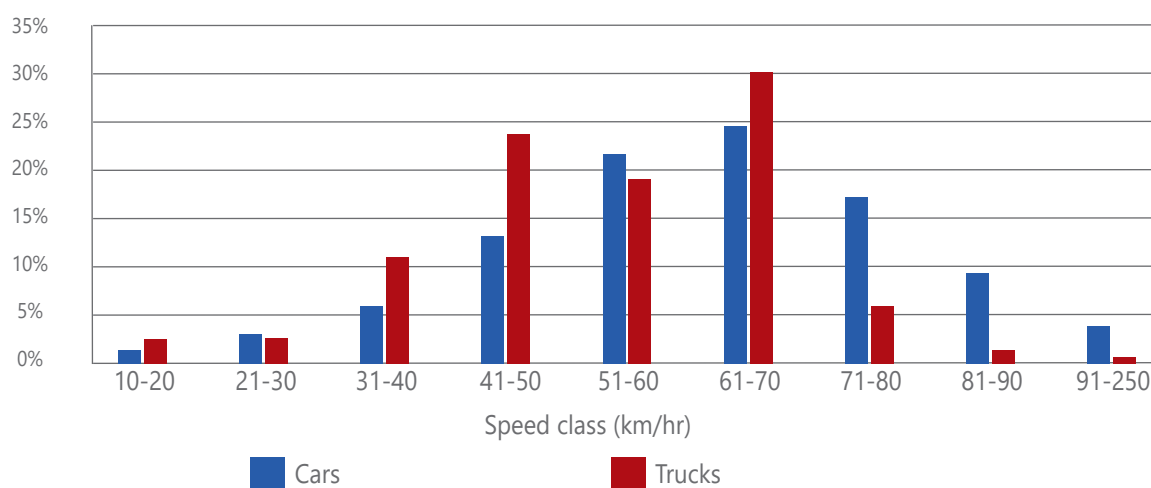
The average number of cars or motorcycles per day

ranged from 90 to 514 in August 2019, while the average number of trucks per day ranged from 50 to 84 in July 2019. It should be noted that in 2019, several stations and site intended to collect and analyze dust levels along the technological road were vandalized. As a result of the data gap, the traffic data cannot be compared with the particulate matter and total dustfall data to determine if there is a correlation between traffic volume and speed



and fugitive dust levels. However, the data continue to show that mine-related vehicles comprise only 25% of the total traffic volume and that the daily numbers are fairly consistent throughout the year. Most of the vehicles (78% of the cars and 57% of the trucks) travelled above the posted speed limit of 50 km/hr as shown on Figure 4.16. It should be noted that KGC equipped all vehicles with GPS-navigators, which allow monitoring the speed rate of KGC vehicles.

## 4.16 Kumtor Technical Road Percentage of Vehicles in each Speed Class







According to the survey, conducted by G.A. Lazkov, Doctor of Biological Sciences, KR National Academy of Sciences, it was determined that the KGC activities do not have a significant impact on the vegetation cover of the Barskoon gorge. Uncontrolled grazing and recreational loads have a much greater impact.

Residents of some villages in the Issyk-Kul region suggest

that dust and other emissions occurring at the mine have a negative impact on them. However, the mine site is separated from these villages by a mountain range, and the distance to them exceeds several tens of kilometers. Burning of rubbish and other uncontrolled air emissions are known to be commonplace in these village areas, and therefore, a much more likely source of emissions.

#### 4.17 Dust monitoring in the Barskoon Valley, $\mu\text{g}/\text{m}^3$

Sampling Points (Stations)	Jul 2017	Aug 2017	Jul 2018	Aug 2018	Jul 2019	Aug 2019
# 1	31	20	47	77	31	49
# 2	20	46	39	113	31	40
# 3	12		24	39	21	41
Recommended MAC*	100	100	100	100	100	100

**Note:** #1 sampler was located 50 m to the south of the road upstream of the Kamaz truck monument; #2 sampler was located 100 m to the north of the road, towards the Barskoon River; #3 sampler was located 50 m to the north of the road, opposite to Kamaz truck monument, towards Barskoon River.

\* Recommended KR maximum admissible concentration (MAC) standard for populated areas



## 4.6 WASTE MANAGEMENT

KGC understands the importance of minimization of negative impact of waste on the environment and operates in compliance with Good International Industry Practice. We are committed to the ongoing improvement of our waste management strategy.

### Waste Management Strategy

KGC developed an integrated waste management strategy with input from international consultants. This strategy includes principles such as minimizing the negative impact of waste on the environment and effective use of financial resources spent on labour and purchase of equipment. KGC achieved the previously set objectives for waste management, namely:

- 100% recycling of industrial waste;
- Reduction of the volume of solid domestic waste to be landfilled;
- 100% composting of food waste from the camp kitchen on site.

In 2019, food waste sorting out was also started at other mine's facilities, such as Mega Shop, Mill, Fleet Shop.

### Major waste streams

Three major types of waste (not including waste rock and tailings) result from the mine operation: solid domestic waste, industrial and hazardous waste. Solid domestic waste includes food waste, various types of packaging, as well as other out-of-use household items. Industrial waste includes scrap metal, waste tires, plastic, waste oil and fluids, and other low hazard waste, generated in large volumes and subject to recycling and further use as a secondary raw material. Hazardous waste includes packaging materials, polypropylene bags and wooden boxes used for transportation of toxic agents, batteries, mercury lamps, medical waste and expired reagents. An important part of effective waste management is the accurate reading of waste generation.

### Improvement of waste handling practices

Reducing the negative impact on the environment and the effective use of financial resources related to waste management are the key priorities in improving our waste management strategy. As part of the implementation of the strategy objectives,

KGC seeks partners who are able to provide waste processing/recycling services, contributing to reduction in waste volumes disposed at site landfills.

Since 2014, not a single kilogram of industrial waste has been disposed on site. Scrap metal, plastic, rubber, wood, paper, waste oil and other waste are removed from the mine and delivered to our local partners to reuse and recycle. The re-use of scrap metal in the production of grinding balls is of particular note. The local company "Vulkan Plus" produces different size steel balls used for ore grinding at the Mill.

Domestic and hazardous waste are disposed at two landfills commissioned in 2015. These landfills were designed and constructed in full compliance with all engineering and environmental requirements. When designing and constructing the landfills, the following factors were taken into account: prevention of negative impact on ground and surface water, minimization of pollutant emissions into the atmosphere, preservation of pasturelands, effect of runoff and melt water on generation of leachate products and their safe utilization, and prevention of negative impact on local fauna. The landfills are operated in full compliance with the approved design and required environmental, sanitary and technical standards. Operation of the landfills involves placing and compacting the waste in batches, followed by covering the waste with a 20-30 cm soil layer to prevent access by wild animals. According to the mine closure plan, the landfills will be reclaimed with the rest of the areas onsite.

## Waste management

In compliance with KR environmental legislation, as well as high regulations and standards of environmental responsibility, KGC, as the owner of waste, is committed to ensure safe recycling or utilization of its waste, as well as continuous improvement of its waste management systems/processes/practices in order to minimize negative impact on the environment.

In 2019, the mine produced 5,412.5 tonnes of industrial waste, but for the fifth year in row, KGC recycled 100% of this. Separate collection of all industrial waste at all key locations on site and at BMY made it possible to eliminate the need for the temporary industrial waste sorting area, which, in turn, resulted in a significant cost-saving due to reduction in labour and equipment previously involved in these areas. Currently, all industrial waste is collected separately into corresponding containers and tanks, which as soon as filled, are removed from the mine avoiding unnecessary loading/ unloading and sorting operations.

In 2019, the mine produced 580.9 tonnes of solid domestic waste. In 2016, KGC committed to reduce volume of solid domestic waste to be buried in the Kumtor mine landfill by 50%, which is currently being implemented. The main purpose of the program is to reduce negative impact of waste on the environment and extend the life of the Solid Domestic Landfill. Such reduction in volumes of solid domestic waste has become possible through introduction of separate collection and further recycling of this waste.

Domestic waste can be segregated into three main categories: 1) Biodegradable waste - food; 2) Recyclable items - plastic, paper, glass, metal; 3) Non-recyclable items - multilayer packaging, domestic waste, etc. At the same time, biodegradable and recyclable waste can be relatively easily recycled and reused. Thus, taking into account composition of solid domestic waste, it is easy to see that if separate collection of waste is organized, about 75% of waste volume can be recycled and reused, and only 25% can not be recycled. It means that volume of solid domestic waste to be landfilled can be reduced 3-4 times.

As part of implementation of the strategy to optimize waste management system, as well as to reduce volume of waste to be buried at the Kumtor mine, in 2017, KGC introduced a partial separate collection and recycling of solid domestic waste at the mine.

In 2017, a biodegradable waste processing station, or compost unit, was designed and constructed. In this station, food waste is processed by aerobic decomposition

producing compost - an organic fertilizer that will be used for restoration of fertile properties of top soil, reclamation of disturbed fertile soil areas. Laboratory tests confirmed that the chemical-biological composition of the final product - compost - fully complies with the properties of organic fertilizers. In this way, about 1 ton of food waste is processed per day. The recyclable types of waste are still sent to processors of plastic, paper and metal what made it possible to significantly reduce the amount of waste to be buried on site and, therefore, extend life of the waste landfills, reduce negative impact on the environment, reduce expenses for maintenance of landfills and partially solve the problems with wild animals feeding on food waste.

The biodegradable waste processing station underwent all stages of designs, state expertise and obtained a construction permit. It should be noted that this is the first such project in Kyrgyzstan demonstrating a high level of environmental responsibility at KGC.

In 2019, the mine produced 407.5 tons of hazardous waste, of which 14.6 tons were shipped off site for recycling by a specialized company. The volume of hazardous waste shipped off for recycling was significantly lower than the 2018 volume because oily rags were classified as a lower hazard class and its volume was included in the total volume of industrial waste. Hazardous waste includes various packaging materials, used for transportation and storage of toxic chemicals, car batteries and other types of batteries, mercury-containing lamps, as well as soil contaminated with hazardous materials. Chemicals packaging materials are buried on site in the authorized Hazardous Waste Landfill.

Car batteries are collected separately and shipped off site for recycling. In addition, collection of other types of batteries was started - AA batteries, typically used in communications and computer equipment. As this type of hazardous waste accumulates, it is shipped off site to Bishkek for safe disposal by a specialized company. In 2017, with assistance of local companies, KGC started the process of utilization of oily rags and big bags and these works were continued in 2019. In general, KGC significantly improved its waste management practices, adhering to the main priorities for reduction of negative impact on the environment, effective use of financial resources and introduction of the best waste management practices.

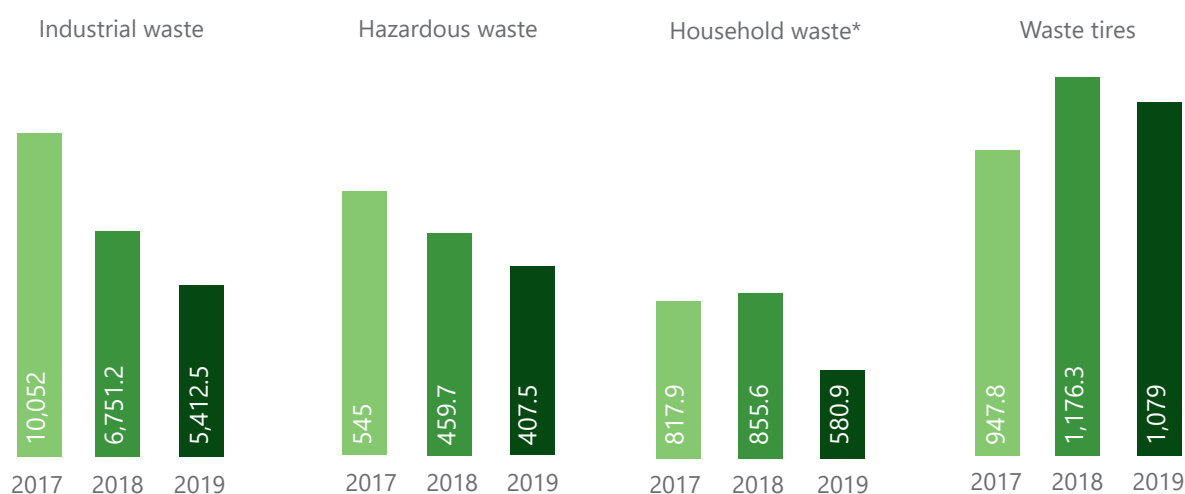


## 4.18 Waste generation 2019 (tonnes)

	Generated tonnes	Disposal method
Industrial waste		
Metal	3,088.902	100% Recycled
Paper	125.195	100% Recycled
Wood	302.410	100% Recycled
Plastic	213.199	100% Recycled
Rubber products	47.894	100% Recycled
Oily rags	132.790	100% Recycled
Used oil and blends	1,502.060	100% Recycled
Total	5,412.450	
Hazardous waste		
Packaging	392.912	Landfilled
Batteries	12.520	100% Recycled*
Mercury lamps	2.039	100% Recycled
Total	407.5	
Tires		
Waste tires	1,079.0	100% Recycled

**Note:** 10 tons of used batteries, including those remained from previous years, are temporarily stored at the mine. In 2019, 1,079 tons of used tires were generated, 1,309,006 tons were transferred for recycling. 280 tons of used batteries, including those remained from previous years, are temporarily stored at the mine.

## 4.19 Waste produced at Kumtor Mine Site (tonnes)



\* In 2018, volume of produced domestic waste increased due to the increased number of employees (Fig. 3.5).



## 4.7 UNPROCESSED WASTE ROCK

As typical for most open pit mining projects, KGC has to remove large volumes of unprocessed (waste) rock and other materials in order to safely access the ore.

The waste rock is deposited in agreed designated locations and is routinely monitored for its impact on the environment.

### Waste rock dumps

In accordance with the KR Law on Subsoil Protection, as well as industrial safety standards, waste rock dumps shall have sufficient storage capacity, and be located at a minimum distance from a mining cutback. Mined waste rock shall not be placed in areas with mineralization, hinder mining operations in the pit and shall be formed according to the safety requirements. In addition, dumping methods and equipment shall ensure uninterrupted waste rock dumping in the required volume per time unit, and comply with limitations on dump capacity whilst maintaining dumping costs at the lowest level and labour/equipment productivities at the highest level. Modeling and assessment of waste dump stability are performed by specialists of the Research and Design Laboratory LLC of Geotechnical Objects Stability based on KGC's monitoring data.

### Waste rock movement

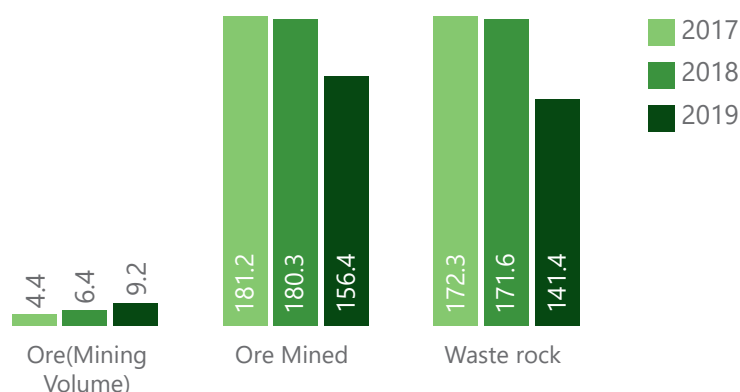
KGC continues to monitor potential deformations of soil and ice throughout the mine, including timely relocation of ice and assessment of waste dumps condition to ensure safe mining operations and timely relocation of the affected infrastructure. In 2019, the company continued to implement special measures aimed at reducing the rate of dump deformations through a more even distribution of loads, construction of water drainage systems, and introduction of an automatic monitoring system.



### Acid rock drainage analysis

Acid rock drainage (ARD) describes contaminated water that can be generated from water contacting the sulfur containing waste rock. The issue of acid formation is directly related to both mining and post closure period. KGC has routinely monitored for ARD risk since the initial environmental impact assessment, taking into account the ore body, waste rock and tailings. A number of independent assessments by international consultants concluded the ARD risk from KGC is low due to the high carbonate content in dumps, which neutralizes acidity. A long-term ARD assessment is a part of the mine closure planning.

## 4.20 Key production statistics of Mine Operations, million tonnes





## 4.8 TAILINGS MANAGEMENT

Tailings are liquid and solid materials, also called slurry, that remain after extraction of economically beneficial metals and minerals from crushed and processed ore.

Tailings of the Kumtor mine are transported through a 6.7-kilometer slurry pipeline from the Mill to the tailing management facility (TMF), where they are deposited, settled, and stored. The liquid component is treated before discharge and the solid component retained in the tailing pond until further reclamation and mine closure activities. The Kumtor TMF consists of two slurry pipelines (main tailings line and a spare one), a tailings dam supported by a buttress and a shear key, monitoring equipment and instruments, an effluent treatment plant, and two diversion ditches to direct surface water around the TMF. In addition to general tailings management, two important aspects are monitored and controlled: (i) cyanide containing solutions, which are securely contained within the TMF, and (ii) dam stability. These issues are discussed below.

### Cyanide residue management

The concentration of cyanide in the TMF is routinely monitored. In the tailings pond there is a natural disintegration of the chemical, or its decomposition, as a result of a chemical reaction and exposure to ultraviolet radiation. The liquid component is pumped and treated by the effluent treatment plant (ETP) to reduce cyanide and metals for safe discharge to the environment. More discussion of the cyanide concentrations discharged to the external environment is provided in the Water Quality and Compliance section.

### Geotechnical monitoring and stabilization

The dam is constructed and managed to safely retain tailings. The dam is 3,050 meters long with a maximum height under its crest of 40.5 meters at an elevation of 3,670.5 meters above sea level. The dam is constructed primarily of dense granular fill made of the local ground. The dam surface is covered with an HDPE liner (a strong impermeable synthetic material) from the upstream slope to the toe of the dam, and then 100 meters into the tailings pond. This liner extends into the permafrost to minimize seepage through the dam. The height of the dam is increased over time to ensure sufficient volume for tailings storage. Along with the increase of the pond volume,

the existing buttress downstream of the dam is also expanded, which helps to increase the strength and stability of the structure. Some movement of the KGC dam was first observed in 1999, and since then, Kyrgyz specialist organizations and international engineering experts have been consulted on management and mitigation. In response, a shear key and buttress were constructed along the downstream toe to reduce, and eventually eliminate, the movement of the dam. Since 2006, a tendency of horizontal displacement velocity reduction has been observed. A branched network of sensitive instrumentation is installed to detect and record any movements in the dam structure. In 2019, operations on the buttress construction above the shear key were carried out at the dam lower edge for further expansion of the dam from the downstream toe. Compliance with timelines for periodic topping of the tailings dam, construction of the shear key and the buttress will ensure increase of the dam overall stability. To implement the planned activities ensuring the dam stability at 3,674.0 m crest level, a sequence of construction operations has been developed, starting from 2017 to 2020. Dam construction operations and the technological process of tailings impounding are carried out in accordance with ecological, economic and technical standards and fulfillment of safety conditions.

### Tailings balance

Accurate knowledge of what enters and leaves the TMF and the volumes of liquid and solids it contains, are an important part of safe management. We survey the extent and depth of the pond, and track the volume of tailings entering the TMF and volume of water leaving it after treatment at the ETP and by evaporation from the pond surface. Tailings slurry, 49% consisting of solids, is continuously added to the TMF throughout Mill operations (most of the year). Water treatment and removal (via the ETP) occurs only during summer months when the pond and Kumtor River is not frozen - usually May to October. Therefore, TMF water volume peaks in spring and reaches its lowest level at the start of winter.



## 4.21 Tailings dam monitoring instrumentation (number of instruments)

Type	Purpose	2017	2018	2019
Inclinometers	Measure horizontal displacement	50	50	50
Settling plates	Identify dam base settlement	32	37	37
Piezometers	Measure water levels in dam body and base	33	38	38
Thermistors	Dam body and base temperature	48	53	53

## 4.22 Key Characteristics of Kumtor's Tailings Management Facility (TMF)

	Units	2017	2018	2019
Tailings discharged to Tailings Pond	mil. m <sup>3</sup>	8.36	8.68	8.55
Net tailings remaining in Tailings Pond per year	mil. m <sup>3</sup>	4.98	4.99	4.00
Total cumulative tailings in Tailings Pond at year end	mil. m <sup>3</sup>	83.29	88.28	92.28
Total free water in Tailings Pond at year end	mil. m <sup>3</sup>	6.55	7.32	7.34
Elevation of Tailings Dam Wall crest	masl	3,670.5	3,670.5	3,670.5
Peak water level in Tailings Pond during year	masl	3,664.86	3,665.95	3,666.90
Minimum water freeboard (dam crest level - peak water level)	m	5.66	4.55	3.60

## 4.23 Water balance in TMF, m<sup>3</sup>

	2017	2018	2019
Free water at start of year (January 1)	5,730,850	6,546,038	7,321,113
Water added in tailings	6,174,299	6,465,724	6,457,637
Net precipitation/runoff less evaporation	470,340	816,738	1,344,018
Water remaining in tailings voids	-1,861,268	-1,884,923	-1,778,539
Water discharged from Tailings Pond to Effluent Treatment Plant	-5,026,168	-4,622,464	-6,000,482
Adjustment based on bathymetric survey	1,057,985	0	0
Free water at the end of year (December 31)	6,546,038	7,321,113	7,343,746



# 5. GLACIERS AND WATER MANAGEMENT

## 5.1 WATER USE AND TREATMENT

We use water for operational activities (mostly in the Mill), as well as for domestic use (drinking and sanitation) in the mine camp, offices, and workshops. Water is removed from the mine pit in order to ensure safe and stable operations.

### Our main water management responsibilities are:

- Providing safe drinking water for our employees;
- Removing water and moving ice from the open pit to ensure safe access to ore, and stable and safe working conditions;
- Ensuring water returned to the natural environment is safe and meets specified quality criteria;
- Managing run-off to reduce sediment load entering local creeks and rivers.

An information brochure describing Water Management at KGC can be downloaded from our website at: [www.kumtor.kg/en/environment-protection/water-management](http://www.kumtor.kg/en/environment-protection/water-management).

### Water sources

We have two primary sources of water at the mine site. Most of the water we use is extracted from Petrov Lake. We also pump large volumes of water from the open mine pit to ensure its safe and stable operation, some of which we use at the Mill, thus reducing our demand from Petrov Lake. In 2019 we extracted approximately 5.41 million m<sup>3</sup> of water from Petrov Lake, which is more than in the previous year (5.17 million m<sup>3</sup>).

### Operational water use

Our main use of water is as process water in the Mill, for crushing the ore and processing it to produce gold.

In 2019, the Mill used 4.95 million m<sup>3</sup> from Petrov Lake, 1.49 million m<sup>3</sup> collected from the mine pit and

7.99 million m<sup>3</sup> of recycled water. The use of pit water, which reduces our demand on water from Petrov Lake, has increased from zero in 2011 to 1.49 million m<sup>3</sup> in 2019. In 2020, we plan to increase the amount of water collected from the pit for the Mill processes. In 2019, the total amount of water used at the Mill decreased approximately by 0.4 million m<sup>3</sup>, but the total amount of fresh water sourced from Petrov Lake actually increased in 2019 compared to 2018.

### Drinking water

We also use treated water from Petrov Lake for domestic uses (drinking and sanitary) in the mine camp, the Mill, and other facilities. Domestic water use in 2019 was about 0.2 million m<sup>3</sup>, representing just 3.58 % of the freshwater we collect from Petrov Lake. Drinking water quality is monitored to ensure its safety and compliance.

### Pit dewatering

We collect and discharge large quantities of water as a necessary part of our pit-dewatering program to keep the pit stable and safe. Some dewatering occurs throughout the year, but most occurs during the summer period when large quantities of glacial melt water collects in the open pit. The majority of the pit water is discharged to the environment.

# 5.1 Water Flows at Kumtor Mine, mln m<sup>3</sup>\*

## Petrov Lake

Formed by the meltwater of Petrov Glacier, the lake is the source of drinking water at the mine and also supplies most of the water used for gold processing at the Mill.

29.6 mln m<sup>3</sup>

## Pit

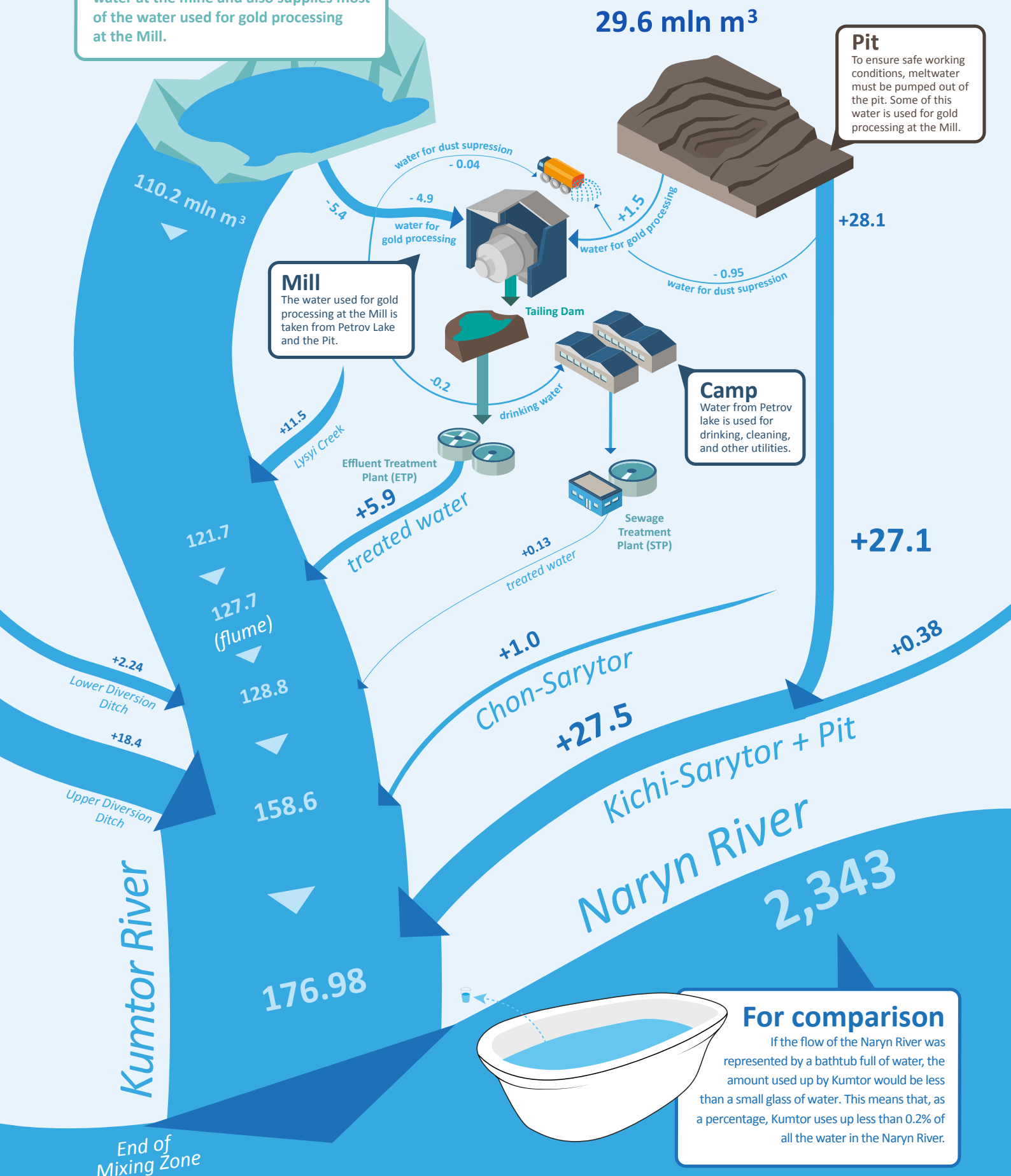
To ensure safe working conditions, meltwater must be pumped out of the pit. Some of this water is used for gold processing at the Mill.

## Mill

The water used for gold processing at the Mill is taken from Petrov Lake and the Pit.

## Camp

Water from Petrov lake is used for drinking, cleaning, and other utilities.



## For comparison

If the flow of the Naryn River was represented by a bathtub full of water, the amount used up by Kumtor would be less than a small glass of water. This means that, as a percentage, Kumtor uses up less than 0.2% of all the water in the Naryn River.

\* These flows are indicative only and will vary year to year





## 5.2 Water usage at Kumtor Mine Site

	Units	2017	2018	2019
<b>Sources of Water</b>				
Total Water Extracted from Petrov Lake	mil. m <sup>3</sup>	5.21	5.17	5.41
Pit water pumped to the Mill	mil. m <sup>3</sup>	1.14	1.54	1.49
Pit water pumped to the environment	mil. m <sup>3</sup>	29.24	25.17	27.11
<b>Water used for Domestic Purposes</b>				
Water Used for camp domestic purposes	mil. m <sup>3</sup>	0.13	0.14	0.15
Water Used for Mill domestic purposes	mil. m <sup>3</sup>	0.02	0.02	0.02
Water Used for lower zone domestic purposes				0.03
<b>Water used for Process/Mill</b>				
Raw water used at Mill (from Petrov Lake)	mil. m <sup>3</sup>	5.03	4.91	4.95
Total water used at Mill (Petrov Lake + Pit water)	mil. m <sup>3</sup>	6.17	6.45	6.44
Water internally recycled at Mill	mil. m <sup>3</sup>	6.19	8.06	7.99
Ore Feed to Mill	mln tonnes	6.25	6.33	5.97
Raw Water Intensity Ratio	litres/tonne	805	776	829
Process water fro drilling exploration operations (Petrov Lake)				0.23
<b>Water used for Dust Suppression</b>				
Water used for dust suppression (from Petrov Lake)	mil. m <sup>3</sup>	0.05	0.11	0.04
Water used for dust suppression (from Pit water)	mil. m <sup>3</sup>	0.77	0.75	0.95
<b>Wastewater Discharged to Environment</b>				
Treated wastewater discharged from ETP	mil. m <sup>3</sup>	4.75	4.58	5.99
Treated wastewater discharged from STP	mil. m <sup>3</sup>	0.10	0.13	0.13
Net water usage	mil. m <sup>3</sup>	0.36	0.46	-0.72

## Sewage treatment

Sewage wastewater is treated at the sewage treatment plant (STP) before discharge to the environment. This uses standard processes of biological treatment and disinfection (chlorination). The biological treatment improves the water quality by removing the 'oxygen demand' of organic matters, which would otherwise use up oxygen in the river and reduce its quality. Chlorination eliminates potentially harmful bacteria. Although challenging to operate in extreme conditions - high altitude with low oxygen and harsh weather conditions, treatment is achieved successfully through careful calculations and management. During freezing winter conditions, treated sewage is stored in a holding pond prior to gradual discharge during summer. In 2019, approximately 0.13 million m<sup>3</sup> of sewage was treated and discharged.

## Industrial wastewater treatment

Industrial wastewater containing residual cyanide is a component of tailings slurry discharged by gravity flow from the Mill to the tailings management facility (TMF).

The liquid component of tailings (approximately 51% of the slurry by weight) is pumped to and treated at the Effluent Treatment Plant (ETP), for compliance with the established standards - Maximum Allowable Discharge (MAD), before discharge to Kumtor River. Due to the freezing winter conditions, the treatment and discharge of wastewater is restricted only to the warmer season, typically from May to October.

The main concerns of community regarding wastewater from the Kumtor mine are related to cyanide, a highly chemical used routinely in the processing of ore to recover gold.

In 2019, 8.55 million m<sup>3</sup> of tailings were produced and discharged into the tailings pond. The tailings containing remaining concentrations of cyanide and other chemicals can do harm to the environment if discharged without treatment. The solid component is retained in the TMF, while the majority of liquid component is pumped to and treated at the ETP to reduce concentrations or remove elevated contaminants. We use the patented INCO treatment process, and operate one of the largest cyanide treatment plants outside of North America.

In 2019, approximately 5.99 million m<sup>3</sup> of industrial wastewater from the tailings ponds was treated and discharged.

## Water use intensity

Extraction of water from Petrov Lake for the mine's needs has no measurable impact on average annual lake water level. During the year, the water level naturally fluctuates within 2 meters.

Total water extraction from Petrov Lake of 5.41 million m<sup>3</sup> in 2019 represents approximately 4.91% of its natural outflow to Kumtor River. We then returned 6.13 million m<sup>3</sup> as treated wastewater (STP plus ETP). The difference between the total water extraction from Petrov Lake in 2019 and the total water returned to the environment as treated wastewater is explained by the accumulation of water in the tailings pond in previous periods.

In 2019, we pumped a total of 29.6 million m<sup>3</sup> of water from the pit, including surface and glacier melt water.

Of this, 1.49 million m<sup>3</sup> was used in the Mill, 0.95 million m<sup>3</sup> for watering the pit roads and the remaining volume (27.11 million m<sup>3</sup>) discharged to the environment.

The gold recovery technology used at the Kumtor mine and severe climatic conditions limit our ability to increase our water use intensity by recycling effluents from our tailings pond. Studies have shown that even low levels of cyanide in the tailings pond would adversely affect our gold recovery process. All year round operation of the Effluent Treatment Plant is impossible because of climatic conditions. Since July 2012, we have been using water from pit dewatering in the Mill. As a result, we are seeing a decreasing trend in the water use intensity of our operation, reflecting the positive impact of in-mill recycling and using an increasing proportion of water from pit dewatering.

## Managing run-off

We continue to improve the management of surface run-off (precipitation and ice melt) to reduce the risk and prevent possible contamination. Pumps are installed at the toes of Davydov, Lysiy and Sarytor glaciers and pipeline system was constructed around the waste rock dumps. Melt water is diverted to Kichi Sarytor and Lysyi Creeks. We also constructed a number of settlement ponds for settlement of solid particles. Flume stations with automatic calculation of water flow and data import directly to the MP-5 database were constructed at the Kumtor River and Lysyi Creek.



## 5.2 WATER QUALITY AND COMPLIANCE

### Drinking water

The water we use at the mine site for standard domestic use (for drinking, food preparation, personal hygiene and general cleaning of the mine camp and offices) is regularly tested against Kyrgyz, Canadian and World Health Organization (WHO) drinking water standards. The key parameters of our drinking water are compliant with these standards, and therefore safe for all relevant uses.

### End of mixing zone

We sample and test water quality at over 30 points across the Concession area, which are listed and shown in the Environmental Monitoring Section. Sampling points are selected from a combination of legal obligations and additional commitments related to our environmental management responsibilities and programs. Our main compliance point is where surface water converges downstream of our operations, below where treated water is discharged to the river and shortly after leaving the concession area (as shown in Fig. 4.3). This point, designated as W1.5.1, and referred to as 'End of Mixing Zone', was selected by KGC to be protective of the intent of the Environmental Management Action Plan (EMAP) and the water quality in the Kumtor River. Any exceedance of water quality criteria at W1.5.1 triggers us to examine the data at W1.8, the monitoring point 1 km upstream of Naryn City, which is the nearest to the mine downstream community consuming the water. Results for 2019 are presented in the bar chart (Fig. 5.3), which includes the Kyrgyz maximum allowable concentration (MAC) limits recommended for water bodies providing public water supply.

Overall, the glacial origin of surface water sources in the Kumtor project area results in them having elevated sediment loading (suspended solids), visible in the generally milky appearance of the water. This sediment loading influences the total concentration of metals (aluminum, copper, iron, zinc). This naturally elevated background condition was documented in baseline monitoring prior to the start of KGC mining operations.

Elevated background concentrations are also reflected in water quality results from Petrov Lake, the source of Kumtor River located upstream of the mine. The presence of sediments and associated metals is not indicative of poor environmental performance of Kumtor mine. Kyrgyz water quality standards refer to total metal concentrations, whereas international environmental water quality standards are more commonly based on dissolved metals, which is more indicative of environmental impact and associated risks. We consider these aspects when evaluating water quality at KGC.

A review of results from 2019 shows the average total aluminum and iron concentrations exceeded the MAC standards. However, they remained consistent with the naturally high background concentrations in the region, which can be of the same order or higher. These results do not represent a significant risk to human health or the environment, as iron effects are mainly aesthetic (taste, visual appearance). These are some of the most abundant metals in the Earth's crust, and therefore not unusual to see at these concentrations.

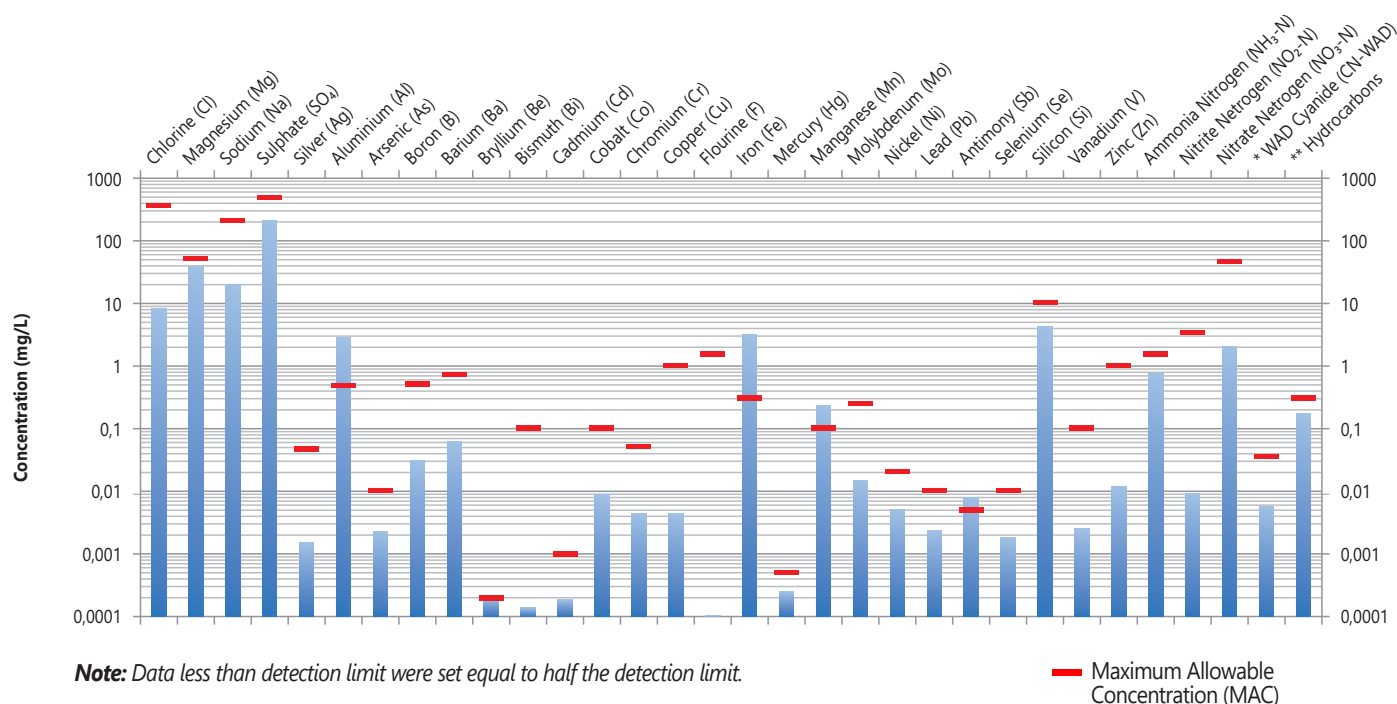
The average total manganese concentration (0.224 mg/L) at the End of Mixing Zone is above its MAC Communal Use standard (0.1 mg/L) in 2019, but lower than 2018 values. It should be noted that manganese occurs naturally in the environment, produced by erosion and weathering of rocks and minerals. The concentrations observed do not represent a significant risk to human health or the environment, as manganese effects are primarily aesthetic in humans and livestock.

According to the EMAP, KGC is required to consider international guidelines when processing water quality data. In particular, the current Canadian water quality guidelines do not provide for maximum concentrations of manganese allowable for livestock. There is a Canadian aesthetic guideline of 0.05 mg/L for distribution systems, which is not based on toxicity but rather potential problems in restricted flow devices in water lines (Olkowski, 2009). Ministry of Health Canada also assigns an aesthetic objective for human drinking water at 0.05 mg/L based on taste, staining of laundry, as well as quality of plumbing fixtures (Health Canada, 2014). There are no Canadian Environmental Quality Guidelines or United States Environmental Protection Agency (US EPA) guidelines for the protection of aquatic life or livestock (CCME, 1999). In Canada, the province of British Columbia has a chronic guideline for protection of freshwater aquatic life of 0.7 mg/L in soft water (mg/L as CaCO<sub>3</sub>) and higher guidelines in higher hardness water (Nagpal, 2001). The average manganese levels in 2016 were well below the British Columbia guideline for protection of aquatic life from long-term exposure. In 2019, the antimony concentration (average of 0.0079 mg/L) exceeded the relevant MAC limit (0.005 mg/L). In light of this, Kumtor retained CanNorth consultants from Saskatoon, Canada, to complete a risk assessment for potential environmental and human exposure to antimony downstream of the Kumtor mine. It was concluded that this antimony level was "well below levels associated with potential effects on aquatic receptors and thus are not a concern for the health of the aquatic environment". The antimony concentration in 2019 is below the threshold reference value (TRV) for mammals, suggesting that this antimony concentration is not toxic to them.



**Our drinking water is safe and compliant. All our wastewater is treated and is environmentally safe before discharge**

### 5.3 2019 Water Quality Data in the Kumtor River at the End of the Mixing Zone and Kumtor Concession Area (location WL5.1)



\* MAC is for Free Cyanide (CNF). Measuring CNWAD is conservative as CNF is always less than or equal to CNWAD.

\*\* Hydrocarbon fractions F1 (C6-C10) to F4 (C34-C50) were analyzed individually and all measured at less than laboratory method detection limit. The value reported above (0.1 mg/L) represents half of the highest detection limit (0.2 mg/L for F3 and F). Other fractions had lower detection limits.

Unfortunately, a quantitative assessment is not possible for birds due to a general lack of available toxicity data for birds exposed to antimony.

With respect to human health, the Kyrgyz Republic does not have a drinking water guideline for antimony. However, CanNorth (2017) notes that the World Health Organization (WHO, 2011) has derived an antimony drinking water guideline of 0.020 mg/L for the protection of human health. Despite the fact that in 2019, the concentration limits noted in the WHO drinking water guidelines are not exceeded, CanNorth also considered other pathways of exposure (e.g., consumption of fish) through the comparison of an intake to a TRV. The TRV for antimony was selected from

the United States Environmental Protection Agency (US EPA) Integrated Risk Information System (IRIS) database. Exposures were then calculated for adults, children and toddlers that were assumed to be potentially influenced as part of a shepherd family living seasonally downstream of Kumtor near the Taragay River. The calculated intakes were "well below TRV levels" indicating that antimony concentrations "do not represent a cause for concern from a human health perspective" (CanNorth, 2017). Notwithstanding the conclusions above, Kumtor is committed to identifying and mitigating the source of antimony released to the Kumtor River.

## Effluent treatment plant discharge

Given the extreme climate conditions at the mine site, KGC's effluent treatment plant (ETP), which treats the effluents contained in the tailings management facility (TMF), generally operates between May and October each year (when water is not frozen).

During the water treatment season, the Kumtor river, which receives treated discharge from the ETP, is not frozen and exhibits significant flow volumes.

The ETP treated water quality results for 2019 are presented in the bar chart (Fig. 5.4). The results are compared to the MAD standards and discussed below.

The results show that concentrations of cyanide in the treated effluent discharge, as well as certain other key parameters met their respective MAD standards, including the average total ammonia (as N) concentration (21.39 mg/L). However, there were onetime exceedances of total ammonia (as N), which do not represent any significant risks to the environment.

## Sewage treatment plant discharge

In 2019, the average generation of sewage water was approximately 369 m<sup>3</sup>/day. The quality of treated water discharged from the STP met all required MAD standards, including the total ammonia value (1.7 mg/L) which met the approved MAD standard (2.01 mg/L) (Table 5.5). In 2019, the antimony concentration (average of 0.0079 mg/L) exceeded the relevant MAC limit (0.005 mg/L).

## External water quality testing

Our operations are routinely subject to inspections by local government agencies, who notify us of any concerns identified. We then respond and address these concerns accordingly.

## Monthly and historic results

Average monthly monitoring results are presented in the appendix to this report. Monitoring results from previous years are presented in the past annual environment reports, which are also available on the website [www.kumtor.kg](http://www.kumtor.kg).

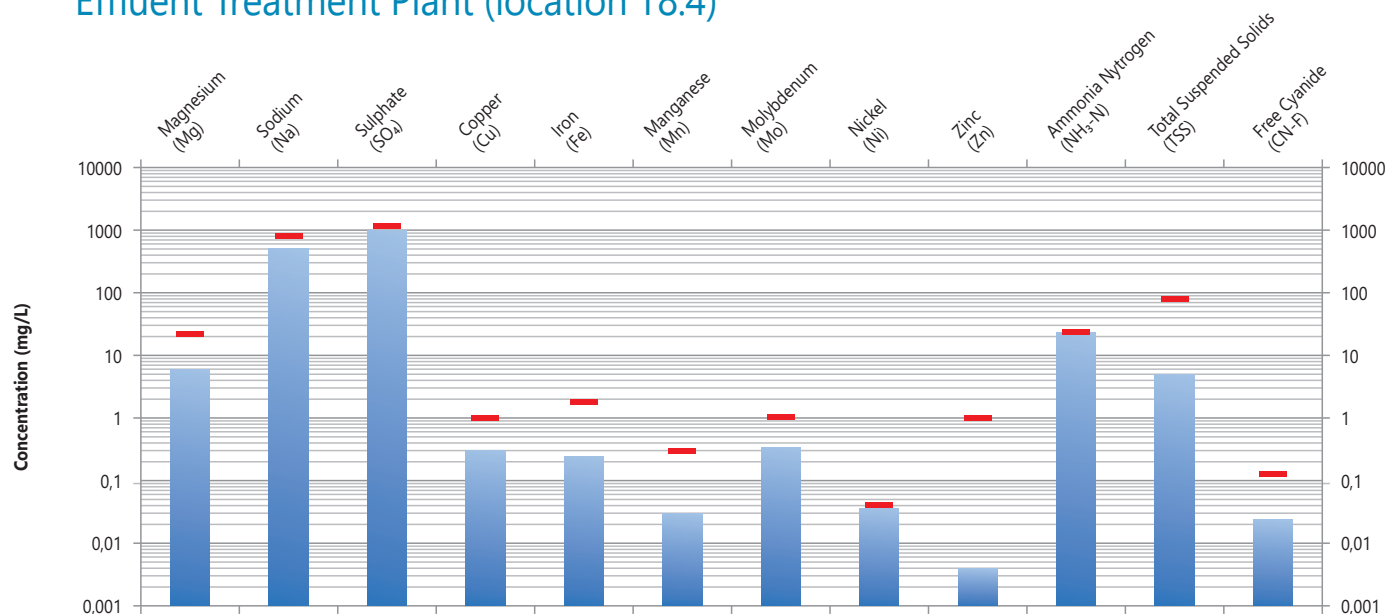


### References:

Canadian Council of Ministers of the Environment (CCME), 2008. *Canadian Water Quality Guidelines (CWQG)*. Accessed at: [https://www.ccme.ca/files/Resources/supporting\\_scientific\\_documents/cwqg\\_pn\\_1040.pdf](https://www.ccme.ca/files/Resources/supporting_scientific_documents/cwqg_pn_1040.pdf); United States Environmental Protection Agency (US EPA), 1995. *1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water*.



## 5.4 2019 Water Quality Data at the Discharge Point of the Effluent Treatment Plant (location T8.4)

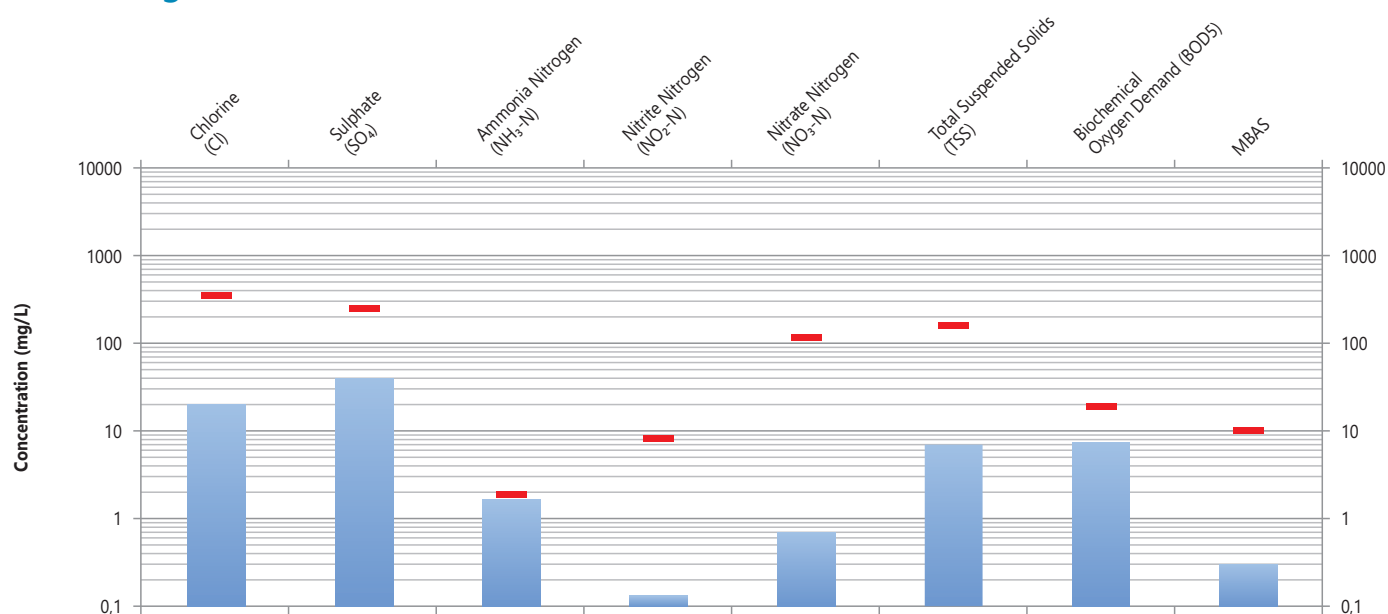


**Note:** Data less than detection limit were set equal to half the detection limit.

\* MAC is for Free Cyanide (CNF). Measuring CNWAD is conservative as CNF is always less than or equal to CNWAD.

Maximum Allowable Discharge (MAD)

## 5.5 2019 Water Quality Data at the Discharge Point of the Sewage Treatment Plant (location SDP)



**Note:** Data less than detection limit were set equal to half the detection limit.

Maximum Allowable Discharge (MAD)





## 5.3 GLACIER MANAGEMENT

Kumtor's high altitude mining operation is in close proximity to active glaciers, with part of the ore deposit and associated infrastructure extending beneath or affected by moving glaciers.

Ice removal is required to provide safe access to ore and has been an approved part of mining since 1994. Glaciological studies have shown that, compared to the natural melting caused by climatic changes, the removal and relocation of glacier ice to ice fields (practically at the same elevations) protects the relocated ice from excessive melting, significantly reducing their loss.

In response to stakeholder concerns, and taking into account changes in the legislation of the Kyrgyz Republic prohibiting activities that result in the acceleration of glacier melting, or activities that may affect the condition of glaciers, KGC describes relevant information on mining operations.

### Ice unloading

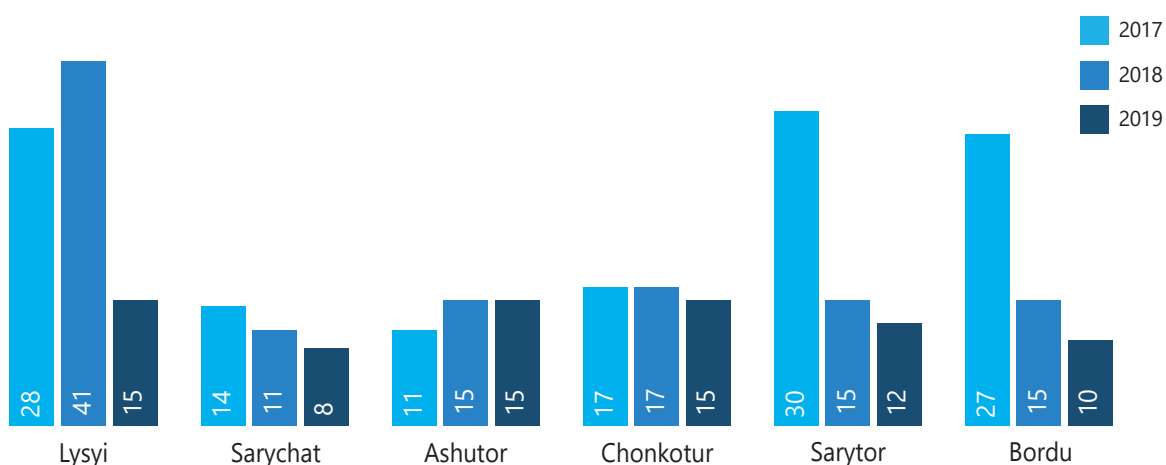
As visible on the map in the Environmental Monitoring section of this report (Figure 4.3 - Key Environmental Monitoring Locations), parts of five active glaciers are located within the Kumtor Concession area (Davydov, Lysyi, Sarytor, Petrov, Bordu). Ice is also present in extensive ice fields in the southern and eastern parts of the Concession area. The continuation of mining at Kumtor depends on our ability to minimize the impact on glaciers and remove the ice only in the vicinity of the open pit and other infrastructure throughout the

life of the mine. Over the years, KGC has found the best mining options, adapting to the current situation. Taking into account the opinion of stakeholders, KGC no longer deposits waste rock on the part of the glacier surface and now segregates waste rock and ice, avoiding co-disposal. The ice removed by Kumtor as part of its mining process is deposited back on other ice fields. In 2019, approximately 5.8 million tonnes of ice was removed and placed subsequently in the isolated areas. Ice removal will need to continue in the future to provide ongoing safe access to the ore body as mining progresses.

### Environmental aspect

The impact of climate change has been observed in Central Asia, as well as around the world, over the past century. According to the United Nations Development Programme (UNDP), nearly 1/3 of the glacial area of Central Asia has disappeared since 1930, including the glaciers of the Kyrgyz Republic. In 2003-2013, the Ak-Shyirak massif glaciation reduced by 21.9 km<sup>2</sup> or 0.59% per year. Both the rates of reduction of the Ak-Shyirak massif glaciers and the rates of retreat of the glaciers tongues have significantly increased in the recent years. This is due to the rapid increase in air temperature in the warm period (May - September).

## 5.6 Retreat of the observed glaciers, m/year



## Glacier monitoring

The nature of all glaciers is for them to move steadily downhill, much like a very slow-moving river. The movement of the Davydov and Lysyi glaciers has been monitored since 1995, before mining started, with Sarytor and Bordu glaciers included in recent years.

Flow rates of the glaciers, like any other glaciers, follow a seasonal pattern, being faster in warmer months and slower in winter. The retreat of the observed glaciers for 2015-2019 is shown in Fig. 5.6.

In 2014, Kumtor constructed an in-pit retaining buttress to reduce the movement rate of the south arm of the Davydov Glacier. Regular monitoring has shown this has been an effective engineering solution, and has reduced the quantity of ice that needs to be removed to ensure pit safety.

Averaged movement rates of glaciers determined by the fixed points (ablation stakes #1, 3, 6) for 2017-2019 are shown in Fig. 5.7.

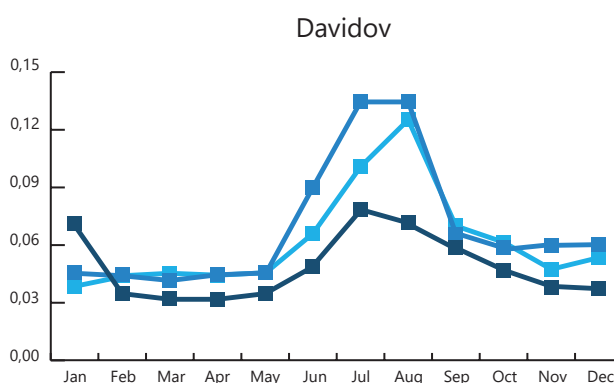
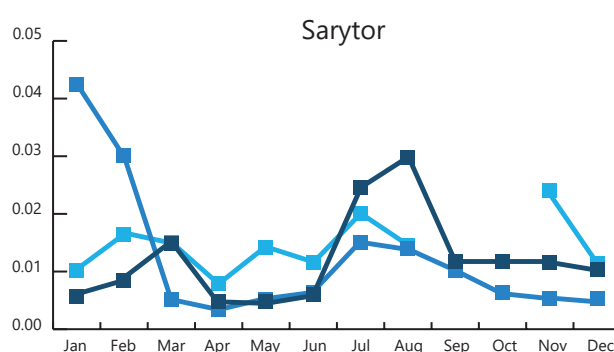
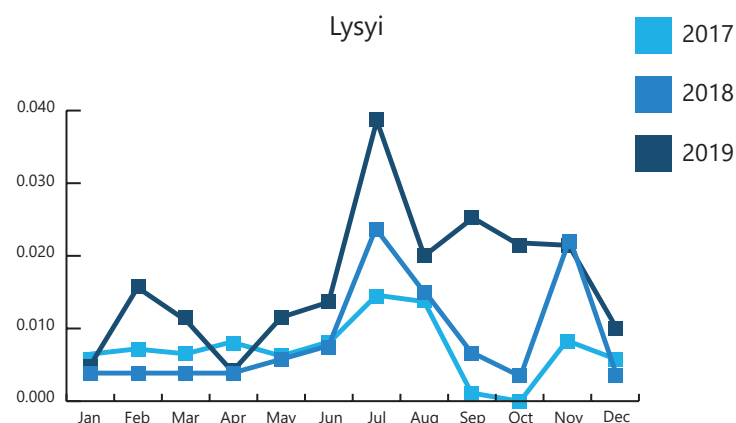
In 2014, we commenced a long-term glacier and hydrometeorological monitoring program covering KGC concession area and basins of Arabel and Uchkol rivers.

The studies are conducted by the Institute of Water Problems and Hydropower under KR NAS with involvement of experts from MGU (Moscow State University, Russia). The monitoring program aims to assess the status of glaciers and trace the dynamics of their change (movement rate, linear retreat, and surface depression) and reflective properties of their surfaces (albedo) within the area of immediate anthropogenic impact by KGC and comparison of obtained data with similar observations undertaken on glaciers located at significant distances from the mine. Further information is contained in the case study in this chapter.

## Regulatory aspects

Measures to move glaciers and ice have been a feature of mining operations at Kumtor starting from 1994. These measures are the subject of frequent inspections and considered when the KR supervisory and regulatory authorities issue permits and approvals to KGC for any activity, and are also studied by international technical and environmental experts. In November 2017, amendments regulating the operations on Davydov and Lysyi Glaciers were introduced by the KR Parliament into the KR Water Code.

## 5.7 Retreat of the observed glaciers,m/day



## 5.8 Relocation of ice to isolated areas at the mine

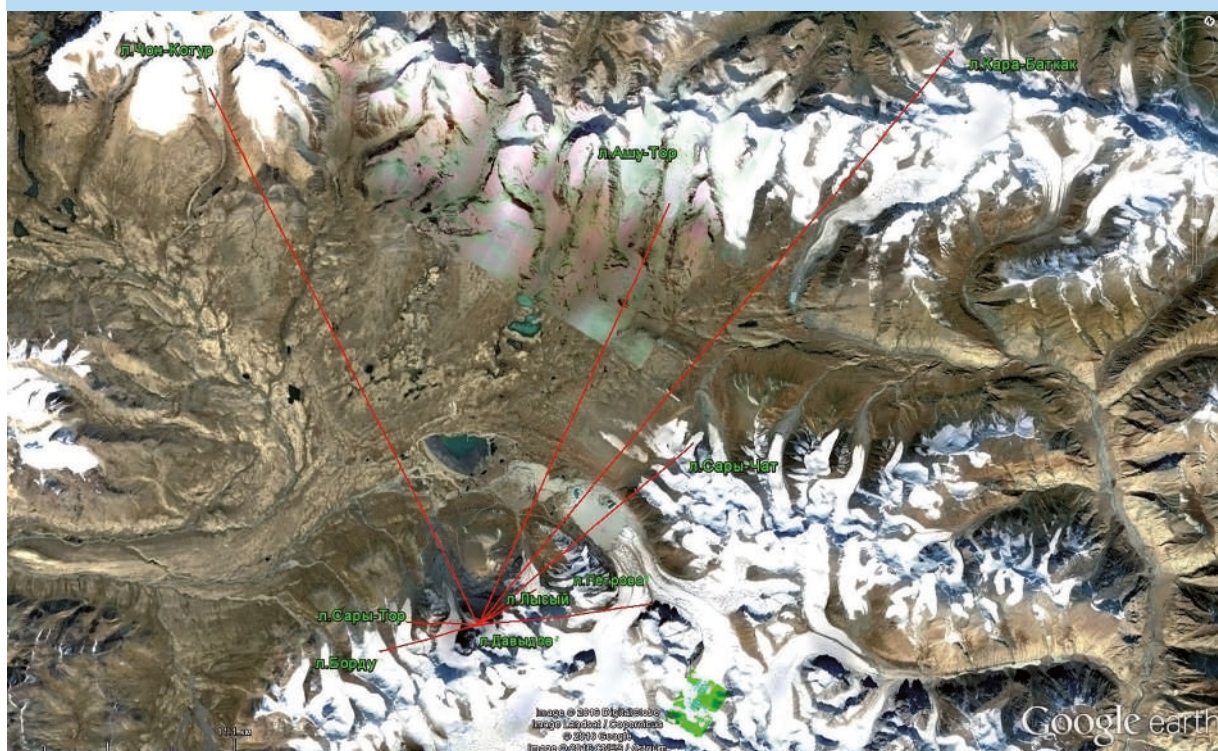
2017	mil t/year	4.4
2018	mil t/year	2.3
2019	mil t/year	5.8

### Glacier research and assessment of technogenic impacts on Ak-Shyrak Massif Glaciers

Studies of the Ak-Shyrak massif glaciers have been conducted for more than 140 years. As a result of the studies, it was found that the area of glaciation of the Ak-Shyrak massif in the late 1950s - early 1960s was 436 km<sup>2</sup> (Katalog lednikov SSSR [Glacier Catalogue of the USSR] 1969,1970). In 2019, KGC continued funding the glacier research covering the glaciers within and outside the KGC concession area. In 2019, the Kyrgyz Institute of Water Problems and Hydropower (IWPH) of the KR National Academy of Sciences continued 2014-2018 research and based on the approved by both parties expanded glacier and hydrometeorological monitoring program covering KGC concession area.

The monitoring program aims to assess natural (due to global warming) and technogenic (caused by the Kumtor mine activities) factors affecting the shrinkage of glaciers in KGC concession area.

The studies have shown that the melting capacity depends not only on the changes in air temperature, but also on the increase in natural and technogenic pollution of the glacier surfaces. An increase in pollution on glaciers leads to a decrease in surface albedo, which, in turn, affects the absorbed radiation amount.







## The main conclusions from the observations in 2018-2019

In 2018-2019, from all observed glaciers of a northern macroslope of the Ak-Shyirak ridge (Sarytor, Lysyi, Sarychat, Bordu) the Lysyi glacier underwent the greatest ablation.

Lysyi glacier is subject to the significant technogenic impact of the Kumtor mine operations. This is due to the following: first, the Lysyi glacier is located downwind relative to the mine (which already indicates its greatest vulnerability to dusting through the Aeolian deposition of dust brought by the winds prevailing in this area); second, this glacier is closely adjacent to the waste rock dumps, which are the most powerful potential source of fine earth which can be transferred in the form of Aeolian dust to this glacier.

For the period 2014-2019, all the observed glaciers underwent a persistent retreat of the front tongue sections. This can be most associated with such natural causes as the apparent global warming.

In general, according to the calculations of the air temperatures adjusted in one line made by the Tien-Shan-Kumtor Weather Station, the average annual air temperature increase trend made up 1.5 °C for 1930-2019. Due to the ongoing global warming, mass balance of the Sarytor glacier

in the period of field measurements 1985-1989 remained within the negative values (-) 140 mm of water equivalent, and in the period 2014-2019 -within significantly negative values (-) 923 mm of water equivalent.

In 2018-2019 balance year, the highest movement rates were recorded for the Chon Kotur (17m/year) and Lysyi (15m/year) glaciers.

In 2014-2019, the observed glaciers in the Arabel river basins, as well as in the whole Central Asia, tended to retreat. In the context of the Arabel and Uchkol river basins, this can be seen on the examples of Sarytor and Petrov glaciers, which have been monitored on a periodic basis since 1932. The same picture is seen in the results of glacier monitoring in these basins, including measurements of the mass balance of Sarytor and Bordu glaciers. Based on this, it is concluded that retreat of most of the observed glaciers in the Arabel and Uchkol river basins is mainly caused by global climate warming, and not by technogenic impact of the mine operations.

Research of the glaciers surrounding the Kumtor mine will be continued in 2020.



## 5.4 PETROV LAKE WATER BALANCE

Water balance of the Petrov Lake was estimated based on data of water flow in the river, as well as water consumption and discharge to determine the total volume of water used at the Mill in 2019.

To determine the impact of water intake by the Kumtor mine on the Petrov Lake water balance, the Company took measurements at points of water outflow from the lake. We used readings from sensors installed at the Petrov Lake for measurement of water level fluctuations, water meters at the water supply pipeline to the Mill, data taken from the Kumtor River flume, as well as measurements of precipitation and evaporation.

Volume of water flow measured at the Kumtor River flume is determined by:

- Volume of treated effluents discharged from Effluent Treatment Plant (ETP);
- Inflow of water from the Lysyi Creek;
- Volume of precipitation;
- Inflow of glacial melt water into the Petrov Lake;
- Inflow of spring meltwaters or surface waters into the Petrov Lake.

Total inflow into the Petrov Lake is calculated using the following formula:

$V_{\text{inflow}} = V_{\text{Water according to Kumtor River flume}} - V_{\text{Water discharged from ETP}} - V_{\text{Lysyi Creek Flow}} + V_{\text{Water consumption by the Mine}} - P_{\text{Precipitation}} + E_{\text{Evaporations from the Lake}} \pm V_{\text{Lake water volume fluctuations}}$

### Outflow calculation

**Kumtor River.** Volume of inflow into the Kumtor River is obtained by summing outflow from the Petrov Lake, discharge from ETP, and Lysyi Creek flow. Kumtor River flow in 2019, according to measurements at the flume comprised 127.68 million m<sup>3</sup> for the period from May to October.

**Effluent Treatment Plant.** Volume of water discharged from ETP is obtained by summing up readings of flowmeters installed at the pump station #3. Total volume comprised 5.9 million m<sup>3</sup> (for the period from May to October).

**Lysyi Creek.** Lysyi Creek flows into the Kumtor River upstream of the flume. Total flow of the Lysyi Creek throughout the season comprised 11.46 million m<sup>3</sup>.

**Consumption of water at the Mill, Camp and other facilities.** The total water consumption by the Mill and the camp was measured by flow meters at the pump station on the Petrov Lake and the Potable Water Treatment Plant (WTP). In 2019, the total volume of water consumed by all facilities at the Mine was 5.41 million m<sup>3</sup>.

**Precipitation.** Volume of water evaporated from the surface of the Petrov Lake was calculated according to Meyer's equation (equation for determination of evaporation from water surface). Evaporation from the surface of the Petrov Lake throughout May to September comprised 127.39 mm or 0.51 million m<sup>3</sup>. This value does not contradict the data of A. M. Molchanov, who notes that evaporation from the surface of mountain lakes in the area of the Petrov Lake is below 400 mm/year (A. M. Molchanov, "Central Asian Lakes", Gidrometizdat, Leningrad, 1987).

With precipitation of 333.3 mm, the volume of water in the Petrov Lake increased by 1.34 million m<sup>3</sup>.

**Changes in volume of accumulated water.** When comparing the start and end of the year, the level of water in the Petrov Lake increased by 0.16 m - from 3,731.52 to 3,731.68 m.

**Final Calculations.** Using the above formula, the total calculated inflow into the Petrov Lake in 2019 was 115.44 million m<sup>3</sup>.

**Conclusion.** The volume of water consumed by the KGC operations in 2019 comprised 4.69% of total water inflow into the lake. The above calculations of the water balance demonstrate that the volume of water consumed from the Petrov Lake by the mine facilities for production, domestic use and other needs is negligible. General data on water consumption and diversion, including wastewater treatment, are presented in the Table 5.2.





## Risk of Petrov Lake outburst and preventive activities conducted by the Company

Understanding the concerns of state and regulatory authorities, as well as the public, KGC carries out continuous monitoring of water level in the Petrov Lake, water flow in the Kumtor River and readings of thermistors installed at three different points in the natural moraine dam.

In 2015, commissioned by KGC, the head of the research and design laboratory "Geotechnical Objects Stability" Ph.D. Chukin B.A. developed recommendations for a system of instrumental monitoring of the condition of the Petrov Lake natural dam. In accordance with these recommendations, KGC has repeatedly taken steps

to develop design solutions for lowering water level in the Petrov Lake. In 2017, commissioned by KGC, JSC "Kyrgyzsuudolboor" developed a design for a gradual lowering of water level in the Petrov Lake. The design has obtained all expert opinions and approvals in the relevant state authorities, as required by the KR legislation. KGC commenced the 1st stage of the design "Gradual lowering of water level in the Petrov Lake". 2nd stage is scheduled for the LOM end, including further water level lowering in the lake and construction of a spillway channel, which will eliminate the risk of a significant failure of the natural dam.





# 6 SOCIAL RESPONSIBILITY

## 6.1 STAKEHOLDER ENGAGEMENT

Effective stakeholder engagement is essential for us to manage our social responsibility. We have established structured processes to effectively listen to and communicate with our stakeholders, including regulators, stakeholders, employees, local communities, small businesses, and the general public.

The process also includes bringing stakeholders together. Many of the projects described in this section have brought together communities, other supporting partners, the international aid community (see case study boxes), and government representatives.

### Engagement context

Our approach to engagement reflects our desire for respectful and meaningful dialogue within the complex social and political context of the Kyrgyz Republic. This context means that public and media interest in the KGC activities remains high.

### Structured dialogue

Our local engagement is maintained through our two Regional Information Centres, which have been established in the Jeti-Oguz and Ton districts. The main objective of the Centres is to provide information about KGC to local residents. This includes information related to our hiring procedures, human resources policies and job vacancy information. Residents of Balykchy can get information about the company's activities in the office of Balykchy Municipal Administration, where visitors are received by Regional Sustainable Development officer once a week. Regional Sustainable Development officers attend local community events, monitor the implementation of development projects funded by KGC, and act as a point of first contact for members of local communities. In addition to these structured activities, other types of formal and informal engagements occur on a regular basis across our host communities, with a range of other stakeholders such as community leaders, community organizations, local small businesses, and farmers. To ensure partnerships based on consensus we initiated an establishment of Regional Committees in Jeti-Oguz, Ton and Balykchy.

Committee members are local authorities, heads of village councils, representatives of civil society organizations, members of different unions. In these meetings, KGC management raises issues about operations and defines plans of investment projects in liaison with local communities. Decisions are made together with the representatives of each Committee so that KGC's investments meet expectations and needs of communities. Regional Committee meetings take place every quarter.

### Public communication

Adhering to the information transparency policy and main principles of the Extracting Industries Transparency Initiative (EITI), KGC recognizes the importance of providing accurate and objective information on the Company and satisfying the information needs of all stakeholders. Effective engagement with all stakeholders is highly important for us in terms of social responsibility management.

In recognition of the increased interest in KGC's activities, we update our corporate website ([www.kumtor.kg](http://www.kumtor.kg)), in three languages (English, Russian, and Kyrgyz) on a regular basis. On the website, we post news releases, downloadable reports, and media articles that feature KGC.

Stakeholders can also have an access to the information describing our business, and our environmental and social responsibility activities.

We commission films about our activities that we post on our website and through social media channels, such as Youtube and Facebook (**as Kumtor Gold Company**). We have a free telephone number to allow members of the public to contact us, in order to express a concern or request information, and we also have an email address for this purpose, or can be contacted via our website. On a quarterly basis, we produce special issues of regional newspapers in Kyrgyz and Russian languages about our activities and distribute them in focus areas.

On a regular basis, we organize mine site visits for stakeholders, including representatives of state bodies, Government, local authorities, partner organizations, as well as teachers and students from various educational institutions. The Program for such groups usually includes a visit to the main work areas: Camp, Mill, Open Pit, Petrov Lake, Tailings Management Facility and Water Treatment Stations.

Department Managers accompany the groups to the relevant sites and discuss the emerging issues on the spot.

We continue our cooperation with the International Business Council (IBC) and took part in all meetings of its Board. IBC is the largest multisector organization that unites the leading mining companies. We took an active part in the events of the KR Chamber of Commerce and Industry, as well as the American Chamber of Commerce.

- KGC maintain a structured dialogue with representatives of local communities, strengthening cooperation with all stakeholders.



## Issyk-Kul Reginal Development Fund

KGC contributes 1% of gross annual revenues to the Issyk-Kul Development Fund (the "Fund"). This fund is governed by an oversight and steering committee (independent of KGC), which includes local government representatives and NGOs. The fund is designed to develop the socioeconomic infrastructure of the Issyk-Kul Region in accordance to local and regional government priorities. Since the creation of the fund in 2009, KGC has invested more than \$78.4 million into projects as diverse as kindergartens, schools, sports clubs, and irrigation infrastructure across the Issyk-Kul region. We understand that the Fund continues to be criticized for lack of transparency and that some stakeholders are expressing concerns about selection of projects and application of the IKDF resources. We are aware of these concerns and continue to encourage the fund to be more transparent.

In 2019, the IKDF started an interest-free financing of budget revenue generating business projects aimed at creating jobs and developing the Issyk-Kul region.

Financial support was provided to entrepreneurs from Balykchy, Jeti-Oguz and Ton districts. Thus, for example, 3.5million KgSwere allocated to entrepreneur fromBalykchy to establish sewing workshop, 1,55 million KgS to entrepreneur from the village of Lipenka in Jeti-Oguz district to establish an agricultural farm, and 5.6million KgSwere allocated to resident from the village of Barskoon to establish a stone crushing workshop.

Funds in the amount of 50% of the IKDF budget are used in coordination with KGC for the social and economic development of Jeti-Oguz and Ton districts, as well as Balykchy city.

### 6.1 Annual Contribution to Issyk-Kul Region Development Fund

Units	2016	2017	2018	2019
Million US\$	6.2	6.4	7.3	8.4

**Kumtor Gold Company contributes 1 percent of its gross revenues to the Issyk-Kul Development Fund. In 2019, 592,469,150 soms were transferred to the Issyk-Kul Development Fund**

**Distribution of funds by sectors (in mln soms)**



**Education**

Actual expenditures **82,666.9**



**Health**

Actual expenditures **27,158.1**



**Culture**

Actual expenditures **22,617.2**



**Roads and water supply**

Actual expenditures **123,205.8**



**Own investments**

Actual expenditures **46,905.8**



**Sports**

Actual expenditures **58,809.8**



**Budget generating projects**

Actual expenditures **23,710**



**Other**

Actual expenditures **80,265.6**

**Distribution of funds by districts and towns (in mln soms)**

Name of districts and towns	Planned	Actual	%
	Total	Total	
Jety-Oguz District	120,839.2	99,016.4	82.0
Ton District	75,089.7	66,893.3	89.1
Balykchy	79,218.0	29,592.7	37.4
Ak-Suu District	50,904.0	48,523.4	95.3
Issyk-Kul District	71,506.2	48,210.9	67.4
Tyup District	48,562.0	47,462.0	97.7
Karakol	102,798.0	81,840.7	79.6
Regional institutions	56,278.6	47,034.7	83.6
<b>Total for the Region</b>	<b>605,195.8</b>	<b>468 574,1</b>	<b>77.4</b>



## Nature Development Fund, Cancer Care Support Fund and Social Partnership for Regional Development Fund

The Nature Development Fund, Cancer Care Support Fund and Social Partnership for Regional Development Fund were established within the framework and pursuant to the Strategic Agreement for Environmental Protection and Investment Promotion between the Government of the Kyrgyz Republic, Centerra Gold Inc., Kumtor Gold Company CJSC and Kumtor Operating Company CJSC signed on September 11, 2017 and entered into force in August 2019.

**The Nature Development Fund** was established in order to develop the environment protection potential throughout the Kyrgyz Republic territory, to support environment and nature well-being, to promote the effective use of the KR natural resources and other environmental purposes. The Nature Development Fund's resources shall be used exclusively for financing the environmental protection and nature conservation projects in the Kyrgyz Republic. In 2019, KGC has transferred US\$ 61.1 million to the Nature Development Fund, including a lump-sum payment in the amount of US\$ 50 million and annual contributions in the amount of US\$ 3.7 million since 2017. Annual contributions will be allocated by the Company until the end of the life of the mine.

**The Cancer Care Support Fund** was established to develop the cancer care service of the Kyrgyz Republic, to raise the Kyrgyz Republic potential to reduce the number of cancer diseases in the country and to improve the quality of medical services provided to patients with cancer. The resources of the Fund should be used exclusively to finance the reconstruction and purchase of equipment for the National Center of Oncology and Hematology under the KR Ministry of Health, for treatment of oncological diseases, conduct researches, support and hold educational activities in the Kyrgyz Republic. KGC transferred US\$ 7 million to the Cancer Care Support Fund in 2017, and the remaining US\$ 3 million will be transferred in 2020, pursuant to the Agreement.

**The Social Partnership for Regional Development Fund** was established to provide funding for social projects in the KR regions such as education, health, sports and recreation, and other initiatives aimed at regional development.

In 2019, KGC has transferred US\$ 5.95 million to the Social Partnership for Regional Development Fund, including a lump-sum payment in the amount of US\$ 5 million and monthly contributions equivalent to 0.4% of KGC's revenues. A second lump-sum payment in the amount of US\$ 5 million is planned to transfer in 2020.

The company promotes and is interested in implementing sustainable social and economic projects providing stable job places for local community after closure of mine, as well as additional tax contributions to the local budget.

## Impact assessment

Apart from regular monitoring and evaluation processes embedded in each project and donation supported by the company, we regularly conduct impact assessments and perception studies in our focus areas – Jeti-Oguz, Ton and Balykchy. Our Stakeholder Engagement Strategy and Plan are based on these studies and quarterly review of major stakeholders and their concerns, documented in internal system, updated by employees of the Sustainable Development Department.

Based on analysis and studies we have formulated a summary of stakeholder concerns.



## 6.2 Summary of stakeholder concerns

Stakeholders	Topic	Report section where discussed
Kyrgyz Republic Government and Parliament	<ul style="list-style-type: none"> <li>■ Project benefits</li> <li>■ Changing legal agreements</li> <li>■ Environmental claims</li> <li>■ Waste Management and permits for new landfills.</li> </ul>	<ul style="list-style-type: none"> <li>■ President's Message</li> <li>■ Economic Responsibility</li> <li>■ Social Responsibility</li> <li>■ Corporate Governance Structure</li> <li>■ Environmental Sections</li> </ul>
Various Commissions, Government Agencies and Local Communities	<ul style="list-style-type: none"> <li>■ Economic benefits</li> <li>■ Environmental impacts</li> <li>■ Waste rock management</li> <li>■ Tailings dam displacement</li> <li>■ Impacts on glaciers</li> <li>■ Glacial lake outburst flood</li> <li>■ Mine closure and its funding</li> </ul>	<ul style="list-style-type: none"> <li>■ President's Message</li> <li>■ Economic Responsibility</li> <li>■ Social Responsibility</li> <li>■ Environmental Sections</li> <li>■ Mine Closure</li> </ul>
Local Communities, Youth, Vulnerable Groups	<ul style="list-style-type: none"> <li>■ Employment opportunities</li> <li>■ Environmental impacts</li> <li>■ Water Resources</li> <li>■ Tailings Management Facility</li> <li>■ Community support, projects and donations</li> </ul>	<ul style="list-style-type: none"> <li>■ President's Message</li> <li>■ Water Use and Treatment</li> <li>■ Tailings Management Facility</li> <li>■ Mine Closure</li> <li>■ Social Responsibility</li> <li>■ Local Procurement</li> </ul>
Local Businesses	<ul style="list-style-type: none"> <li>■ Supplying goods and services</li> </ul>	<ul style="list-style-type: none"> <li>■ President's Message</li> <li>■ Economic Responsibility</li> <li>■ Local Procurement</li> <li>■ Social Responsibility</li> </ul>
Employees and Contractors	<ul style="list-style-type: none"> <li>■ Employment conditions</li> <li>■ Benefits</li> <li>■ Health, safety and well-being</li> </ul>	<ul style="list-style-type: none"> <li>■ Employment at Kumtor</li> <li>■ People</li> <li>■ Occupational Health &amp; Safety</li> </ul>
Conservation NGOs	<ul style="list-style-type: none"> <li>■ Environmental impacts</li> <li>■ Biodiversity strategy</li> <li>■ Mine closure</li> </ul>	<ul style="list-style-type: none"> <li>■ President's Message</li> <li>■ Environment sections</li> <li>■ Mine Closure</li> </ul>

### KGC Grievance Mechanism

As the major company operating in the Kyrgyz Republic, KGC receives complaints and requests ranging from dust burden because of KGC trucks movement to job requests and hospital or road construction requests. We maintain an open dialogue with all stakeholders and listen to rational ideas. The measures taken by the company with regard to the dust on the technological road are described in the Environmental Monitoring Section. KGC also experienced temporary road blocks in 2012 and 2013, but none in 2014-2018. Protests typically involved demands for a greater distribution of the mine's profits and benefits. Grievances on sustainability issues are dealt in accordance with the accepted grievance acceptance mechanisms. In 2019 KGC received 14 grievances and resolved all of them during the year. Relevant meetings were arranged to consider

the ways to resolve these grievances. We understand the importance of raised concerns and their timely resolution. The Company will continue to dedicate its efforts to mitigate related risks.

KGC's Sustainable Development Department has two information centres in the Issyk-Kul region, and community representatives and local authorities contact our specialists for any information. In their turn, they report all issues raised by communities to the Government Relations & Community Relations Manager. Our grievance acceptance mechanisms are available in all regional information centres. We try to resolve each raised issue and concern, and provide requested information for every stakeholder group. All grievances and issues raised are also reported directly to the KGC senior management.



## 6.2 COMMUNITY INVESTMENT PROJECTS

We believe in importance of providing assistance to local communities in reaching their goals to develop local economy and well-being of Issyk-Kul citizens.

Taking into account that the mine closure will have a direct impact on region's economy, we consider that our high-priority task is to have a structured and well-planned approach in community development projects, which is therefore a vital component in maintaining our social license to operate.

The current life of the Kumtor mine is expected to end in 2026. Given its role as a major employer, taxpayer, and purchaser, mine closure is expected to bring with it a negative economic impact in the Issyk- Kul region and across the country.

In order to reduce this impact, the strategy of our community investments is to promote and develop a more diverse economy which will not be over-reliant on KGC. We work in partnership with a number of international and local organizations to maximize the impact of our community investments. The partnerships focus mainly on the southern shore of Issyk-Kul Lake. Projects are developed taking into account stakeholder input, community needs, company risks, and availability of an experienced partner that can deliver against expected outcomes.

Within the framework of implementing its programs in the region, the Company strictly follows the

Sustainable Development Strategy of the Issyk-Kul Region that includes four main areas:

1. Support business growth and diversification (especially small businesses and entrepreneurs).
2. Support to development of the agricultural sector.
3. Youth and educational projects.
4. Environmental protection projects.

## 6.3 Sponsorships & Sustainable Development Projects

Units	2016	2017	2018	2019
Million US\$	0.7	0.9	2.2	1.35

**Note:** From June 2016 until October 2017, KGC was unable to finance development projects because of the decision of the interdistrict court to prohibit the transfer of assets to third parties.





## Projects implemented in 2019

### "One Village One Product" Project (OVOP)

The goal of the project is to combine the efforts of private entrepreneurs and local communities to develop the economic potential of the Issyk-Kul region by manufacturing products with the use of available local resources. KGC restarted the project in 2016 (more precisely, it started co-financing again). A small business model based on the "One Village One Product" approach had already been created in the Issyk-Kul region as part of the OVOP project, funded by the Japanese International Cooperation Agency (JICA). Target group and project area: local community associations engaged in the production of felt products in the Jeti-Oguz and Ton districts.

#### 2019 results:

- 8 felt production facilities were created (4 in Jeti-Oguz and 4 in Ton district);
- 1,462 people were involved as direct beneficiaries;
- 1,411 people were involved as indirect beneficiaries;
- 130 trainings were conducted;
- Participation in EXPO-19;
- 105 types of new products were developed;
- Total earned by the felt production facilities in Jeti-Oguz and Ton districts is 11,428,077 soms.

### Education Improvement Program in the Issyk-Kul region

The project was launched in 2016 to improve the main high school education indicators (Grades 10-11) in individual schools in the Issyk-Kul region to increase the number of graduates enrolled at universities.

In 2019 the project was implemented by two organizations and was focused on two main components:

1. capacity building of high school teachers;
2. skills development of students to pass structured testing; educational guidance and career development of students.

#### 2018-2019 results:

- 14 schools were involved in the project;
- 485 teachers were trained;
- 422 students completed monthly training in 2018-2019 academic year and 542 students in 2019 academic year (September- December);
- 71.3% of graduates who studied at Kyrgyz language schools and 73% of graduates who studied at Russian language schools who passed were able to get a passing score at the National Testing (ORT) (110 or more);
- 2 school based Resource Centers were created and equipped in the Ton and Jeti-Oguz districts;
- 86 pilot schools participated in the educational guidance program;
- 150 teachers from 86 pilot schools took part in the educational guidance trainings;
- About 800 high school students took part in the educational guidance trainings;
- 457 students received advice from social educators;
- 852 students took part in the "My future profession" essay contest.

### Waste segregation introducing project "Uch Chaka"/ Three Bins" in Jeti-Oguz and Ton districts.

The project goal was to create the potential for 6 local municipal enterprises and to raise awareness of the local community about correct and effective practices of solid waste management and sorting.

#### 2019 results:

- 6 waste collection points providing the job opportunities for the local residents were opened in Barskoon, Kyzyl-Suu, Tamga, Eshperov, Kadji-Sai and Bokonbaev villages;
- During the period from August to December 2019, 658 kg of plastic, 5.4 tons of glass, 428 kg of paper and 382 kg of cardboard, as well as 7 kg of aluminum cans were collected in these 6 points. About 7,000 kg of recyclable materials have been removed from the landfill since May;
- A manual for waste segregation was developed and 10,000 copies have been distributed to local schools and rural administrations;
- 2,725 schoolchildren from 12 schools of the Jeti-Oguz and Ton Regions took the trainings on separate waste collection;
- 12 mass clean-up events were arranged and 21 plastic garbage cans were installed in public places;
- 4 trainings were organized for employees of municipal enterprises and rural administrations.

### Potable Water Supply Projects

The goal of this project is to provide potable water to local communities. The project is highly demanded as it improves the lives of thousands of people. Applications for potable water projects, submitted to the Company are discussed at the Regional Committee sittings.

#### 2019 Projects:

- The Potable Water Project to provide drinking water to the residents of Jenish village, Jeti-Oguz District was started in 2018 and completed in 2019. KGC has allocated Kgs 7.6 million for the repair of reservoirs, construction of a sanitary protection zone, water pipeline and a distribution network with a length of 6.5 kilometers, rehabilitation of the water intake area as well as the technical pipelines.
- A joint project to provide potable water to residents of the Bokonbaev village, Ton District. KGC has purchased pipes in total for Kgs 5.64 million for laying out additional water supply lines for 397 families. All works were funded by the local village administration.
- The Potable Water Project for the Orgochor village in Jeti-Oguz District was funded jointly with the FSDS and the local village administration. KGC has allocated Kgs 2.77 million for drilling of the well.
- The project for rehabilitation of water intake and reservoir areas in the Tilekmat village, Jeti-Oguz District. 3,105 people live in the village. There are 786 households in the village. Previously, only half of the village used to have access to drinking water, due to repair of the well as part of the project, today the whole village is provided with drinking water. The project budget made up Kgs 4.5 million



### Irrigation Improvement Project

The project goal is to support agricultural development and to stop land degradation as well as to provide access to irrigation water.

#### The main objectives of our investments are to:

- Increase the irrigation water volume and expand significantly the irrigated land area.
- Increase crop productivity and, as a result, increase income for farmers.
- The areas eligible for the irrigation restoration project were identified during the Regional Committee meetings.

In 2019, 42 channels totaling to 271,800 m<sup>3</sup> were cleaned up in the Jety-Oguz District. All work was performed by local contractors who have signed the contracts with KGC, thus providing opportunities to local companies to develop and replenish the regional budget.

### Projects initiated by local communities

This project provides financial support for local initiatives in accordance with requests that are pre-discussed at Regional Committee meetings. Projects are implemented in partnership with local authorities, local NGOs and youth groups. Projects are initiated, owned and supported by local communities. Projects initiated by local communities should benefit a large number of people, not individuals. The projects are aimed at developing local infrastructure, supporting social initiatives, sports and youth, as well as supporting vulnerable groups.

#### Projects supported in 2019:

- Construction mini-football fields in Jety-Oguz district. The main construction works were financed by KGC and the artificial turfs were purchased from the Issyk-Kul Development Fund budget.

Construction of the mini-football field in the village of Tamga was completely at the Company's expense:

- In the village of Svetlaya Polyana. Budget - KgS 1,454,292
- In the village of Tamga. Budget - KgS 2,280,514
- In the village of Kyzyl-Suu. Budget - KgS 2,760,598
- In the village of Boz-Beshik. Budget - KgS 1,466,390
- In the village of Baltabay. Budget - KgS 1,791,686
- In the village of Jele-Dobo. Budget - KgS 1,968,428
- In the village of Jele-Dobo. Budget - KgS 1,968,428
- Purchase of artificial turf for the mini-football field in the village of Kyzyl-Tuu, Ton district in the amount of KgS 1,130,000.
- Construction of a playground in the village of Orgochor, Jety-Oguz district. Budget - KgS 982,460.
- Rehabilitation of an earth road in the upper valley of Ton district with a total length of 18 km. Residents of 10 villages can now drive on a safe road. KGC purchased 15,888 tons of diesel fuel.
- Purchase of materials for a local greenhouse in Ton district in the amount of KgS 156,260.
- Project to improve infrastructure of villages and material and technical base of local governments (Aiyl Aimaks) and state bodies of Ton district as part of the competition for improvement and landscaping in Ton district - KgS 1,500,000.
- Publishing of the encyclopedia of Jety-Oguz district - KgS 1,000,000.

#### Rehabilitation of roads leading to remote pastures

The project goal is to provide to local farmers and shepherds access to remote pastures in order to prevent the degradation of pastures located nearby. Remote pastures are no longer used, bridges are destroyed, resulting in excessive concentration of cattle around large population areas.

In 2019, the KGC supported a project for rehabilitation of 2 pasture roads leading to remote pastures across the Taragay and Arabel rivers in Jety-Oguz District, and allocated funds to purchase heavy equipment for Ton Municipal Enterprise, which will be used for pasture restoration.

## Emergency Earth Works project

The project goal is to provide support to the regional departments of the KR Ministry of Emergency Situations to prevent and/or addressing such emergencies as mudslides, floods and landslides, which, as a result of increasing average temperatures and precipitation in the country, can cause damage to roads, houses and loss of life.

The company concludes the contracts with local companies to perform the following work.

In 2019, the following work was completed in Jeti-Oguz District:

- Clearing 6 irrigation channels
- Strengthening the river banks of the Chon-Kyzyl-Suu and Jeti-Oguz rivers
- Restoration of roads leading to pastures

As a result of the work performed, 36 houses and 6 farms, more than 400 private gardens and agricultural lands got access to irrigation water.

In Ton District:

- Protection of 4.5 km Kyzyl-Tuu river side
- Reinforcement of 2 bridges
- Road rehabilitation

As a result, more than 60 homes were protected and agricultural land was provided with access to irrigation water.

## Supporting businesses

We support the development of local businesses in a number of ways. The most important one is based on our policy of supporting local procurement and encouraging new local suppliers to supply goods and services, as described in the Local Procurement section.

However, we are aware of the risk for individual suppliers to become overly reliant on business with KGC. Therefore, we work with suppliers to support them in improving business processes (such as quality management systems) and encourage them to seek additional customers apart from KGC.

Another important initiative is our micro-credit program to support farming businesses and small enterprises, which has been implemented in the region since 2006 and is aimed at the socio-economic development of the region. The Company supported the establishment of three micro-credit agencies, which offer the lowest annual interest rate (10 to 12%) in Kyrgyzstan. With support of this program, residents of Jeti- Oguz, Ton districts, as well as Balykchy, who are interested in receiving financial resources, have an opportunity to develop farms, livestock, create and maintain small and medium businesses.





## 6.4 Indicators as of December 31, 2019 (KgS)

Indicator	Jeti-Oguz	Ton	Balykchy	Total
Credit Portfolio	120,764,787	85,137,809	59,263,567	265,166,163
Issued Credits	265	197	171	633
Average Rate %	11.58	10.36	11.6	11
Amount of Issued Credits	74,595,000	65,725,000	47,865,000	188,185,000
Credit Repayment, %	95.2	99.9	97.6	97.5
Micro-credit Agency Employees	11	7	8	26
Jobs Created as part of the MCA Projects	174	190	170	534
All mandatory payments to the country's budget	2,697,609	2,083,732	1,412,006	6,193,347
Net Profit	5,809,300	2,822,200	2,309,217	10,940,717

### Donations and Charitable Support

In addition to our sustainable community development programs, we provide one-off donations, usually in form of equipment or services. We receive many requests for support from across the country. Donation requests and proposals are reviewed on a monthly basis by our donations committee consisting of the company management representatives under the chairmanship of the KGC president. All donation applications are reviewed to approve they meet the selection criteria specified by our Corporate Donations and Sponsorship Policy and Company procedures. KGC conducts follow up monitoring visits on a regular basis to ensure that the donations are used for the intended purposes.

### Main priorities in providing donations:

- Socially significant projects;
- Sports and sporting events;
- Environmental activities and initiatives;
- Projects and events initiated by young people;
- Support for socially vulnerable groups;
- Educational and cultural events.

In 2019, the Donations Committee reviewed 292 applications, of which 67 were supported. See the infographics on next page for the applications review mechanism, which is also available online in our web-site.



## 7. MINE CLOSURE

The current mine plan indicates that gold production of KGC will cease in 2026.

As outlined in the Environmental Management Action Plan (EMAP), KGC is required to update the Conceptual Closure Plan (CCP) for the operation every three years, and complete a Final Closure Plan (FCP) two years prior to closure.

This approach allows for a period for testing and monitoring of several years to evaluate the various options provided by the CCP, and time to consider any changes to the environmental, regulatory and social environment that may have occurred over the life of the mine. KGC has been preparing CCPs since 1999 with the most recent CCP in 2019, covering the existing components of the Kumtor operations including the open pits, waste rock dumps, tailings management facility and related water treatment facilities, and the Mill complex and associated mine infrastructure.

Closure and land use objectives of KGC:

- materially comply with regulatory requirements;
- minimize residual environmental impacts;
- ensure mine site features are geotechnically stable;
- ensure the protection of public health and safety;
- return the land to suitable post-mining land use;
- identify and mitigate social risks/impacts on the community, the business and the overall success of the closure process.

All CCPs have been previously submitted to the relevant Kyrgyz regulatory agencies for their information.

The 2019 update to the CCP is based on the 2015 NI 43-101 Technical Report, and incorporates new data and information, changes to the facilities, an analysis of closure risks, and changes to the environmental and social context of the project. The primary closure consideration will be the long-term stability of the TMF and the waste rock dumps. Key changes to the 2019 CCP update include the following:

- **Waste Rock Dumps (WRD) configuration** - this CCP update includes updated dump configurations predicted at the end of mining by Institute of Geomechanics and Mineral Resources of Kyrgyz National Academy of Science (IGMR) (2017, 2019). Because of the movement on the dumps highly irregular dump surfaces will exist at closure and this CCP assumes that surface regrading will be required to blend the dumps into the surrounding topography.
- **New facilities** - closure actions for several new facilities constructed since the 2016 CCP were incorporated.
- **Socioeconomic transitioning** - this 2019 CCP builds on the social and socio-economic context of the Kumtor mine closure.





## 7.1. TAILINGS MANAGEMENT FACILITY (TMF) CLOSURE



Earlier CCPs have used a 100-yr/24-hr storm event plus 50% as the design event for the TMF spillway system. The 2016 CCP update conservatively used a probable maximum flood (PMF) as the design storm event for the TMF spillway design. The updated CCP uses the PMF design event.

The post-closure land use chosen for the TMF is industrial because of the potential hazards that could exist after closure for agricultural or wildlife habitat use. Therefore, the primary objective of the TMF cover is to limit erosion and preclude dust generation to reduce the risk of exposure to tailings by wildlife and grazing animals. Based on this objective, the cover design includes a single layer of crushed gravel.

Reclamation of the TMF will begin with growth media placement on the outer embankment. Following the completion of processing additional actions will begin in 2026 including the following actions:

- Placement of the final cover on top of TMF, and on the final slopes of the containment embankment;
- Construction of the water management system, which will include the final spillway to convey water both from the TMF and its watershed;
- Demounting and reclamation of the Effluent Treatment Plant;
- Reclamation of the industrial and hazardous waste facility.

The cover will comprise a single 300 mm layer of waste rock crushed in the grinding circuit. The cover material will be conveyed to the TMF via the existing tailings deposition system. A network of causeways will be constructed across the surface of the TMF to facilitate distribution of the cover material.

The downstream embankment of the TMF will be covered with alluvial and topsoil material and reseeded.

A water management system around TMF will ensure that all the surface water from TMF and its catchment area is conveyed into the spillway diversion ditch located on native ground along the northwest edge of TMF.





## 7.2. WASTE ROCK DUMP CLOSURE

Waste rock dump creep resulting from movement in glacial till beneath the dumps was used to update predictions on future dump footprints.

The current movement creates a rough dump surface with overall slope angles much shallower than the constructed slopes of the dump. Therefore, major slope regrading will not be necessary. Instead, once the movement has stopped, general recontouring will be performed over the

dump as needed to blend the slopes into the surrounding topography. Select areas of the waste rock dump will then be revegetated using approximately 300 ha of soil/alluvium "islands," primarily focusing on the south-facing portions of the dumps.

Water discharging from the pits will be collected and conveyed in lined, riprapped engineered channels adjacent to the northern edges of the dumps and natural ground.



## 7.3. POST-MINING LAND USE

The primary objective of the Kumtor reclamation and revegetation process is to bring the land back to its former use as high alpine wildlife habitat, free of unusual hazards. However, the diversity of conditions across the site and variety of closure methods that must be used for different facilities requires that the post-closure condition of each facility be considered separately when selecting a post-closure land use. This is considered good industry practice and will typically result in a variety of post-closure land uses across the site.

To prepare a more complete assessment of post-closure land use for this update KGC also considered the KR Regulation "On land reclamation (recovery) and order of land return for land use" as a basis of defining achievable and sustainable post-closure land uses. The proposed post-closure land uses for the site are shown in Table 7.1.

### 7.1 Post-closure land use for project components

Facility	Post-closure land use
Open Pit	Lake
TMF	Industrial (consistent with the 'construction' land use category defined by KR legislation)
Waste Rock Dumps	Local wildlife habitat
Camp	Wildlife research center to monitor wildlife in the region and the neighboring Sarychat Eertash Nature Reserve
Roads to Camp and Nature Reserve	Access to wildlife research center
Infrastructure	Part of the infrastructures (including high voltage power line, roads, and culverts) will be part of wildlife research center.
Rest of infrastructure will be decommissioned.	

## 7.4. SOCIO-ECONOMIC IMPACTS OF MINE CLOSURE



Closure of the Kumtor mine will have local and national economic and social impacts.

The social baseline of communities in areas surrounding the mine was characterized by primary data collection and secondary data review. This included aspects related to social welfare, social change, population movement, community cohesion, social conflict, poverty levels, vulnerability, and of communities.

The Kumtor mine and its upcoming closure affect a wide range of stakeholder in KR with varying levels of impact.

Table 7.2 is a summary of those affected and the key issues surrounding each stakeholder group.



### 7.2 Stakeholders and key issues

Stakeholder Group	Key issues
Employees	Compensation and working environment, support of family
Suppliers	Revenue from Kumtor, current and future capacity for non- Kumtor business
Issyk-Kul Region: Balykchy, Ton, Jety-Oguz Residents	Social programs and infrastructure supported by Kumtor, livelihoods of resident employees, contractors and suppliers, tax revenue
KR State Agencies	Environmental and technical closure issues. Responsible for sign-off on closure plan.
KR Public Sector (including KyrgyzAlty)	Revenues from Kumtor – tax receipts and refinery payments
Non-governmental organizations (NGO)	Ways to maximize the impact of Kumtor's contributions prior to closure
General Public	Social programs supported by Kumtor's payments to government





## Reduction in GDP

KGC gold sales will remain at approximately current levels until 2022 and decline sharply thereafter by 40-50% per annum. In the last year of operation (2026), gold sales are expected to be ~15% of current (2019) sales volumes. As a result, the IMF projects slowing of GDP growth to 3.4% in 2023 and 2024, which underperforms projected non-gold real GDP growth of 4.4%, held back by projected negative growth in gold GDP of -15%.

## Loss of government revenue

Taxes paid by KGC, which contribute considerably to national and local government income, will decline sharply after 2022. In the last year of Kumtor Mine's operation (2026), direct tax payments are expected to be ~13% of current (2019) payments generated by KGC. The overall impact on fiscal revenue will be larger than the loss of KGC's direct tax payments, as indirect charges such as VAT and taxes paid by KGC's suppliers will also decline. The IMF projects that provide public revenue will decline slightly as a percentage of GDP from 2022, primarily driven by an equivalent decline in tax revenues. As GDP growth is expected to decline from 2023, the decline in actual fiscal revenue is more pronounced. The IMF also expects, however, that the general government fiscal deficit will not exceed 3% of GDP after 2020 due to a draft fiscal rule presently considered by parliament that caps debt at 70% of GDP and the budget deficit at 3% of GDP, requiring fiscal tightening.

## Increase in trade and current account deficits

Increased remittances and gold exports - almost entirely from KGC's operations - have shored up the current account balance, foreign exchange reserves and national currency.

The trade balance and current account should decline after 2022, as the share of gold in export value is predicted to decline from 40.6% in 2022 to 31.9% in 2024 and the current account balance is expected to return to 9% of GDP over the medium term. Therefore, gross official foreign exchange reserves would fall to three months of imports in 2024, a level considered just adequate by the IMF.

## Loss of local government income from Issyk-Kul Development Fund contributions

In 2022, KGC's contributions to the IKDF are expected to decline in each subsequent year by around 40 - 50%. Although KGC's contribution to the IKDF varies over time, the reduction and eventual end of payments is expected to significantly impact the regional administration's funds and ability to maintain projects currently funded using these contributions, especially if these include operating costs for standard municipal services, as has been suggested. The Issyk-Kul government has grown increasingly concerned about the future of the IKDF, and the administration and KGC are engaged in joint efforts to develop mechanisms that ensure some of the IKDF contributions remain available for allocation after closure of Kumtor Mine, e.g. through loan agreements and redirecting funding to more sustainable and profit-oriented projects.

## Loss of direct employment and income opportunities and increase in unemployment

Approximately 3,500 people are currently employed or contracted at KGC will eventually lose their jobs with the closure of Kumtor Mine. Contractor staff numbers will reduce at an approximately even rate over the remaining LoM, while the number of full-time employees



will experience a sharp decline in 2024. In the final year of operation, KGC is expected to employ 192 full-time staff and 27 contractor staff. As three quarters of current employees and contractor staff are from Issyk-Kul, the impact of retrenchment will be more intense at a local level and significant relative to the 4,197 people registered as unemployed in Issyk-Kul in 2017, assuming none of the former KGC employees obtain new jobs. However, the actual direct effect on unemployment is expected to be much smaller, since the reduction in the workforce is gradual and the KGC workforce is relatively well trained and expected to have a competitive advantage in the local or national labor market, with new mines under development.

## Loss of indirect employment and income opportunities due to loss of procurement

The closure of the Kumtor Mine will also indirectly affect employment at Kyrgyzaltyn (which receives fees and refines the Kumtor Mine's gold at the Kara-Balta gold refinery) and at suppliers to Kumtor Mine. The impact of the Kumtor Mine closure on the Kara-Balta refinery will depend on whether supply by Kumtor Mine can be sufficiently replaced; there is currently insufficient information to quantify this. Local procurement, approximated as 30% of OpEx, is expected to be between US\$20 million and US\$30 million for most of the closure period, and drop to US\$ 12 million in 2026. More than 600 Kyrgyz-enterprises supply the Kumtor Mine operations. These might employ some as many as 7,000 people. Continued viability of and employment at these suppliers after closure of the Kumtor Mine will depend on whether they identify alternative markets for their products in time. KGC has made it a policy to encourage suppliers to broaden their customer base as much as possible. Other mines currently under exploration or development may be able to replace some of the KGC's local procurement demand.

## Economic impact of sudden closure

In the event of a sudden and unexpected (early) closure of the Kumtor Mine, all economic benefits associated with the mine would cease more suddenly than under the planned closure scenario, and total KGC contributions over



the LoM would be lower. The significance of the economic impacts would be higher, as there would be an unbudgeted shortfall in fiscal revenue (potentially resulting in a higher budget deficit and public debt), unexpected decline in export earnings (leading to potential shortages in foreign exchange reserves and a higher trade deficit and current account deficit), less time to build a sustainable IKDF, sudden retrenchment of a relatively large workforce and loss of local procurement (affecting ~600 local suppliers).







## 7.5. SOCIAL IMPACTS OF MINE CLOSURE

### Access to services and facilities

The mine closure could place additional burden on the KR Government in terms of managing infrastructure within the affected regions (i.e. roads, electric grid, health services, housing). The IKDF provides for large scale support of local self-government in the Jeti-Oguz and Ton Regions. Financial resources received in the local government budget from the IKDF play an important role and make up a significant share of the local budget. Local governments fully finance state and municipal services provided to the population in the local budgets due to these revenues.

Local governments of the Jeti-Oguz and Ton Regions understand the scale of assistance received from KGC for socio-economic development of the region. They are fully aware of the risks associated with closure of the mine and try to take various preventive measures to mitigate the consequences. However, despite public awareness raising campaigns implemented by KGC, communities are poorly informed about the various ways in which KGC promotes the development of social and physical infrastructure.

### Social effects of loss of employment and reduced support to employees

During the cessation of mining and closure of the operations, surrounding businesses will lose income due to the loss of employment or redeployment of employees/contractors, as well as the reduction of local purchases made by the mine. This will result in a loss in buying power for the surrounding businesses.

Information received from discussions with Trade Unions at Kumtor Mine highlighted the issue of employee indebtedness.

KGC employees lack financial education and would benefit from personal financial education, budget planning, savings etc. Approximately 80% of Kumtor Mine employees have loans, which amount to about US\$7.8 million. With the closure of the mine and associated employment cuts, many of these debts may not be fully paid, and this will further lead to additional debts for employees, and no income to service the debt.

### Out-migration and loss of skilled professionals

With lack of opportunities in the area, the majority of employees are likely to relocate to the nearby towns, such as Bishkek, while some might choose to relocate to Russia and Kazakhstan. Out-migration is characterized by the outflow of highly skilled and productive labor. While obtaining a job out of the country might assist with continued livelihoods for employees and their dependents through remittances, it might also lead to the breakdown of social networks.

### Reduced contributions to community development programs

As mentioned above, KGC is involved in community development through several social investment programs. The closure of Kumtor Mine will lead to no further contributions towards programs for the youth, unemployed and women, local farmers, and learners. These groups will be the most impacted by the scaling down of support by KGC.







In addition to this, it is very likely that impacts to infrastructure maintenance, quality of services, inputs into local development programs will also be experienced in the local regions, leading to further livelihoods impediments in the area. Because the programs are managed internally by KGC, with some of the projects co-financed by donors and municipalities, it will be difficult for these to be transferred once the mine closes. Furthermore, municipal enterprises established to assist with social infrastructure maintenance in villages, are supported by KGC. Lack of funding from KGC after closure may lead to the decline of social facilities.

## Personal and family impacts

The impacts of the Kumtor Mine closure on the women and youth will lead to a reduction of economic activities in the local areas. This will most likely lead to increased poverty levels and vulnerability, decrease in wellbeing and the general quality of life, and anxiety. Due to their vulnerability status, additional support may be required. Reportedly previous job losses at the Kumtor Mine have led to social issues such as divorces and alcoholism and family violence. If not properly managed, this trend will continue to increase with the closure of the mine.

## Improved environment and access to eco-system services

Almost one third of survey respondents believed that mine closure will lead to improvement in the environment and public health. Although this impact is deemed to be Low (positive), it can be enhanced through mitigation to a Moderate (positive) impact.

## Social impacts of sudden mine closure

In the event of a sudden and unexpected closure of the Kumtor Mine, all benefits associated with the mine and listed above would cease suddenly. As mentioned previously, employees and contractors will be the most directly impacted stakeholders. The shock of sudden

closure, that under planned closure would have taken a number of years for them to process, will have to be dealt with within a shorter period of time, taking away the opportunity to consider and to re-adjust to their new realities. Experience has also shown that in such circumstances, beneficiaries turn back to the mine when their money is finished, to make more demands, which sometimes lead to reputational damage.

## Socioeconomic Transitioning Plan

The mitigation plan provides actions required for mitigating the risks, monitoring, review and people responsible for implementing the actions. However, the Socio-economic Transition Mitigation Plan (STMP) serves as a guideline and highlights key actions, some of which are not fully dependent on KGC, but on other players such as the KR Government, communities, employees, etc.

Financial planning for the implementation of the actions is also important in order to achieve the closure objectives. However, the costs in the STMP exclude ongoing Human Resources related matters such as wages and salaries as well as current expenses for engagement and community development and support.







## 7.6. CLOSURE COSTS

In preparation of the reclamation and closure cost estimate, the Standardized Reclamation Cost Estimator (SRCE) Version 1.4, developed in the state of Nevada, USA and verified by the U.S. Bureau of Land Management, has been used to estimate quantities and hours corresponding to reclamation and closure activities based on first principles and productivities per the Caterpillar Performance Handbook Edition 35 (Caterpillar, 2004) and RS Means Heavy Construction Cost Data (RSMeans 2015) as applicable.

Most of the equipment and labor rates are based on current KGC costs. Where equipment for a certain activity is not available on site, the cost estimate assumes the use of contractors based on previous work contracted by KGC.

Because the cost estimate is based on a conceptual plan, a number of assumptions related to the LOM closure costs are necessary. Key cost assumptions include the following:

- final footprints of waste rock dumps
- diversion channels to manage water collected in the catchments of the TMF, pits and waste rock dumps.
- diversion channels to manage water collected in the catchments of the TMF, pits and waste rock dumps.
- buildings not identified for a post-mining land-use.
- monitoring of water quality and geotechnical stability

### LOM Closure Cost

Closure cost estimates include closure activities that will primarily be completed within a five-year period following the cessation of operation, but some activities such as placement of growth media on the outer tailings embankment and closure planning will occur before the closure period begins in 2027. An additional five-year period will extend post-operational monitoring to ten years beginning in closure year 1.

The total closure and post-closure cost estimate for the project is US\$58.7 million, with the largest costs being associated with tailings (US\$20.5 million), waste rock dumps (US\$7.5 million), pits (US\$6.1 million), water treatment (US\$5.6 million), general and administration costs (US\$6.0 million), and monitoring and maintenance (US\$3.5 million). Of this total, approximately US\$1.3 million will be spent during the 5-year post-closure period for monitoring and inspections.

The methodology used, correction factors applied, and input parameters selected result in this estimate being conservative. This is a common practice for conceptual closure plan cost estimates and limits the need for arbitrarily applied contingencies.

### Current Obligations

In addition to the LOM closure cost estimate, KGC also prepared an assessment of its current obligation. This is based on the configuration of the site as of December 31, 2019 and applies the commitments made in the CCP to that configuration. This is consistent with methods used for financial reporting of Asset Retirement Obligations (ARO) under International Financial Accounting Standards (IFRS).

The methodology and assumptions are the same as those used for the LOM estimate; however, there are differences relating to facilities that have yet to reach their final configuration. For example, the current TMF covers a smaller area than the LOM TMF will, and therefore, the amount of cover required would be less. The ARO for end-of-year 2019 is estimated at US\$54.9 million.







# GLOSSARY AND ABBREVIATIONS

**Albedo** - is the coefficient of spectral whiteness (reflection) of surface used as a key parameter in climate surveys to estimate the Earth's energy budget, radiation transfer in earth-atmosphere system and glacier balance.

**ARD** - Acid rock drainage is a term used to describe the outflow of mine waters that have been acidified by contact and exposure to rocks, reducing the pH levels which, in turn, can release and mobilize metals into the environment.

**Biodiversity** - Short for "biological diversity," the variability among living organisms and the ecosystems of which they are part. This includes diversity within species, between species, and within ecosystems.

**BMV** - Balykchy Marshalling Yard.

**CAP** - Change Acceleration Process.

**Capacity Building** - Activities and initiatives that strengthen the knowledge and skills of individuals and improve structure and processes such that communities can grow and develop in a sustainable way.

**CCP or MCP** - Conceptual Closure Plan (see also Closure Plan).

**CG** - Centerra Gold Inc.

**CJSC** - Closed Joint Stock Company.

**Closure Plan** - A plan designed to ensure public safety and restore the physical, chemical, and biological quality of the area disturbed by mining to an acceptable level. It must aim at leaving the area in such a way that the rehabilitated property does not become a burden to society after the mining operation is over.

**Code of Ethics** - A policy that sets out Centerra's dedication to upholding high moral and ethical standards and specifies basic business conduct and behaviour.

**Collective Bargaining Agreement** - An agreement between a company and one or more workers' organizations or, in absence of such organizations, the representatives of the workers duly elected and authorized by them in accordance with national laws and regulations.

**Corporate Responsibility** - A form of corporate self-regulation integrated into a business model where companies embrace the responsibility for impact of their activities on the environment, consumers, employees, communities, and stakeholders.

**Currencies** - Kyrgyz som (KGS): 2019 average exchange rate 1 USD = 69.84 KGS.

**Cyanide** - A chemical compound containing carbon and nitrogen used to dissolve gold from ore.

**Derived Air Concentration (DAC)** - A derived limit on the activity concentration in air (in Bq/m<sup>3</sup>) of a specified radionuclide - calculated such that a typical worker, breathing air with constant contamination at the DAC while performing light physical activity for a working year, would receive the annual limit on intake for the radionuclide in question.

**EBRD** - European Bank for Reconstruction and Development.

**Economic Value Retained** - Component of GRI Economic Indicator EC1 and calculated as economic value generated less economic value distributed (see also [www.globalreporting.org](http://www.globalreporting.org) for further details).

**EITI** - Extractive Industries Transparency Initiative.

**EMAP** - Environmental Management Action Plan.

**Engagement** - A process of contact, dialogue, and interaction that ensures all parties of interest are informed and participate in decisions that affect their future.

**Environmental Assessment** - The process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development proposals prior to making major decisions and commitments.

**Environmental Incident** - An event that has caused or could cause environmental harm. Ranges in scale and severity from Type I (Insignificant) to Type V (Catastrophic).

**Environmental Management System (EMS)** - A framework developed by an organization to help improve its environmental performance by taking environmental considerations into account when making decisions and managing risks.

**ETP** - Effluent treatment plant.

**First Aid Injury (FA)** - A work related injury that requires first aid treatment.

**GDP** - Gross Domestic Product.

**GHG** - Greenhouse gas - Emissions commonly reported as CO<sub>2</sub> equivalents (CO<sub>2</sub>e).

**GIIP** - Good International Industry Practice. Defined in the International Finance Corporation Environmental, Health and Safety Guidelines for Mining as "the exercise of professional skill, diligence, prudence and foresight that would be reasonably expected from skilled and



experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.”

**Global Reporting Initiative (GRI)** - A global network based organization that has developed a widely used sustainability reporting framework consisting of principles and indicators to measure and report on an organization's economic, environmental, and social performance (see also [www.globalreporting.org](http://www.globalreporting.org) for further details and definitions of the GRI framework and indicators).

**Governance** - A set of processes, customs, policies, laws, and institutions affecting the way a company is directed, administered, or controlled.

**Hazard** - A source of potential damage, harm, or adverse effects on something or someone under certain conditions at work.

**HSE** - Health, Safety and Environment.

**ICMI** - International Cyanide Management Institute.

**IFC** - International Finance Corporation, a member of the World Bank Group.

**ISO** - International Organization for Standardization, the world's largest developer of voluntary International Standards.

**ISO 31000 standard** - Standard developed by ISO Technical Management Board Working Group.

**IWP & HP** - Institute of Water Problems and Hydropower.

**IUCN** - International Union for Conservation of Nature.

**JSC** - Joint Stock Company.

**KR NAS** - Kyrgyz National Academy of Sciences.

**KGC** - Kumtor Gold Company.

**Local Suppliers** - Suppliers based in the same country as the operation that they supply.

**Lost Time Injury (LTI)** - A work related injury resulting in the employee being unable to attend work on the next calendar day after the day of the injury. If a suitably qualified company medical professional advises that the injured person is unable to attend work on the next calendar day after the injury, regardless of the injured person's next rostered shift, a lost time injury is deemed to have occurred. Site and company medical advisors will determine when a lost time injury is no longer recorded as a lost time injury. This includes fatalities.

**LTI Frequency Rate** - Number of LTIs x200,000/hours worked.

**LTI Severity Rate** - Number of days lost to injury x200,000/hours worked.

**MAC** - Maximum allowable concentration standards which apply at KGC's surface water quality compliance point (referred to as W.1.5.1) downstream of the Kumtor mine.

**MAD** - Maximum allowable discharge standards which apply to treated effluent discharges from the effluent treatment plant and the sewage treatment plant.

**MAE** - Maximum allowable emission standards which apply to airborne emissions from Kumtor.

**Materiality** - The threshold at which an economic, environmental or social issue or indicator becomes sufficiently important that it warrants disclosure in the corporate responsibility report.

**Medical Aid (MA)** - A work related injury or illness that requires medical treatment administered by an off-site physician or by a registered medical personnel. Site and company medical advisors are to be consulted and a final decision as to how a medical aid injury is to be managed will be determined by the company medical team in consultation with senior site management.

**Millimeter/Millimetre (mm)** - International System unit of length, 1000th of a metre.

**NGO** - Non-Governmental Organization, a not-for-profit group largely funded by private contributions and operating outside of institutionalized government or political structures. NGOs focus on environmental, social, and economic issues at local, regional, national and international levels.

**Near Miss** - An event not causing harm, but has the potential to cause injury.

**Oblast** - Administrative division, which in English translates as province or region.

**OJSC** - Open Joint Stock Company.

**Open Pit** - A mine where the minerals are mined entirely from the surface.

**Ore** - A naturally occurring solid material (usually rock) from which a metal or valuable mineral can be extracted profitably.

**QA/QC** - Quality assurance and quality control program for collection, handling, and analysis of samples to ensure a consistent approach and accurate results.

**Reclamation** - The restoration of a site after the completion of mining or exploration activity.

**Reportable Injury** - The sum of the number of Medical Aid Injuries and Lost Time Injuries in a given period.

**Reportable Injury Frequency Rate (RIFR)** - Number of Reportable Injuries per 200,000/Hours Worked  
**Responsible Mining** - A comprehensive and transparent minerals activity that respects the rights of all stakeholders, especially those of local people, operates safely, protects the environment, minimizes the impact on human health, embraces the best international practices, and upholds the rule of law while generating benefits for host countries (see also Corporate Responsibility).

**Restricted work injury** - Temporary transfer to lighter work.

**SAEL** - Stewart Assay and Environmental Laboratories LLC (part of the ALS international group of laboratories), located in Kara-Balta, Kyrgyz Republic.

**SAEPF** - State Agency of Environment Protection and Forestry.

**SCER** - Sarychat-Eertash Reserve, a strictly protected Zapovednik neighbouring Kumtor Concession. Sometimes referred to as SCEZ, with Zapovednik replacing Reserve. Zapovednik is a word of Russian origin meaning protected wilderness.

**SEDAR** - System for Electronic Document Analysis and Retrieval.

**Significant Spill** - Any spill that is Level III or higher, as defined by Centerra's incident reporting system, Level III spills are significant enough that they must be reported to Centerra's Board of Directors.

**SME** - Small or medium sized enterprise, referring usually to small businesses. Definitions vary, but typically they have less than 50 employees.

**Stakeholder** - Any person or group of people who may be affected in a good or bad way by the financial, safety, environmental, and social aspects of our operations and those who have an interest in or an influence on our activities.

**Stakeholder Engagement** - The communication with stakeholders, through various means, to find out what social and environmental issues matter most to them, with a view to a company improving decision-making and actions to address these concerns.

**STP** - Sewage Treatment Plant.

**Sustainable Development** - As used in the report Our Common Future (also known as the Brundtland Report): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (see also Corporate Responsibility). Kumtor develops mineral deposits in a manner that does not restrict communities' efforts to sustain themselves and strives to catalyze economic activity that promotes long-term sustainability among our communities and their surroundings.

**Sustainability** - An approach to decision-making that integrates economic, environmental, and social considerations (see also Corporate Responsibility).

**Tailings** - The material that remains after recoverable metals or minerals of economic interest have been removed from ore through milling.

**Threshold Limit Values (TLV)** - The level/concentration of a chemical substance to which it is believed a worker can be exposed day after day for a working lifetime without adverse health effects.

**TMF** - The Tailings Management Facility is the combination of infrastructure to hold and manage semi-liquid tailings so as to avoid negative health and environmental impacts, consisting of delivery infrastructure, storage ponds, holding dam, water and waste treatment facilities, and discharge facilities for treated effluent.

**TSP** - Total suspended particulates.

**USD** - US Dollars.

**WTP** - Water Treatment Plant.

# PERFORMANCE DATA

## Economical and operational indicators

	2017	2018	2019
Gold produced, oz	562,749	534,563	600,201
KGC's share in KR GDR %	9.7	8.6	9.8
KGC's share in the aggregate industrial output, %	21.1	18.4	20.8

## Direct economic value generated and distributed<sup>1</sup>

	2017	2018	2019
Revenues from gold sales	685,163,279	660,058,489	827,537,641
Other income <sup>2</sup>	4,069,740	1,126,089	2,302,370
Operating costs (Goods and Services) <sup>3, 5</sup>	206,804,840	222,831,431	209,404,804
Corporate administration costs	-	-	-
Exploration costs		6,090,617	11,302,849
Capital expenditure <sup>4</sup>	78,745,280	60,429,073	54,642,620
Other operating costs	2,469,333	3,097,024	12,155,184
Employee and contractor wages and benefits	117,237,524	117,800,253	120,699,331
Taxes and royalties	400,000,000	100,000,000	188,000,000
Payments to providers of funds	96,729,304	92,988,345	116,416,807
Community donations and investments	1,035,343	2,603,835	1,644,367
Payment to Cancer Support Fund <sup>6</sup>	7,000,000		
Payments to Nature Development Fund <sup>6</sup>			61,100,000
Payments to Social Partnership for Regional Development Fund <sup>6</sup>			5,951,665
Economic value retained	(220,788,605)	55,344,000	48,108,760

### Notes:

1. Data has been prepared on an accrual basis and non-cash costs have been omitted.
2. Other income includes income from financial investments, sale of assets, and other services.
3. Includes capitalized overburden stripping costs.
4. Excludes capitalized overburden stripping costs.
5. Includes by-product sales (silver).
6. Payments to the Nature Development Fund, Cancer Care Support Center and Social Partnership for Regional Development Fund are made in accordance with the Strategic Agreement signed among the Government of the Kyrgyz Republic, Centerra Gold Inc, Kumtor Gold Company CJSC and Kumtor Operating Company CJSC as of September 11, 2017, and as part of the unilateral obligation of Kumtor Gold Company CJSC as of August 7, 2019.

## Major consumables, tonnes

	2017	2018	2019
Cement & lime	10,264	9,719	7,981
Reagents & chemicals	11,611	12,174	12,109
Grinding balls	11,389	11,759	12,375
Diesel (x1000 litres/yr)	124,652	140,262	124,455
Explosives	32,200	29,789	23,029

## Local procurement in context

	2017	2018	2019
Total Payments for Goods and Services	266,126,258	317,703,765	285,090,753
Local Payments for Goods and Services	60,385,333	81,176,660	70,760,657
Local Payments for Goods and Services as% of Total	23	26	25

## Environmental performance indicators

	2017	2018	2019
<b>Direct energy consumption, GJ</b>			
Diesel, litres/yr	124,651,982	140,262,495	124,455,262.00
Retrol, litres/yr	395,842	466,989	629,365
Explosives, tonnes/yr	32,698	29,789	23,029
<b>Indirect Energy Consumption, GJ</b>			
Electricity, GJ/yr	1,041,539	1,045,065	1,034,446.76
Electricity, MWh	289,316	290,296	287,346.32
Direct GHG Emissions (Scope 1) tonnes CO <sub>2</sub> e	340,525	382,028	338,884
Indirect GHG Emissions (Scope 2) tonnes CO <sub>2</sub> e	25,279	25,114	25,104
GHG intensity ratio, tonnes CO <sub>2</sub> e/oz gold	0.65	0.76	0.61



## Kumtor mine emissions. tonnes/year

Pollutant	MAE	Actual 2019
	Standard 2019	
Dust that contains SiO <sub>2</sub> 20-70%	689.8808	584.0288
Hydrocyanide (hydrogen cyanide)	0.0026	0.00014
Sodium hydroxide (sodium hydrate)	0.054513	0.05081
Calcium oxide dust (lime)	2.4135	2.0487
Carbon (soot)	2.1175	1.3595
Lead and its inorganic compounds	0.000565	0.000666
Sulfur dioxide	15.02429	12.2179
Welding aerosol	0.5053	0.4408
Manganese oxide	0.0688	0.0598
Hydrofluoride (hydrogen fluoride)	0.0593	0.0518
Hydrocarbon	15.14902	11.29739
Nitrogen dioxide	143.4017	94.4088
Carbon oxide	67.0756	49.1953
Tetrafluorosilane (fluorides)	0.0222	0.0199
Ammonia	1.2834	1.7941
Silicon compounds	0.0222	0.0199
Hydrochloride (hydrogen chloride)	0.0061	0.0224
Nitrogen oxide	0.1154	-
Hydrocarbons (as kerosene)	2.2164	-
Formaldehyde	0.4563	0.3098
Benzpyrene	0.00004224	0.000032
Ammonium nitrate	1.677	0.0188
Carbon dust	0.0552	0.0522
Suspended solids	0.2418	0.7201
Carbon dioxide	36.424	37.2973
Total	978.27353	795.4149

## Waste management, tonnes

	2017	2018	2019
Industrial waste - total (tonnes)	10,052	6,751.2	5,412.45
Hazardous waste - total (tonnes)	545	459.7	407.471
Hazardous waste - recycled (tonnes) *	817.9	855.6	580.9
Waste Tires	947.8	1,176.3	1,079.006

**Note:** 10 tons of used batteries, including those remained from previous years, are temporarily stored at the mine. In 2019, 1,079 tons of used tires were generated, 1,039,006 tons were transferred for recycling. 280 tons of used batteries, including those remained from previous years, are temporarily stored at the mine.

## Water Use and Treatment. mil m<sup>3</sup>

	2017	2018	2019
<b>Sources of Water</b>			
Total Water Extracted from Petrov Lake	5.21	5.17	5.41
Pit water pumped to the Mill	1.14	1.54	1.49
Pit water pumped to the environment	29.24	25.17	27.11
<b>Water used for Domestic Purposes</b>			
Water Used for camp domestic purposes	0.13	0.14	0.15
Water Used for Mill domestic purposes	0.02	0.02	0.02
Water Used for lower zone domestic purposes			0.03
<b>Water used for process/Mill</b>			

## Water Use and Treatment. mil m<sup>3</sup>

	2017	2018	2019
Raw water used at Mill (from Petrov Lake)	5.03	4.91	4.95
Total water used at Mill (Petrov Lake + Pit water)	6.17	6.45	6.44
Water internally recycled at Mill	6.19	8.06	7.99
Ore Feed to Mill	6.25	6.33	5.97
Raw Water Intensity Ratio	805	776	829
Process water fro drilling exploration operations (Petrov Lake)			0.23
<b>Water used for dust supression</b>			
Water used for dust suppression (from Petrov Lake)	0.05	0.11	0.04
Water used for dust suppression (from Pit water)	0.77	0.75	0.95
<b>Wastewater discharged to environment</b>			
Treated wastewater discharged from ETP	4.75	4.58	5.99
Treated wastewater discharged from STP	0.10	0.13	0.13
Net water usage	0.36	0.46	-0.72

## Social performance indicators

	2017	2018	2019
<b>Training Hours by Gender</b>			
Average hours per year	46.31	30.61	36.90
Total Employee Training Hours	127,999	104,258	102,882
Total Number of Employees	2,764	2,767	2,788
Average/Female Employee	21.16	21.28	21.34
Total Female Employee Training Hours	7,386	7,279	6,765
Total Number of Female Employees	349	342	317
Average/Male Employee	49.94	39.99	38.90
Total Male Employee Training Hours	120,614	96,979	96,117
Total Number of Male Employees	2,415	2,425	2,471
<b>Training Hours by Employee Category</b>			
Average/Senior Management	34.15	61.23	57.84
Total Training Hours Provided to Senior Management	1,400	2,388	2,140
Total Number of Senior Management	41	39	37
Average/Middle Management	45.06	35.16	41.46
Total Training Hours Provided to Middle Management	12,934	9,775.5	12,271
Total Number of Middle Management	287	278	296
Average/Funtional Employee	46.66	37.59	36.04
Total Training Hours Provided to Funtional Employees	113,665.5	92,094	88,470.5
Total Number of Funtional Employees	2,436	2,450	2,455

## Social performance indicators

	2017	2018	2019
<b>Health and Safety</b>			
Annual medicals	2,870	2,633	1,960
Pre-employment medicals	334	162	115
Total visits	38,709	37,607	34,357
Reduction in overall vehicle accidents	14	17	5
Reduction in high-potential injury risk -light vehicle accidents	1	2	0
In-pit heavy versus light vehicle collisions	0	1	0
Injuries due to vehicle accidents	1	2	0
Hours worked	5,882,917	6,334,208	6,518,416
Lost time injuries (LTI's)	1	4	2
Restricted work injuries	1	2	0
Medical aid	1	2	1
First aid	13	9	4
Days lost to injury	6,026	107	12,041
LTI frequency rate	0.03	0.06	0.09
LTI severity rate	205	3.38	369.45
Total Reportable Injury Frequency Rate (TRIFR)	0.14	0.19	0.12
Incidents w/Property damage	28	16	14

**Note:** The number of lost days due to injuries with lost time incidents (LTI) for 2019 compared to 2018 is significantly higher, because in 2019 there were one lost time injury and one fatal incident involving deaths of two employees. In accordance with international norms, an automatic calculation of 12,000 lost person-days due to a fatal incident (2 deaths, 6,000 days each) and 41 lost persons-days due to lost time injury was made.

Reportable injury frequency rate: KGC/Centerra vs peer group			
Kumtor	-	0.19	0.12
Centerra	-	0.47	0.44
Peer group	-	0.66	0.76

## Employee demographics

	2017	2018	2019
<b>Standard national entry level wages and those paid by Kumtor</b>			
Kyrgyz minimum wage per hour	7.14	10.06	10.58
Kumtor entry-level wage per hour	94.62	99.35	109.18
Kumtor entry-level to Kyrgyz minimum wage	13 : 1	10 : 1	10 : 1
<b>Staffing at the Kumtor mine (as at Dec each year)</b>			
Kyrgyz national (Total)	2,627	2,596	2,591
-men	2,306	2,291	2,298
-women	321	305	293
Expat staff (Total)	66	45	40
-men	66	45	40
-women	0	0	0
Full time staff Total (Kyrgyz + Expat)	2,693	2,641	2,631
-men	2,372	2,336	2,338
-women	321	305	293
Contractors (Total)	947	850	830
Total staff (Full time staff + Contractors)	3,640	3,491	3,467
Proportion of Kyrgyz national as full time staff (%)	98	98	99
<b>Total Number and Rates of New Employee Hires and Employee Turnover by Gender and Region</b>			
Bishkek	29	20	27
Bakychi	5	5	3
Karakol	23	8	13
Jeti-Oguz	65	23	48
Ton	6	2	10
Other regions	11	24	33
Women (from all)	27	5	13
Total	139	82	134
Employee turnover (%)	6.2	3.9	4.8
<b>Return to work and retention rates after parental leave (female employees)</b>			
Entitled to parental Leave	7	12	7
Returned -rom parental leave	10	10	12

## Economical and Operational Indicators

Indicator	Description	Omissions
GRI 101: Foundation 2019		
GRI 102: General Disclosures 2019		
Organizational Profile		
102-1 Name of the organization	About Kumtor mine (p.2)	-
102-2 Activities, brands, products, and services	About Kumtor mine (p.2); Environment and Sustainability Snapshot (p.10-11); Economic Value (p.24)	-
102-3 Location of headquarters	Contacts (p.123)	-
102-4 Location of operations	About Kumtor mine (p.2)	-
102-5 Ownership and legal form	About Kumtor mine (p.2)	-
102-6 Markets served	About Kumtor mine (p.2)	-
102-7 Scale of the organization	Environment and Sustainability Snapshot (p.10-11); Economic Value (p.24-25); Workplace Practices (p.34)	-
102-8 Information on employees and other workers	Workplace Practices (p.32-33)	-
102-9 Supply chain	Local Procurement (p.26-29)	-
102-10 Significant changes to the organization and its supply chain	No significant change has been occurred neither in company's operational or financial structure nor supply chain;	-
102-11 Precautionary principle or approach	Disclaimer Regarding Forward-Looking Statements (p.123)	-
102-12 External initiatives	Governance (p.14-15)	-
102-13 Membership of associations	Governance (p.14-15)	-
Strategy		
102-14 Statement from senior decision-maker	Message From the President (p.4-6)	-
Ethics and Integrity		
102-16 Values, principles, standards, and norms of behavior	Business Ethics (p.22-23), Values (p.13)	-
Governance		
102-18 Governance structure	Governance (p.14-15)	-
Stakeholder Engagement		
102-40 List of stakeholder groups	Stakeholder Engagement (p.91)	-
102-41 Collective bargaining agreements	Collective Bargaining (p.31)	-
102-42 Identifying and selecting stakeholders	Stakeholder Engagement (p.88-91)	-
102-43 Approach to stakeholder engagement	Stakeholder Engagement (p.88-91)	-
102-44 Key topics and concerns raised	Environmental Claims (p.15); Risk Management and Continuous Improvement (p.18); Stakeholder Engagement (p.90-91)	-



Indicator	Description	Omissions
Reporting Practice		
102-45 Entities included in the consolidated financial statements	About This Report (p.2)	-
102-46 Defining report content and topic boundaries	About This Report (p.2); Materiality Assessment (p.19-21)	-
102-47 List of material topics	Materiality Assessment (p.19-21)	-
102-48 Restatements of information	No restatements made in information given in previous reports.	-
102-49 Changes in reporting	About This Report (p.2)	-
102-50 Reporting period	About This Report (p.2)	-
102-51 Date of the most recent report About This Report (p.2)	About This Report (p.2)	-
102-52 Reporting cycle	About This Report (p.2)	-
102-53 Contact point for questions regarding the report	Contacts (p.124)	-
102-54 Claims of reporting in accordance with the GRI Standards	About This Report (p.2)	-
102-55 GRI content index	GRI Content Index (p.103-106)	-
102-56 External assurance	Disclaimer Regarding Forward-Looking Statements (p.123)	-

Material Issues		
Indicator	Description	Omissions
Water Management		
GRI 103: Management Approach 2019	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.19-21) -
	103-2 The management approach and its components	Governance Model (p.14); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19); Environmental Responsibility (p.42); Water Use and Treatment (p.72)
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.18-19); Environmental Monitoring (p.46-49)
GRI 303: Water 2019	303-1 Water withdrawal by source	Water Use and Treatment (p.72-75) -
	303-2 Water sources significantly affected by withdrawal of water	Water Use and Treatment (p.72-75)
	303-3 Water recycled and reused	Water Use and Treatment (p.72-75)
GRI 306: Effluents and Waste 2019	306-1 Disclosure 306-1 Water discharge by quality and destination	Water Use and Treatment (p.72-75)
Biodiversity		
GRI 103: Management Approach 2019	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.19-21) -
	103-2 The management approach and its components	Governance Model (p.14-15); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19); Environmental Responsibility (p.42); Biodiversity (p.50)
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.18-19); Environmental Monitoring (p.46-49)

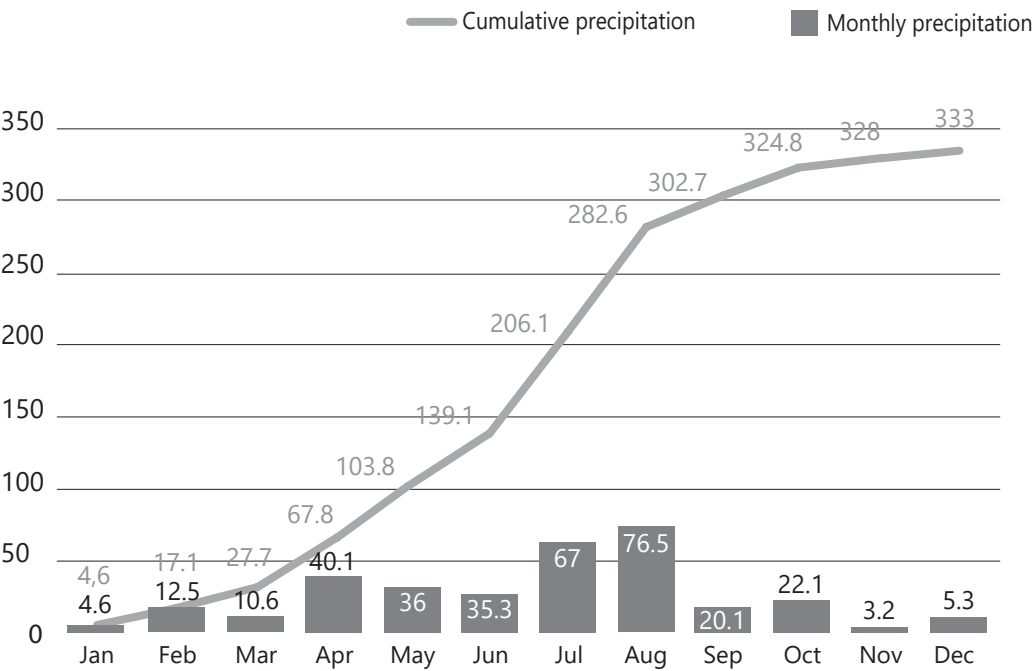
	Indicator	Description	Omissions
Biodiversity			
GRI 304: 2019	304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	Biodiversity (p.50-56)	
	304-2 Significant impacts of activities, products, and services on biodiversity	Biodiversity (p.50-56)	
	304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	Biodiversity (p.56)	-
Waste and Hazardous Material Management			
GRI 103: Management Approach 2019	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.19-21)	-
	103-2 The management approach and its components	Governance Model (p.14); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19); Environmental Responsibility (p.42); Waste Management (p.62-64)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.18); Environmental Monitoring (p.46-49)	-
GRI 306: Effluents and Waste 2018	306-2 Waste by type and disposal method	Waste Management (p.64); Performance Data (p.100)	
	306-3 Significant spills	Environmental Incidents (p.17)	
G4 Sector Supplement	G4-MM3	Unprocessed Waste Rock (p.64); Tailings Management (p.66-68)	
Legal Compliance			
GRI 103: Management Approach 2018	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.19-21)	-
	103-2 The management approach and its components	Governance Model (p.14); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19);	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.18-19)	-
GRI 307: Environmental Compliance 2018	307-1 307-1 Non-compliance with environmental laws and regulations	Legal Compliance (p.16-17)	-
Ethical Conduct and Anti-Corruption			
GRI 103: Подход к управлению 2019	103-1 Explanation or the material topic and its boundary	Materiality Assessment (p.19-21)	-
	103-2 The management approach and its components	Governance Model (p.14); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19); Business Ethics (p.22-23)	-
	103-3 Evaluation o-' the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16)	-
GRI 205: Anti-Corruption 2018	205-2 205-2 Communication and training about anti- corruption policies and procedures	Business Ethics (p.22-23)	-

	Indicator	Description	Omissions
Fostering Local Economies			
GRI 103: Management Approach 2018	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.19-21)	-
	103-2 The management approach and its components	Governance Model (p.14); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19); Local Procurement (p.26-29)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.18-19)	-
GRI 201: Economic Performance 2018	201-1 201-1 Direct economic value generated and distributed	Economic Performance (p.24-25)	-
GRI 204: Procurement Practices 2018	204-1 204-1 Proportion of spending on local suppliers	Local Procurement (p.26)	-
Local Communities			
GRI 103: Management Approach 2018	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.19-21)	-
	103-2 The management approach and its components	Governance Model (p.14); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19); Stakeholder Engagement(p.88-91)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.18-19)	-
GRI 413: Local Communities 2018	413-1 Operations with local community engagement, impact assessments, and development programs	Stakeholder Engagement(p.88-91);	-
Occupational Health and Safety			
GRI 103: Management Approach 2018	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.19-21)	-
	103-2 The management approach and its components	Governance Model (p.14); Sustainability Management (p.18); Risk Management and Continuing Improvement (p.18-19); Collective Bargaining (p.31); Health and Safety (p.38-41)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.18-19)	-
GRI 403: Occupational Health and Safety 2018	403-2 Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	Health and Safety (p.39)	-
	403-3 Workers with high incidence or high risk of diseases related to their occupation	Health and Safety (p.38-41)	-
	403-4 Health and safety topics covered in formal agreements with trade unions	Collective Bargaining (p.31)	-

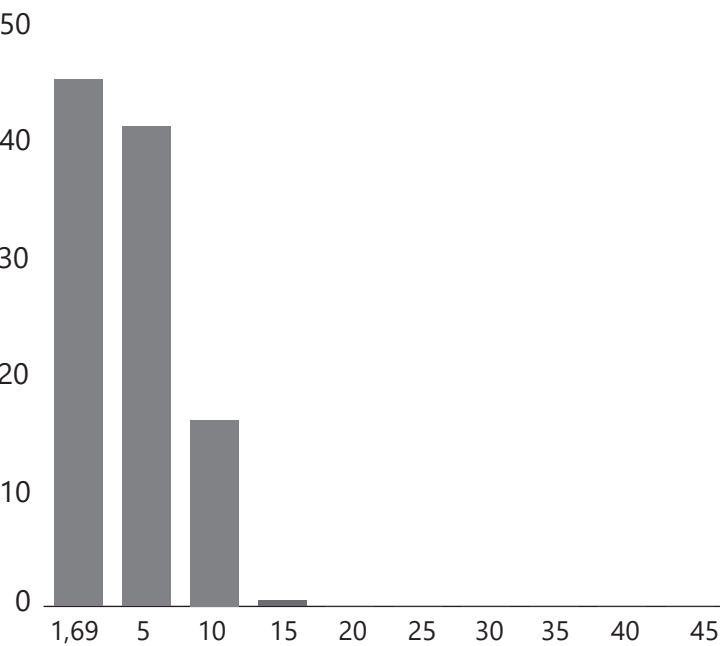


# APPENDIX

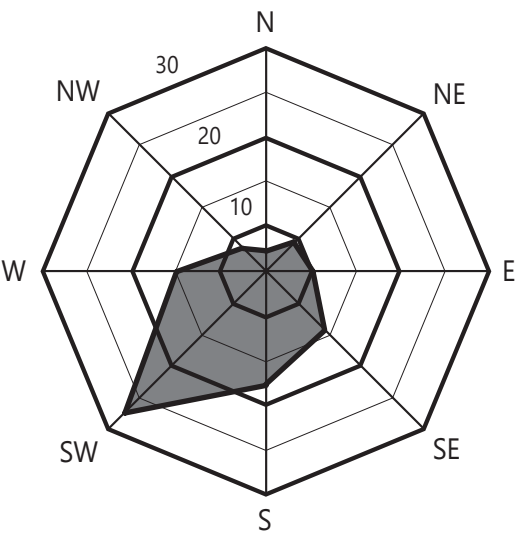
## Precipitation 2019 equivalent mm of water



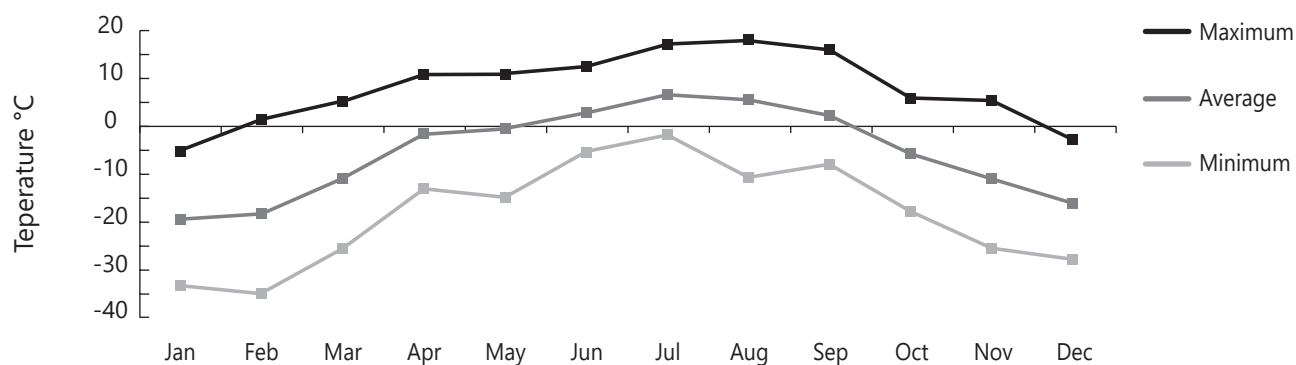
## Wind Speed and Direction 2019, km/hour



## Distribution of Wind Direction 2019, %



## Average monthly temperatures 2019



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	-34.20	-35.10	-25.40	-13.40	-15.00	-5.90	-1.80	-11.10	-8.90	-18.80	-25.50	-28.50
Maximum	-5.60	-2.40	5.10	11.20	11.20	13.70	17.40	18.80	15.70	5.30	5.20	-3.30
Average	-20.20	-18.10	-10.10	-1.90	-1.00	3.30	6.90	5.50	2.40	-5.90	-11.30	-15.40

## Radionuclides and heavy metals in dust samples - Mine Site

Station	Zn, ng/m <sup>3</sup>	CN, ng/m <sup>3</sup>	S, ng/m <sup>3</sup>	As, ng/m <sup>3</sup>	Ni, ng/m <sup>3</sup>	Se, ng/m <sup>3</sup>	U, ng/m <sup>3</sup>	Sr-90, mBq/m <sup>3</sup>	Pb-210, mBq/m <sup>3</sup>	Ra-226, mBq/m <sup>3</sup>
TLV1	1,600,000	5,000,000	330,000	10,000	200,000	200,000	200,000			
DAC2								300,000	8,000	4,000
A1.1	11,700	0.700	50	7.50	13.0	0.240	2.60	<0.2	0.500	0.060
A1.2a	2,110	0.600	820	5.90	11.0	0.180	2.10	<0.2	0.600	0.020
A1.3a	3,710	0.400	280	7.20	10.0	0.290	2.00	<0.1	0.290	<0.01
A1.4	2,200	0.300	180	7.00	12.0	0.250	2.00	<0.1	0.420	0.050
A1.5a	8,910	1.750	1,030	8.70	12.5	0.260	2.15	<0.45	0.720	0.110
A1.6	990	0.700	640	5.60	10.0	0.150	1.90	<0.2	0.600	0.160
	2,360	0.300	560	5.40	9.7	0.140	2.00	<0.1	0.520	0.020

### Notes:

1. TLV's have been sourced from either the Agency for Toxic Substances and Disease Registry (ATSDR), or the Occupational Health & Safety Administration (OHSA). S and Zn TLV's have been adjusted using the molar ratios of SO<sub>2</sub> and ZnO.
2. DAC's have been sourced from the 1999 International Atomic Energy Agency (IAEA) safety standards.

## Radionuclides and heavy metals in dust samples - Barskoon

Station	Zn, ng/m <sup>3</sup>	CN, ng/m <sup>3</sup>	S, ng/m <sup>3</sup>	As, ng/m <sup>3</sup>	Ni, ng/m <sup>3</sup>	Se, ng/m <sup>3</sup>	U, ng/m <sup>3</sup>	Sr-90, mBq/m <sup>3</sup>	Pb-210, mBq/m <sup>3</sup>	Ra-226, mBq/m <sup>3</sup>
TLV1	1,600,000	5,000,000	330,000	10,000	200,000	200,000	200,000			
DAC2								300,000	8,000	4,000
Barskoon #1	3,170	2,000	580	5.40	9.3	<0.5	1.80	<0.4	0.900	0.310
Barskoon #2	530	2,000	530	4.90	11.0	<0.5	1.40	<0.4	0.900	<0.04
Barskoon #3	311	0.100	59	0.66	1.1	0.020	0.19	<0.04	0.110	0.009

### Notes:

1. TLV's have been sourced from either the Agency for Toxic Substances and Disease Registry (ATSDR), or the Occupational Health & Safety Administration (OHSA). S and Zn TLV's have been adjusted using the molar ratios of SO<sub>2</sub> and ZnO.
2. DAC's have been sourced from the 1999 International Atomic Energy Agency (IAEA) safety standards.

# Kumtor weather station summary 2019

2019		DAILY AVERAGE READINGS FOR 2019 Г.									hr./rdg. Total precip., mm
		W. Spd., km/h	W. dir. deg.	TEMPERATURE °C			Rel. hum.,%	Solar rad., KW/m²	Barom. Press., mbar	Barom. Press., mmHG	
				Avg./h	Max., 5 s.	Min., 5 s.					
JAN	max	9.40	356.27	-13.33	-5.58	-19.11	90.20	553.00	653.60	490.24	4.60
	min	0.08	6.12	-26.55	-17.11	-34.16	24.20	0.00	643.50	482.67	
	avg	1.63	145.09	-20.23	-10.67	-28.11	61.90	95.20	649.50	487.17	
	tot										
FEB	max	11.11	352.98	-9.65	-2.42	-16.25	90.30	718.10	652.80	489.64	12.50
	min	0.03	9.56	-23.64	-14.28	-35.08	18.70	0.00	639.40	479.59	
	avg	2.09	169.14	-18.05	-8.68	-26.90	64.30	135.30	647.80	485.89	
	tot										
MAR	max	11.37	354.87	-0.43	5.13	-5.89	99.10	925.00	657.80	493.39	10.60
	min	0.00	0.00	-15.54	-5.38	-25.44	20.10	0.00	642.30	481.77	
	avg	2.06	217.73	-10.12	-1.47	-18.13	62.00	184.00	651.90	488.97	
	tot										
APR	max	17.33	353.09	3.13	11.17	-1.97	99.30	981.00	660.00	495.04	40.10
	min	0.00	0.00	-6.35	-1.88	-13.39	14.80	0.00	647.90	485.97	
	avg	3.41	217.03	-1.92	4.27	-7.40	70.30	180.40	654.70	491.07	
	tot										
MAY	max	18.38	346.88	4.40	11.20	-1.70	99.30	1,005.00	661.80	496.39	36.00
	min	0.00	0.00	-9.22	-4.95	-14.96	14.10	0.00	652.40	489.34	
	avg	3.23	183.80	-0.98	4.75	-6.17	61.10	215.30	656.70	492.57	
	tot										
JUN	max	14.43	350.70	5.86	13.72	1.49	99.40	1,131.00	661.00	495.79	35.30
	min	0.00	3.57	-0.77	2.63	-5.89	21.50	0.00	653.80	490.39	
	avg	3.25	202.70	3.32	9.40	-1.84	67.50	193.50	656.80	492.64	
	tot										
JUL	max	14.86	352.47	10.18	17.38	5.22	99.30	1,013.00	662.70	497.07	67.00
	min	0.08	8.34	3.33	7.11	-1.80	11.90	0.00	653.60	490.24	
	avg	2.91	184.83	6.88	13.89	0.62	64.60	197.80	658.40	493.84	
	tot										
AUG	max	14.28	352.33	10.93	18.82	6.58	99.30	922.00	662.40	496.84	76.50
	min	0.00	0.00	-2.22	4.57	-11.12	11.70	0.00	654.10	490.62	
	avg	2.67	173.30	5.48	12.40	-0.28	69.40	172.70	659.20	494.44	
	tot										
SEP	max	15.05	355.08	6.18	15.66	0.47	99.30	843.00	665.60	499.24	20.10
	min	0.01	9.52	-2.82	1.86	-8.93	10.60	0.00	651.50	488.67	
	avg	3.33	197.41	2.28	9.89	-3.55	59.60	156.90	659.40	494.59	
	tot										
OCT	max	12.44	356.25	0.75	5.34	-3.74	98.70	791.50	663.40	497.59	22.10
	min	0.03	6.89	-12.07	-5.11	-18.77	20.30	0.00	653.40	490.09	
	avg	2.86	195.31	-5.76	0.92	-11.68	63.40	121.80	658.20	493.69	
	tot										
NOV	max	11.66	354.31	-3.15	5.20	-6.02	93.10	626.10	662.40	496.84	3.20
	min	0.02	4.88	-19.68	-10.97	-25.54	11.60	0.00	647.50	485.67	
	avg	2.86	181.00	-11.27	-4.27	-17.06	56.90	95.10	654.60	490.99	
	tot										
DEC	max	13.11	352.18	-11.69	-3.30	-15.88	88.80	516.80	661.30	496.02	5.30
	min	0.07	5.41	-22.17	-13.87	-28.54	13.10	0.00	641.10	480.87	
	avg	2.29	162.86	-15.41	-8.14	-21.80	58.50	75.60	651.80	488.89	
	tot										
Yearly	Max	18.38	356.27	10.93	18.82	6.58	99.40	1,131.00	665.60	499.24	333.30
	Min	0.00	0.00	-26.55	-17.11	-35.08	10.60	0.00	639.40	479.59	
	Avg	5.45	181.16	-5.56	1.59	-11.74	58.56	329.14	654.56	490.96	
	tot										



## W1.1 Petrov Lake (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	0.8	0.6	0.9	1.3	1.4	2.5	5.2	5.9	4.5	2.8	1.4	1.1
Conductivity	mS/cm	0.146	0.137	0.133	0.114	0.100	0.091	0.215	0.108	0.165	0.116	0.128	0.099
pH		8.0	7.9	8.0	7.9	7.9	8.0	8.3	8.1	8.3	8.1	8.2	8.1
Major Constituents													
Calcium	mg/L	16.9	18.9	19.3	16.3	12.0	12.50	13.5	16.5	13.1	13.1	17.6	17.7
Chloride	mg/L	0.60	0.70	0.70	1.00	0.70	0.60	0.25	0.60	0.50	0.70	0.60	0.70
Carbonate	mg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Bicarbonate	mg/L	43.0	44.0	44.0	41.0	30.0	32.0	41.0	38.0	36.0	36.0	40.0	42.0
Potassium	mg/L	1.98	1.72	1.78	1.71	1.10	1.21	1.51	3.12	1.98	1.82	1.58	3.57
Magnesium	mg/L	3.42	3.25	3.73	3.24	2.20	2.18	3.30	4.14	2.92	2.69	3.59	1.82
Sodium	mg/L	2.12	2.07	2.27	1.75	1.36	1.47	1.64	2.59	1.95	1.97	1.94	1.92
Sulphate	mg/L	17.0	20.0	20.0	17.0	13.0	13.00	20.0	19.0	17.0	20.0	21.0	21.0
Hardness - Total	mg/L	54.0	55.0	56.0	44.0	36.0	38.0	51.0	48.0	44.0	47.0	51.0	61.0
Alkalinity - Total	mg/L	35.2	36.4	36.2	34.0	25.0	26.4	33.2	31.1	29.5	29.3	33.1	34.0
Total metals													
Silver - Total	mg/L	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150
Aluminum - Total	mg/L	0.53	0.20	0.50	0.40	0.25	0.55	0.54	8.47	0.86	0.36	0.98	0.22
Arsenic - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00200	0.00100	0.00100	0.00050	0.00050
Cadmium - Total	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Chromium - Total	mg/L	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250
Iron - Total	mg/L	0.21	0.10	0.21	0.32	0.12	0.35	0.37	5.31	0.51	0.21	0.45	0.14
Mercury - Total	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese - Total	mg/L	0.01300	0.01000	0.01100	0.01200	0.00700	0.01300	0.02900	0.15000	0.03000	0.01300	0.01900	0.01400
Molybdenum - Total	mg/L	0.00500	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200
Nickel - Total	mg/L	0.01300	0.00250	0.00250	0.00500	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250
Lead - Total	mg/L	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00500	0.00300	0.00100	0.00200	0.00100
Antimony - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00100	0.00050	0.00050	0.00050
Selenium - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00200	0.00050
Zinc - Total	mg/L	0.00200	0.00100	0.00050	0.00200	0.00200	0.00100	0.00300	0.02100	0.00300	0.00300	0.00300	0.00200
Nutrients													
Ammonia - N	mg/L												
Nitrite - N	mg/L												
Nitrate - N	mg/L												
Solids													
Turbidity	NTU	17.0	13.0	11.0	7.10	4.70	11.0	136	222	222	40.0	21.0	21.0
TDS Total	mg/L	101	70.0	68.0	88.0	54.0	55.0	95	119	128	90.0	77.0	84.0
Dissolved Solids													
TSS Total	mg/L	7.00	2.00	0.50	4.00	2.00	5.00	72.0	85.0	80.0	5.00	20.0	28.0
Suspended Solids													
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

## W1.3 Kumtor River above ETP Discharge (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				1.2	2.0	4.1	5.4	8.9				
Conductivity	mS/cm				1.302	1.211	0.393	0.445	0.408				
pH					8.5	8.1	8.1	8.2	8.2				
Major Constituents													
Calcium	mg/L				88.0	108	40.2	17.4	36.3				
Chloride	mg/L				12.3	9.85	2.20	0.60	1.90				
Carbonate	mg/L				1.00	0.50	0.50	0.50	0.50				
Bicarbonate	mg/L				142	130	63.0	46.0	57.0				
Potassium	mg/L				4.88	3.47	1.98	1.62	1.57				
Magnesium	mg/L				75.1	118	24.0	6.77	20.30				
Sodium	mg/L				8.33	5.64	2.56	1.98	2.02				
Sulphate	mg/L				474	544	106	41.0	104				
Hardness - Total	mg/L				664	714	188	77.0	173				
Alkalinity - Total	mg/L				118	107	51.8	37.5	46.8				
Total metals													
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150				
Aluminum - Total	mg/L				1.31	8.14	6.28	0.50	0.82				
Arsenic - Total	mg/L				0.00250	0.02300	0.00633	0.00050	0.00050				
Cadmium - Total	mg/L				0.00015	0.00021	0.00015	0.00015	0.00015				
Chromium - Total	mg/L				0.00400	0.00725	0.00400	0.00400	0.00400				
Copper - Total	mg/L				0.00250	0.01138	0.00250	0.00250	0.00250				
Iron - Total	mg/L				2.50	4.66	3.11	0.29	0.57				
Mercury - Total	mg/L				0.00025	0.00025	0.00025	0.00025	0.00025				
Manganese - Total	mg/L				0.17275	1.10400	0.37700	0.05100	0.34200				
Molybdenum - Total	mg/L				0.00625	0.00950	0.00433	0.00200	0.00200				
Nickel - Total	mg/L				0.00250	0.03388	0.00250	0.00250	0.00250				
Lead - Total	mg/L				0.00400	0.01175	0.00433	0.00100	0.00100				
Antimony - Total	mg/L				0.00088	0.00100	0.00050	0.00050	0.00050				
Selenium - Total	mg/L				0.00188	0.00213	0.00100	0.00050	0.00050				
Zinc - Total	mg/L				0.00800	0.04775	0.01900	0.00900	0.00300				
Nutrients													
Ammonia - N	mg/L				0.09	0.32	0.12	0.12	0.12				
Nitrite - N	mg/L				0.00250	0.00213	0.00333	0.00050	0.00300				
Nitrate - N	mg/L				2.18	1.95	0.57	0.40	0.60				
Solids													
Turbidity	NTU				45.1	192	193	180	200				
TDS Total	mg/L				675	981	258	125	265				
Dissolved Solids													
TSS Total	mg/L				91.3	750	430	129	126				
Suspended Solids													
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

## W3.4 Lysyi Creek above Kumtor River (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				0.4	0.9	5.5	7.7	6.2	2.4	1.4	0.8	
Conductivity	mS/cm				1.737	1.448	1.373	1.232	1.356	1.498	1.765	2.100	
pH					8.2	8.1	8.1	8.3	7.9	8.0	8.1	7.9	
Major Constituents													
Calcium	mg/L				157	131	137	113	156	121	167	237	
Chloride	mg/L				13.8	10.4	9.50	6.85	7.38	6.30	11.8	18.0	
Carbonate	mg/L				1.00	0.50	1.20	1.88	0.50	0.50	0.50	0.50	
Bicarbonate	mg/L				225	137	137	132	123	113	201	266	
Potassium	mg/L				5.88	3.88	4.11	3.77	4.04	3.61	5.17	7.13	
Magnesium	mg/L				210	150	130	97.7	112	97.9	141	240	
Sodium	mg/L				9.72	6.22	6.38	5.23	5.52	4.89	8.09	15.4	
Sulphate	mg/L				869	700	694	570.3	740	552	884	1168	
Hardness - Total	mg/L				1176	894	852	704.5	858	678	1076	1376	
Alkalinity - Total	mg/L				186	113	113.4	110.8	101.0	93.0	164	218	
Total metals													
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	
Aluminum - Total	mg/L				0.74	12.3	10.6	1.25	3.95	0.25	1.61	0.27	
Arsenic - Total	mg/L				0.00167	0.05350	0.01800	0.00225	0.00800	0.00050	0.00250	0.00050	
Cadmium - Total	mg/L				0.00015	0.00043	0.00015	0.00015	0.00018	0.00015	0.00015	0.00015	
Chromium - Total	mg/L				0.00400	0.02925	0.00400	0.00400	0.00640	0.00400	0.00400	0.00400	
Copper - Total	mg/L				0.00250	0.07525	0.00250	0.00250	0.01420	0.00250	0.00250	0.00250	
Iron - Total	mg/L				1.20	8.32	16.5	2.35	8.00	1.25	5.14	0.62	
Mercury - Total	mg/L				0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	
Manganese - Total	mg/L				0.19967	2.65450	1.32600	0.56700	2.38200	1.84075	1.43550	0.58300	
Molybdenum - Total	mg/L				0.01250	0.01350	0.01040	0.00650	0.00460	0.00500	0.00375	0.01000	
Nickel - Total	mg/L				0.00250	0.10013	0.03660	0.00250	0.03540	0.00250	0.00250	0.00250	
Lead - Total	mg/L				0.00100	0.02433	0.00640	0.00225	0.00360	0.00150	0.00100	0.00100	
Antimony - Total	mg/L				0.00050	0.00163	0.00090	0.00050	0.00080	0.00050	0.00050	0.00050	
Selenium - Total	mg/L				0.00300	0.00400	0.00360	0.00188	0.00440	0.00275	0.00600	0.00450	
Zinc - Total	mg/L				0.00533	0.10650	0.03240	0.00625	0.02540	0.00900	0.01275	0.00550	
Nutrients													
Ammonia - N	mg/L				0.18	0.47	0.55	0.32	0.31	0.24	0.13	0.11	
Nitrite - N	mg/L				0.00200	0.00363	0.00140	0.00313	0.00160	0.00625	0.00700	0.00250	
Nitrate - N	mg/L				2.98	2.35	2.98	2.48	2.34	1.75	2.20	3.00	
Solids													
Turbidity	NTU				31.7	348	369	179	242	126	78.3	13.5	
TDS Total	mg/L				1708	1291	1211	1011	1223	981	1520	2000	
Dissolved Solids	mg/L												
TSS Total	mg/L				65.3	319	852	318	302	170	137	10.0	
Suspended Solids	mg/L												
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

## T8.1 Tailings Pond - Feed to ETP (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	2.5	1.7	1.5	2.6	4.5	9.0	12.4	12.3	8.5	3.8	2.3	1.6
Conductivity	mS/cm	3.831	4.222	3.916	3.215	3.338	2.481	2.489	2.584	2.649	2.669	2.633	2.350
pH		10.1	10.3	10.0	10.5	10.2	8.9	8.8	8.9	9.0	9.0	9.1	9.2
Major Constituents													
Calcium	mg/L	62.2	63.3	64.6	49.9	35.6	40.0	37.0	38.7	41.5	39.4	44.1	38.5
Chloride	mg/L	26.3	27.5	32.2	23.0	21.5	24.6	25.5	26.0	25.5	25.0	27.0	27.0
Carbonate	mg/L	16.4	27.5	70.4	11.9	20.0	12.2	12.0	9.40	9.25	8.00	15.0	23.0
Bicarbonate	mg/L	242	218	166	179	120	163	179	186	188	191	184	188
Potassium	mg/L	99.0	105	126	71.2	69.2	77.1	83.2	80.8	83.4	84.5	95.2	94.6
Magnesium	mg/L	6.12	6.06	8.13	10.06	4.36	5.08	5.46	5.84	6.22	5.85	7.24	6.26
Sodium	mg/L	522	546	658	374	378	439	456	446	456	446	528	541
Sulphate	mg/L	843	923	1041	603	570	703	744	777	768	754	797	824
Hardness - Total	mg/L	187	165	145	149	112	133	135	137	160	136	129	129
Alkalinity - Total	mg/L	225	225	355	166	131	155	167	168	170	170	177	193
Total metals													
Silver - Total	mg/L	0.04125	0.05175	0.04880	0.02938	0.05875	0.07180	0.06525	0.08660	0.09450	0.10700	0.10200	0.01600
Aluminum - Total	mg/L	0.29	0.35	0.34	0.22	0.32	0.38	0.27	0.39	0.22	0.59	0.72	0.19
Arsenic - Total	mg/L	0.00875	0.01175	0.00740	0.00575	0.00575	0.00640	0.00650	0.00580	0.00775	0.01200	0.01100	0.01100
Cadmium - Total	mg/L	0.00168	0.00175	0.00156	0.00111	0.00133	0.00124	0.00135	0.00112	0.00140	0.00100	0.00150	0.00130
Chromium - Total	mg/L	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400
Copper - Total	mg/L	24.0800	26.6000	27.6660	17.5450	19.5700	24.2800	24.3995	21.6220	21.6000	22.9000	24.8000	24.7000
Iron - Total	mg/L	0.78	1.37	1.50	1.20	1.69	2.35	1.98	2.25	1.49	1.94	2.40	0.58
Mercury - Total	mg/L	0.00508	0.00613	0.00762	0.00470	0.00413	0.00450	0.00603	0.00558	0.00565	0.00700	0.00790	0.00640
Manganese - Total	mg/L	0.03050	0.02425	0.02420	0.05025	0.01550	0.02040	0.02300	0.03140	0.03200	0.03500	0.04400	0.02400
Molybdenum - Total	mg/L	0.44875	0.46150	0.51920	0.30775	0.34500	0.40840	0.41975	0.38700	0.38025	0.37100	0.37700	0.39400
Nickel - Total	mg/L	0.83325	0.91475	1.00240	0.59050	0.68150	0.84300	0.87200	0.80940	0.81300	0.81300	0.78300	0.57700
Lead - Total	mg/L	0.00100	0.00100	0.00100	0.00100	0.00100	0.00140	0.00150	0.00100	0.00275	0.00100	0.00400	0.00100
Antimony - Total	mg/L	0.51975	0.50050	0.48220	0.30000	0.28250	0.36200	0.39900	0.36960	0.40975	0.45400	0.52200	0.62600
Selenium - Total	mg/L	0.03750	0.03875	0.04080	0.02300	0.02200	0.02220	0.02425	0.02240	0.02150	0.02900	0.02500	0.02900
Zinc - Total	mg/L	0.02475	0.03125	0.03500	0.03675	0.09750	0.09680	0.07700	0.03320	0.02500	0.02600	0.05600	0.10600
Nutrients													
Ammonia - N	mg/L	16.5	16.4	17.2	13.8	13.3	12.7	13.2	12.2	12.3	13.8	8.10	13.9
Nitrite - N	mg/L	0.00500	0.00413	0.00880	0.01400	0.01725	0.00850	0.02425	0.05180	0.06325	0.11000	0.03800	0.01900
Nitrate - N	mg/L	21.3	23.8	27.8	17.3	17.7	16.8	18.0	18.6	18.3	18.0	21.0	20.0
Solids													
Turbidity	NTU	10.1	9.63	49.1	7.90	12.9	22.2	31.0	37.4	39.3	35.0	39.0	28.0
TDS Total	mg/L	2164	2220	2635	1633	1474	1742	1824	1807	1833	1787	1868	2017
Dissolved Solids	mg/L												
TSS Total	mg/L	5.25	8.25	62.0	7.00	4.38	10.4	17.5	15.0	20.0	27.0	21.0	11.0
Suspended Solids	mg/L												
Trace Constituents													
Cyanide - Free	mg/L	3.10	3.10	13.96	4.47	7.05	3.72	2.60	2.54	2.35	2.10	2.10	3.00
Cyanide - Total	mg/L	46.8	49.0	59.0	43.7	36.4	35.8	28.5	26.8	27.0	32.0	37.0	46.0
Cyanide - WAD	mg/L	41.5	45.0	53.0	49.0	33.6	33.0	27.0	25.4	25.8	30.0	36.0	45.0

## T8.4 ETP Discharge into Kumtor River (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C				7.0	8.6	12.1	12.1	9.4			
Conductivity	mS/cm				1.94	2.64	2.67	2.62	2.78			
pH					7.6	7.7	7.5	7.5	7.5			
Major Constituents												
Calcium	mg/L				39.2	55.3	54.8	51.8	61.6			
Chloride	mg/L				47.0	25.8	24.5	25.2	24.7			
Carbonate	mg/L				17.0	4.20	0.50	0.50	0.50			
Bicarbonate	mg/L				111	132	73.8	90.6	108			
Potassium	mg/L				44.7	69.8	80.2	76.5	78.9			
Magnesium	mg/L				8.59	5.59	5.68	5.93	6.33			
Sodium	mg/L				340	477	487	471	487			
Sulphate	mg/L				550	898	958	977	998			
Hardness - Total	mg/L				129	167	178	160	188			
Alkalinity - Total	mg/L				120	115	60.6	74.2	89			
Total metals												
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150			
Aluminum - Total	mg/L				0.48	0.10	0.08	0.10	0.06			
Arsenic - Total	mg/L				0.00200	0.00220	0.00175	0.00170	0.00167			
Cadmium - Total	mg/L				0.00050	0.00100	0.00120	0.00098	0.00120			
Chromium - Total	mg/L				0.00400	0.00400	0.00400	0.00400	0.00400			
Copper - Total	mg/L				0.23500	0.43360	0.23975	0.18320	0.33667			
Iron - Total	mg/L				0.68	0.28	0.19	0.18	0.13			
Mercury - Total	mg/L				0.00190	0.00388	0.00665	0.00628	0.00580			
Manganese - Total	mg/L				0.05600	0.03160	0.01975	0.01940	0.02933			
Molybdenum - Total	mg/L				0.18700	0.34800	0.37625	0.34700	0.34700			
Nickel - Total	mg/L				0.01700	0.02775	0.03700	0.03240	0.04767			
Lead - Total	mg/L				0.00100	0.00100	0.00100	0.00120	0.00100			
Antimony - Total	mg/L				0.11500	0.26280	0.30175	0.28500	0.29233			
Selenium - Total	mg/L				0.01100	0.02200	0.02425	0.02260	0.02267			
Zinc - Total	mg/L				0.00800	0.00400	0.00350	0.00350	0.00467			
Nutrients												
Ammonia - N	mg/L				14.5	23.2	22.6	23.0	16.3			
Nitrite - N	mg/L				0.00700	0.01270	0.20000	0.31600	0.47333			
Nitrate - N	mg/L				8.10	15.2	16.5	16.2	16.7			
Solids												
Turbidity	NTU				14.0	2.19	2.22	1.73	1.40			
TDS Total	mg/L				1196	1851	1947	1934	1995			
Dissolved Solids	mg/L											
TSS Total	mg/L				13.0	4.40	4.50	4.00	4.33			
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L				0.01000	0.02920	0.02100	0.02100	0.02100			
Cyanide - Total	mg/L				0.23000	0.30400	0.40500	0.44800	0.46667			
Cyanide - WAD	mg/L				0.02300	0.03700	0.03000	0.03460	0.04067			

## W1.4 Kumtor River Flume (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C			1.7	4.4	6.7	10.3	10.2	3.5			
Conductivity	mS/cm			1.052	1.247	0.743	0.861	0.609	0.414			
pH				8.4	8.1	8.2	8.3	8.1	7.9			
Major Constituents												
Calcium	mg/L			99.2	108	50.6	17.1	33.3	30.0			
Chloride	mg/L			11.3	10.3	6.83	1.40	5.00	3.00			
Carbonate	mg/L			1.88	0.50	0.50	0.50	0.50	0.50			
Bicarbonate	mg/L			151	142	79.3	47.0	57.0	51.0			
Potassium	mg/L			4.27	5.40	10.9	3.47	10.3	7.71			
Magnesium	mg/L			97.6	118	27.1	5.4	14.0	10.8			
Sodium	mg/L			8.7	21.2	67.0	15.2	57.0	42.1			
Sulphate	mg/L			436	484	240	59	184	105			
Hardness - Total	mg/L			618	717	213	73.0	146	102			
Alkalinity - Total	mg/L			127	117	65.3	38.5	46.8	41.6			
Total metals												
Silver - Total	mg/L			0.00150	0.00150	0.00150	0.00150	0.00150	0.00150			
Aluminum - Total	mg/L			2.33	2.76	5.33	1.03	0.62	0.73			
Arsenic - Total	mg/L			0.00275	0.00425	0.00900	0.00050	0.00050	0.00100			
Cadmium - Total	mg/L			0.00015	0.00015	0.00015	0.00015	0.00015	0.00015			
Chromium - Total	mg/L			0.00400	0.00400	0.00400	0.00400	0.00400	0.00400			
Copper - Total	mg/L			0.00638	0.00250	0.00250	0.00250	0.00250	0.00250			
Iron - Total	mg/L			5.54	4.81	10.7	1.08	0.37	0.44			
Mercury - Total	mg/L			0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			
Manganese - Total	mg/L			0.21250	0.28775	0.42533	0.08500	0.16500	0.11000			
Molybdenum - Total	mg/L			0.00450	0.01375	0.04167	0.01100	0.04100	0.02500			
Nickel - Total	mg/L			0.00250	0.00663	0.00250	0.00250	0.00250	0.00250			
Lead - Total	mg/L			0.00100	0.00125	0.00500	0.00100	0.00100	0.00400			
Antimony - Total	mg/L			0.00063	0.00488	0.02600	0.00700	0.03200	0.01800			
Selenium - Total	mg/L			0.00175	0.00225	0.00217	0.00050	0.00300	0.00050			
Zinc - Total	mg/L			0.01125	0.00925	0.01900	0.00900	0.00200	0.00500			
Nutrients												
Ammonia - N	mg/L			0.10	0.79	2.78	0.54	2.40	1.61			
Nitrite - N	mg/L			0.00350	0.00250	0.00300	0.01500	0.04500	0.03400			
Nitrate - N	mg/L			1.75	1.78	2.43	0.70	2.30	1.40			
Solids												
Turbidity	NTU			92.3	76.0	149	221	167	173			
TDS Total	mg/L			931	1061	505	169	421	287			
Dissolved Solids	mg/L											
TSS Total	mg/L			209	152	442	220	112	105			
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L			0.00250	0.00313	0.00367	0.00250	0.00250	0.00250			
Cyanide - Total	mg/L			0.00313	0.02250	0.08567	0.01700	0.13000	0.04700			
Cyanide - WAD	mg/L			0.00250	0.00775	0.01733	0.00500	0.01900	0.01200			



## W4.1 UDD at Headwater of Arabel Suu Diversion Ditch (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C				3.6	6.0	9.4	8.7				
Conductivity	mS/cm				0.137	0.169	0.145	0.141				
pH					8.2	8.1	8.2	8.2				
Major Constituents												
Calcium	mg/L				22.7	20.3	16.8	12.5				
Chloride	mg/L				3.00	5.50	3.40	1.40				
Carbonate	mg/L				0.50	0.50	0.50	0.50				
Bicarbonate	mg/L				61.0	56.0	54.0	42.0				
Potassium	mg/L				1.62	0.82	0.59	0.52				
Magnesium	mg/L				2.74	2.27	2.00	1.51				
Sodium	mg/L				1.85	1.81	1.50	0.97				
Sulphate	mg/L				8.00	6.00	6.00	5.00				
Hardness - Total	mg/L				59.0	58.0	51.0	39.0				
Alkalinity - Total	mg/L				50.0	45.9	44.4	34.6				
Total metals												
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150				
Aluminum - Total	mg/L				0.13	0.06	0.15	0.16				
Arsenic - Total	mg/L				0.00050	0.00050	0.00050	0.00050				
Cadmium - Total	mg/L				0.00015	0.00015	0.00015	0.00015				
Chromium - Total	mg/L				0.00400	0.00400	0.00400	0.00400				
Copper - Total	mg/L				0.00250	0.00250	0.00250	0.00250				
Iron - Total	mg/L				0.28	0.26	0.22	0.21				
Mercury - Total	mg/L				0.00025	0.00025	0.00025	0.00025				
Manganese - Total	mg/L				0.07600	0.04900	0.02700	0.02100				
Molybdenum - Total	mg/L				0.00200	0.00200	0.00200	0.00200				
Nickel - Total	mg/L				0.00250	0.00250	0.00250	0.00250				
Lead - Total	mg/L				0.00100	0.00100	0.00100	0.00200				
Antimony - Total	mg/L				0.00050	0.00050	0.00050	0.00050				
Selenium - Total	mg/L				0.00050	0.00050	0.00050	0.00050				
Zinc - Total	mg/L				0.00200	0.00050	0.00050	0.00100				
Nutrients												
Ammonia - N	mg/L				0.10	0.02	0.02	0.06				
Nitrite - N	mg/L				0.00400	0.00400	0.00200	0.00300				
Nitrate - N	mg/L				0.10	0.05	0.20	0.20				
Solids												
Turbidity	NTU				2.90	2.70	5.30	6.30				
TDS Total	mg/L				78.0	78.0	68.0	47.0				
Dissolved Solids	mg/L											
TSS Total	mg/L				2.00	2.00	5.00	3.00				
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## W4.2 LDD Lower Diversion Ditch (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C				10.5							
Conductivity	mS/cm				0.337							
pH					8.5							
Major Constituents												
Calcium	mg/L				49.1							
Chloride	mg/L				19.0							
Carbonate	mg/L				2.00							
Bicarbonate	mg/L				122							
Potassium	mg/L				1.55							
Magnesium	mg/L				11.2							
Sodium	mg/L				8.11							
Sulphate	mg/L				32.0							
Hardness - Total	mg/L				156							
Alkalinity - Total	mg/L				103							
Total metals												
Silver - Total	mg/L				0.00150							
Aluminum - Total	mg/L				0.19							
Arsenic - Total	mg/L				0.00050							
Cadmium - Total	mg/L				0.00015							
Chromium - Total	mg/L				0.00400							
Copper - Total	mg/L				0.00250							
Iron - Total	mg/L				0.20							
Mercury - Total	mg/L				0.00025							
Manganese - Total	mg/L				0.02000							
Molybdenum - Total	mg/L				0.00200							
Nickel - Total	mg/L				0.00250							
Lead - Total	mg/L				0.00100							
Antimony - Total	mg/L				0.00050							
Selenium - Total	mg/L				0.00050							
Zinc - Total	mg/L				0.00200							
Nutrients												
Ammonia - N	mg/L				0.02							
Nitrite - N	mg/L				0.00300							
Nitrate - N	mg/L				0.10							
Solids												
Turbidity	NTU				4.20							
TDS Total	mg/L				222							
Dissolved Solids	mg/L											
TSS Total	mg/L				4.00							
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## W4.2.1 NLDD New Lower Diversion Ditch (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C					6.8	7.4	11.2				
Conductivity	mS/cm					0.240	0.213	0.189				
pH						8.2	8.2	8.3				
Major Constituents												
Calcium	mg/L					35.9	28.3	26.1				
Chloride	mg/L					8.80	6.20	4.30				
Carbonate	mg/L					0.50	0.50	0.50				
Bicarbonate	mg/L					103	97.0	88.0				
Potassium	mg/L					1.78	1.57	1.44				
Magnesium	mg/L					7.49	5.82	4.87				
Sodium	mg/L					3.63	2.84	2.35				
Sulphate	mg/L					21.0	16.0	14.0				
Hardness - Total	mg/L					113	83.0	88.0				
Alkalinity - Total	mg/L					84.8	79.3	71.9				
Total metals												
Silver - Total	mg/L					0.00150	0.00150	0.00150				
Aluminum - Total	mg/L					0.69	0.39	0.11				
Arsenic - Total	mg/L					0.00100	0.00050	0.00050				
Cadmium - Total	mg/L					0.00015	0.00015	0.00015				
Chromium - Total	mg/L					0.00400	0.00400	0.00400				
Copper - Total	mg/L					0.00250	0.00250	0.00250				
Iron - Total	mg/L					0.78	0.47	0.09				
Mercury - Total	mg/L					0.00025	0.00025	0.00025				
Manganese - Total	mg/L					0.02800	0.02300	0.00900				
Molybdenum - Total	mg/L					0.00200	0.00200	0.00200				
Nickel - Total	mg/L					0.00250	0.00250	0.00250				
Lead - Total	mg/L					0.00100	0.00200	0.00100				
Antimony - Total	mg/L					0.00050	0.00050	0.00050				
Selenium - Total	mg/L					0.00050	0.00050	0.00050				
Zinc - Total	mg/L					0.00300	0.00100	0.00300				
Nutrients												
Ammonia - N	mg/L					0.02	0.02	0.02				
Nitrite - N	mg/L					0.00400	0.00200	0.00200				
Nitrate - N	mg/L					0.10	0.20	0.20				
Solids												
Turbidity	NTU					7.10	5.40	8.10				
TDS Total	mg/L					141	121	107				
Dissolved Solids	mg/L											
TSS Total	mg/L					27.0	13.0	16.0				
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## W4.3.1 Discharge from LDD Sediment Pond to Kumtor River (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C				3.8	6.3	10.3	7.3				
Conductivity	mS/cm				0.173	0.154	0.133	0.102				
pH					8.4	7.8	8.2	8.0				
Major Constituents												
Calcium	mg/L				29.1	24.3	19.6	15.8				
Chloride	mg/L				7.70	6.50	3.20	1.70				
Carbonate	mg/L				0.50	0.50	0.50	0.50				
Bicarbonate	mg/L				77.0	68.0	63.0	51.0				
Potassium	mg/L				1.61	0.99	0.75	0.60				
Magnesium	mg/L				4.01	3.30	2.62	2.10				
Sodium	mg/L				2.42	2.19	1.64	1.21				
Sulphate	mg/L				10.0	9.00	8.00	6.00				
Hardness - Total	mg/L				82.0	69.0	50.0	47.0				
Alkalinity - Total	mg/L				63.4	56.0	51.9	41.5				
Total metals												
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150				
Aluminum - Total	mg/L				3.36	0.17	0.10	0.07				
Arsenic - Total	mg/L				0.00300	0.00050	0.00050	0.00050				
Cadmium - Total	mg/L				0.00015	0.00015	0.00015	0.00015				
Chromium - Total	mg/L				0.00400	0.00400	0.00400	0.00400				
Copper - Total	mg/L				0.00900	0.00250	0.00250	0.00250				
Iron - Total	mg/L				4.17	0.31	0.14	0.11				
Mercury - Total	mg/L				0.00025	0.00025	0.00025	0.00025				
Manganese - Total	mg/L				0.14700	0.02300	0.01200	0.01000				
Molybdenum - Total	mg/L				0.00200	0.00200	0.00200	0.00200				
Nickel - Total	mg/L				0.00250	0.00250	0.00250	0.00250				
Lead - Total	mg/L				0.00100	0.00100	0.00100	0.00100				
Antimony - Total	mg/L				0.00050	0.00050	0.00050	0.00050				
Selenium - Total	mg/L				0.00100	0.00050	0.00050	0.00050				
Zinc - Total	mg/L				0.01100	0.00200	0.00050	0.00200				
Nutrients												
Ammonia - N	mg/L				0.13	0.02	0.02	0.02				
Nitrite - N	mg/L				0.00600	0.00300	0.00100	0.00200				
Nitrate - N	mg/L				0.10	0.05	0.10	0.20				
Solids												
Turbidity	NTU				69.0	5.10	3.20	4.60				
TDS Total	mg/L				115	81.0	68.0	56.0				
Dissolved Solids	mg/L											
TSS Total	mg/L				200	14.0	5.00	4.00				
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## POR1 SUMP Collection Point for Central Pit Waters Prior to Discharge (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C			3.9	3.7	5.0	4.4	3.1	4.0	3.7		
Conductivity	mS/cm			1.755	1.505	1.160	0.540	0.707	1.109	0.987		
pH				8.2	8.3	8.4	8.5	8.0	8.3	8.2		
Major Constituents												
Calcium	mg/L			209	213	202	115	63.8	139	93.6		
Chloride	mg/L			38.0	43.8	18.0	12.0	3.00	9.1	5.20		
Carbonate	mg/L			0.50	1.63	0.50	0.50	0.50	0.50	2.00		
Bicarbonate	mg/L			160	154	145	88.0	60.0	138	125		
Potassium	mg/L			794	6.78	7.68	5.19	2.57	5.25	3.54		
Magnesium	mg/L			128	156	134.3	56.3	27.1	79.1	45.9		
Sodium	mg/L			36.4	22.6	41.4	10.1	5.75	20.2	14.5		
Sulphate	mg/L			815	895	923	322	212	560	394		
Hardness - Total	mg/L			803	1116	1054	425	265	661	503		
Alkalinity - Total	mg/L			132	128	119	71.8	49.0	113	107		
Total metals												
Silver - Total	mg/L			0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150		
Aluminum - Total	mg/L			1.70	1.45	1.49	0.46	1.93	0.15	0.07		
Arsenic - Total	mg/L			0.01350	0.00650	0.01100	0.00200	0.00300	0.02400	0.01500		
Cadmium - Total	mg/L			0.00015	0.00054	0.00023	0.00015	0.00015	0.00015	0.00015		
Chromium - Total	mg/L			0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400		
Copper - Total	mg/L			0.00250	0.00250	0.00250	0.00250	0.00700	0.00250	0.00250		
Iron - Total	mg/L			2.29	2.18	2.31	0.88	3.26	0.22	0.11		
Mercury - Total	mg/L			0.00025	0.00036	0.00143	0.00025	0.00025	0.00025	0.00025		
Manganese - Total	mg/L			0.43600	0.44125	0.42450	0.29500	0.33000	0.09600	0.04800		
Molybdenum - Total	mg/L			0.05350	0.04925	0.09350	0.03200	0.02200	0.05800	0.03300		
Nickel - Total	mg/L			0.04550	0.04750	0.05600	0.05300	0.04100	0.03600	0.01900		
Lead - Total	mg/L			0.00200	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100		
Antimony - Total	mg/L			0.01900	0.01100	0.02750	0.00800	0.00600	0.02400	0.02400		
Selenium - Total	mg/L			0.00450	0.00350	0.00550	0.00200	0.00050	0.00050	0.00500		
Zinc - Total	mg/L			0.01100	0.01550	0.00800	0.00700	0.00700	0.00400	0.02000		
Nutrients												
Ammonia - N	mg/L			0.72	0.34	1.77	0.22	0.17	0.54	0.02		
Nitrite - N	mg/L			0.01250	0.00375	0.00500	0.00300	0.00600	0.00790	0.01700		
Nitrate - N	mg/L			2.75	2.23	2.30	1.10	0.60	1.61	0.70		
Solids												
Turbidity	NTU			150	42.8	48.5	25.0	64.0	47.0	39.0		
TDS Total	mg/L			1582	1665	1595	624	413	982	732		
Dissolved Solids	mg/L											
TSS Total	mg/L			235	89.8	79.5	23.0	60.0	32.0	41.0		
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## SWW1 Sarytor Glacier Lake Out low at Weir (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C						5.7		1.8			
Conductivity	mS/cm						0.810		1.356			
pH							8.4		8.3			
Major Constituents												
Calcium	mg/L						68.5		131.0			
Chloride	mg/L						1.80		1.70			
Carbonate	mg/L						0.50		0.50			
Bicarbonate	mg/L						82.0		113			
Potassium	mg/L						1.95		2.70			
Magnesium	mg/L						115		117			
Sodium	mg/L						1.53		2.21			
Sulphate	mg/L						655		662			
Hardness - Total	mg/L						726		766			
Alkalinity - Total	mg/L						67.1		93.1			
Total metals												
Silver - Total	mg/L						0.00150		0.00150			
Aluminum - Total	mg/L						0.14		0.09			
Arsenic - Total	mg/L						0.00050		0.00050			
Cadmium - Total	mg/L						0.00015		0.00015			
Chromium - Total	mg/L						0.00400		0.00400			
Copper - Total	mg/L						0.00250		0.00250			
Iron - Total	mg/L						0.20		0.22			
Mercury - Total	mg/L						0.00025		0.00025			
Manganese - Total	mg/L						1.42000		0.86500			
Molybdenum - Total	mg/L						0.00600		0.00600			
Nickel - Total	mg/L						0.06200		0.03800			
Lead - Total	mg/L						0.00100		0.00100			
Antimony - Total	mg/L						0.00050		0.00050			
Selenium - Total	mg/L						0.00050		0.00200			
Zinc - Total	mg/L						0.00800		0.03200			
Nutrients												
Ammonia - N	mg/L						0.16		0.08			
Nitrite - N	mg/L						0.00400		0.00800			
Nitrate - N	mg/L						0.40		0.60			
Solids												
Turbidity	NTU						40.0		15.0			
TDS Total	mg/L						1077		1097			
Dissolved Solids	mg/L											
TSS Total	mg/L						41.0		20.0			
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											



## W2.6.1 New Chon-Sarytor Creek in Central Valley before joining Kumtor River ( 2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C			2.7	4.8	12.0	15.9	8.4	5.9		2.1	
Conductivity	mS/cm			2.910	2.046	1.519	2.317	1.005	1.576	2.169		
pH				8.3	8.3	8.0	8.2	8.2	8.3	8.2		
Major Constituents												
Calcium	mg/L			402	309	224	288	158	247	324		
Chloride	mg/L			31.5	17.4	14.2	18.6	21.0	36.0	40.3		
Carbonate	mg/L			0.50	0.50	0.50	0.50	0.50	0.50	0.50		
Bicarbonate	mg/L			236	198	158	144	133	172	198		
Potassium	mg/L			23.2	15.1	9.24	15.7	4.06	6.93	9.47		
Magnesium	mg/L			158	146	85.1	158	43.4	85.3	127		
Sodium	mg/L			36.8	21.3	14.7	28.9	7.80	15.0	21.6		
Sulphate	mg/L			1329	949	656	1211	420	729	1068		
Hardness - Total	mg/L			1813	1359	899	1589	579	946	1400		
Alkalinity - Total	mg/L			193	163	130	118	109	142	162		
Total metals												
Silver - Total	mg/L			0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150		
Aluminum - Total	mg/L			9.20	40.3	33.1	16.4	28.8	1.63	22.4		
Arsenic - Total	mg/L			0.00700	0.03420	0.05000	0.01900	0.03600	0.00300	0.01400		
Cadmium - Total	mg/L			0.00031	0.00052	0.00120	0.00071	0.00159	0.00019	0.00057		
Chromium - Total	mg/L			0.00675	0.05260	0.08600	0.02375	0.08425	0.00400	0.03000		
Copper - Total	mg/L			0.01863	0.07760	0.16050	0.03975	0.10975	0.00625	0.05933		
Iron - Total	mg/L			15.3	30.5	42.0	23.2	51.1	1.71	28.1		
Mercury - Total	mg/L			0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025		
Manganese - Total	mg/L			0.97050	1.90780	4.11250	2.17625	4.13175	0.53125	2.42233		
Molybdenum - Total	mg/L			0.02350	0.01540	0.01125	0.01700	0.00740	0.01375	0.00467		
Nickel - Total	mg/L			0.03475	0.08560	0.15125	0.03925	0.11538	0.00688	0.05500		
Lead - Total	mg/L			0.01175	0.02500	0.07025	0.02700	0.07700	0.00525	0.04433		
Antimony - Total	mg/L			0.00125	0.00150	0.00200	0.00113	0.00110	0.00088	0.00050		
Selenium - Total	mg/L			0.00425	0.00300	0.00375	0.00525	0.00290	0.00250	0.00533		
Zinc - Total	mg/L			0.02525	0.11780	0.20850	0.05575	0.19450	0.00700	0.08833		
Nutrients												
Ammonia - N	mg/L			2.05	1.50	1.79	2.54	0.89	0.66	0.40		
Nitrite - N	mg/L			0.00800	0.02880	0.00138	0.00275	0.00110	0.01750	0.00517		
Nitrate - N	mg/L			52.0	53.0	23.4	11.2	5.4	15.0	29.0		
Solids												
Turbidity	NTU			438	2594	4410	3640	4600	3368	3324		
TDS Total	mg/L			2913	1988	1287	2308	836	1350	2042		
Dissolved Solids	mg/L											
TSS Total	mg/L			1217	2911	6618	7182	3825	3359	4024		
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## SWS.3.1 Kichi-Sarytor Creek before joining Kumtor River (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C			0.4	1.9	6.5	4.8	5.6	5.9	4.8	0.4	
Conductivity	mS/cm			4.100	4.124	1.488	0.928	0.893	1.221	2.100	7.260	
pH				8.6	8.4	8.3	8.2	8.1	8.2	8.4	8.0	
Major Constituents												
Calcium	mg/L			266	207	112	69.1	86.8	112	173	386	
Chloride	mg/L			27.0	20.7	4.60	2.90	4.90	7.23	6.90	47.0	
Carbonate	mg/L			0.50	0.50	0.50	0.50	0.50	1.13	0.50	0.50	
Bicarbonate	mg/L			312	250	110	74.3	77.2	111	172	507	
Potassium	mg/L			16.0	8.08	3.74	2.61	3.13	4.85	4.00	18.2	
Magnesium	mg/L			123	268	164	83.9	77.8	113	238	153	
Sodium	mg/L			20.8	15.4	4.61	3.13	4.78	16.0	5.34	28.4	
Sulphate	mg/L			728	1529	779	436	442	612	1184	816	
Hardness - Total	mg/L			869	1885	907	517	524	718	1401	869	
Alkalinity - Total	mg/L			256	205	90.8	60.8	63.3	92.6	141	416	
Total metals												
Silver - Total	mg/L			0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	
Aluminum - Total	mg/L			2.32	2.72	7.74	2.58	7.81	0.40	3.05	0.05	
Arsenic - Total	mg/L			0.00600	0.00660	0.00775	0.00538	0.00820	0.00338	0.00500	0.00050	
Cadmium - Total	mg/L			0.00015	0.00044	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	
Chromium - Total	mg/L			0.00400	0.00400	0.00800	0.00400	0.00920	0.00400	0.00400	0.00400	
Copper - Total	mg/L			0.00250	0.00530	0.01175	0.00250	0.01130	0.00250	0.00250	0.00250	
Iron - Total	mg/L			4.82	5.76	14.89	5.02	16.11	0.67	4.12	0.09	
Mercury - Total	mg/L			0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	
Manganese - Total	mg/L			0.98050	1.93500	0.95525	0.97425	0.94360	0.59025	0.94300	1.04600	
Molybdenum - Total	mg/L			0.00200	0.00840	0.01375	0.01325	0.01320	0.02325	0.01400	0.00800	
Nickel - Total	mg/L			0.073600	0.56120	0.09500	0.06150	0.06380	0.04425	0.06200	0.57700	
Lead - Total	mg/L			0.00100	0.00560	0.00225	0.00425	0.00560	0.00275	0.00100	0.00100	
Antimony - Total	mg/L			0.00050	0.00150	0.00150	0.00213	0.00340	0.00900	0.00050	0.00100	
Selenium - Total	mg/L			0.01300	0.00960	0.00200	0.00138	0.00210	0.00138	0.00900	0.01000	
Zinc - Total	mg/L			0.01100	0.01160	0.02400	0.01275	0.02220	0.00450	0.01100	0.00600	
Nutrients												
Ammonia - N	mg/L			1.24	0.73	0.12	0.19	0.14	0.14	0.02	1.78	
Nitrite - N	mg/L			0.02300	0.00780	0.00900	0.00263	0.00090	0.00433	0.00500	0.01100	
Nitrate - N	mg/L			31.0	17.6	2.23	0.78	1.32	1.83	2.50	21.0	
Solids												
Turbidity	NTU			92.0	90.6	294	387	275	204	75.0	0.36	
TDS Total	mg/L			1270	2727	1361	755.8	740.2	1053	2102	1430	
Dissolved Solids	mg/L											
TSS Total	mg/L			311	133	216	565	557	364	94.0	3.00	
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## W1.5.1 Kumtor River Just Downstream of Kumtor Concession Area - Voluntary Compliance Point (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				1.1	5.6	6.4	7.5	6.4	4.3	1.4	0.7	
Conductivity	mS/cm				1.733	0.732	0.511	0.327	0.396	0.494	0.622	0.376	
pH					8.4	8.2	8.1	8.2	8.1	8.0	8.2	8.1	
Major Constituents													
Calcium	mg/L				113	65.3	38.2	28.6	35.2	36.1	48.9	45.6	
Chloride	mg/L				28.3	11.5	6.13	1.88	3.32	4.08	5.20	3.85	
Carbonate	mg/L				0.88	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Bicarbonate	mg/L				142	104	72.0	54.0	54.8	60.0	83.3	78.8	
Potassium	mg/L				5.43	4.41	6.85	4.01	4.59	6.48	2.41	2.39	
Magnesium	mg/L				108	57.0	17.8	14.0	14.7	17.2	45.7	24.8	
Sodium	mg/L				11.1	18.1	41.0	17.5	21.6	34.2	5.26	5.13	
Sulphate	mg/L				469	264	149	100	122	148	247	105	
Hardness - Total	mg/L				684	370	166	107	142	155	324	183	
Alkalinity - Total	mg/L				117	85.7	59.0	44.2	45.2	49.1	68.3	64.6	
Total metals													
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	
Aluminum - Total	mg/L				1.42	1.99	3.50	3.14	7.83	0.46	1.93	0.55	
Arsenic - Total	mg/L				0.00200	0.00210	0.00400	0.00250	0.00360	0.00088	0.00188	0.00063	
Cadmium - Total	mg/L				0.00015	0.00040	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	
Chromium - Total	mg/L				0.00400	0.00400	0.00550	0.00400	0.00540	0.00400	0.00400	0.00400	
Copper - Total	mg/L				0.00250	0.00300	0.01463	0.00250	0.00380	0.00388	0.00250	0.00250	
Iron - Total	mg/L				2.03	2.70	5.26	3.82	7.85	0.24	1.50	0.40	
Mercury - Total	mg/L				0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	
Manganese - Total	mg/L				0.30950	0.23360	0.22075	0.21850	0.38900	0.13750	0.19625	0.04550	
Molybdenum - Total	mg/L				0.00575	0.01120	0.02750	0.01325	0.01760	0.02750	0.00500	0.00750	
Nickel - Total	mg/L				0.00250	0.01200	0.00663	0.00388	0.00560	0.00250	0.00250	0.00250	
Lead - Total	mg/L				0.00100	0.00100	0.00225	0.00400	0.00540	0.00200	0.00150	0.00100	
Antimony - Total	mg/L				0.00063	0.00550	0.01925	0.00613	0.01120	0.01738	0.00163	0.00088	
Selenium - Total	mg/L				0.00163	0.00170	0.00263	0.00088	0.00210	0.00150	0.00250	0.00150	
Zinc - Total	mg/L				0.00925	0.00660	0.01375	0.01350	0.02000	0.00225	0.00575	0.02025	
Nutrients													
Ammonia - N	mg/L				0.28	0.71	1.67	0.72	0.87	1.20	0.14	0.14	
Nitrite - N	mg/L				0.00450	0.00390	0.00550	0.00825	0.01580	0.02550	0.00400	0.00500	
Nitrate - N	mg/L				6.65	2.26	1.68	0.90	1.20	1.55	1.15	0.85	
Solids													
Turbidity	NTU				75.5	51.0	101	183	265	136	56.5	19.0	
TDS Total	mg/L				655	590	344	223	271	326	472	248	
Dissolved Solids													
TSS Total	mg/L				173	93.6	224	350	304	116	56.0	14.8	
Suspended Solids													
Trace Constituents													
Cyanide - Free	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250	0.00313	0.00250	0.00250	
Cyanide - Total	mg/L				0.00313	0.01630	0.03950	0.02525	0.03900	0.03750	0.00250	0.00250	
Cyanide - WAD	mg/L				0.00250	0.00490	0.00925	0.00675	0.00710	0.00875	0.00250	0.00250	

## W6.1 Arabel Suu River - 6km from Kumtor Concession Area (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C					10.5	5.3	10.6	10.3	8.0			
Conductivity	mS/cm					0.175	0.241	0.139	0.108	0.288			
pH						8.3	8.2	8.3	8.2	8.2			
Major Constituents													
Calcium	mg/L					31.8	30.6	21.5	19.0	45.9			
Chloride	mg/L					3.70	3.10	1.10	0.80	4.30			
Carbonate	mg/L					0.50	0.50	0.50	0.50	0.50			
Bicarbonate	mg/L					81.0	81.0	63.0	49.0	102			
Potassium	mg/L					0.88	0.75	0.81	2.04	0.93			
Magnesium	mg/L					3.67	3.63	2.94	2.56	6.34			
Sodium	mg/L					1.91	2.12	1.30	1.22	2.85			
Sulphate	mg/L					15.0	19.0	14.0	10.0	45.0			
Hardness - Total	mg/L					85.0	89.0	68.0	51.0	134			
Alkalinity - Total	mg/L					66.4	66.6	52.0	40.5	83.7			
Total metals													
Silver - Total	mg/L					0.00150	0.00150	0.00150	0.00150	0.00150			
Aluminum - Total	mg/L					0.44	0.15	0.35	13.9	0.41			
Arsenic - Total	mg/L					0.00050	0.00050	0.00050	0.00800	0.00050			
Cadmium - Total	mg/L					0.00015	0.00015	0.00015	0.00015	0.00015			
Chromium - Total	mg/L					0.00400	0.00400	0.00400	0.00400	0.00400			
Copper - Total	mg/L					0.00250	0.00250	0.00250	0.00250	0.00250			
Iron - Total	mg/L					0.59	0.22	0.51	19.7	0.58			
Mercury - Total	mg/L					0.00025	0.00025	0.00025	0.00025	0.00025			
Manganese - Total	mg/L					0.02300	0.01100	0.02000	0.01875	0.02100			
Molybdenum - Total	mg/L					0.00200	0.00200	0.00200	0.00200	0.00200			
Nickel - Total	mg/L					0.00250	0.00250	0.00250	0.00250	0.00250			
Lead - Total	mg/L					0.00100	0.00100	0.00100	0.00100	0.00100			
Antimony - Total	mg/L					0.00050	0.00050	0.00050	0.00050	0.00050			
Selenium - Total	mg/L					0.00050	0.00050	0.00050	0.00050	0.00050			
Zinc - Total	mg/L					0.00200	0.00500	0.01300	0.04600	0.00400			
Nutrients													
Ammonia - N	mg/L					0.06	0.02	0.20	0.10	0.02			
Nitrite - N	mg/L					0.00300	0.00200	0.00600	0.00900	0.00700			
Nitrate - N	mg/L					0.20	0.20	0.30	0.30	0.30			
Solids													
Turbidity	NTU					13.0	3.30	35.0	410	10.0			
TDS Total	mg/L					124	109	90.0	79.0	163			
Dissolved Solids													
TSS Total	mg/L					14.0	5.00	23.0	440	21.0			
Suspended Solids													
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

## W1.6 Kumtor River above Taragay River (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C				2.5	8.0	7.4	10.0	6.2			
Conductivity	mS/cm				0.580	0.678	0.289	0.258	0.637			
pH					8.2	8.1	8.2	8.1	8.2			
Major Constituents												
Calcium	mg/L				55.9	50.4	32.6	30.3	40.2			
Chloride	mg/L				11.0	8.60	2.20	1.80	6.20			
Carbonate	mg/L				0.50	0.50	0.50	0.50	0.50			
Bicarbonate	mg/L				96.0	90.0	60.0	56.0	77.0			
Potassium	mg/L				5.44	7.63	4.25	3.20	9.96			
Magnesium	mg/L				24.8	32.6	12.0	9.6	16.6			
Sodium	mg/L				32.3	48.7	19.4	12.5	59.8			
Sulphate	mg/L				159	225	88.0	72.0	171			
Hardness - Total	mg/L				217	249	111	103	159			
Alkalinity - Total	mg/L				78.9	73.7	49.2	46.0	63.2			
Total metals												
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150			
Aluminum - Total	mg/L				3.81	1.46	0.63	10.9	0.56			
Arsenic - Total	mg/L				0.00500	0.00200	0.00050	0.00500	0.00050			
Cadmium - Total	mg/L				0.00015	0.00015	0.00015	0.00015	0.00015			
Chromium - Total	mg/L				0.00400	0.00400	0.00400	0.00400	0.00400			
Copper - Total	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250			
Iron - Total	mg/L				6.34	2.42	0.60	11.6	0.35			
Mercury - Total	mg/L				0.00025	0.00025	0.00025	0.00060	0.00025			
Manganese - Total	mg/L				0.23400	0.16300	0.10500	0.43800	0.09900			
Molybdenum - Total	mg/L				0.02000	0.02800	0.01200	0.01200	0.03800			
Nickel - Total	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250			
Lead - Total	mg/L				0.00100	0.00100	0.00100	0.01000	0.00100			
Antimony - Total	mg/L				0.01100	0.02100	0.00050	0.00500	0.02700			
Selenium - Total	mg/L				0.00200	0.00100	0.00050	0.00050	0.00050			
Zinc - Total	mg/L				0.01200	0.32700	0.01400	0.01700	0.00300			
Nutrients												
Ammonia - N	mg/L				0.99	1.92	0.64	0.64	2.20			
Nitrite - N	mg/L				0.00300	0.00200	0.00400	0.01000	0.04900			
Nitrate - N	mg/L				1.40	1.90	0.80	0.70	2.20			
Solids												
Turbidity	NTU				110	32.0	165	348	94.0			
TDS Total	mg/L				401	465	195	185	383			
Dissolved Solids	mg/L											
TSS Total	mg/L				196	71.0	336	595	91.0			
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											

## W1.7 Taragay River below Kumtor River (2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data												
Temperature	°C				8.6	10.5	8.3	11.5	8.1			
Conductivity	mS/cm				0.318	0.385	0.250	0.227	0.524			
pH					8.2	8.2	8.2	8.1	8.2			
Major Constituents												
Calcium	mg/L				42.3	42.1	32.2	30.3	51.1			
Chloride	mg/L				8.30	7.20	2.40	2.50	7.50			
Carbonate	mg/L				0.50	0.50	0.50	0.50	0.50			
Bicarbonate	mg/L				90.0	91.0	64.0	64.0	102			
Potassium	mg/L				2.18	3.52	2.59	2.15	5.96			
Magnesium	mg/L				10.6	14.5	11.0	7.34	15.8			
Sodium	mg/L				10.3	21.2	10.9	7.61	34.8			
Sulphate	mg/L				61.0	92.0	63.0	51.0	115			
Hardness - Total	mg/L				132	156	106	95.0	174			
Alkalinity - Total	mg/L				73.8	74.7	52.7	52.5	83.4			
Total metals												
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150			
Aluminum - Total	mg/L				2.06	0.59	0.58	8.74	0.41			
Arsenic - Total	mg/L				0.00200	0.00100	0.00050	0.00500	0.00050			
Cadmium - Total	mg/L				0.00015	0.00015	0.00015	0.00015	0.00015			
Chromium - Total	mg/L				0.00400	0.00400	0.00400	0.00400	0.00400			
Copper - Total	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250			
Iron - Total	mg/L				2.99	0.82	0.68	10.9	0.27			
Mercury - Total	mg/L				0.00025	0.00025	0.00025	0.00760	0.00025			
Manganese - Total	mg/L				0.08700	0.06000	0.08000	0.07250	0.06500			
Molybdenum - Total	mg/L				0.00600	0.01100	0.00900	0.00600	0.02100			
Nickel - Total	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250			
Lead - Total	mg/L				0.00100	0.00100	0.00100	0.00700	0.00300			
Antimony - Total	mg/L				0.00300	0.00800	0.00300	0.00300	0.01400			
Selenium - Total	mg/L				0.00050	0.00050	0.00100	0.00050	0.00050			
Zinc - Total	mg/L				0.00700	0.00300	0.01900	0.01700	0.00300			
Nutrients												
Ammonia - N	mg/L				0.16	0.81	0.42	0.35	1.38			
Nitrite - N	mg/L				0.0050	0.0020	0.0080	0.0080	0.0250			
Nitrate - N	mg/L				0.50	0.90	0.60	0.50	1.50			
Solids												
Turbidity	NTU				58.0	18.0	128	263	47.0			
TDS Total	mg/L				198	246	161	139	321			
Dissolved Solids	mg/L											
TSS Total	mg/L				77.0	27.0	154	313	37.0			
Suspended Solids	mg/L											
Trace Constituents												
Cyanide - Free	mg/L											
Cyanide - Total	mg/L											
Cyanide - WAD	mg/L											



		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				9.3	7.4	7.0	13.9	12.0	12.6	7.0	1.0	1.0
Conductivity	mS/cm						0.259	0.240	0.291	0.335	0.544	0.513	0.487
pH		7.4	7.3	7.4	7.7	7.8	8.0	8.4	8.3	8.5	8.5	8.0	8.8
Major Constituents													
Calcium	mg/L	50.5	53.5	51.7	49.3	45.7	42.4	36.3	46.8	48.9	48.1	56.4	50.4
Chloride	mg/L	9.90	5.90	9.70	10.3	5.12	3.60	2.30	5.34	5.23	5.55	5.30	9.80
Carbonate	mg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.30	1.13	2.75	4.00	0.50
Bicarbonate	mg/L	152	146	142	138	128	117	102	120	124	131	138	149
Potassium	mg/L	3.36	1.56	3.71	3.43	1.56	1.35	1.63	1.66	2.92	1.69	1.53	5.49
Magnesium	mg/L	14.3	15.9	15.8	14.9	13.5	11.2	9.37	12.3	13.8	13.5	16.4	15.0
Sodium	mg/L	10.7	8.81	12.5	10.3	7.11	6.41	4.67	7.62	7.85	7.09	8.92	8.27
Sulphate	mg/L	69.0	63.0	52.0	56.8	47.8	51.0	45.5	59.4	70.8	68.0	70.0	68.0
Hardness - Total	mg/L	142	136	132	134	135	148	117	161	167	176	182	189
Alkalinity - Total	mg/L	124	120	117	114	105	95.8	83.5	100	103	114	120	122
Total metals													
Silver - Total	mg/L	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.01460	0.00150	0.00150	0.00150	0.00150
Aluminum - Total	mg/L	0.42	0.17	0.20	0.80	4.31	1.84	6.50	7.74	0.60	0.12	0.09	0.11
Arsenic - Total	mg/L	0.00050	0.00050	0.00050	0.00063	0.00270	0.00125	0.00375	0.00562	0.00050	0.00050	0.00050	0.00050
Cadmium - Total	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00019	0.00015	0.00015	0.00015
Chromium - Total	mg/L	0.00400	0.00400	0.00400	0.00400	0.00500	0.00400	0.01000	0.00840	0.00400	0.01100	0.00400	0.00400
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.00338	0.00540	0.00313	0.00538	0.00320	0.00363	0.04513	0.00250	0.00250
Iron - Total	mg/L	1.22	0.29	0.48	1.19	5.69	2.23	9.14	10.5	0.73	0.31	0.13	0.16
Mercury - Total	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese - Total	mg/L	0.00800	0.01300	0.02200	0.06225	0.09800	0.07600	0.02400	0.06167	0.03300	0.01675	0.01300	0.01300
Molybdenum - Total	mg/L	0.00200	0.00200	0.00200	0.00200	0.00200	0.00275	0.00200	0.00200	0.00400	0.00375	0.00500	0.00500
Nickel - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00320	0.00375	0.00250	0.00250	0.00250
Lead - Total	mg/L	0.00100	0.00100	0.00100	0.00100	0.00240	0.00125	0.00600	0.00660	0.00100	0.00100	0.00100	0.00100
Antimony - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00075	0.00110	0.00150	0.00050	0.00050	0.00050
Selenium - Total	mg/L	0.00300	0.00050	0.00050	0.00150	0.00110	0.00050	0.00050	0.00160	0.00113	0.00213	0.00050	0.00050
Zinc - Total	mg/L	0.00600	0.00300	0.0050									

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	9.1	9.2	9.3	9.4	9.5	11.8	11.3	12.8	10.9	11.6	12.0	9.9
Conductivity	mS/cm	0.127	0.125	0.126	0.125	0.127	0.107	0.114	0.116	0.111	0.114	0.113	0.104
pH		8.0	8.0	7.9	8.1	7.9	8.0	8.0	8.0	8.0	8.0	8.2	7.8
Major Constituents													
Calcium	mg/L	17.0	17.8	18.1	16.6	15.2	13.3	14.3	13.6	14.3	13.8	15.9	16.8
Chloride	mg/L	1.45	1.23	1.06	1.73	2.13	1.52	1.13	1.22	2.30	1.15	1.24	1.03
Carbonate	mg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.80	0.50	0.50	1.20	0.50
Bicarbonate	mg/L	39.8	38.0	38.2	36.5	34.0	29.8	36.0	30.8	30.3	32.0	34.6	37.3
Potassium	mg/L	1.53	1.62	1.60	1.47	1.54	1.22	1.29	1.09	1.14	1.03	1.27	1.33
Magnesium	mg/L	3.29	3.21	3.56	3.22	2.86	2.50	3.36	3.42	2.79	2.68	4.45	3.35
Sodium	mg/L	2.56	2.37	2.36	2.69	2.75	2.22	2.01	1.82	2.90	1.66	2.11	2.15
Sulphate	mg/L	20.8	24.3	23.0	20.5	19.5	19.2	21.3	23.0	22.3	22.8	23.8	24.8
Hardness - Total	mg/L	46.5	45.5	47.8	41.8	46.0	41.4	45.3	46.0	44.8	46.5	50.8	51.8
Alkalinity - Total	mg/L	32.5	31.0	31.1	30.1	27.7	24.5	29.3	25.6	24.8	26.4	29.8	30.7
Total metals													
Silver - Total	mg/L	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150
Aluminum - Total	mg/L	0.23	0.09	0.07	0.12	0.06	0.14	0.23	0.15	0.17	0.09	0.11	0.09
Arsenic - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Cadmium - Total	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Chromium - Total	mg/L	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250
Iron - Total	mg/L	0.08	0.05	0.08	0.14	0.07	0.06	0.14	0.10	0.11	0.06	0.07	0.05
Mercury - Total	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00031
Manganese - Total	mg/L	0.00350	0.00400	0.00360	0.00375	0.00325	0.00250	0.00750	0.00500	0.00425	0.00325	0.00320	0.01200
Molybdenum - Total	mg/L	0.00300	0.00275	0.00240	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00325	0.00260	0.00200
Nickel - Total	mg/L	0.00250	0.00250	0.00610	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00638
Lead - Total	mg/L	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00260	0.00100	0.00100	0.00100	0.00100
Antimony - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00088	0.00050	0.00050	0.00050
Selenium - Total	mg/L	0.00050	0.00050	0.00050	0.00088	0.00075	0.00050	0.00050	0.00080	0.00050	0.0005		

## P5.3 Mill Kitchen Tap (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	12.4	12.3	13.0	11.8	12.1	14.3	15.9	16.5	15.0	13.6	13.7	15.8
Conductivity	mS/cm	0.124	0.127	0.128	0.152	0.117	0.125	0.124	0.110	0.116	0.121	0.116	0.106
pH		8.0	7.9	7.8	7.9	7.9	7.9	7.9	7.9	8.0	7.8	7.7	7.8
Major Constituents													
Calcium	mg/L	16.9	17.9	18.6	16.9	15.0	14.2	14.5	14.0	14.6	13.9	17.1	16.8
Chloride	mg/L	1.25	1.63	0.98	4.35	2.70	2.10	1.55	1.98	1.75	1.95	1.94	2.15
Carbonate	mg/L	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Bicarbonate	mg/L	35.0	32.8	30.4	24.8	28.8	28.0	31.8	31.0	29.0	26.8	27.0	31.8
Potassium	mg/L	1.50	2.16	1.75	2.24	1.30	1.30	1.28	1.34	1.25	1.08	1.31	1.33
Magnesium	mg/L	3.28	3.19	3.62	3.24	2.73	2.48	3.27	2.69	2.89	2.71	3.35	3.47
Sodium	mg/L	2.32	2.34	2.50	4.56	3.53	2.67	2.38	2.28	2.44	2.25	2.70	2.98
Sulphate	mg/L	24.5	29.0	31.4	29.8	22.3	19.4	25.3	21.0	23.5	28.0	31.0	30.3
Hardness - Total	mg/L	47.5	46.5	48.0	40.8	44.5	40.2	46.8	44.2	44.5	46.8	49.6	53.8
Alkalinity - Total	mg/L	28.6	26.8	24.8	20.4	23.6	22.8	26.1	25.7	23.8	22.0	22.0	25.9
Total metals													
Silver - Total	mg/L	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150
Aluminum - Total	mg/L	0.19	0.34	0.08	0.20	0.14	0.27	0.08	0.09	0.10	0.08	0.10	0.10
Arsenic - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Cadmium - Total	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Chromium - Total	mg/L	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400
Copper - Total	mg/L	0.00250	0.00250	0.00370	0.00250	0.00313	0.00250	0.00313	0.00250	0.00250	0.00313	0.00340	0.00313
Iron - Total	mg/L	0.05	0.05	0.11	0.12	0.03	0.07	0.06	0.06	0.05	0.04	0.06	0.04
Mercury - Total	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese - Total	mg/L	0.00350	0.00425	0.00700	0.00525	0.00300	0.00340	0.00575	0.00420	0.00375	0.00300	0.00280	0.00650
Molybdenum - Total	mg/L	0.00325	0.00450	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00325	0.00200	0.00200
Nickel - Total	mg/L	0.00250	0.00725	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00313	0.00300	0.00250
Lead - Total	mg/L	0.00100	0.00100	0.00100	0.00100	0.00125	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
Antimony - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Selenium - Total	mg/L	0.00050	0.00050	0.00050	0.00050	0.00075	0.00050	0.00050	0.00080	0.00050	0.00200	0.00060	0.00050
Zinc - Total	mg/L	0.00338	0.00550	0.00410	0.00463	0.00350	0.00280	0.00313	0.00270	0.00263	0.00375	0.00460	0.00775
Nutrients													
Ammonia - N	mg/L	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Nitrite - N	mg/L	0.00050	0.00050	0.00090	0.00050	0.00050	0.00050	0.00050	0.00050	0.00063	0.00050	0.00050	0.00050
Nitrate - N	mg/L	0.40	0.40	0.33	0.26	0.38	0.26	0.30	0.30	0.30	0.30	0.30	0.38
Solids													
Turbidity	NTU	0.80	2.03	3.04	1.18	0.42	1.52	0.48	1.52	0.97	0.51	0.38	0.32
TDS Total	mg/L	72.8	75.3	82.2	77.5	68.0	62.8	76.3	64.8	65.8	67.0	74.0	78.0
Dissolved Solids													
TSS Total	mg/L	0.88	1.38	1.30	1.13	0.50	1.30	1.13	1.00	0.88	0.50	0.50	0.50
Suspended Solids													
Trace Constituents													
Cyanide - Free	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250
Cyanide - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250
Cyanide - WAD	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250

## SDP Treated Sewage Discharge into Kumtor River (2019)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C					13.6	17.0	18.6	16.6	16.6			
Conductivity	mS/cm					0.518	0.419	0.289	0.736	1.086			
pH						8.4	8.6	8.1	7.9	8.0			
Major Constituents													
Calcium	mg/L					21.4	24.4	21.2	17.5	25.0			
Chloride	mg/L												
Carbonate	mg/L					8.00	1.00	0.50	0.50	0.50			
Bicarbonate	mg/L					34.0	68.0	72.0	50.8	89.8			
Potassium	mg/L					5.79	5.06	6.50	3.43	4.92			
Magnesium	mg/L					4.69	10.0	5.47	3.85	6.78			
Sodium	mg/L					29.5	34.3	31.9	15.1	22.8			
Sulphate	mg/L					38.0	59.7	38.0	28.4	44.0			
Hardness - Total	mg/L					68.0	97.3	70.7	54.6	86.5			
Alkalinity - Total	mg/L					41.1	57.2	58.9	41.7	73.6			
Total metals													
Silver - Total	mg/L												
Aluminum - Total	mg/L												
Arsenic - Total	mg/L												
Cadmium - Total	mg/L												
Chromium - Total	mg/L												
Copper - Total	mg/L												
Iron - Total	mg/L												
Mercury - Total	mg/L												
Manganese - Total	mg/L												
Molybdenum - Total	mg/L												
Nickel - Total	mg/L												
Lead - Total	mg/L												
Antimony - Total	mg/L												
Selenium - Total	mg/L												
Zinc - Total	mg/L												
Nutrients													
Ammonia - N	mg/L					0.19	0.28	2.28	1.15	2.74			
Nitrite - N	mg/L					0.06800	0.03133	0.55500	0.02680	0.01100			
Nitrate - N	mg/L					3.30	0.83	0.30	0.42	0.65			
Solids													
Turbidity	NTU					11.0	6.20	12.4	11.4	3.62			
TDS Total	mg/L					214	226	206	115	180			
Dissolved Solids													
TSS Total	mg/L					8.00	5.67	13.8	8.20	2.13			
Suspended Solids													
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

## MAD and MAC Limits

Parameter	Units	T8.4 (MAD Limit)	SDP (MAD Limit)	W1.5.1 (MAC Limit - Communal Use)
Chlorine (Cl)	mg/L	21,72	350	350
Magnesium	mg/L	808,60		50
Sodium	mg/L	1157,19		200
Sulphate	mg/L		254,8	500
Silver - Total	mg/L			0,05
Aluminum - Total	mg/L			0,5
Arsenic - Total	mg/L			0,01
Boron (B)	mg/L			0,5
Barium (Ba)	mg/L			0,7
Beryllium (Be)	mg/L			0,0002
Bismuth (Bi)	mg/L			0,1
Cadmium - Total	mg/L			0,001
Cobalt (Co)	mg/L			0,1
Chromium - Total	mg/L	1,00		0,05
Copper - Total	mg/L			1
Fluorine	mg/L	1,8		1,5
Iron - Total	mg/L			0,3
Mercury - Total	mg/L	0,29		0,0005
Manganese - Total	mg/L	1,014		0,1
Molybdenum - Total	mg/L	0,040		0,25
Nickel - Total	mg/L			0,02
Lead - Total	mg/L	0,492		0,01
Antimony - Total	mg/L			0,005
Selenium - Total	mg/L			0,01
Silicon	mg/L			10
Vanadium	mg/L	1,00		0,1
Zinc - Total	mg/L	23,48		1
Ammonia - N	mg/L		2,01	1,5
Nitrite - N	mg/L		8,39	3,3
Nitrate - N	mg/L	0,1280	120,10	45
Cyanide - Free (CN-F)	mg/L			
Cyanide - WAD (CN-WAD)	mg/L	77,7		0,035
Total Suspended Solids (TSS)	mg/L		161,3	
Biochemical Oxygen Demand (BOD5)	mg/L		19,68	
MBAS	mg/L		10,5	0,5
Hydrocarbons	mg/L			0,3

## Laboratory Detection Limit

Parameter	Units	Method Detection Limit
Major Constituents		
Calcium	mg/l	0,05
Chloride	mg/l	0,5
Carbonate	mg/l	1
Bicarbonate	mg/l	1
Potassium	mg/l	0,09
Magnesium	mg/l	0,5
Sodium	mg/l	0,5
Sulphate	mg/l	1
Hardness - Total	mg/l	1
Alkalinity - Total	mg/l	1
Total metals		
Silver - Total	mg/l	0,003
Aluminum - Total	mg/l	0,03
Arsenic - Total	mg/l	0,005
Cadmium - Total	mg/l	0,0003
Chromium - Total	mg/l	0,008
Copper - Total	mg/l	0,005
Iron - Total	mg/l	0,004
Mercury - Total	mg/l	0,0005
Manganese - Total	mg/l	0,003
Molybdenum - Total	mg/l	0,005
Nickel - Total	mg/l	0,005
Lead - Total	mg/l	0,002
Antimony - Total	mg/l	0,001
Selenium - Total	mg/l	0,001
Zinc - Total	mg/l	0,001
Nutrients		
Ammonia - N	mg/l	0,04
Nitrite - N	mg/l	0,001
Nitrate - N	mg/l	0,1
Solids		
Turbidity	NTU	0,35
TDS Total Dissolved Solids	mg/l	1
TSS Total Suspended Solids	mg/l	1
Trace Constituents		
Cyanide - Free	mg/l	0,2
Cyanide - Total	mg/l	0,005
Cyanide - WAD	mg/l	0,005



## Cautionary note regarding forward-looking statements

Certain information contained or incorporated by reference herein may include “forward-looking statements” within the meaning of certain securities laws. Such forward-looking statements involve risks, uncertainties, and other factors that could cause actual results, performance, prospects, and opportunities to differ materially from those expressed or implied by such forward-looking statements.

For a detailed discussion of such risks, uncertainties, and other factors, the Management’s Discussion and Analysis included in Centerra’s most recent Annual Report and Annual Information Form, both of which are available on Centerra’s website [www.centerragold.com](http://www.centerragold.com). Although Centerra believes that the assumptions inherent in these forward-looking statements are reasonable, the reader should not place undue reliance on these statements. Forward-looking information is as of December 31, 2018. Centerra disclaims any intention or obligation to update or revise any forward-looking statements whether as a result of new information, future events or otherwise. The data in this Report has not been independently verified.

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What else can we make to improve our performance?  
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