KUMTOR
КУМТОР

centerra GOLD

ENVIRONMENT AND SUSTAINABILITY REPORT **2016**

ABOUT KUMTOR MINE

Kumtor Mine is the largest western-operated gold mine in Central Asia and has been operating since 1997, having produced approximately 10.94 million ounces of gold by the end of 2016. Kumtor Gold Company CJSC (KGC) is the license holder for the Kumtor deposit.

The Kumtor open pit mine is located approximately 350 kilometres southeast of the capital Bishkek and 60 kilometres north of the border with the People's Republic of China. It is at an altitude of 4,000 metres above sea level in a partially glaciated permafrost zone in the Central Tien Shan Mountains. 2016 marked the twentieth year of the Kumtor Mine operation in the Kyrgyz Republic, and the thirteenth year under the parent company Centerra Gold Inc. (Centerra). The current life of the Kumtor Mine is until 2026.

About Centerra

Centerra Gold Inc. 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 the largest Western-based gold producer in Central Asia. Centerra has two producing gold mines, one in the Kyrgyz Republic and the other in British Columbia, Canada. Centerra also owns three development stage properties, its 100% owned Öksüt Gold Project in Turkey and Gatsuurt Project in Mongolia, and a 50% interest in the in the Greenstone Gold Property which includes the Hardrock Gold Project in northwestern Ontario, Canada. The Company also has interests in exploration properties in Armenia, Canada, Mexico, Mongolia, Nicaragua, Portugal, Sweden and Turkey. Kyrgyzaltyn Open Joint Stock Company, a state owned entity, is Centerra's largest shareholder, owning 77,401,766 common shares, representing 26.57% of Centerra's outstanding common shares. Additional information on Centerra is available at SEDAR (**www.sedar.com**) and on the Company website (**www.centerragold.com**).

About this Report

This document is the Kumtor Annual Environment and Sustainability Report (AESR) for the 2016 financial year (ending December 31, 2016). This report is focused on the Kumtor Mine in the Kyrgyz Republic. Kumtor's 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 amounts are reported in US dollars (USD) unless otherwise stated.

This report has been prepared in accordance with GRI Standards: Core option. For sector specific disclosures, various indicators set in GRI's Mining and Metals Sector Supplement (see **www.globalreporting.org**) has been employed. KGC has been reporting under GRI G3 standards from 2012 and switched to GRI G4 reporting standards from 2015. Previous report of the Company was based on 2015 financial year and was published in September 2016 and is also available on our corporate website.

This is in addition to addressing the key reporting requirements contained in Kumtor's Environmental Management Action Plan. In determining the scope, content, and boundaries of this report, we considered a materiality assessment process described in the Governance Section of this report. Please see our Cautionary Note Regarding Forward-Looking Statements also 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.

GRI GOLD Community Kumtor Gold Company CJSC 2017

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MESSAGE FROM THE PRESIDENT

The Company's key activities, accomplishments and challenges we faced in 2016 are described in this report. We beat our production guidance, moved into a new heavy-duty maintenance workshop at the mine site, and became more efficient and cost conscious. We are looking forward to continue our improvements in all aspects of our operations.

> "Since mining started, regional wildlife numbers of key species such as the snow leopard and Marco Polo sheep have increased in areas around the mine site."

Contribution to the Kyrgyz Economy

KGC continues to contribute significantly to the economy of the Kyrgyz Republic. In 2016, our production accounted for 23.4% of Kyrgyzstan's overall industrial output and 8% of GDP. In 2016, payments made within the Kyrgyz Republic totalled $238 million making a total of $3.2 billion since 1994.

Largest Private Sector Employer

KGC is the largest taxpayer and the largest employer in Kyrgyzstan's private sector. By the end of 2016, we employed 3,485 Kyrgyz citizens - 97% of the full-time workforce. In 2016 we continued to decrease the number of expat employees, trying to promote local professionals. Payments made within the Kyrgyz Republic in 2016 include more than $108 million in employee and contractor wages and benefits.

Increasing Local Procurement

We believe that the strategic approach to local procurement issues will not only benefit our company but also contribute to the development of local communities by creating more jobs and boosting the economy across the Issyk-Kul region. We continue to promote and support local business and in 2016, our company spent more than $58 million on local procurement.

Stakeholder Engagement

The company continues to deepen its cooperation with all stakeholders. Senior management takes part in the regular meetings with representatives of local communities to discuss cooperation, inform about company's plans, as well as to listen and address concerns raised by communities, represented by community and youth leaders, local authorities as well as representatives of small business and private farms.

Many of the projects described in this report have brought together communities, other partners, international aid organizations and government officials. We continue to make additional efforts to mobilize and promote local entrepreneurs and business in the region.

Launched in 2015, the Kumtor Ambassadors program continue to promote volunteering among employees and contractors thereby engaging one of our largest internal stakeholder group – our workers – into social projects within the Republic. We have volunteered more than 3,000 hours to social work and took part in more than 30 charity, volunteering and mentorship activities.

Community Investments

We have launched a number of programs aimed at the integrated development of the Issyk-Kul province. These are centered on the following four components: development of the agricultural sector; promotion of small and medium-sized business growth and diversity; collaboration with young people; and promotion of educational and environmental initiatives. This report describes some of the programs we have voluntarily initiated and results we have achieved. Moreover, the company has been contributing 1% of its gross revenue to the Issyk-Kul Region Development Fund since 2009. In 2016, our contribution was $6.2 million making a total of $53.6 million since these payments commenced.

In June 2016, all the social investment payments had been suspended due to the judgment of the Inter-District Court of Bishkek, which banned KGC to transfer its assets. By the date of publishing this report, the Court decision was still in place.

Geotechnical Safety

The Kumtor Mine ore body and related infrastructure are situated under moving glaciers or subject to their impact. Since the approval of the Kumtor project in 1994, the removal of glacial ice (necessary for the safe operation of the mine), have been an integral part of the annual mining plans that are subject to approval by relevant Kyrgyz regulatory authorities. As described in this report, we have retained leading local and international experts and have employed advanced technologies to monitor and appraise the mine's geotechnical safety. We have also implemented programs designed to maintain proper safety standards at all facilities.

Health and Safety

We maintain our policy that no job is so important that it cannot be done safely. Unfortunately, despite our focus and efforts on health and safety, and our positive historical safety performance, a KGC Mill employee was fatally injured. As a result, we have undertaken an investigation and review of the accident, existing controls and procedures with safety specialists. An investigation run by the Governmental bodies is ongoing. KGC is working closely with local authorities and State Agencies to resolve this issue.

Overall, our safety performance is better than mines in some industrialized countries and we are always committed to ensuring our employees return home safely after every shift. In 2016, we launched a new Safety Leadership Program called Work Safe- Home Safe. Designed to promote Leadership, provide skills to change behaviour and build commitment to change, the Program serves as a platform to continually manage, change and improve safety leadership and culture, which we believe will result in a zero harm.

Environment and Biodiversity

We consider responsible environmental management an important part of our business, and in 2016 we spent approximately $6.9 million on environmental assessment and management. This includes on-site and regional monitoring of water, air, biodiversity, soils and sediments, radiation, and waste. In 2016 we updated the Conceptual Closure Plan to reflect the latest mine plan.

In 2016 we continued to improve our waste management practices and introduced waste segregation in all our key locations. This not only relates to industrial waste, but also domestic.

The Company attaches great importance to conservation of the region's biodiversity and has worked with stakeholders concerned about nature conservation since the start of operations, including contributing to the creation of the Sarychat-Eertash Nature Reserve (SCER), established in 1995. We continued our partnership with Fauna & Flora International – the world's longest established international conservation body - to support biodiversity conservation projects within the SCER. KGC is proud of its support in this area, and since mining started, regional wildlife numbers of key species such as the snow leopard and Marco Polo sheep have increased in the areas adjacent to the mine.

Environmental Claims

By the end of 2016 there were several environmental and criminal claims received by the company from the General Prosecutor, Kyrgyz State Agencies and the Green Party. As previously disclosed, we dispute the allegations made in these claims and consider them to be exaggerated and without merit. We continue to work in close cooperation with the Government of the Kyrgyz Republic to amicably settle claims. Details are described further in this report.

Life of Mine

As of December 31, 2016, KGC's proven and probable gold reserves totalled 5.130 million ounces. The most recent life-of-mine plan is for open-pit mining to end in 2023 and milling operations to conclude in 2026.

Looking Forward

Kumtor successfully implemented various continuous improvement initiatives throughout the year resulting in higher throughput in the mill and lower unit costs.

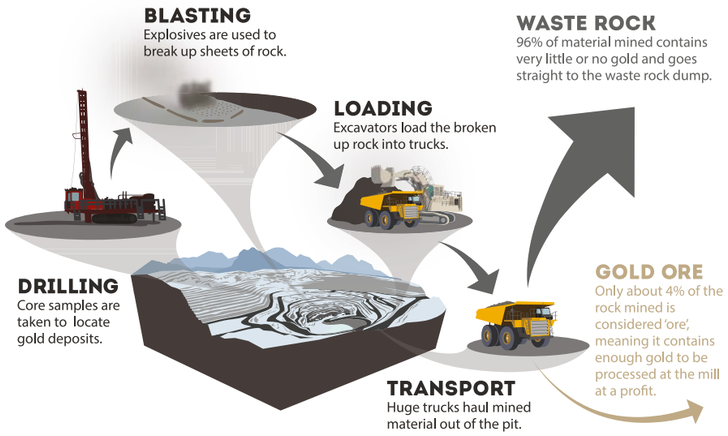
It is important for KGC that we continue to meet our production targets in a way that is safe, and environmentally and socially responsible. Kumtor's gold production forecast in 2017 is expected to be in the range of 455,000 ounces to 505,000 ounces with 30% of the gold production expected to be in the fourth quarter.

Our long-term vision is to build a team-based culture of excellence that responsibly delivers sustainable value and growth. We welcome feedback on this report and encourage comments on how we can further improve our environmental and social performance in future.

Daniel Desjardins,
President,
Kumtor Gold Company

MINING PROCESS

Gold ore at the Kumtor deposit occurs mostly as fine gold particles embedded in pyrite. This ore is extracted using standard open-pit mining techniques, where rock is drilled and blasted in large strips. The blasted rocks can now be loaded unto large trucks using excavators and transported out of the pit.



Kumtor mine is outfitted with the latest mining machinery available. The fleet includes 99 Caterpillar trucks, each with the carrying capacity of 145-185 tonnes, 8 boring rigs, and 14 excavators. Besides these, there are 14 bulldozers and 11 blade graders which maintain the roads and other infrastructure of the mine. Workers are transported to and from the mine using KAMAZ trucks, popularly referred to as crew buses.

DRILLING

Drilling plays an essential role in extraction of precious metals. Before any major work can begin on a given section, geologists must have a precise idea of the average gold grade in the ore. Based on the drilling data they will then decide whether to process the ore at the mill, or haul it to a waste rock dump, if the gold content is too low to make a profit.

The mine's drilling rigs can drill to a depth of up to 12.5 meters, with an average drilling speed of 120 rotations per minute.

An average of 230 holes are drilled during one shift. In addition drilling of these holes serves as the first step in the blasting process, and drill cuttings are sampled to determining gold content.

BLASTING

Blasting is used to break up large sheets of primary rock. Rock in the permafrost zone is extremely hard which makes it impossible to load or transport without breaking it up first.

A grid of several dozen holes is drilled in that block of rock and filled with explosives.

Occupational health and safety compliance during the blasting of a section is of paramount importance for all employees involved in the mining operation. Before any explosives are detonated, mining specilist ensures the withdrawal of operators and machinery from the pit to a safe distance.

LOADING

After the roads on the blast site have been cleared, excavators come to load the blasted rock unto trucks. There are two types of excavators working on the mine, the largest of which are five Hitachi EX3600-6 excavators.

TRANSPORTATION

In order to get at the gold ore, large sections of rock that contain little or no gold also need to be removed. This unprocessed 'waste rock' is hauled to designated waste rock dumps and unloaded there. Trucks transporting gold ore on the other hand go to stockpiles and then further blended to feed the mill.

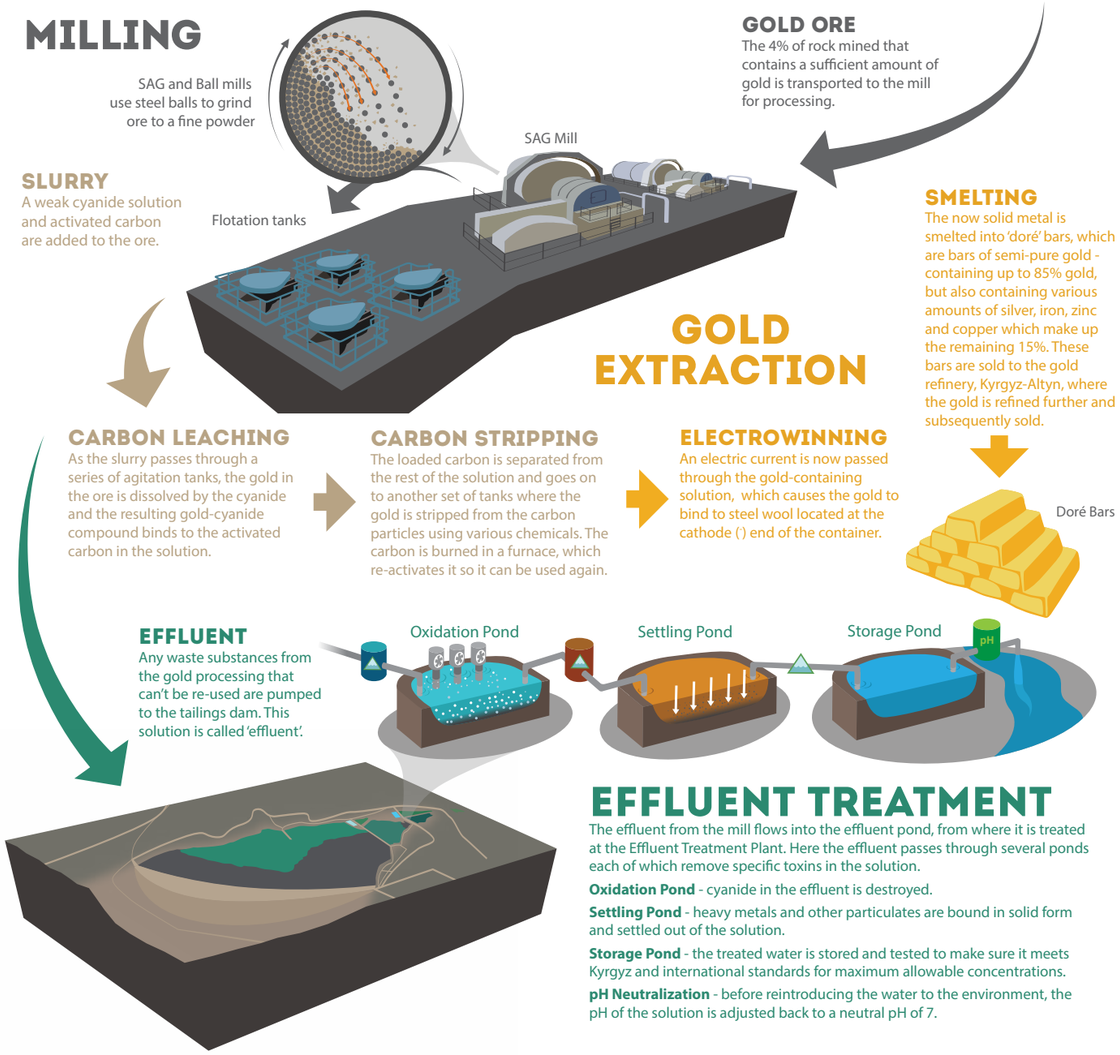
MILL

The blended ore is delivered to the crusher and then to the mill, where gold is extracted using carbon-in-leach technology. For more effective ore processing an ultra fine grinding mill (ISA Mill) was installed in the factory in 2005. It grinds ore down to 20 microns, which is about one fifth of the diameter of a human hair.

The mill's rated throughput is between 16,000 to 17,000 tonnes of ore per day. The entire production process is automated involving just 16 people per shift to operate the entire factory.

After the gold extractions is complete, the gold is smelted into Dore bars, which contain up to 80 percent of gold.

The Doré bars produced by the Kumtor mine are purchased by Kyrgyzaltyn JSC for processing at the Kara-Balta refinery pursuant to a Gold and Silver Sales Agreement signed by KGC, Kyrgyzaltyn and the Government of the Kyrgyz Republic. Kyrgyzaltyn JSC enjoys the exclusive right to sell refined gold and silver both in- and outside the Kyrgyz Republic.



EFFLUENT TREATMENT

The effluent from the mill flows into the effluent pond, from where it is treated at the Effluent Treatment Plant. Here the effluent passes through several ponds each of which remove specific toxins in the solution.

Oxidation Pond - cyanide in the effluent is destroyed.

Settling Pond - heavy metals and other particulates are bound in solid form and settled out of the solution.

Storage Pond - the treated water is stored and tested to make sure it meets Kyrgyz and international standards for maximum allowable concentrations.

pH Neutralization - before reintroducing the water to the environment, the pH of the solution is adjusted back to a neutral pH of 7.

ENVIRONMENTAL AND SUSTAINABILITY SNAPSHOT

Pillar	2016 Targets	Target Outcome and Comment on Targets	2017 Targets
Project Benefits	■ Reduce All-In Sustaining Cost Per Ounce to 840 (US$/oz)	■ All-In Sustaining Cost was $640 (US$/oz)	■ Reduce All-In Sustaining Cost Per Ounce to 843 (US$/oz)
Health & Safety	■ Recordable injury frequency rate of 0.33 or lower ■ Develop and Implement Visible Felt Leadership Program	■ 11 Reportable Incidents ■ RIF = 0.39, including KGC + Contractors ■ Work Safe Home Safe Leadership Program Developed	■ RIF = 0.30 ■ Work Safe – Home Safe Leadership program fully implemented by end of Q3
Environment	■ No Reportable Spills > Level 2 ■ Update Conceptual Closure Plan including socio-economic conditions by Year- End 2016	■ No Reportable Spills > Level 2 ■ Conceptual Closure Plan updated with socio-economic conditions chapter included into the Plan	■ No Reportable Spills > Level 2 ■ Progress towards achieving ICMI compliance to CNwad discharge limits.
Community	■ No material business interruptions ■ Ensure continued implementation of Kumtor Ambassador Program	■ Zero days of material business interruptions ■ More than 3,000 hours dedicated for corporate volunteering by KGC employees in 2016	■ Zero days of production disruption ■ Develop protocol between Issyk-Kul Development Fund, regions, and KGC for future social and economic projects by the end of Q2 ■ Increase involvement in Kumtor Ambassadors Program by 10% (hours) over 2016

1 GOVERNANCE

1.1 | GOVERNANCE MODEL

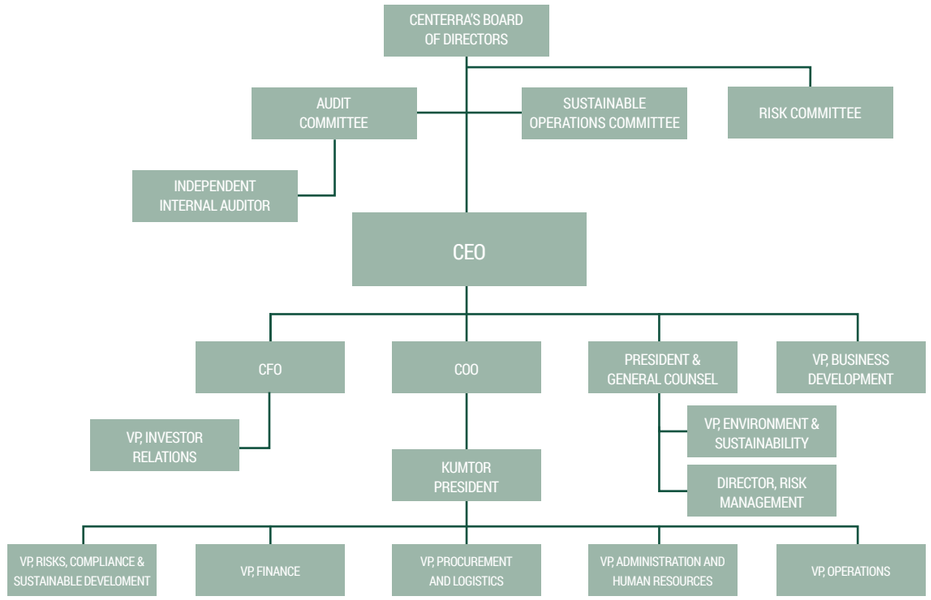


Fig. 1.1 Corporate Governance Structure (2016)

Aspects of corporate responsibility are considered by the Sustainable Operations and Audit Committees of Centerra's Board of Directors.

KGC operates under the governance and standards set by its parent company Centerra Gold Ltd. All our operations adhere to the governance and standards set by Centerra, whose board of directors and management believe that sound and effective corporate governance is essential to our performance. We have adopted practices and procedures to ensure that these governance principles are followed. We expect management, officers, and employees to conduct themselves in accordance with the highest ethical standards. These are detailed in three key policies:

a) Code of Ethics for officers and employees;

b) Code of Ethics for directors; and

c) International Business Conduct 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 takes day to day in the following areas:

- **Operational Health and Safety:** KGC ensures provisions for safe performance and operation during all states of our activities. Kumtor 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 is running an Environmental Management System (EMS) designed to monitor the effects of operations on the environment and 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 Ltd as well as on the company website (**www.kumtor.kg**).
- **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 todays changing environment and variety of emerging risks, KGC uses an Enterprise Risk Management System to support its business activities and safeguard shareholder value. The risk management system is designed to ensure the risks are systematically identified, rigorously assessed, prioritized consistent with KGC's risk appetite and effectively managed to eliminate unwanted impacts.

The Code of Ethics for Directors requires Centerra's directors to promptly report all actual, potential, or perceived conflicts of interest to the corporate secretary, who is in turn required to bring such potential conflicts to the attention of the Nominating and Corporate Governance Committee. Directors may not participate in discussions, deliberations, or decision-making for matters in which they have a conflict of interest. All new directors are required to review and accept the Code of Ethics for Directors.

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 Transparency Initiative (EITI) in 2011.

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** and **eiti.org/Mongolia**. Centerra is also a member of the World Gold Council (WGC). The Council's members regard the management of the local environment and relationships with local communities as paramount considerations during the lifetime of any mine project.

In 2013, Centerra Gold adopted and implemented the WGC's Conflict-Free Gold Standard. In doing so, Centerra acknowledges that operating responsibly and maintaining the trust of our stakeholders requires us to demonstrate that the gold we produce has been extracted in a manner that does not fuel unlawful armed conflict or contribute to serious human rights abuses or breaches of international law.

Centerra is a signatory to the International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold. 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.

Compliance

In order to comply with the requirements of regulatory and legal acts of the Kyrgyz Republic and international procedures in the area of operating activities and in order to ensure uninterrupted and safe operation of the mine, the Company established the Compliance and Projects Department (C&P) in 2012.

The C&P Department consists of 14 personnel, led by the Director of Compliance, who in turn reports to the KGC VP Risk Management, Compliance, and Sustainable Development. It cooperates with all structural divisions of KGC and is governed by applicable legislation of the Kyrgyz Republic, international standards, restated investment and concession agreements, therefore abiding by the strictest requirements.

The C&P Department specialists monitor changes in KR legislation and determine potential risks affecting the activity of the Company. In accordance with the requirements of legislation, the C&P Department ensures timely obtaining of permits and licenses for the activities subject to licensing.

In addition, the C&P Department:

- Assists other parts of the company to prepare contracts;
- Obtains all required permits for design and construction of mine site infrastructure facilities;
- Obtains approvals for the design estimate documentation and commissioning process;
- Assists design organizations to obtain approval/ expert opinions for Mine Plans/Designs, standards for emissions, discharges and wastes (including infrastructure projects) for the mine site and BMY;
- Provides technical assistance during update and/or introduction of new internal documentation for the Company in accordance with the requirements of KR legislation and international regulations;
- Manages verification of measuring instruments used at the Kumtor mine.

To ensure uninterrupted operation of Kumtor Mine site, the C&P specialists maintain a constant liaison with authorities in the area of subsoil management, natural resources management, construction, sanitary and epidemiological control, technical supervision, as well as with KR Ministry of Economy, KR Ministry of Interior, KR Agency on Communications and KR Ministry of Emergency Situations.

The C&P Department constantly updates the following permits that are issued by various Ministries and Agencies of the Kyrgyz Republic:

- Permit to execute mining (survey) operations at concession area;
- Permit to execute blasting operations in the Central Pit and Sarytor Pit;
- Permit to use explosive materials;
- License for producing and selling explosive materials;
- License for importing explosive materials and Sodium Cyanide;
- Permit to execute mining operations within Concession Area;
- Permit to store weapons at the Kumtor Mine, which are necessary for safeguarding the mine site;
- Certificates of admission of vehicles and drivers to transport hazardous cargo, Permit to transport large and heavy cargoes;
- Permit to use and store precursors and medicines at Kumtor Mine site;
- License and Permit to dispose toxic materials in TMF and at specialized landfills within prescribed limit;
- Permit for emission into atmosphere and discharge of treated industrial and domestic effluents within prescribed limits;
- Permit to dispose wastes;
- Licenses for Radio Spectrum Use and Frequency Assignments to secure reliable connection between KGC facilities;
- Permit to use X-Ray devices and equipment containing ionizing radiation sources;
- Visas and Permits to Work in the Kyrgyz Republic for foreign employees of KGC.

About 322 permits to import goods, subject to mandatory certification or sanitary inspection, were obtained in 2016.

Audits, Inspections and Claims

Our operations are subject to regular audits by Kyrgyz and international companies and experts. We also receive inspections from relevant national agencies and audits commissioned by Centerra Gold and the European Bank for Reconstruction and Development (EBRD).

Environmental Claims

Kyrgyz Permitting and Regulatory Matters

In December 2016, KGC received permits for 2017 annual mine plan in Central and Sarytor Pit.

However, there remained several other outstanding permits and approvals required from Kyrgyz regulatory authorities including the Ecological Passport and the Life-of-Mine technical plan (which outlines mining plans for the Kumtor Life-of-Mine). We understand that the regulatory authorities reviewing such permits and approvals have expressed concerns regarding potential conflicts with the Kyrgyz Republic Water Code. Centerra and KGC do not believe that the Water Code is applicable to the Kumtor Project. Centera believes that any disagreement over the application of the Water Code regarding the Kumtor project will have to be settled by the international arbitration court in accordance with the 2009 agreements governing the activities for the Kumtor project.

Centerra will continue to engage constructively and in good faith with the Kyrgyz Republic Government to resolve all outstanding matters affecting the Kumtor Project, including, among other things:

1. Claims made by the General Prosecutor relating to a $200 million inter-corporate dividend declared and paid by KGC to Centerra in December 2013;
2. Claims made by the General Prosecutor seeking to invalidate Kumtor's land use certificate and to seize certain lands within the Kumtor concession area;
3. Significant environmental claims made by various Kyrgyz state agencies from 2013 to 2016 alleging environmental offenses and other matters totalling approximately $477 million (at applicable exchange rates when the claims were commenced). Centerra believes that each of these claims is without foundation.

Green Party Claim

In 2016, KGC once again received a claim filed by the Green Party of Kyrgyzstan (the Green Party) with a Kyrgyz court which alleges environmental and glacier pollution and seeks damages of approximately $6.4 billion. The Company understands that the court has rejected the claim on procedural grounds, and it was returned to claimants. The Company believes that this claim is without merit and, in any event, is subject to the international arbitration provision of the Restated Investment Agreement.

Environmental Incidents

Kumtor maintains a system for reporting environmental and safety related incidents. This is based on a five category reporting system, which allows us to classify reportable and non-reportable environmental incidents and spills. The classification system considers level of environmental impact, national and other regulatory compliance, and concern of local communities. Senior environmental staff are immediately informed of all incidents and allocate the appropriate classification level. For Type I and Type II incidents, which are considered insignificant in terms of scale and severity of impact, there are no external reporting requirements. Such incidents are also not immediately reported to Kumtor's president and Centerra's board of directors. Incidents classified as III to V are reported to the board of directors and, in many cases, trigger external reporting requirements to relevant local regulatory agencies. No reportable environmental incidents occurred at Kumtor during 2016. However, 16 non-reportable incidents were reported, down from 29 in 2015. These were typically minor spills of fuels that were immediately contained and cleaned up, resulting in no significant or extended impact.

Fig. 1.2 Environmental Incidents and Spills

	2014	2015	2016
Non-reportable spills and environmental incidents (Type I)	31	28	15
Non-reportable spills and environmental incidents (Type II)	7	1	1
Reportable spills and incidents (Type III-V)	0	0	0

1.2 | SUSTAINABILITY MANAGEMENT

While Centerra's ultimate objective is to deliver value to our shareholders, we also believe in 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 potential for adverse impacts from our operations, taking into account social and economic factors;
- 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;
- 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.

1.3 | RISK MANAGEMENT AND CONTINUOUS IMPROVEMENT

The Risk Management processes are integrated with the general management of the organization so they are a part of decision-making process. Critical risks and monitoring of their mitigation plan is being successfully integrated in the day-to-day activities with the departments managing their own risks identification and monitoring process. Senior Management discusses new risks at a weekly Steering Committee Meeting and through a Quarterly Critical Risk Review Meeting. The goal is to use the outcome of risk assessment processes in planning, budgeting and cost control to ensure we focus on proactive rather than reactive management strategies.

The key risks events in 2016 related to Permitting and Geotechnical conditions of the pit and dumps as well as the characteristics of the ore that affect the gold extraction:

- **Permitting and Licensing:** Mining operations at Kumtor are subject to various permits and licenses, some of which are obtained on an annual basis or for a fixed term. During 2016 KGC experienced delays in obtaining the necessary permits and approvals for the KGC annual mine plans and certain environmental permits, including the maximum allowable discharge permit, the permit for waste, and the Ecological Passport. KGC continues to work closely with Kyrgyz regulatory agencies to resolve all matters, and to ensure that the permits and licenses are received within the time frame provided under Kyrgyz Laws;
- **Geotechnical issues:** Constant ground movement in the pit and dumps in the result of geological and geotechnical ground characteristics requires constant vigilance because it poses the risk of mining operations and may impact on the volume of gold produced, changing in sequence of mining operations, increasing of unloading expenditures, organising of dewatering, movement or reconstruction of existing infrastructure, reduced slope angles of the central pit and changes in waste rock dump design. Extensive efforts are taken by KGC personnel to impose appropriate measures on adjusting the plan to prevent and anticipate further ground movement. The Company also uses third party geotechnical consultant to review pit wall, glacier and waste dump on a quarterly basis;
- **Gold Recovery:** It is not always possible to predict the precise metallurgical parameters of the ore. To minimize this natural effect, KGC conducts continuous metallurgical analysis and utilizes advanced methods to maximize the gold recovery. In 2016 work on the modernization and installation of additional cyclones on the regrind mill and the ultrafine grinding mill continued. Also, as a result of testing, it was proven that using balls of a larger size leads to a better grinding. The outcome had been that the manufacturers team managed to increase grinding the ore by 2%.

Management of the risks connected to gold Recovery clearly demonstrates how risk management processes is linked with constant improvement activities that became part of our daily operation. We aim for continuous improvement embedded in everything we do. We continue our efforts to improve safety, effectiveness, and productivity. At the end of 2016, as a part of continuous improvement process, some new tools were introduced in order to accelerate the changes necessary for improvement. These included: efficient meetings discipline and responsible fulfillment of assigned tasks; work of the teams on advancing improvement processes - Change Acceleration Process teams (CAP teams).

One such team, consisting of representatives from different departments, had been working on the waste management program, resulting in achievement of the goals set to organise procedures of waste segregation and disposal. Another team is proceeding to work on improvement of the issues of mine machinery dispatching for system optimisation in order to minimise mine machinery downtimes and increase productivity.

1.4 | MATERIALITY ASSESSMENT

In accordance with the GRI Standards, KGC is required to identify and report only 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 our 2016 materiality assessment on previous year's interviews and workshops, held with Senior Management:

- Opinions of Senior Management and Departments Heads – via several internal meetings and workshops mostly held in 2016 for the materiality process of the 2015 report;
- Views of local communities in Issyk-Kul;
- Risks that were rated as High or Extreme on the KGC Risk Register;
- Relevant legal obligations of the Company;
- Data from the KGC community relations on-line database, where we document our engagements with the 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.

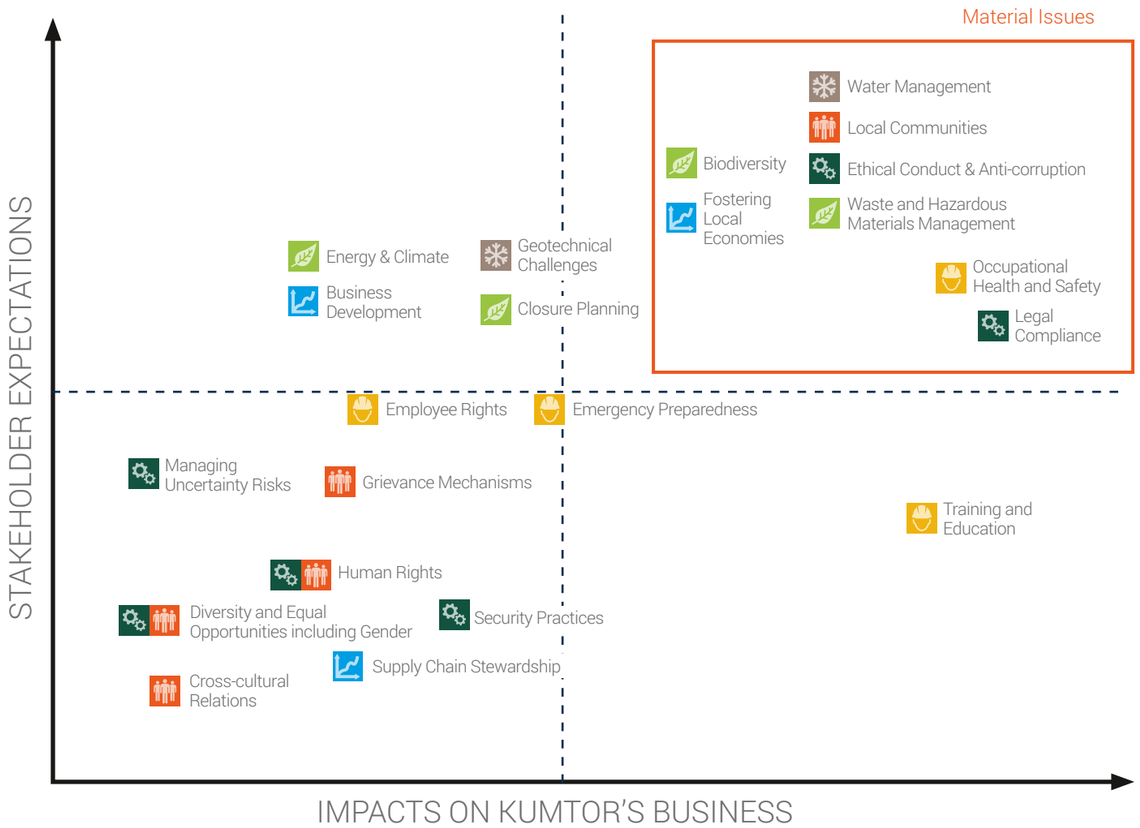
UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

There are 17 Sustainable Development Goals (SDGs) defined by the international community with 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

Fig. 1.3 Materiality Matrix



Legend: Areas of Impact

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

Fig. 1.4 List of Identified Material Aspects and Boundaries

Material Aspects	Impact Inside organization	Impact Outside organization	Relevance outside the 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 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, including environmental claims and claims made by the General Prosecutor.
Ethical Conduct and Anti-Corruption	×	×	According to the Transparency International Corruption Perception Index Kyrgyzstan 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 8% of GDP, jobs for more than 3,000 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 safety clothing, and receive health and safety trainings 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 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 non-compliance and the related damage to organizational reputation. 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 behaviour and has always been committed to fair and transparent operation. Supported by our Code of Conduct, Code of Ethics and IBC Policy. The Code of Conduct provides an ethical framework for employee decisions, actions and behaviour. It outlines the principles for appropriate conduct and explains the standard of behaviour expected. These Policies regulate KGC's business conduct with Government Officials, interactions with others and include important concepts such as preventing conflicts of interest between parties of the company including engaging in improper activities with suppliers and others that do business with the Company. The IBC Policy contributes to creating a workplace culture that encourages and supports staff to identify and declare conflicts of interests so that they can be managed in an open and transparent way. Our employees provide formal acknowledgment of awareness on these Policies, as this subject is an important component of our commitment to conduct business in an ethical and lawful manner.

The Company has established financial and other controls to (a) prevent corrupt payments from being made, (b) detect any such payments that are made, and (c) defend KGC actions if challenged by enforcement authorities. KGC require accurate documentation from all of our partners. KGC maintains records that accurately reflect all transactions — payments, expense reimbursements, gifts, business entertainment, disbursements, commission payments, fees and other dealings with prospective customers, agents, subsidiaries and other affiliates. Any valid case can be reported to the Confidential Complaint Hotline – available in English/Russian at **www.clearviewconnects.com**. The Hotline is confidential and available 24 hours a day and is operated by a third party provider.

> "KGC has a zero tolerance policy for unethical behavior and has always been committed to fair and transparent operation."

TRAINING ON INTERNATIONAL BUSINESS CONDUCT POLICY, CODE OF ETHICS AND ANTI-CORRUPTION PROGRAMS

A total of 9 sessions held (both for expatriates and Nationals in English and Russian) at Kumtor and 1 session in Ankara. A total of 125 employees attended training at Kumtor and 17 employees in Ankara.

Training objective was 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. Topics presented included:

- **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 reporting hotline**
- **Annual certification of compliance**

Our objective is to conduct this training on an annual basis.

KUMTOR КУМТОР

HONESTY & INTEGRITY

HOW WE CONDUCT BUSINESS IS IMPORTANT TO US

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

*for more information check the Company's X drive in the "Policies" folder.

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

Non-compliance with these policices 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

VP OF HUMAN RESOURCES
deon_badenhorst@kumtor.com

CENTERRA GOLD (for concerns beyond Kumtor management)
frank.herbert@centerragold.com

COMPLIANCE HOTLINE
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 territory of the Kyrgyz Republic. In 2016 KGC operations accounted for 8% of GDP and 23% of national industrial output.

Payments made within the Kyrgyz Republic in 2016 were $238 million. Total payments within the Kyrgyz Republic since 1994 have now reached $3.2 billion. Our strategic community investment programs in 2016, described in the Social Responsibility section, were $700,000.

We continue to contribute 1% of gross revenue to the Issyk-Kul Development Fund for support of social and community projects. In 2016 we paid $6.2 million to the Fund. The Fund is government-controlled with local oversight, which aim is to develop social infrastructure such as schools, clinics and kindergartens in Issyk-Kul Oblast.

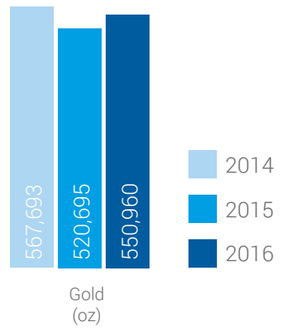
In addition, the Kyrgyz government, through the state owned mining company Kyrgyzaltyn OJSC, remains the largest single shareholder of Centerra Gold, owner of KGC. By the end of 2016, KGC employed 3,485 people, including contractors, with Kyrgyz nationals making up more than 97% of full-time staff, which is detailed further in the People section.

Fig. 2.1 Kumtor's Share of GDP (%)

Fig. 2.2 Kumtor's Share of Total Industrial Output (%)

Kumtor's macroeconomic impact in the Kyrgyz Republic SOURCE | Kyrgyz Republic National Statistics Committee

Fig. 2.3 Gold Production Statistics



> "Total payments within the Kyrgyz Republic since 1994 have now reached $3.2 billion."

Fig. 2.4 Direct Economic Value Generated and Distributed*

Indicator	2014	2015	2016
Revenues from gold sales	694,590,808	604,521,845	687,805,172
Other income [a]	2,134,531	5,029,607	1,926,887
Operating costs (goods and services) [b]	288,327,187	235,845,312	195,295,968
Corporate administration costs	-	-	-
Exploration costs	-	-	-
Capital expenditure [c]	88,847,144	64,642,771	75,778,978
Other operating costs	1,845,042	1,572,558	2,304,654
Employee and contractor wages and benefits	118,579,207	105,111,954	108,861,856
Payments to providers of funds	-	-	135,000,000
Taxes and royalties	97,242,713	84,633,058	96,292,724
Community donations and investments	5,114,257	2,203,078	1,176,986
Economic value retained	96,769,787	115,542,721	75,020,894

Notes:

***** *Data has been prepared on an accrual basis and non-cash costs have been ignored.*

a) *Other income includes income from financial investments, sale of assets, and other services.*

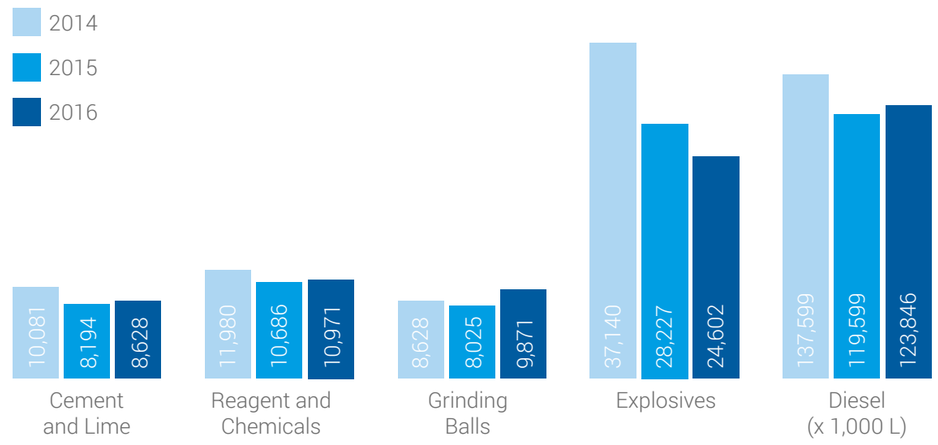
b) *Includes capitalized overburden stripping costs.*

c) *Excludes capitalized overburden stripping costs.*

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, cement and lime, reagents and chemicals (including cyanide) used in the milling and leaching processes, and grinding balls to crush the ore. We also consume substantial quantities of other non-renewable materials such as fuel, lubricants, grease and explosives.

Fig. 2.5 Major Consumables (tonnes)



2.2 | LOCAL PROCUREMENT

One of KGC's priorities is to procure goods locally. We have strict criteria all local suppliers must meet. We consider sustainability, quality, and price when we procure goods and services.

We believe KGC's Local Procurement Strategy creates substantial economic benefits for Kyrgyzstan on local, regional, and national levels. Local procurement leads to creation of new employment opportunities and income sources, acquisition of new skills and technologies, and helps to establish vital local business networks. Therefore, local procurement provides immediate opportunities for creation of common benefits – benefits for both KGC and the communities in which we operate. More information about our local procurement strategy is available on our corporate website in the Procurement and Logistics section **(www.kumtor.kg/en/procurement_logistics/)**.

Some of our stakeholders may be surprised to learn that nearly 600 Kyrgyz enterprises supply our operations with almost 11,000 items needed for our day-to-day operations. For more than 9 years 100% of food products are purchased within the Kyrgyz Republic.

Throughout the calendar year, KGC continuously provides work for about 1,100 contracted personnel of various trades and qualifications. The survey showed that the contracted labour predominantly (about 88%) originates from the Issyk-Kul province. This includes the major contributions of 48% from the Jeti-Oguz district, 14% from Ton district, with remaining 26% from other districts of Issyk-Kul province.

In view of the relatively constant seasonal work scopes for currently contracted organizations, and the well-established labour and equipment sourcing processes from nearby towns and villages, then potential new providers of the same services must be well equipped, very experienced, and competitive.

We proactively inform and communicate our requirements, and advise potential suppliers what they need to achieve to have the best chance of becoming a KGC supplier.

In 2016, we continued to implement the local procurement improvement opportunities identified by the KGC Procurement Department and Engineers Without Borders, an international NGO. Details and examples of joint efforts of KGC and an NGO are outlined on the website: **www.miningsharedvalue.com/our-work/**.

Fig. 2.6 **Local Procurement in Context**

	Units	2014	2015	2016
Total Payments for Goods and Services[#]	USD	377,760,751	279,731,777	256,188,105
Local Payments for Goods and Services[#]	USD	79,750,616	59,336,002	58,439,328
Local Payments for Goods and Services as% or Total	%	21%	21%	23%
Local Payments for Goods and Services as% of Adjusted Gross[*]	%	58%	57%	55%

[#] These figures include the fees paid to the Kyrgyzaltyn Refinery

** Excluding original equipment manufacturer (OEM) capital equipment and parts, major consumables, and reagents that are not available for purchase in the Kyrgyz Republic and fuel import from Russia. This is slightly different to the figures included in the Direct Economic Value Generated and Distributed Table because it is based on actual invoices paid (including advance payments) and does not differentiate between operating costs and capital expenditure.*

> "Since 2008 100% of food products are purchased within the Kyrgyz Republic."

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:

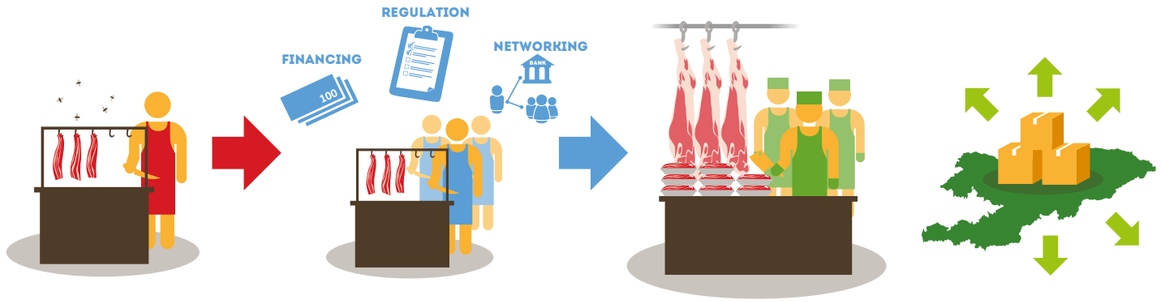
Formalization of business practices
- reduces corruption
- provides government revenue to pay for roads, schools, etc...
- job creation

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

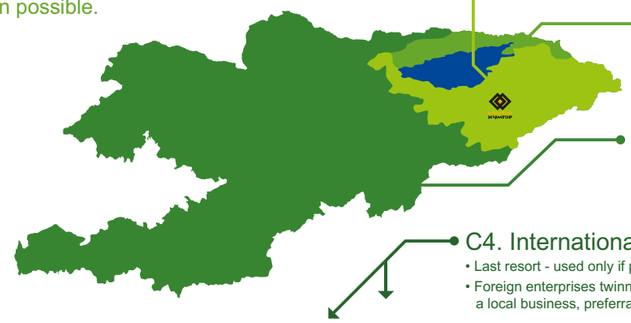
Competitiveness
- ability to compete with larger, more affluent enterprises for Kumtor contracts



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.



C1. Local Enterprises
- Located in the in Jeti-Oguz, Tong or Ak-Suu Raion.
- Most preferred

C2. Regional Enterprises
- Located in the wider Issyk-Kul Oblast.
- Second preference

C3. National Enterprises
- Located in the Kyrgyz Republic.
- Third preference

C4. International Enterprises
- Last resort - used only if products can't be supplied from within the country
- Foreign enterprises twinning with local Kyrgyz enterprises to develop a local business, preferrably in the Kumtor Impact Region.

KUMTOR КУМТОР

Like most international mining companies operating in regions with a limited history of large scale or modern mining practices, KGC faces a number of barriers to sourcing more goods and services locally. However, we support existing and potential local suppliers to help them overcome these barriers. In 2016, 23 types of goods and services from 8 categories previously purchased on the international market were replaced by local suppliers. We have increased our database of local partners by 89 new enterprises and service providers.

We are convinced that local procurement brings significant benefits to KGC, not only for the company itself, but also for local economies. It is one of the most effective ways for KGC to maintain its social license to operate, strengthen its relationship within the Kyrgyz Republic, and improve the supply chain efficiency. One of the priories of our procurement team is to increase the quantity and range of goods and services procured locally by KGC in order to create shared value for the company and the Kyrgyz Republic. We also aim to leave a positive legacy, which will further drive the development of the Mining sector and related industries.

Despite our continuous efforts for improvement, there remains a significant part of our procurement needs, which are not produced or readily available in the Kyrgyz Republic. Examples include specialized mining goods and services, such as heavy mining trucks, original equipment manufacturer (OEM) parts, tires, and major consumables and reagents. Also, as a large consumer of diesel fuel, we have to import a large portion of our fuel.

Our total expenditures on goods and services in 2016 was nearly $256 million. This included approximately $58 million procurement within the Kyrgyz Republic. When adjusted to exclude goods with no potential for local procurement, and imported fuel, over 55% of procurement expenditures remained within the Kyrgyz Republic in 2016.

- 2016 total spend represented by 1,049 suppliers (486 International and 563 Local);
- 80% of the total spend represented by 53 suppliers (36 International and 17 Local);
- 20% of the total spend represented by 996 suppliers (450 International and 546 Local).

Leaving a Positive Legacy

We carried out an economic impact assessment of our business in 2014 which was reviewed and updated as part of the 2016 conceptual closure planning process. This provided more detail on the impact Kumtor Gold has on the Kyrgyz economy, and helped us further determine where we could improve in this area. The current projected lifetime of the Kumtor Gold Mine is until 2026. We want our positive impact on the Kyrgyz economy to continue long after this time. Therefore, we encourage our suppliers not to be over-dependent on our business, but to use it as a catalyst to diversify their product and customer base. Many of our suppliers highlight that a contract to supply KGC is a mark of quality making their products more attractive to other potential customers. Looking ahead to 2026 and mine closure, we need to ensure that we do not cause greater socio-economic difficulties by having large numbers of suppliers suddenly closing once KGC stops operating. Therefore, we place an emphasis on helping businesses grow without relying on KGC as a sole customer.

We want our suppliers be more successful and continue to create new jobs and opportunities for the local community. Understanding their need for working capital, we pay suppliers quickly, often within days, and provide advance payment in appropriate cases involving long-lead items.

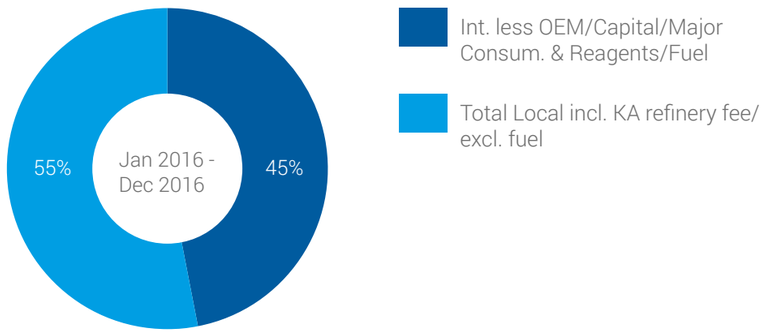
Balykchy Marshalling Yard

Balykchy Marshalling Yard (BMY) is the central transportation hub for all materials arriving by rail. Materials are dispatched to the Kumtor Mine using mostly MACK (KGC) trucks and contracted transport (when necessary).

- An average of 218 rail cars and 60 truck loads are received per month;
- BMY dispatches an average 22 truckloads of goods and products to the mine site per day. These typically consist of 11 trucks of fuel, 6 trucks of ammonium nitrate, 1 truck of lime, and others carry consolidated containers containing equipment and reagents;
- Our self-owned fleet of trucks consists of 48 trucks, and we use an average of 1 or 2 contracted trucks per day;
- The distance from BMY to the mine site is 250 km, which means distances of 341,000 km are travelled monthly, volume of transported diesel fuel per month amounts up to 10 million litres.

BMY also includes a fuel farm with a filling station. The fuel farm accommodates 6 tanks with capacity of 12,000 m^3, two 100 m^3 for fuelling trucks with diesel fuel, and one 200 m^3 tank for gasoline. Other infrastructure includes warehouses, mechanical workshops, administration facilities and a guest house. 207 people are employed at BMY and the strategy is to employ people from local communities in and around Balykchy. We also make use of suppliers in Balykchy for material and product purchases, and maintenance work required for the day-to-day operational needs for BMY and its guesthouse.

Fig. 2.7 12-month Spend, International less OEM Equipment/OEM parts/ Major Consumables/Reagents and fuel vs Local excluding fuel



AIKO SEIKO - CONSTANT PURSUIT OF EXCELLENCE

A local sewing company Aiko Seiko has been operating in KR for 13 years. In December 2003, the first order was issued with KGC and since then a strong supplier partnership has been strengthened. Almost all workers at Kumtor need winter and summer garments suitable for the challenging natural and climatic conditions. It is very important for the KGC to provide employees with high-quality garments to facilitate hard work and ensure the safety of our employees. Aiko Seiko meets the standards and requirements of our company and is constantly improving the quality of products. In 2016, after visiting the mine and conducting product analysis in the field the supplier had new ideas, which will be implemented in 2017. Aiko Seiko has demonstrated it can consistently meet our quality, quantity, and safety requirements and has consequently become a preferred supplier. Starting out with a few orders Aiko Seiko today is one of the largest taxpayer in the region, paying about 150,000 dollars to the local budget annually and provides jobs to more than 50 local residents, most of whom are women. About 25 large companies from different regions of the country are clients of the company. Aiko Seiko's products are in great demand, so the company plans to increase production and purchase additional equipment.

KURMENTY CEMENT - REVIVAL OF THE ENTERPRISE

The procurement strategy of KGC always assumes the support of local producers of raw materials necessary to maintain continuous production at the mine. The company's needs for lime for a long time could not be satisfied with the Kyrgyz suppliers, but a couple of years ago, KGC began to replace part of the needs for lime from the Kurmenty cement plant (Tyup district, Issyk-Kul oblast).

Our orders allowed the Kurmenty cement plant to resume production at full capacity and provide jobs for 73 people through increased cash flow. In 2016, the Kurmenty cement plant successfully supplied a trial lot of lime, improved the packaging and optimized the logistics of the goods, thus proving to be a good supplier. The company consequently signed a contract to supply 4,200 tonnes of lime to the mine.

Kurmenty cement plans a complete reconstruction of all production lines, including cement line, which was stopped because of the failure of the rotary kiln. Construction Materials, cement and lime can become a source for the production sandblocks, concrete products for foundations, silicate bricks, sandwich panels, etc. Increased production capacity will not limit sales only to Bishkek and Issyk-Kul oblast.

A RELIABLE PARTNER IN THE SUPPLY OF BEDDING

The Kumtor Mine site has about 1,500 employees who need a good rest after working a12-hour shift. The company pays special attention to the well-being of all the staff, and therefore has high standards for the suppliers of bedding.

The Society for the Blind and Deaf LLC supplies half the necessary amount of blankets and bedding.

The Society has 65 members, most of whom are women with disabilities. They produce about 40 different high quality products.

KGC orders a relatively small amount from the Society, but the enterprise has other customers all over Kyrgyzstan.

OPTIMIZATION OF PRODUCTION PROCESSES - TIRE RECYCLING

In 2016, KGC found a private entrepreneur who offered to repair a test sample of medium-sized tires. The process is laborious and no more than five tires can be repaired in a day.

The entrepreneur Neforosnyh borrowed tire repair technology from a Shanghai firm and in 2013 invited a specialist to conduct training for the employees. Cold curing technology is used in the plant to repair and restore tires - a technology which is used around the world and which allows substantial financial and material savings.

Leading manufacturers make new tires with a margin of safety, which guarantees that the service life and durability of the tire is 3-5 times greater than the life of the tread. In weight and cost of a tire, worn tread is slightly more than 20%. Others parts of tire can serve several extra years. Through this, there is a possibility of multiple recovery of the tread of the tire, which is a profitable economic alternative to purchasing new tires.

Using tires of the world's leading manufacturers, monitoring the load capacity of the trucks, allows the entrepreneur to retread a tire 2-3 times, without compromising quality and safety. The use of certified materials and technologies ensure reliable operation of a restored tire. Moreover, for KGC it is another way to reduce the amount of industrial waste.

TRAINING OF MAINTENANCE PERSONNEL AT THE SUPPLIER'S ENTERPRISE

We continue to provide all possible assistance to our international suppliers wanting to expand their potential in the local market. The official dealer of Caterpillar products Borusan Makina Kazakhstan from Karaganda, Kazakhstan supports our policy on professional development and in 2016, we jointly launched a training program for maintenance department young professionals.

The training course was specifically designed for the employees of Kumtor, who graduated from Technical School #27. All costs for flights, training and accommodation are fully paid by Kumtor.
KGC has cooperated with Technical School #27 for more than 16 years. More information about the Internship program is available in the Social Responsibility Section of the Report.

20-day internship of young specialists at the supplier's enterprise is an investment in the successful future of both the Company and young professionals. They have learned new technologies and working methods, and on arrival, they shared their experiences and skills with colleagues.

Cooperation with the supplier was also expanded after the establishment of a local branch of the official dealer in the Kyrgyz Republic. This allowed more than 36 Kyrgyz citizens to get trained in Karaganda for six months on heavy-duty equipment maintenance and get a job at the Kumtor mine, supporting the uninterrupted work of our heavy-duty trucks.

3 PEOPLE

3.1 | WORKPLACE PRACTICES

KGC maintains a high level of care and responsibility for our workforce, including contractors. We train and equip our workforce to operate safely. Employees' health and diet is monitored, and they are trained to work with respect for the natural environment around them.

Labour and Local Hiring

We continue to maintain a high percentage of Kyrgyz nationals among our full-time employees, rising from 95% in 2011 to 97% by the end of 2016.

Worker Compensation

We believe the biggest contribution we make to the well-being of local communities is through creation of long-term, well-paid employment opportunities. This helps not only the employee and their family, but also provides wider economic benefits to their communities. Our pay rates are far above the Kyrgyz average, with the entry-level wage in 2016 fourteen times higher than the national minimum wage. The satisfaction of Kyrgyz employees is reflected in the fact that many remain working for us long term.

Employee Benefits

The benefits we provide to our full-time employees include:

- Cash awards for significant work anniversaries, births, and child adoptions;
- Home improvement loans;
- Vacation and rest allowances;
- Funeral allowances and many other benefits.

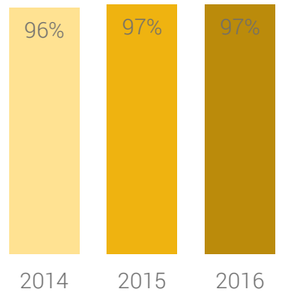
Collective Bargaining

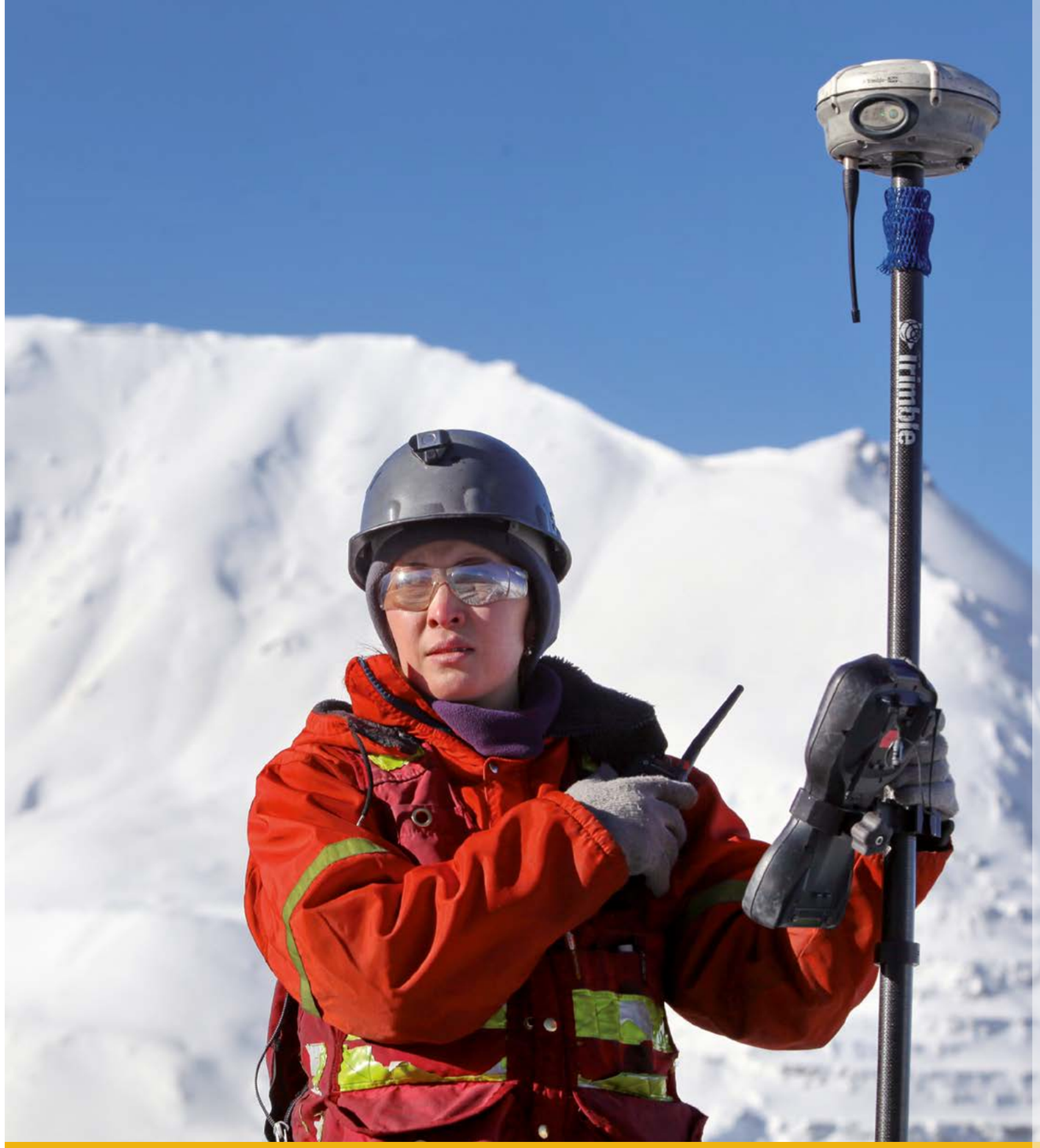
Freedom of association is a human right defined by international declarations and conventions, and support of the principles of collective bargaining is part of a framework of responsible management at KGC. The Collective Contract signed between five trade unions (that currently exist in the Company) and KGC administration (effective from January 1, 2017, to December 31, 2018), covers 84% of employees. This Contract covers a wide range of issues, including labour compensation, inflation increase, work schedule, health and safety, benefits for employees and their families, as well as labour dispute resolution. Staff commit in turn to perform their job duties safely and with good quality, adhere to labour discipline, not to hold illegal strikes, etc. The Collective Contract stabilizes and guarantees labour relations at the largest gold mining company in Kyrgyzstan for the next two years.

Fig. 3.1 **Standard National Entry Level Wages and Those Paid by Kumtor**

	units	2014	2015	2016
Kyrgyz minimum wage per hour	KGS	5.40	5.80	6.33
Kumtor entry-level wage per hour	KGS	73.34	78.20	86.2
Kumtor entry-level to Kyrgyz minimum wage ratio	Ratio	14:1	13:1	14:1

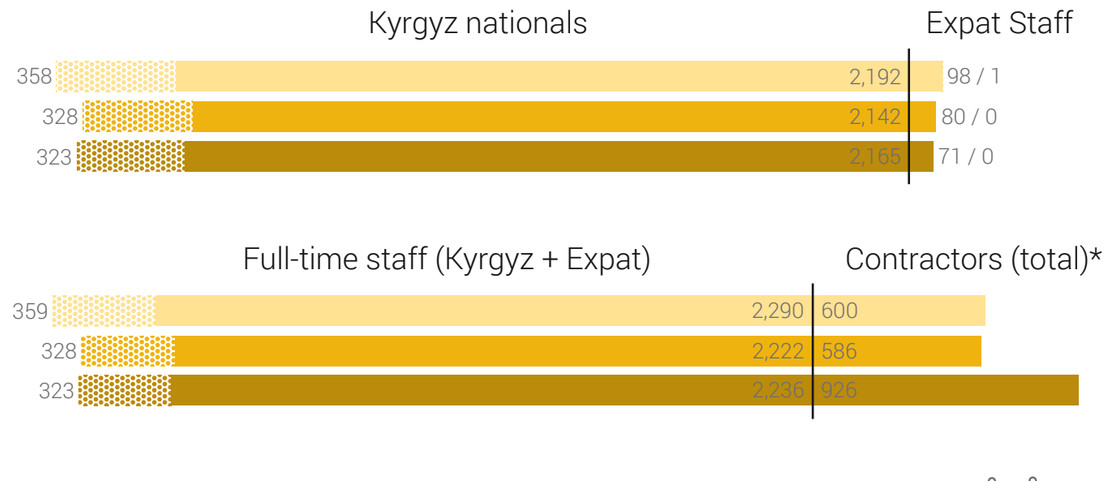
Fig. 3.2 Proportion of Kyrgyz Citizens as Full-time Staff





> "Our pay rates are far above the Kyrgyz average, with the entry-level wage 14 times higher than the national minimum wage."

Fig. 3.3 Employee Demographics at KGC*



Notes:

** Number of contractors for 2014 changed due to clarifications and improvement in our tracking systems.*

Fig. 3.4 Total Workforce by Region and Gender

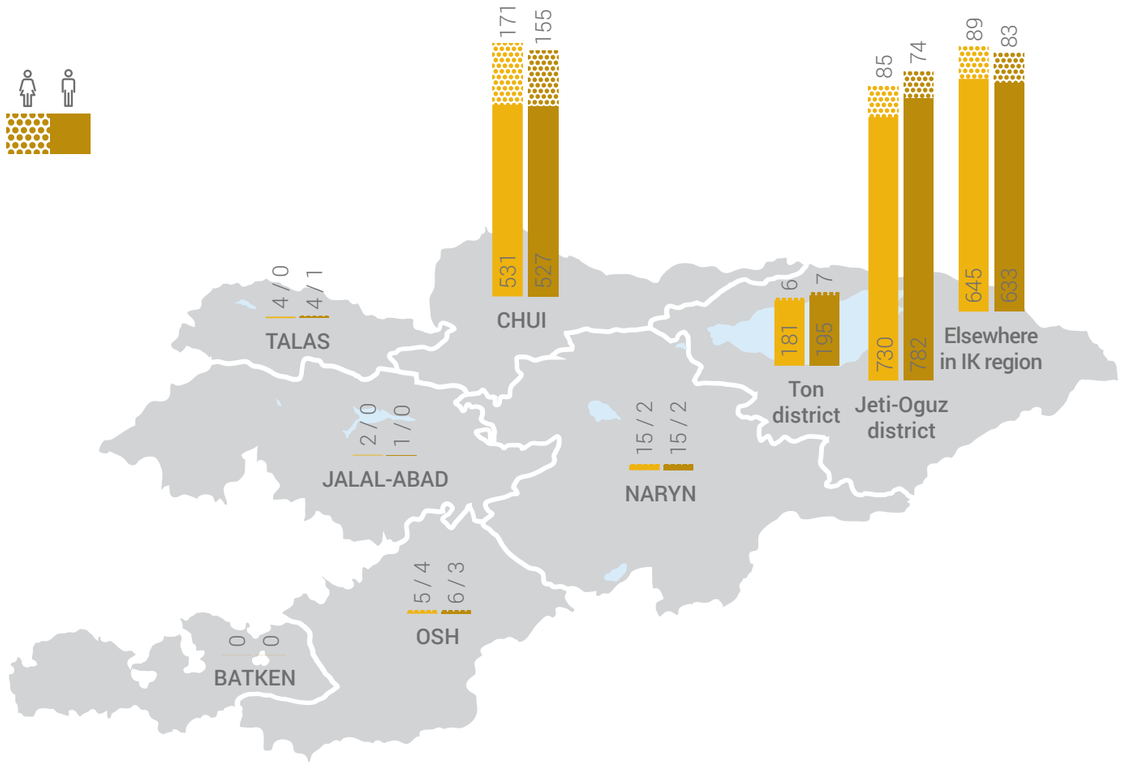


Fig. 3.5 Number of Contractors by Region and Gender

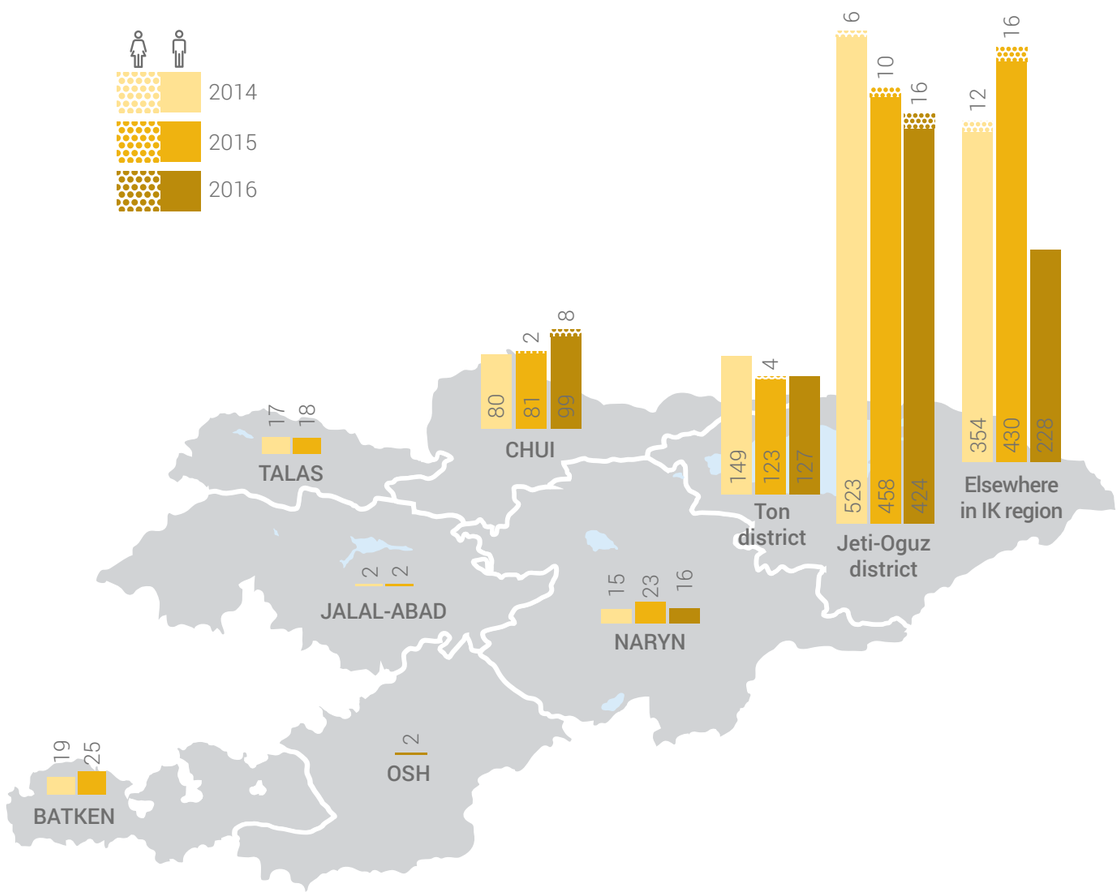


Fig. 3.6 Total Number and Rates of New Employee Hires and Employee Turnover by Gender and Region

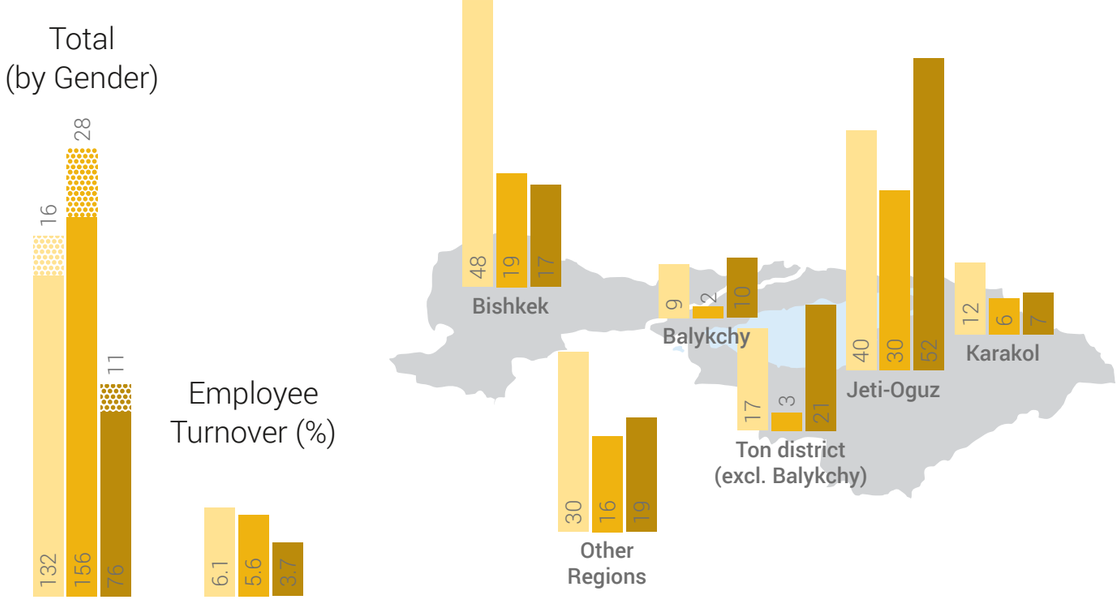
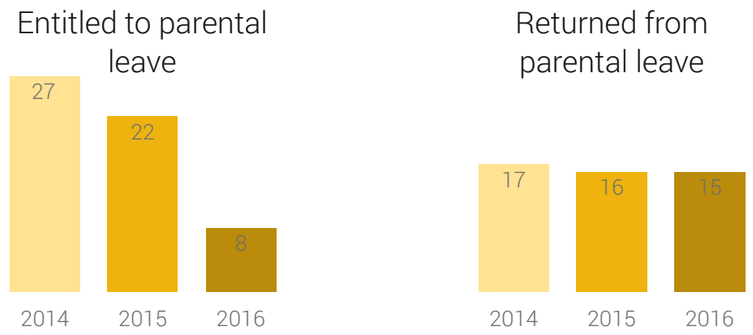


Fig. 3.7 Return to Work and Retention Rates After Parental Leave (Female Employees)



Recruitment Process

KGC has a policy to ensure its recruitment process is open, transparent and fair, as defined in the Policy and Procedure documents on National Employment and Recruitment and Selection. We have clear criteria on defining who is eligible for consideration, and we operate a clear and open recruitment process.

As it is standard for employment in an advanced industrial operation, we have minimum eligibility requirements. Depending on the position, candidates must meet minimum education and qualification requirements and pass appropriate medical examinations to demonstrate fitness and good health given the high altitude conditions at the mine site. Some positions require specialized state-issued certificates, for example, for drilling and blasting work. Our recruitment process covered in the infographic on the next page.

> “Kumtor is regularly on the lookout for people with specific skills, initiative, and good character to help take the company forward.”

KUMTOR HIRING PROCEDURE

Kumtor is regularly on the lookout for people with specific skills, initiative, and good character to help take the company forward.

To find these people we have procedures in place:

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 REQRUITMENT CAMPAIGN IN HELD.

EMPOYMENT OPPORTUNITY ANNOUNCEMENT

Advertising for an open position is done through media (newspaper, TV, web). The community relations department uses all possible channels to notify the local community.

APPLICATION

Application forms are available at all company offices - located in Bishkek, Karakol, Balykchy, Bokonbaevo, and Kyzyl Suu.

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

The candidate whose experience best meet the requirements will be selected.

THE FINAL HIRING DECISION IS MADE BY THE COMPANY ADMINISTRATION.

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.

KUMTOR
КУМТОР

Employee Training

All new KGC employees, students and contract partner employees receive Safety Induction and Initial Health, Safety and Environment Instruction, First Aid Training along with regular annual refresher training. Training covers safety orientation, first aid, firefighting, emergency response, workplace hazards, materials safety, transportation of dangerous goods, defensive driving, forklift truck operation, work permits, radiation hazards, vessels under pressure, working in confined spaces, handling cyanide and other chemicals, hearing protection, ultraviolet radiation, frost bite and hypothermia.

- Mandatory and Compliance Safety training totalled 56,656 hours for the year 2016 for more than 2500 employees students and contractors;
- Sessions for new employees students and contract partner employees - 18,005 hours;
- Annual Refresher Sessions - 24,171 hours;
- Red Crescent First Aid Certification Training - 14,480 hours.

During 2016 KGC invested approximately $2.9 million for the training of employees, students and contract partner employees, which is a slight increase to the $2.8 million spent in 2015. KGC employs more than 35 full-time dedicated training staff and KGC also utilizes the services of external training providers, such as Red Crescent Society of Kyrgyzstan, Training Centre under the State Agency of Geology and Natural Resources, Bishkek Business School, Alfa Leader, Borusan Makina and several other local and international training providers.

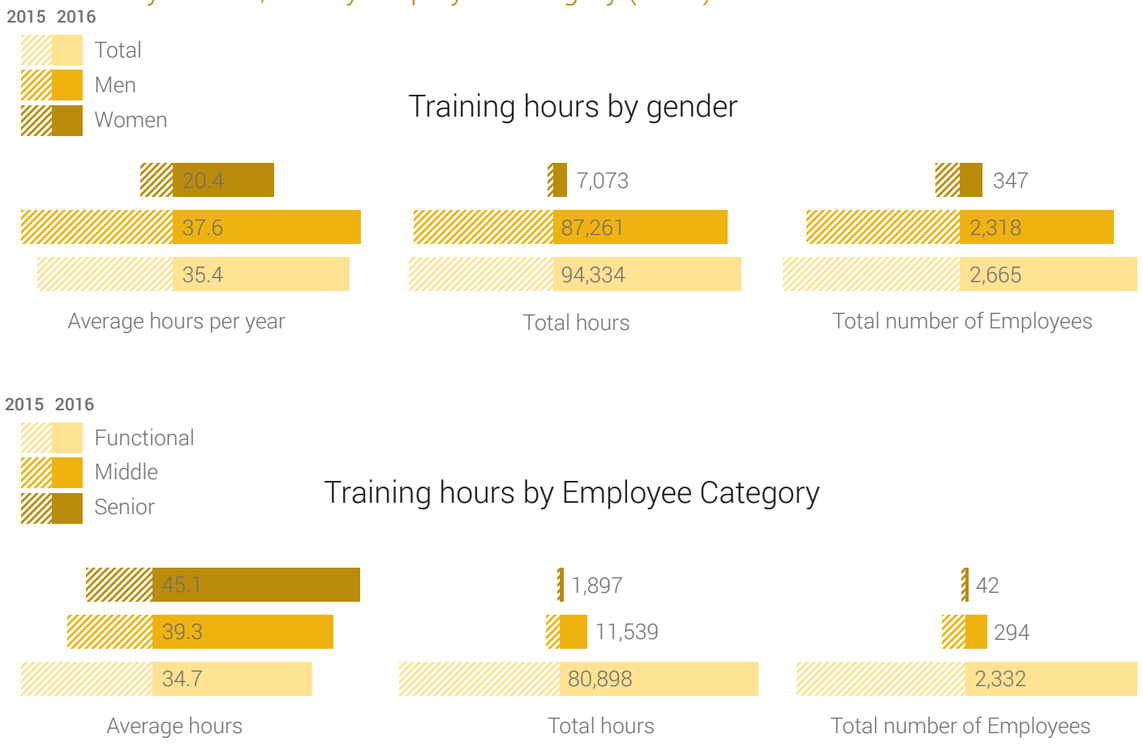
The total value of $2.9 million includes all cost associated with training from all KGC departments and includes all costs incurred with employing training staff, maintaining facilities, contracts with local and international providers, etc.

Three training facilities established in 2014 in Karakol, Balykchy and Bishkek continued their operation in 2016 proving to be a cost and time efficient decision in terms of process of optimization. It allowed KGC employees, students and contract partner employees the opportunity to attend any required training during their off-duty time in a location close to their place of residence.

All regular workers - especially those in charge, engineers and technicians - are trained in specialized centres and receive certification from government agencies in hazardous operations, in accordance with the law of the Kyrgyz Republic.

During 2016 KGC completed the implementation of an electronic Training Management System allowing for more efficient scheduling and planning of training activities, centralized training data collection and enhanced reporting capability.

Fig. 3.8 Average Hours of Training per Year per Employee by Gender, and by Employee Category (2016)



Cross-cultural dialogue

In 2016 there was an incident with an expat employee resulting in departure of that employee from the country. The misunderstanding between local employees and the expat employee took place because of a national dish chuchuk. KGC adheres to the KR laws and respects the national culture of all employees.

To avoid similar situations a more comprehensive module on Kyrgyz culture has been included to the New Employee Induction that all new expat employees are required to attend. In addition to this all KGC expatriate employees attended mandatory Cultural Sensitivity Refresher training during the first quarter of 2016.

GRADUATE DEVELOPMENT PROGRAM

KGC introduced the two-year Graduate Development program in 2006, intended to attract high calibre post-secondary graduate students whose areas of study are closely related to the mineral extraction industry.

Recent graduates are eligible to apply for the program that allows them the opportunity to gain practical experience by applying their theoretical knowledge and expertise in the workplace. They are also given opportunity to become familiar with the interaction of departments within the company and the structure of KGC and Centerra Gold Inc.

In April 2016, KGC participated in the Annual AUCA Career Fair as a Platinum Sponsor. Representatives from KGC were available the booth to provide information, receive applications and answer the numerous questions of the many students and other visitor that stopped to view the displayed items.

This Graduate Development Program has been instrumental in KGC's ability to recruit, develop and retain many talented graduates that have chosen employment with KGC following completion of the program.

Since inception of the program 63 graduates have been recruited, with 44 gaining full-time positions or continuing to participate in the program, including 4 that are now in supervisory positions.

2016 professional development opportunities for employees included:

- Education assistance support to obtain higher education degrees at institutes of higher learning, examples of this are roles requiring technical diplomas or MBAs, financial support and education leave are granted as per Policy 1-25;
- 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 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 2016, 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. Also, in agreement with Technical School #27 and Technical School 91, KGC sponsored Red Crescent First Aid Training for all 2016 Regional Scholarship recipients attending each institution.

After completing the eight-hour training session each participant is awarded a First Aid Certificates 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.

3.2 | OCCUPATIONAL HEALTH AND SAFETY

When mining at the high altitude of 4,000 metres, the major challenges are living and working in a cold climate and reduced oxygen levels. Average annual temperature is minus 8°C with a minimum as low as minus 38°C.

Our employees receive regular health checks and support and 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, and maintain an emergency response team that performs regular training exercises. Our motto is **"No job is so important that we cannot take time to do it safely."**

Medical Screening and Wellness

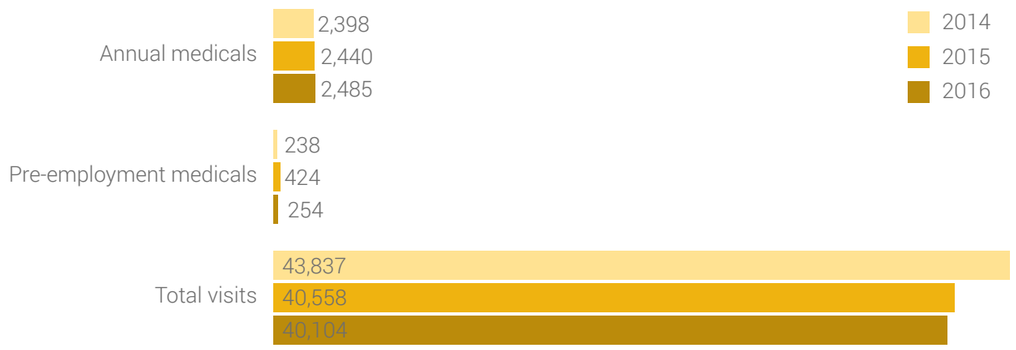
Our employees undergo annual medical examinations, in particular with respect to ensuring they are fit to travel and work at the mine site with reduced oxygen conditions. To assist with these examinations, KGC has several contracts with local state polyclinic in Bishkek and Issyk-Kul regions. In 2016, 2,299 employees passed annual medical examinations, 201 passed pre-employment screening, 170 employees were referred for special medical examinations and 52 employees were classified as medically unfit to work at the high altitude mine site.

KGC maintains medical clinics and staff in Bishkek, at the BMY and at the mine site, with trained medical staff including doctors and nurses. Expatriate employees and 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. A barometric chamber and oxygen are always available on site to help treat persons with symptoms of AMS.

We have pro-active health programs to motivate our employees and improve their general health and wellbeing. Every year we conduct a flu prevention vaccination program, which included 800 employees during the 2015/16 winter season. Our monitoring shows that upper respiratory tract infections remain the principal cause of illness and work absence. We have been running a smoking cessation program since 2002 consisting of a number of parallel initiatives including individual counselling, medication and allocating areas outside of the work place where smoking is permitted. This latter provision is particularly important for reducing the risks of passive smoking.

A nutrition-monitoring program has been conducted since 2010, which includes individual counselling of employees on their nutrition and reviewing the nutritional balance of food, provided at the mine camp. For every meal, a wide choice of high quality, freshly prepared food is available, providing for personal and cultural preferences, and entirely sourced from companies within the Kyrgyz Republic.

Fig. 3.9 Medical Screening and Visits



LEADERSHIP PROGRAM: WORK SAFE - HOME SAFE

Centerra is poised for considerable growth over the next few years with a strong commitment to develop leadership across its operations worldwide. Essentially, all facets of the organization will need to demonstrate commitment to build, operate and maintain safe and productive projects and mines in a responsible and professional manner. Centerra has embarked on a journey towards a desired company culture that values its employees and their contributions to Centerra's goals and objectives.

We have always been committed to ensuring our employees return home safely after every shift. We believe that every individual within the Centerra organization, its contractors, and other business partners, must also take ownership of their personal safety, and the safety of those working around them. Centerra is an industry leader in safety statistics. However, safety statistics can be misleading and, unfortunately, significant incidents and serious injuries continue to occur.

Gathering feedback and input from discussions at all levels of the organization throughout CG's global business units in 2016, we agreed that there was a need for a Safety Leadership transformation. CG managed to collect and integrate views into the joint program, and along with the assistance and guidance of a consultant, Work Safe | Home Safe became CG's Safety Leadership initiative. Newly-adopted CG's Vision and Values were also incorporated into the Program.

The implementation and rollout of Centerra's Vision, Values and WS | HS program began in the fall of 2016 with Kumtor employees being selected as the first within the organization to be exposed to the initiative. The program consists of a one (1) Day version (for employees) and a two (2) Day "Leadership" version for supervisors and managers. Both versions are designed to provide information to change behaviour, deliver an emotional element to build commitment to change, and conduct several interactive team based exercises where data is collected to provide on-going focus and feedback to management teams. This feedback is then considered for opportunities in continually managing change and improving safety leadership and culture.

Implementation of Work Safe | Home Safe at KGC is expected to be completed by the end of Q3 2017.

Accident Reporting

We implement programs that identify, record, assess and control 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 then evaluate the risk and according to risk classification, implement appropriate measures to remove the hazard and reduce any future risks from taking place. Unfortunately, despite our focus and efforts on health and safety, and our positive historical safety performance, we had a fatal incident with our Crusher Operator.

As a result we have undertaken an investigation and review of the accident, existing controls, procedures and service requirements with local authorities. The company has installed more guarding, warning signs and revised the procedure of maintenance of this section in the Mill.

Our key health and safety statistics are shown in the table overleaf.

We have a Joint Occupational Health and Safety and Environment Protection Committee, which includes representatives from various departments, organizational units, services and contractor employees by various locations of the company. Visits of managers and heads of departments is also required. Occupational health and safety and environmental protection issues are being discussed during the Committee meetings. Members of the Committee conduct inspections and check workplaces.

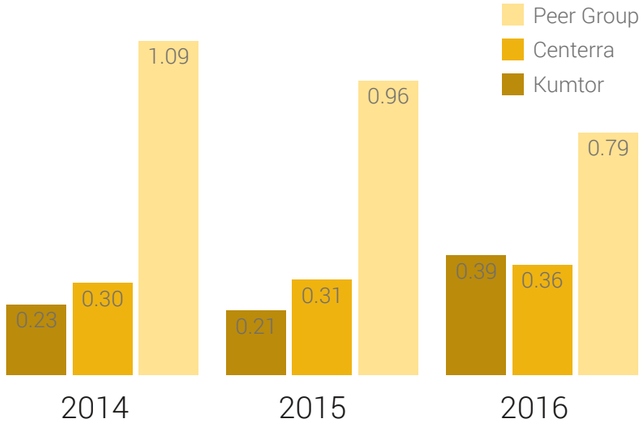
Fig. 3.10 **Key Health and Safety Statistics**

	Units	2014	2015	2016
Hours worked	Hours	5,981,799	5,734,240	5,712,626
Lost Time Injuries (LTIs)	Number	4	3	9
Medical aid	Number	3	3	2
First aid	Number	16	16	17
Days lost to injury	Days	6,093	52	6,349
LTI frequency rate	No. of LTIs per 200,000 hours worked	0.13	0.10	0.33
LTI severity rate	Lost time days per 200,000 hours worked	203	1.81	222
Reportable Injury Frequency Rate (RIF)	No. of Reportable Injuries per 200,000 hours worked	0.23	0.21	0.39
Incidents with Property damage	Number	38	31	31

Note: *See Glossary for definitions of key terms*

**Compared to 2015, the large variance in the table for days lost to injury and the LTI severity rate in 2016 is due to the fatality and lost time injury that occurred at the Mill. Based on international standards, an automatic 6,000 lost work days is counted for the fatality.*

Fig. 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. As well, 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

A special focus for employee awareness remained, as for previous years, on vehicle incidents with collisions and over-turning vehicles in the mine pit considered the most significant risks. Our program has been successful in reducing vehicle accidents by one and a half times compared to 2014. The following 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 skill and awareness through job assessments and training. Currently we are in the process of reducing Light Vehicle permits/licenses in the pit in an effort to reduce the risk of Heavy Equipment and Light Vehicle interaction.

Cyanide Transport and Handling

Cyanide is an essential chemical for gold extraction, which must therefore 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**. Since April 2012, Kumtor is 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.

Fig. 3.12 **Vehicle Incident Reduction Program (total number of incidents)**

	2014	2015	2016
Overall vehicle accidents	17	12	11
High-potential injury risk - light vehicle accidents	4	2	3
In-pit heavy versus light vehicle collisions	4	2	2
Injuries due to vehicle accidents	2	1	1

Emergency Prevention and Response

We have 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 appliance 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. Mock training exercises and an annual competition involving the Company's team and others (such as Ministry of Emergency Situations, local communities and Kyrgyzaltyn) contribute to our preparedness and emergency response capabilities. Our training is in accordance with the Kyrgyz State Inspectorate for Environmental and Technical Safety. Our emergency response training is aligned with international practices. If significant events occur we analyze and learn from them, review our emergency procedures and improve them as appropriate. Our mine rescue practices and training programs are aligned with best international industry standards.

Emergency Team Trainings and Exercises

Every Saturday, between 1 p.m. and 6 p.m. (5 hours) emergency response team members from all mine site locations go through Emergency prevention training sessions and exercises. In 2016, we conducted 52 training sessions at the mine, and 26 sessions at the BMY, totalling 260 hours at the mine and 78 hours at the BMY, as well as 5 special circumstance sessions at the mine site simulating various types of emergencies at the mine about different types of emergency, and 4 sessions at the BMY (cyanide and chemicals spills and dispersal, vehicle accidents, injuries, fires, etc).

Additionally, every year, team members are trained in a specialized Training Centre under the Ministry of Emergency Situations of the Kyrgyz Republic where they receive special certificates upon 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 voluntary emergency response team consists of three teams at the Kumtor mine and one team at the BMY.”

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 over 25 people at the mine site. Our total annual expenditure on environmental management (including capital expenditure) exceeded $6.9 million in 2016 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

We completed a range of focused environmental projects during 2016 – all aimed at improving our environmental management practices or our understanding of the natural environment and our impact upon it. These studies involved staff of the KGC Environment Department working with international consultants, many scientists and researchers from the Kyrgyz National Academy of Sciences, Kyrgyz National Agrarian University, and, as well as other national scientists, postgraduates and researchers. These projects included:

- Continued monitoring of traffic and dust concentrations in the Barskoon Valley in accordance with international standards;
- A variety of fauna surveys within the KGC concession area including observations of migratory birds, Marco Polo sheep, mountain goats, wolves, and foxes;
- Continued studies into the potential risk of CN impacts on biodiversity around the tailings dam – as part of demonstrating compliance with the International Cyanide Management Code;
- Further support and cooperation with Flora Fauna International (FFI) to improve biodiversity conservation and management in the SCER;
- Continued research into appropriate rehabilitation techniques for disturbed land, including the expansion of rehabilitation trial plots and top soil development strategies to improve the long term storage and viability of collected topsoil;
- Continued research into the use of wetlands to reduce concentrations of ammonia and heavy metals from the waste rock dump runoff and ETP discharge;
- Formation of a CAP Team to investigate and implement 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 the basins of the Arabel and Uchkol Rivers;
- Controlled lowering of the water level in Petrov Lake to reduce the risk of a Glacial Lake Outburst Flood (GLOF).

Fig. 4.1 **KGC Environmental Protection Expenditures and Investments (USD)**

	2014	2015	2016
Waste disposal, emissions treatment	4,036,409	3,456,740	3,803,376
Pollution Prevention & Environmental Management Costs	3,547,008	3,344,100	3,018,788
Environmental Capital Projects	321,634	0	105,100
Total	7,905,051	6,800,840	6,927,264

> “Our total annual expenditure on environmental management exceeded $6.9 million.”

4.2 | ENVIRONMENTAL MONITORING

Our monitoring programs follow Kyrgyz and international standards, and include:

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

The locations of key monitoring points are detailed in Figure 4.3 on the next page.

Fig. 4.2 **Description of Key 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
W1.3	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)
W4.3.1	Discharge of Upper Diversion Ditch (UDD) sediment pond to Kumtor River
W2.6	New Chon-Sarytor Creek in Central Valley before joining Kumtor River
POR1	Pit water collection sump before discharge to Kichi-Sarytor Creek
SWS.3	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, 6km 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 230km downstream from Kumtor Concession Area
W1.8F	Naryn River just after Naryn City
P5.2N, P5.3	Potable (treated drinking) water - Camp and mill

Fig. 4.3 Key Environmental Monitoring Locations

Meteorological Monitoring

We have a mutually beneficial arrangement with the Agency of Hydrometeorology under the Ministry of Emergency of Kyrgyz Republic Government. One of the monitoring stations (relocated and upgraded in 2016) is a formal part of the national weather network, which provides local weather forecasts, important for safe and efficient operation in the extreme climatic conditions on site. This new station collects and exports data to MP5 (the environmental monitoring software used at KGC - see case study below), in accordance with Canadian Atmospheric Environment Services protocols. In addition, KGC has installed other automated meteorological stations, - one in the Central Pit and one on the Sarytor Glacier. The Saskatchewan Research Council in Canada is contracted to calibrate sensors and ensure they function correctly.

ENVIRONMENTAL DATA MANAGEMENT SYSTEM ADOPTED AT THE MINE

To minimize the risk of human error and ensure quality control of data we adopted 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 synchronised later in the office, external laboratory reports are directly imported, and some environmental monitoring instrumentation (river and creek flows, weather etc) imports data directly into MP5. 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.

Hydrological Flow Monitoring

We track hydrological flows of the main water bodies within the concession area. These include Kumtor River and its principal tributaries (including Chon-Sarytor, Kichi-Sarytor and Lysyi Creek), 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 April and September each year. In 2016, a peak of 16.59 m^3/s was recorded on July 17. In 2016, the total annual flow of Kumtor River at the flume within the concession area was 107.55 million m^3 and the flow at the End of Mixing Zone (also called W1.5.1), KGC's main water quality compliance point, was estimated to be 131.030 million m^3. These variations are not considered significant in the context of normal year-to-year fluctuations (see Fig. 4.4).

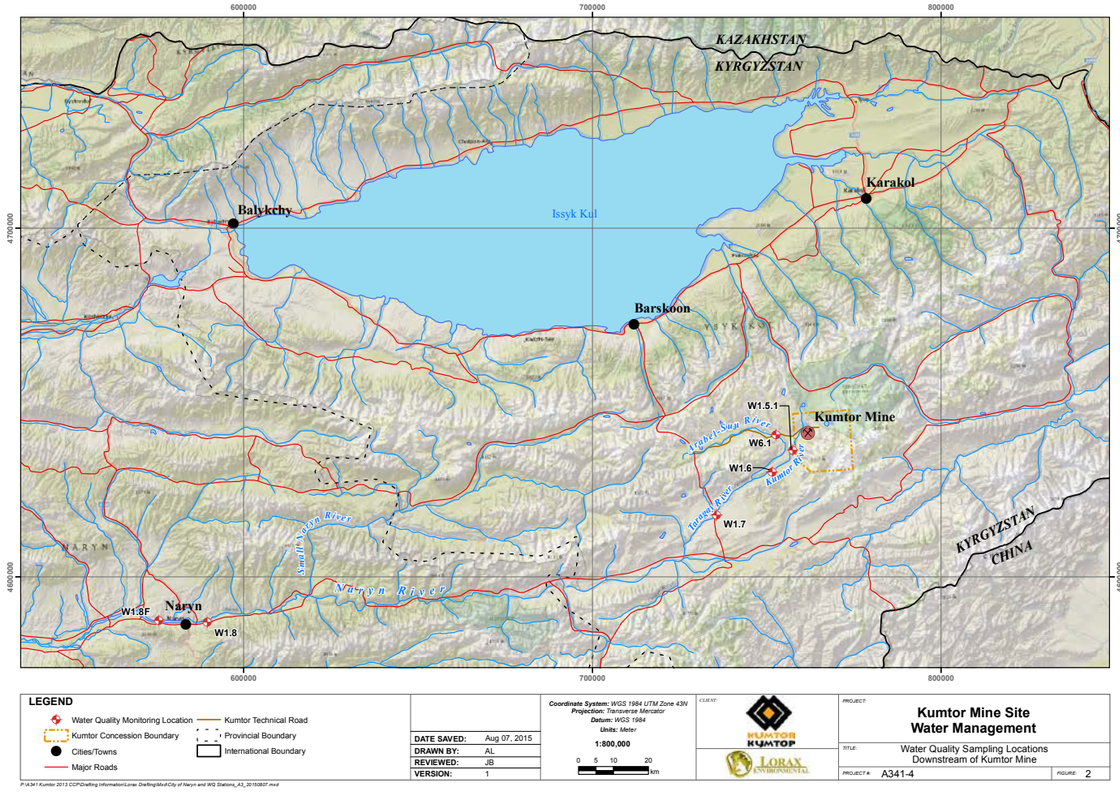
We also monitor water levels in Petrov Lake, which serves as the fresh water source for Kumtor Mine site. The highest recorded level was 3,732.54 m above sea level in July 2016 (compared to 3,734.49 m in 2015) and the lowest was 3,731.51 m at the end of December 2016 (compared to 3,731.55 in 2015).

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, approximately 230 km downriver from Kumtor, the flow increases to an estimated 2,340 million m^3 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 effluent discharged back to the Kumtor River also reduces the net extracted volume (Fig. 4.5).

Fig. 4.4 **Kumtor River Flow**

Monitoring station	units	2014	2015	2016
Annual Flow in Kumtor River at flume (W1.4)	m^3/year	91,169,982	159,247,771	107,553,394
Annual Flow in Kumtor River at compliance point (W1.5.1)	m^3/year	103,765,221	197,085,788	131,030,653
Annual Peak instantaneous flow in Kumtor River at Flume	m^3/s	18.8	36.7	16.6
Peak daily flow in Kumtor River at Flume (W1.4)	m^3/day	1,627,776	3,172,608	1,433,376

Fig. 4.5 Water Quality Sampling Stations Downstream of Kumtor Mine



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 Figure 4.2 in this section, with locations shown on an aerial photograph of the concession area (Fig. 4.3 and in Figure 4.5). Water quality results and associated discussion are in a separate section of this report: Water Quality and Compliance.

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.

> “To minimize the risk of human error and ensure quality control of data we adopted a comprehensive and integrated Environmental Data Management system.”

4.3 | BIODIVERSITY

Our Commitment

We are committed to understanding and reducing our impacts to native biodiversity and working with our local, national, and international stakeholders to pursue net biodiversity gains. Further information is available on our website via the link below, from where our full Biodiversity Management Strategy and Plan (2012) can be downloaded: **www.kumtor.kg/en/environment-protection/biodiversity**.

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 region features globally important biodiversity and is home to a number of endangered species including the snow leopard, 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. Other species of concern include an aquatic plant in the Ranunculus family (Hedysarum kirgizorum), which is also included in the Kyrgyz Red Data book, possibly endemic species of dandelion (Taraxacum syrtorum), and a tulip (Tulpe tetraphylia).

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 day-to-day 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 a different 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 right) is expected to generate positive benefits for the wider region.

Glacier-fed rivers, including the Kumtor River, which originates from the Petrov Lake, form part of an important ecosystem service 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.

WILDLIFE MONITORING ON THE TAILINGS MANAGEMENT FACILITY

In 2016, the daily wildlife census monitoring program continued on the KGC 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 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 365 days out of a possible 366 days in 2016 (2016 was a leap year) – which equates to 99.7% 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 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 with the tailings and supernatant and exposure to their cyanide content. Figures for 2015 are included for comparison.

In 2016, four mammal species were recorded on the TMF (Grey Marmot, Red Fox, Wolf and Argali) and 30 species of birds – predominantly made up of wildfowl and waders. Two bird carcasses were identified during the year (both common species) with natural causes or predation identified as the most likely reason.

In summary, the extreme weather conditions and low food resources at the high altitude TMF continue to present a low-visitation habitat for birds and other wildlife. For large parts of the year, the TMF pond remains frozen, preventing wildlife exposure to the supernatant. 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 2017.

Fig. 4.6 **Summary of Wildlife Observations on the TMF**

Month	Total
No. of days NO wildlife observed	209/365
No. of days mammals observed	87/365
No. of mammal days 2016	201
No. of mammal days 2015	446
Max. mammal group size seen	12
No. of days birds observed	105/365
No. of bird days 2016	1,111
No. of bird days 2015	6,505
Max. bird flock size seen	60

KGC'S SUPPORT TO THE SARYCHAT-EERTASH NATURE RESERVE

KGC has cooperated with Fauna & Flora International (FFI) to deliver biodiversity conservation and management in the SCER and the wider surrounding Central Tien Shan landscape area of Kyrgyzstan. The two parties have signed a Memorandum of Understanding (MoU) to act as a platform for cooperation. As part of a five year commitment, in 2015 KGC provided financial support of $50,000 to enable FFI to work with the SCER administration and local stakeholders to develop and deliver effective conservation actions in line with the updated SCER Management Plan. Activities in 2015-2016 built on the achievements of previous years and took forward priority actions from the Management Plan.

SARYCHAT-EERTASH STATE RESERVE MANAGEMENT PLAN

The SCER Management Plan that was first developed by FFI with earlier support from IFC/EBRD and ongoing support from KGC, was approved in the summer of 2016. Now the reserve staff can officially rely on and be guided by the activities included in the management plan that was designed with inputs from Sarychat-Eertash management and staff, as well as international and local specialists in relevant fields.

TRAINING ON WILDLIFE MONITORING SCHEME

The training on wildlife monitoring scheme, which was developed in 2015 by the specialists from the National Academy of Science was delivered in 2016 to the rangers of the state reserve. There were two schemes developed, one on monitoring of plants, another – on animals. Two daily trainings were conducted in Ak-Shyirak village in October 2016.

GRANTS FOR POSTGRADUATE STUDENTS

A framework and application form of the research grant program was developed and distributed in the National Academy of Science, Kyrgyz National State University, and some environmental NGOs. Three preliminary applications was submitted and reviewed; since the program has not been widely announced yet. More applications are expected in 2017 before the field season starts in spring/summer.

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Locations of the tagged wolf named Kumtor at the Kumtor Mine, based on Google Earth data.

COEXISTENCE

The coexistence of humans and animals is an extremely important issue for KGC, given the operation's location adjacent to the Sarychat Eertash Nature Reserve. This is why hunting of all animals has been prohibited within the Kumtor Concession Area since the onset of mining operations. The mine site and surrounds has been the original habitat for many species, and according to monitoring data, approximately 30 wolves live in the immediate vicinity of the Mine.

The main causes of conflict between wolves and humans is most often as follows:

- Presence of offspring nearby (wolf may be defending them);
- Wounded, exhausted and sick animals may attack if suddenly disturbed;
- Adaption to human presence.

In 2015, KGC engaged a wolf expert from Flora Fauna International (FFI), to visit the mine site to help raise employee awareness about wolves (ecology and behaviour), the likelihood and possible cause of attacks and how to behave when wolves are encountered. Recommendations were also provided on how to protect the site and personnel from wolves. Additional support was provided by a wolf expert from the Kyrgyz Republic National Academy of Science (KR NAS).

As a result of this review, a number of measures were undertaken by KGC in 2016:

- Where natural food is in abundance, an important step is to eliminate access to food wastes that attract many carnivores to the Mine territory (Goldthorpe, 2015). The solid domestic waste landfill (commissioned in 2015) was fenced off against wolves and other animals to eliminate access to food wastes. These wastes are also covered with soil on a daily basis.
- Training was conducted for employees regarding the company policy of not feeding animals and the proper procedures relating to the disposal of food waste. In addition, a series of workshops and presentations were provided by the FFI and KR NAS experts on the correct response in the event of an encounter with wolves. In addition, a new section dedicated to wolves has been added into the annual refresher training and orientation training for new employees.
- A proactive program was launched to scare away wolves and re-introduce their fear of humans. As part of this initiative, two professional hunters armed with non-lethal rubber bullets were included in the night patrol of the Mine Security Department.
- As part of the efforts to monitor and study the etiology of wolves within the territory of the Mine, two wolves were caught by specialists of KR NAS, Shinshu Veterinary University (Japan), and Kumtor's Environment Department employees. Both wolves were equipped with GPS collars that will assist the study of the biology of the wolves by determining temporal and spatial habitat use, as well as their seasonal migration. In the future, these collars (designed to last for two years) will provide the opportunity to track the movements of the wolves, locations of their dens, and their feeding habits. The captured wolves were named Kumtor (male) and Elmira (female).

As part of the company's ongoing efforts to understand and minimize impacts to local biodiversity, KGC will continue to study the wolves living on/near the mine site, and implement strategies designed to minimize the potential of wolf-human conflicts.

References:

- Flora Fauna International (2015), Human-Carnivore Conflict Assessment Report and Mitigation Recommendations: Kumtor Gold mine site, Kyrgyzstan.
- Davletbakov (2016), Report on Research of Wolf Biology at the Kumtor Mine.

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Fig. 4.7 **Regional Fauna Species with Conservation Status Identified Within the Study Area***

Common Name	Latin Name	Kyrgyz Red Book (2006)	IUCN Red Book	Kumtor Concession	SCER
		Mammals			
Snow Leopard	*Uncia Uncial*	Critically Endangered	Endangered	Yes	Yes
Brown Bear	*Ursus Arctors*	Locally Rare	Least Concern	No	Yes
Argali	*Ovis Ammon*	Vulnerable	Near Threatened	Yes	Yes
Manul	*Otocolobus Manul*	Near Threatened	Near Threatened	No	Yes
Stone Marten	*Martes Foina*	Lower Risk/Least Concerned	No	Yes	Yes
		Birds			
Golden Eagle	*Aquila Chrysaetos*	Near Threatened	Least Concern	Yes	Yes
Lammergeyer	*Gypaetus Barbatus*	Near Threatened	Least Concern	Yes	Yes
Saker Falcon	*Falco Cherrug*	Endangered	Endangered	Yes	Yes
Black Stork	*Ciconia Nigra*	Near Threatened	Least Concern	Yes	Yes
Whooper Swan	*Cygnus Cygnus*	Least Concern	Least Concern	Near	Yes
Eurasian Black Vulture	*Aegypius Monachus*	Near Threatened	Near Threatened	Yes	Yes
Himalayan Griffon	*Gyps Himalayensis*	Least Concern	Least Concern	Yes	Yes
Demausel Cranes	*Anthropoides Virgo*	Near Threatened	Least Concern	Yes	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.*

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% of the commodity and service-related purchases. However, wherever feasible, we use electricity. The most energy-intensive operation is the mill, representing approximately 75% of our electricity consumption.

The Kyrgyz Republic generates more than 70% 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.

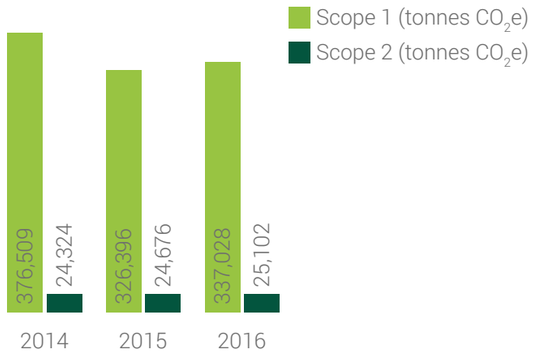
We continue to calculate and monitor our greenhouse gas (GHG) emissions, and explore ways to reduce them as part of energy conservation measures. Our calculations include our three main sites: the mine, Balykchy Marshalling Yard, and Bishkek head office. However, the mine represents around 98% of energy 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.

Fig. 4.8 Electricity, Fuel and Explosive Consumption (Kumtor Mine)

GHG Emissions and Intensity

Scope 1 (direct) total GHG emissions in 2016 are slightly higher compared to 2015, mainly because of increased diesel usage. We used less explosives because we blasted less overall material, expanded our blast pattern size and used less emulsion product because of drier conditions in the pit. Scope 2 (indirect) total emissions are comparable to previous years. Kumtor's GHG intensity, a measure that normalizes GHG emission to gold production, is slightly less than 2015 for the reasons mentioned above, but generally consistent with previous years.

Fig. 4.9 GHG Emissions



Energy Conservation Measures

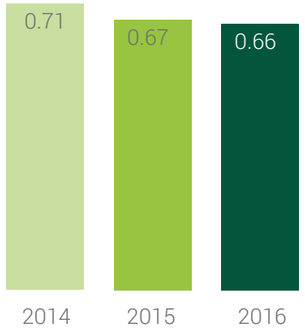
We aim to reduce our GHG intensity by reducing our specific energy consumption and by increasing energy efficiency. We switch from diesel generators to grid electricity, wherever and whenever feasible, for such uses as mine-site lighting, dewatering pumps, and other equipment. This reduces both costs 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-intense 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 behaviour 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.

Fig. 4.10 GHG Intensity Ratio



We continue to explore ways of reducing 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 Carbon Disclosure Project. 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.

> "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."

4.5 | AIR EMISSIONS

Road dust, dispersed by the movement of light and heavy vehicles, is the principle source of observable and measurable air emissions along our access road through the Barskoon Valley. Concerns have also been raised about mine dust deposition on nearby glaciers.

Air Quality at the Mine

We routinely monitor and report the air quality at the mine site. This effort is supported by six high-volume samplers located strategically around the mine site to measure total suspended particulate (TSP) levels (See Figure 4.3 on page 47). In 2016, the TSP concentration at all monitoring stations was below the Kyrgyz 24-hour TSP limit of 500 µg/m³ for industrial zones.

Our analysis of historical data suggests that during spring, occasional point exceedances are generally related to commencement of tailing dam works.

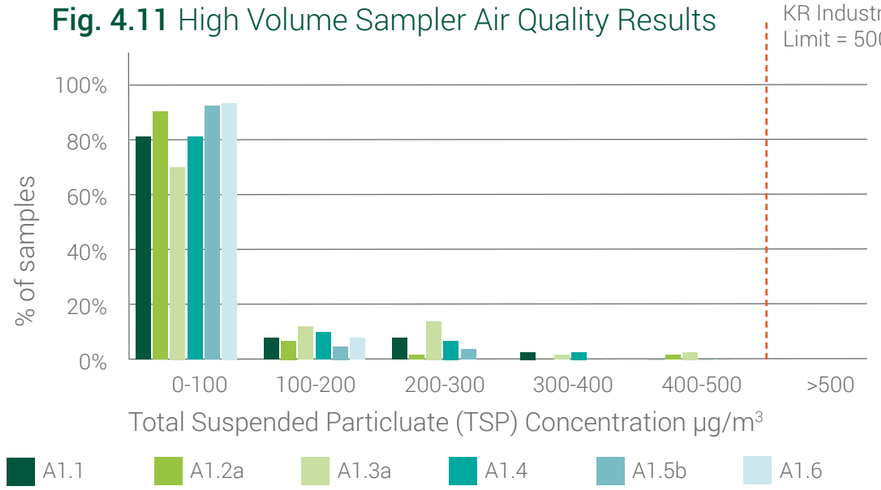
Selected TSP samples are also analyzed for cyanide, sulphur, arsenic, nickel, selenium, zinc, uranium, radium-226, and strontium-90. Consistent with previous results, the 2016 monitoring data, which are presented in the Appendix, demonstrate that the results are orders of magnitude below their relevant threshold limit values.

KGC has Maximum Allowable Emission (MAE) limits for pollutants emitted into the atmosphere. Actual emissions are compared against these limits (Figure 4.12) and calculated 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 days blasted - 335;
- Specific consumption of ANFO and emulsion per 1m³ of mine rock blasted;
- 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 (data on instrumental measurements);
- Average concentration of pollutants in emissions from the Mill, Crusher, Emulsion Plant, Assay Laboratory (data on instrumental measurements);
- Work hours of emission sources of onsite main and auxiliary facilities;
- List of areas and volumes of dumped mine rock in waste rock dumps and ore stockpiles etc.

Emissions of pollutants from stationary sources at the Mill, Crusher, Emulsion Plant, and Assay Laboratory were calculated based on instrumental measurements of pollutants in exhaust gases, conducted by Environmental Monitoring Department of the State Agency on Environmental Protection and Forestry (SAEPF) under the KR Government. According to results of the calculation and

Fig. 4.11 High Volume Sampler Air Quality Results



Note: *TSP is total suspended particulates, Kyrgyz 24-hour TSP compliance limit for industrial zones is 500 µg/m³. Monitoring station locations change occasionally along with changing footprint of the mine. Only annual average results are shown for locations with more than 6 months of data.*

Fig. 4.12 **Kumtor Mine Emissions vs MAE Standard (tonnes/year)**

Pollutant	MAE Standard 2016	Actual 2016
Dust that contains SiO_2 20-70%	1,113.6	618.2641
Hydrogen cyanide	0.0008	0.0008
Sodium hydroxide	0.3516	0.3627
Calcium oxide dust (lime)	0.5892	1.4690
Carbon (soot)	0.0845	0.0781
Welding aerosol	0.3120	0.4216
Manganous oxide	0.0424	0.0573
Tetrafluorosilane (fluorides)	0.0136	0.0189
Hydrocarbon	3.4833	3.7557
Carbon oxide	48,8865	29.5715
Nitrogen dioxide	79.2213	46.6396
Hydrogen fluoride (fluorides)	0.00114	0.00144
Sulfur dioxide	1.0502	1.1281
Ammonia	0.7787	0.8028
Hydrochloride	0.0000257	0.000026
Silica compositions	0.0136	0.0189
Total:	**1,248.4954**	**702.6402**

based on mass and composition of emitted pollutants, the enterprise belongs to hazard category 1.

Emissions from non-stationary sources are calculated according to methodological instructive regulations based on actual data (operating factors) for the previous period. In 2016, a total of 702.6 tonnes of constituents were emitted into the atmosphere from onsite sources (see Fig. 4.12), the majority of which were from pit operations. Blasting operations, and emissions of inorganic dust from excavation-and-loading operations were the major contributors.

KGC exceeded some of the MAE norms for pollutants due to the fact that the mine produced more gold than planned, resulting in the extra consumption of some materials. In addition, construction of the MEGA shop (the new maintenance facility for all heavy equipment) also contributed to the emissions. However, the total amount of emissions has decreased compared to 2015 because of our efforts to reduce dust, which represent 70% of all emissions at the mine site.

Among gaseous constituents, nitrogen oxide is a major contributor to atmospheric emissions. Within the Concession area, maximum ground level concentration is calculated at 0.2 times the MAC standard. The maximum concentrations of the remainder pollutants do not exceed 0.3 times the MAC standard.

According to calculations, the impact of Kumtor mine operations on the atmosphere is predicted as moderate.

Based on analysis of ground level concentrations of constituents, it can be predicted that outside the Concession area none of pollutants in atmospheric air will exceed MAC limits.

To minimise these impacts, work areas are wetted down during mining and other operations on site, including excavation-and-loading operations. The mining face is also wetted down prior to and after blasting operations.

Taking into account that Sarychat-Eertash Nature Reserve is located in close proximity to mine operations, regular monitoring of atmospheric air is conducted in the northeastern part of the Concession area and in the southwestern part of the Nature Reserve.

Dust in Barskoon Valley

Access to the site, for personnel and delivery of consumables and other materials, is technical road which is managed by KGC, which passes through the Barskoon Valley. This road also serves as an access road to tourist sites, several small communities, including Ak-Shyirak village, summer pastures and 'hunting farms' in the high altitude valleys, and the Sarychat-Eertash Nature Reserve. Consequently, this road brings not only the supplies and people needed for mining operations, but also residents, researchers, hunters, and tourists.

Following stakeholder concerns about dust levels in the Barskoon Valley, we continued our road watering activities with more than 10 water trucks servicing the road on a daily basis. As in previous years, three high-volume air samplers were installed during the summer of 2016 to measure the total suspended particulate (TSP) concentrations in the air - there were no exceedance of the applicable standard of 100 micrograms per m^3 (µg/m^3) in the Barskoon gorge. To verify that the company vehicles are not the sole source of dust, in autumn of 2014 we installed a radar device which records any vehicle passing by at a speed faster than 10 km/hr. Also, along the whole technical road going to the mine we installed dust fallout gauges to measure the amount of dust in the air, which have been monitored monthly since 2015 . Results show that all samples complied with the international standard criteria for dust deposition, and not of concern for human health.

Concerns have been raised that dust adversely impacts some flora immediately adjacent to the road, that it is a driver of landslides originating from steep slopes (which often follow significant rain events), that is endangering a rare tulip species (Tulipa tetraphylla).

Some stakeholders from villages near the Issyk-Kul Lake, claim they are being adversely affected by dust and other air emissions emanating from the mine. However, the separation of these villages from the mine by a mountain range, and a radial distance of tens of kilometres, rules out the mine as a source of air pollution. 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.

Fig. 4.13 **Dust Monitoring in the Barskoon Valley (µg/m^3)**

Sampling Points (Stations)	Jul 2014	Aug 2014	Jul 2015	Aug 2015	Jul 2016	Aug 2016
#1	87	175	88	71	30	41
#2	126	304	78	58	37	89
#3		248	47	71	50	59
Recommended MAC*	100	100	100	100	100	100

Note: *#1 sampler was located 50 m south of the road from the upper Kamaz truck monument; #2 sampler was located 100 m to the north from the road, towards the Barskoon River; #3 sampler was located 50 m to the north of 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 (GIIP). We are committed to the ongoing improvement of our waste management strategy.

Waste Management Strategy

In 2013, 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 equipment. In 2016, KGC set the following specific objectives for waste management:

- Continued 100% recycling of industrial waste;
- Reduce the volume of solid domestic waste to be landfilled by 50%;
- Reduce waste management costs by 20%.

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 and other out-of-service 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, medical waste and expired reagents.

An important part of effective waste management is the accurate registration of waste generation. In previous years, KGC used mainly visual observation as a method of accounting the volume of waste generation. In 2016, KGC implemented a practice of weighing of certain types of waste. This allowed to significantly improve the accuracy of data on the waste generation volume. However, this also affected the homogeneity of the data compared to previous years. In particular, registered volumes of domestic and hazardous waste showed significant increase from the previous years.

Improvement of Waste Handling Practices

Reducing the negative impact on the environment and the effective use of financial resources on waste management are the key priorities in improving our waste management strategy. In this context, KGC seeks to minimize the disposal of waste at the Mine. Since 2014, not a single kilogram of industrial waste has been disposed on site.

Scrap metal, plastic, rubber, wood, paper, waste oil, etc. are shipped to our local partners to reuse and recycle.

The reuse of scrap metal in the production of grinding balls is of note. The local company "Vulkan Plus" produces different size steel balls used for ore grinding at the Mill. In 2016, KGC spent $4.5 million on the purchase of grinding balls, which demonstrates KGC's commitment to support local producers and suppliers.

Solid 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, applicable in KR. When designing and constructing of 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 defined by the KR government. Operation of the landfills involves placing the waste and compacting, followed by covering the waste with a 20-30 cm soil layer to prevent access by wild animals.

After mine closure, landfills will be capped using the same process as the tailings dam and is outlined in the Conceptual Closure Plan.

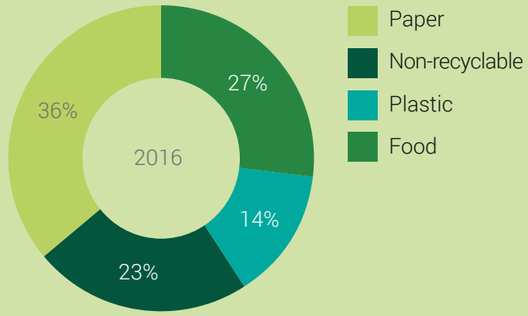
Waste Management

In compliance with KR environmental legislation, as well as high standards of environmental responsibility, Kumtor, as the owner of waste, is committed to ensure safe utilization of its waste, as well as continuous improvement of its waste management practices in order to minimize negative impact on the environment.

In 2016, the mine produced 6,996 tonnes of industrial waste, but for the third year in row, KGC recycled 100% of this. In 2016, separate collection of all industrial waste was started at all key locations on site. This made it possible to eliminate the need for the Industrial Waste Sorting area, which, in turn, resulted in 30% reduction in waste management costs. Currently, all industrial waste is collected separately into various containers and tanks, which as soon as filled, are taken out from the mine avoiding unnecessary loading/unloading and sorting.

In 2016, the mine produced 1,798 tonnes of solid domestic waste. In the same year, KGC committed to reduce volume of solid domestic waste to be buried at the Kumtor Mine area by 50%. 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 can be made possible through introduction of separate collection and further recycling of this waste. Solid 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 buried can be reduced 3-4 times. In 2016, the mine generated about 4.9 tonnes of solid domestic waste per day. Introduction of separate collection and recycling of solid domestic waste will make it possible to reduce this volume to 1.6 tonnes per day.

In 2016, the mine produced 697 tonnes of hazardous 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, medical waste, as well as ground contaminated with hazardous materials.

Chemicals packaging materials are buried on site in the authorized Hazardous Waste Landfill, commissioned in 2015.

Car batteries are collected separately and shipped off site for recycling. In 2016, all batteries were shipped off site and recycled. 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 will be shipped off site to Bishkek for safe utilization by a specialized company.

2,000 mercury-containing lamps were shipped off site for safe utilization by a specialized company.

As detailed above, in 2016, KGC considerably 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.

Fig. 4.14 **KGC Waste Generation - 2016**

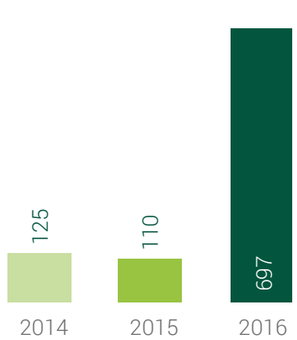
	Generated	Units	Disposal Method
Industrial Waste			
Metal	4,984.7	tonnes	100% Recycled
Paper	71.7	tonnes	100% Recycled
Wood	484.5	tonnes	100% recycled and donated to local communities
Plastic	88.7	tonnes	100% Recycled
Oil	1,366.9	tonnes	100% Recycled
Total	***6,996.3***	***tonnes***	
Hazardous Waste			
Packaging	530.0	tonnes	Landfilled
Oily rags	162.9	tonnes	Landfilled
Batteries	5.0	tonnes	100% recycled*
Mercury lamps	0.0	tonnes	Temporarily stored
Total	***697.9***	***tonnes***	
Tires			
Used tires	861.5	tonnes	100% recycled

***Note:** An additional 7.6 tonnes of batteries were recycled from temporary storage areas.*

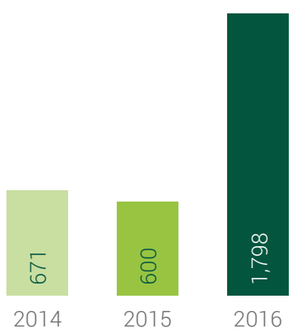
Fig. 4.15 Waste Produced at Kumtor Mine Site (tonnes)

Industrial Waste

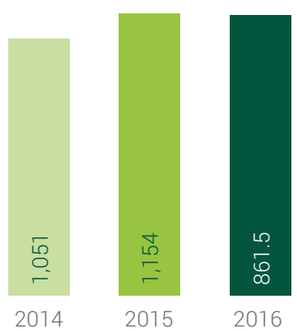
Hazardous Waste



Domestic Waste



Waste Tires



4.7 | UNPROCESSED WASTE ROCK

As typical for most open pit mining projects, KGC must remove a large volume 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 standards of industrial safety, waste rock dumps must have sufficient storage capacity, and be located at a minimum distance from a mining cutback. Mined waste should be placed in areas proven to contain no mineralisation. Waste dumps should not hinder mining operations in the pit and must be developed safely.

In addition, dumping methods and equipment in use at a waste dump must meet required dumping rates of waste rock without interruption, and comply with limitations on dump capacity whilst maintaining dumping costs at the lowest level and labour/equipment productivities at the highest level. Modelling and assessment of waste dump stability is performed by specialists of the Geotechnical Structure Stability Laboratory of the Geomechanics and Subsoil Use Institute under KR NAS based on KGC's monitoring data.

Waste Rock Movement

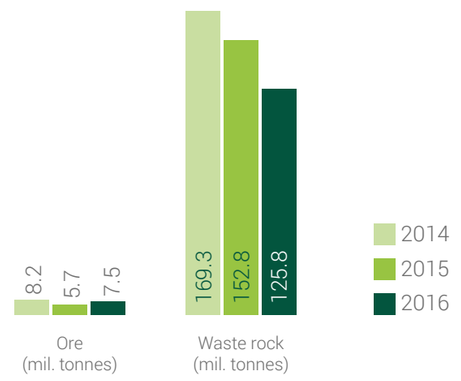
We continue to monitor all potential land and ice movements across the site, and to manage our ice and waste rock dumps to ensure safe mining practice and timely relocation of affected infrastructure.

During 2016, KGC continued to implement a number of controls aimed at reducing waste rock movement rates and decrease the associated risks. In particular, the reduction of waste placed in the Chon-Sarytor Valley, through a more even distribution of loads, construction of water diversion systems, and the introduction of automatic monitoring systems.

Acid Rock Drainage Testing

Acid rock drainage (ARD) describes contaminated water that can be generated from water contacting waste rock, and which can be acidic due to the reaction with sulfide-bearing rocks. It is a concern raised by some stakeholders, relevant both during mining and post closure. 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 of the deposits, which neutralizes acidity. ARD evaluation will continue and be a part of closure planning.

Fig. 4.16 Key Production Statistics



4.8 | TAILINGS MANAGEMENT

Tailings refers to the water and solid materials (together called slurry) that remain after recoverable metals and minerals of economic value are removed from the crushed rock ore by milling and processing.

KGC's tailings are transported via 6.7 km of pipeline from the mill to the tailings management facility (TMF) where they are deposited, settled, and contained. The liquid component is treated before discharge and the solid component retained until eventual reclamation and mine closure activities. The KGC TMF includes a set of twin tailings 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 issues we monitor and control include (i) cyanide containing solutions, which are securely contained within the TMF, and (ii) dam stability. These are discussed further below.

Cyanide Residue Management

The concentration of cyanide in the TMF is routinely monitored. In the tailings pond, there is some natural breakdown through chemical reaction and the effect of the sun's ultraviolet light. The liquid component is further 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 metres long with a maximum height under its crest of 40.5 metres at an elevation of 3,670.5 metres above sea level. The dam is constructed primarily of compacted granular fill, sourced locally. 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 metres 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. In 2016, work was done on enforcement and extension of the dam body to the elevation of 3,670.5 metres.

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 trend of horizontal displacement reduction has been observed. An extensive network of sensitive instrumentation is in place to detect and record any movements of the dam structure.

Fig. 4.17 **Tailings Dam Monitoring Instrumentation (number of instruments)**

Type	Purpose	2014	2015	2016
Inclinometers	Measure horizontal displacement	50	50	45
Settling plates	Identify dam base settlement	28	28	26
Piezometers	Measure water levels in dam body and base	32	32	32
Thermistors	Dam body and base temperature	48	48	47

Fig. 4.18 **Key Characteristics of Kumtor's Tailings Management Facility (TMF)**

	Units	2014	2015	2016
Tailings discharged to Tailings Pond	mil. m³	8.01	7.93	8.30
Net tailings remaining in Tailings Pond per year	mil. m³	3.16	3.53	6.04
Total cumulative tailings in Tailings Pond at year end	mil. m³	68.74	72.27	78.31
Total free water in Tailings Pond at year end	mil. m³	4.16	3.89	5.73
Elevation of Tailings Dam Wall crest	masl	3,667.0	3,667.0	3,670.5
Peak water level in Tailings Pond during year	masl	3,661.03	3,661.73	3,663.68
Minimum water freeboard (dam crest level - peak water level)	m	5.97	5.27	6.82

Note: *masl = metres above mean sea level*

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 we track the volume of tailings entering the TMF and volume of water leaving it, via the ETP and by evaporation from the pond surface. Tailings slurry, of which 49% by weight is 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.

Fig. 4.19 **Water Balance in TMF (m³)**

	2014	2015	2016
Free water at start of year (January 1)	4,889,461	4,160,134	3,890,450
Water added in tailings	5,960,703	5,929,047	6,086,506
Net precipitation/runoff less evaporation	425,139	789,677	1,308,441
Water remaining in tailings voids	-1,740,208	-1,696,810	-1,878,304
Water discharged from Tailings Pond to Effluent Treatment Plant	-4,920,891	-4,827,216	-4,028,844
Adjustment based on bathymetric survey	-454,070	-464,382	+352,600
Free water at the end of year (December 31)	4,160,134	3,890,449	5,730,850

CONCLUSIONS OF EXTERNAL EXPERTS

Geotechnical monitoring data is analyzed by the Institute of Rock Mechanics of the Kyrgyz National Academy of Sciences. Overall tailings dam condition is assessed as suitable for operation.

The international engineering company, Amec Foster Wheeler, carried out inspection of the condition and safety of the TMF dam, providing recommendations for changes and improvement where appropriate. Their October 2016 report concluded: "The visual inspections of the dams and appurtenances of the Kumtor site generally indicated that the structures were in good condition and were functioning as required. It is recommended to continue with annual TMF inspections by third party technical consultants in view of continuous construction process of the tailing dam. KGC is doing an effective job of carrying out routine inspections, preparing monitoring records, reading instrumentation, and implementing the necessary procedures or improvements to operate the facility in a safe manner."

> "Tailings dam condition is assessed as suitable for operation."

4.9 | MINE CLOSURE

Background

The most recent life of mine plan is for open-pit mining to end in 2023 and milling operations to conclude in 2026. As agreed with Kyrgyz authorities and 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 contemplated 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 prepared CCP's in 1999, 2004, 2008, 2011, 2013 and most recently in 2016.

The latest CCP covers the existing components of the Kumtor operations including the open pits, waste rock dumps, TMF and related water treatment facilities, and the mill complex and associated mine infrastructure. Closure and land use objectives have been established to guide development of the plan as follows:

- 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 agencies for their information and in 2013, the conceptual closure plan was also provided to the Government's international technical advisors involved in the ongoing negotiation to restructure Kyrgyzaltyn's ownership in Centerra and Kumtor. The 2016 plan is currently being translated and will also be provided to the relevant Kyrgyz agencies when complete.

Updates to the 2016 CCP

The 2016 update to the CCP is based on the 2013 CCP, and incorporates new data and information, changes to the life-of-mine (LOM) plan, 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 this CCP update include the following:

- TMF design event – The Probable Maximum Flood (PMF) has been calculated for the tailings management facility (TMF) and is used as the design event for the closure of the TMF.
- TMF cover – The TMF cover has been modified to a single layer of inert waste rock crushed in the mill circuit to a size less than 5 mm diameter.
- Waste Rock Dump configuration – This CCP update assumes that the final dump configurations predicted by IGSU (2013) are those that will exist at closure.
- New facilities (admin, camp, landfill) – Closure actions for several new facilities constructed since the 2013 CCP have been incorporated, including new camp and administration buildings and a new landfill.
- Post-closure land use – A analysis of sustainable post-closure land uses for each area and facility of the site has been included.
- Social closure considerations – This CCP considers the social and socio-economic context of closure of the Kumtor mine.
- Closure Cost Estimate – The cost estimating methodology used in this update is based on first engineering and cost principles. In preparation of the reclamation and closure cost estimate the standardized reclamation cost estimator (SRCE) developed in the State of Nevada and verified by the US Bureau of land management was used.

During the development of this plan, additional data collected since 2013 was evaluated to update and confirm conclusions and closure actions presented in the 2013 CCP. In particular, KGC reviewed the available hydrologic and hydrogeologic data, geochemical data, and pit and dump configurations. This review confirmed the general closure actions identified in the 2013 CCP are appropriate and resulted in only minor changes to the pit lake refilling curves and pit overflow channel alignments that do not affect the actions required for, or schedule or cost of closure.

Also, in 2016 Kumtor continued to expand the scientific program to research and develop the best methods for land reclamation. This included collecting native plants and seeds and establishing trial plots with salvaged topsoil to test proposed seed species selection, topsoil addition rate, seeding rate and fertilization requirements. The studies are performed by the K. I. Skryabin Kyrgyz National Agrarian University (refer to case study).

Funding Closure Liabilities

As outlined in the 2016 CCP, the uninflated life of mine closure cost is estimated at $56.7 million. It is also estimated it would cost $54.2 million to rehabilitate the known impacts and disturbance as of December 31, 2016. Kumtor is required to re-calculate closure liability on an annual basis, in accordance with International Financial Reporting Standards to take account of future discount and inflation rates. In 1995, Kumtor established a reclamation trust fund to accrue cash funds for mine closure liabilities. This is funded by sales revenue, annually in arrears. As of December 31, 2016, the balance in the fund was $21.9 million, with the remaining cost to be funded over the life of the mine.

> “Mine Closure Plan priorities are safety and minimizing environmental impacts.”

THE PROGRAM OF SOIL AND VEGETATION STUDIES

KGC is carrying out a program of soil and vegetation studies at the Kumtor mine with the purpose of further reclamation of disturbed lands, which includes field expeditions to both the mine site and adjoining areas, as well to high-mountain valleys of the Kyrgyz Republic. The aim of the expeditions is to identify plant species suitable for reclamation works at the mine site.

Studies, field expeditions, analysis of soil and vegetation at the mine are conducted by KGC Environment Department employees in cooperation with representatives from the Kyrgyz National Agrarian University named after K. I. Skryabin and KR agronomist experts and soil scientists.

Representatives of the University has been conducting studies at the mine since 2012. The scientific program on the most effective reclamation methods includes collection of local plants and seeds, as well as establishment of trial plots with different soils and conditions.

In 2016, field expeditions continued to the mine site, adjoining areas, and pastures of Suusamyr, Jumgal, and Kara-Kujur valleys, the climate conditions of which were the most similar to the ones observed at the mine. Among 115 plant species growing at the mine and on adjoining areas, the researchers identified three plant species from the high-mountain valleys, which can be used in land reclamation at the mine (fescue grass, wheat grass and wild rye).

On the trial plots, the researchers studied soil composition, plants growing conditions and their resistance to weather conditions at the mine, as well as determined seeding rates and types of suitable fertilizers. In 2016, a trial plot in Chui valley was selected for reproduction and multiplication of the seeds collected for futher land reclamation at the mine. A number of agrotechnical measures were taken on the trial plot. Seeds were sown in spring and autumn 2016. Studies will continue in 2017.

FOR REFERENCE:

The program of soil and vegetation studies is a set of measures aimed at improving environmental conditions and restoring lands, suitable for land use in post-closure period. After all the work is done, the restored lands and surrounding areas should become an optimally organized and stable balanced landscape.

5 GLACIERS AND WATER MANAGEMENT

5.1 | WATER USE AND TREATMENT

We use water for operational activities, mostly in the mill, and for domestic use (drinking and sanitary) in the mining camp, offices, and workshops. We must also remove water from the mine pit in order to keep operations safe and stable.

Our main water management responsibilities are:

- Providing safe drinking water for our employees;
- Removing water and ice from the open pit to ensure access to ore, and stable and safe working conditions;
- Ensuring water returned to the natural environment is safe and meets defined 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**.

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 must also pump large volumes of water from the open mine pit to maintain stable and safe working conditions, some of which we can use at the mill, thus reducing our demand from the lake. In 2016, we extracted approximately 5.25 million m³ of water from Petrov Lake, which was very similar to the previous year (5.76 million m³).

In 2016, we pumped a total of 13.75 million m³ of water from the pit, including groundwater and glacier melt water. Of this, 1.0 million m³ was used in the mill with the remaining approximately 12.75 million m³ discharged to the environment.

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. The mill used a total of 6.06 million m³ of 'make-up' water in 2016, of which 5.06 million m³ was from Petrov Lake and 1.0 million m³ collected from the mine pit.

The use of pit water, which reduces our demand on Petrov Lake, has increased from zero in 2011 to 1.0 million m³ in 2016. Due to higher throughput at the Mill in 2016, the total amount of water used increased by approximately 260,000 m³, but this was all sourced from the Pit, so the amount of raw water sourced from Petrov Lake actually decreased in 2016 compared to 2015.

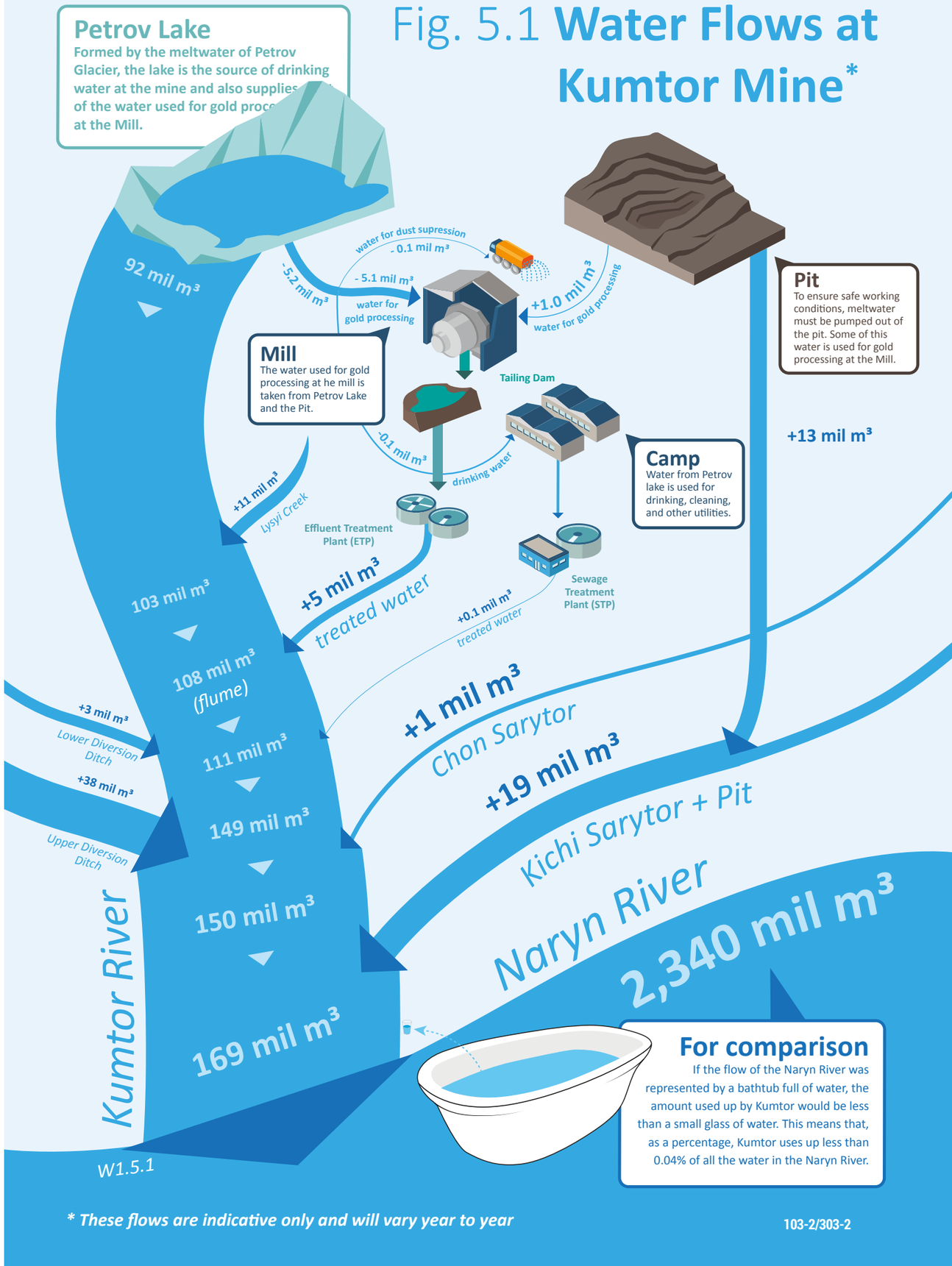
Drinking Water

We also use treated water from Petrov Lake for domestic uses (drinking and sanitary) at the mining camp, the mill, and other working buildings. Domestic water use in 2016, was about 0.15 million m³, representing just 3% of the freshwater we collect from Petrov Lake. Drinking water quality is monitored for 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.

Fig. 5.1 Water Flows at Kumtor Mine*



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

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Fig. 5.2 **Water Usage at Kumtor Mine Site**

	Units	2014	2015	2016
Sources of Water				
Total Water Extracted from Petrov Lake	mil. m³	5.62	5.76	5.25
Pit water pumped to the Mill	mil. m³	0.56	0.64	1.01
Pit water pumped to the environment	mil. m³	8.2	10.9	12.75
Water used for Domestic Purposes				
Water Used for camp domestic purposes*	mil. m³	0.14	0.15	0.13
Water Used for Mill domestic purposes*	mil. m³	0.02	0.02	0.02
Water used for Process/Mill				
Raw water used at Mill (from Petrov Lake)	mil. m³	5.40	5.32	5.06
Total water used at Mill (Petrov Lake + Pit water)	mil. m³	5.96	5.96	6.07
Water internally recycled at Mill	mil. m³	5.50	5.33	6.50
Ore Feed to Mill	tonnes	5,839,623	5,782,419	6,303,032
Raw Water Intensity Ratio	Litres/tonne Mill Feed	924	921	803
Water used for Dust Suppression				
Water used for dust suppression	mil. m³	0.07	0.26	0.04
Wastewater Discharged to Environment				
Treated wastewater discharged from ETP	mil. m³	4.70	4.84	4.14
Treated wastewater discharged from STP	mil. m³	0.14	0.12	0.10
Net water usage	mil. m³	0.79	0.79	1.01

Water Treatment

We source both industrial and drinking water from Petrov Lake, which is largely derived from glacial melt water. This means it exhibits naturally high concentrations of sediments, giving the lake a characteristic milky appearance, along with elevated background concentrations of some parameters such as iron, aluminium, and suspended solids.

Process water does not require treatment. However, the water quality of Petrov Lake does not meet hygienic drinking water standards without treatment. We apply treatment methods standard for public supplies around the world. These include flocculation, filtration, chlorination, and ultra-violet treatment. In combination, these processes remove fine sediments (which may carry metals) and disinfect the water for safe storage and use.

Sewage Treatment

Sanitary waste water is treated at the sewage treatment plant (STP). This uses standard processes of biological treatment and chlorination. The biological treatment removes the 'oxygen demand' of organic matter, which would otherwise use up oxygen in the river and reduce its quality. Chlorination is provided to eliminate potentially harmful bacteria. Although challenging to operate at high altitude with low oxygen and harsh weather conditions, treatment is achieved successfully through careful design and management. During freezing winter conditions, treated effluent is stored in a holding pond prior to gradual discharge during summer. In 2016, approximately 0.1 million m³ 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 in compliance with established standards, at the effluent treatment plant (ETP) before being safely discharged to Kumtor River. Due to the freezing winter conditions, the treatment and discharge of wastewater is restricted to the warmer season, typically from June to October.

The main stakeholder concern regarding wastewater from KGC is related to cyanide, an essential chemical used routinely in the processing of ore to recover gold. Cyanide can be toxic at higher concentrations.

In 2016, 8.30 million m³ of tailings were discharged into the tailings pond. These tailings contain residual levels of cyanide and other constituents which could be harmful to the environment if discharged untreated. The solids component is retained in the TMF, while the majority of liquid component is pumped to and treated at the ETP to reduce and remove cyanide, metals, and other elevated contaminants prior to discharge. We use the patented INCO treatment process, and operate one of the largest cyanide treatment plants outside of North America.

In 2016, approximately 4.14 million m³ of industrial wastewater from the tailings ponds was treated and discharged to the environment, 0.7 million m³ less than in 2015 mainly due to a delay in obtaining the discharge permit from the SAEPF, and climatic conditions at the mine site which reduced the possible discharge season.

Water Use Intensity

Our extraction of water from Petrov Lake has no measurable impact on average annual lake water levels and the level fluctuates naturally by about 2 m during the year.

Our total water extraction from Petrov Lake of 5.25 million m³ in 2016 represents approximately 5.5% of its natural outflow to Kumtor River. We then returned 4.24 million m³ as treated wastewater (STP plus ETP) making the net impact on Kumtor river flow near neutral.

Metallurgical challenges limit our ability to drive down our water use intensity by recycling effluents from our tailings pond back to the mill. Studies have shown that even low levels of cyanide in the tailings pond would adversely affect our gold recovery process. However, for the past few years 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 from snow and ice melt emanating above the rock dumps. As much as possible, we divert clean meltwater from Davydov and Sarytor glaciers away from the central valley and Sarytor rock dumps into the Kichi-Sarytor stream. We also constructed a number of settlement ponds along Lysyi valley to collect large sediment particles. A pipeline diversion system was constructed in 2015 in Lysyi Valley to direct ponded surface water around the Lysyi waste rock dump and decrease the potential for mobilization of contaminants.

> “Kumtor treats its industrial and domestic effluents to meet prescribed standards prior to discharge.”

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 routinely tested against Kyrgyz, Canadian and World Health Organization (WHO) drinking water standards. Our drinking water is 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, the key ones of 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 Figure 4.3).

This point, designated W1.5.1, and also referred to as 'End of Mixing Zone', was chosen 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 downstream community. Results for 2016 are presented in the bar chart, which includes the Kyrgyz maximum allowable concentration (MAC) values recommended for river basins providing public water supply.

Our results show that the majority of water quality parameters in 2016 were below the respective MAC values. This means we have been in material compliance with key water quality standards. However, we exceeded the MAC limits for iron, aluminium, manganese and antimony. Each of these are discussed further in this report.

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 metal concentrations, resulting in elevated results for a variety of metal parameters such as aluminum, and iron. 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 and located upstream of the mine. The presence of sediments and associated metals is not indicative of poor environmental performance of Kumtor mine.

Kyrgyz 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 risk. We take these aspects into consideration when evaluating water quality at KGC.

A review of results from 2016 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.

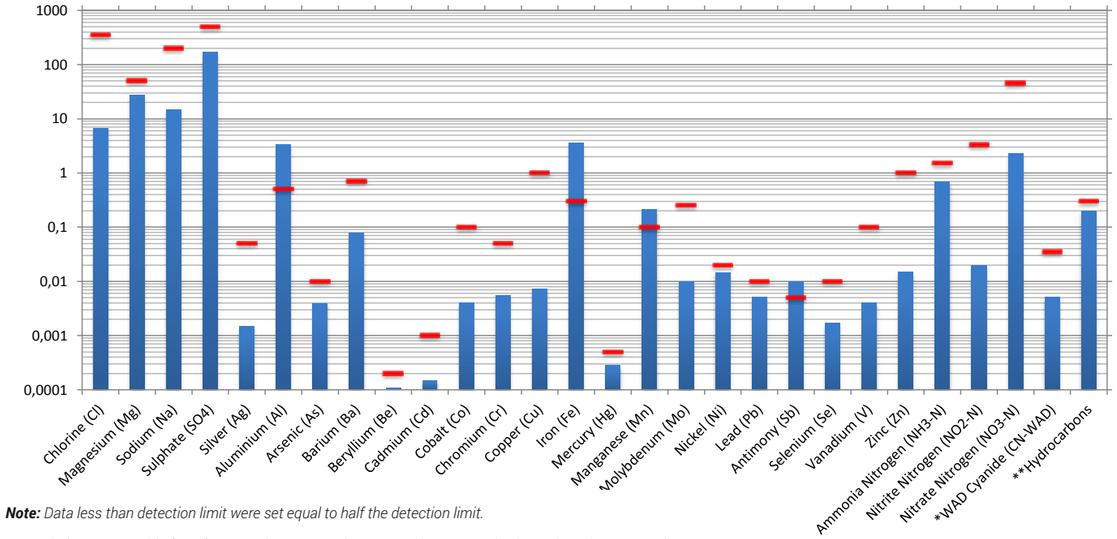
The average total manganese concentration (0.21 mg/L) marginally exceeded its MAC Communal Use standard (0.1 mg/L) in 2016 at the EMZ. It should be noted that manganese occurs naturally in the environment, produced by erosion and weathering of rocks and minerals. The concentrations observed do not represent a significant risk to human health or the environment as manganese effects are primarily aesthetic in humans and livestock.

As required by the EMAP, KGC is required to consider international - and particularly Canadian guidelines when interpreting water quality data. Presently there is no Canadian guideline for the maximum concentration of manganese allowable to protect 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). Health Canada also assigns an aesthetic objective for human drinking water at 0.05 mg/L based on taste and staining of laundry and 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). British Columbia has a chronic guideline for protection of freshwater aquatic life of 0.7 mg/L in soft water (25 mg/L as $CaCO_3$) and higher guidelines in higher hardness water (Nagpal, 2001). The average manganese levels in 2016 were well below the BC guideline for protection of aquatic life from long-term exposure.

The total antimony concentration at the EOMZ (average of 0.010 mg/L, 95th percentile of 0.012 mg/L), for the first time slightly exceeded the associated MAC Communal Use standard (0.005 mg/L) in 2016. In light of this, Kumtor retained CanNorth consultants from Saskatoon, Canada to complete a risk assessment for potential ecological 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 predicted intakes were also

> "Our drinking water is safe and compliant;
> All our wastewater is treated and is environmentally safe before discharge."

Fig. 5.3 2016 Water Quality Data in the Kumtor River at the End of the Mixing Zone and Kumtor Concession Area (location W1.5.1)



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

** MAC is for Free Cyanide (CN-F). Measuring CN WAD is conservative as CN-F is always less than or equal to CN-WAD.*

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

calculated to be below the threshold reference value (TRV) for mammals, suggesting that the 95th percentile antimony concentration for 2016 is not toxic to them. 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. While the 95th percentile for 2016 (0.012 mg/L) does not exceed the WHO drinking water guideline, 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" for 2016 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. For example, Kumtor has voluntarily requested the addition of an antimony discharge limit from the Effluent Treatment Plant (ETP) in 2017, and has already begun exploring treatment and mitigation options.

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 June and October each year (when water is not frozen). In 2016, the average discharge rate was about 1,528 m³/h.

During the water treatment season, the Kumtor River, which receives treated discharge from the ETP, is not frozen and exhibits significant flow volumes. In 2016, the peak flow of the Kumtor River was recorded at 16.59 m³/s in July, and the minimum flow during the period of discharge was 1.5 m³/s.

The 2016 ETP discharge water quality results are presented in Figure 5.4 (note log scale). The results are compared to the MAD standards and discussed below.

The results show that treated effluent discharge concentration of cyanide and certain other key parameters met their respective MAD standards. However, the average total ammonia (as N) concentration (27.76 mg/L) – a by-product of the cyanide destruction process exceeded its MAD standard (23.48 mg/L). This is not considered to represent a significant risk to the environment as the unionized (toxic) portion of the ammonia is within EMAP standards and acute toxicity testing results by the United States Environmental Protection Agency (US EPA) suggest that total ammonia at the ETP discharge will not be toxic to aquatic life in the Kumtor River at concentrations up to 29 mg/L (Lorax, 2014). This assumes that the pH of the discharge is less than 7.7; which was the case, with an average discharge pH of 7.34. It should also be noted that the average ammonia (as N) concentration at the receiving environment compliance point (Kumtor River at W1.5.1) was 0.68 mg/L in 2016 (compared to an MAC standard of 1.5 mg/L). This is additional evidence that the discharge from the ETP is not causing adverse environmental effects.

Sewage Treatment Plant Discharge

In 2016, the average generation of wastewater and sewage was approximately 282 m³/day. The annual average STP discharge water quality met all required MAD standards as shown in Figure 5.5.

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 or address concerns accordingly.

Monthly and Historic Results

Average monthly monitoring results are presented in the appendix. Monitoring results from previous years are presented in past annual environmental reports, which are also available on KGC's website.

References:

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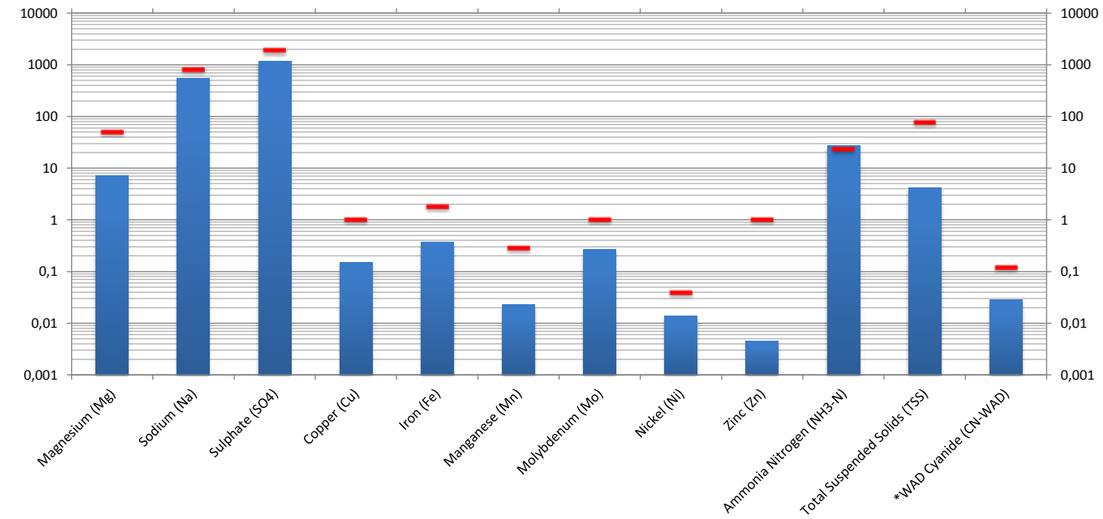
- Nagpal, NK. 2001. Ambient Water Quality Guidelines for Manganese. British Columbia Ministry of Environment and Lands. http://www.env.gov.bc.ca/wat/wq/BCguidelines/manganese/manganese.html.

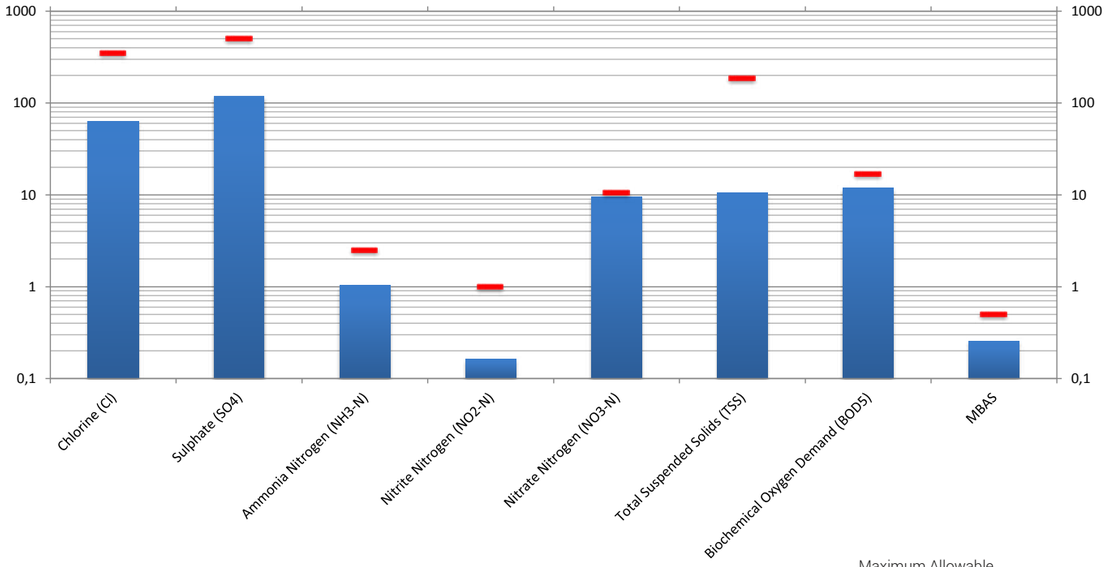
Fig. 5.4 2016 Water Quality Data at the Discharge Point of the Effluent Treatment Plant (location T8.4)



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

** MAC is for Free Cyanide (CN-F). Measuring CN WAD is conservative as CN-F is always less than or equal to CN-WAD*

Fig. 5.5 2016 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.*

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. It is small compared to natural melting.

In response to stakeholder concerns and emerging legislation seeking a ban of glacial ice removal in the Kyrgyz Republic, we describe relevant information on our practices and put our impacts in the context of regional and global trends.

Ice Unloading

As visible in the aerial photo in the Environmental Monitoring section of this report (Figure 4.3), parts of five active glaciers are present within the Kumtor Concession area (Davydov, Lysyi, Sarytor, Petrov, Bordu). Ice is also present in extensive ice fields in the southern and eastern part of the concession area.

The continuation of mining at Kumtor depends on our ability to manage and remove the ice in the vicinity of the open pit and other infrastructure throughout the life of the mine. We have also adjusted our practices over the years. In response to concerns raised by some stakeholders, we no longer deposit waste rock on glaciers and now segregate waste rock and ice and avoid co-disposal. Ice removed by Kumtor as part of its mining process is deposited back on other ice fields. In 2016, approximately 9.7 million tonnes of ice was relocated from the Davydov Glacier and placed in these dedicated areas. Ice removal will need to continue in the future to provide ongoing safe access to the ore body as mining progresses.

Environmental Context

The impact of climate change has been observed in Central Asia 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. The Kyrgyz government's 2009 submission to the United Nations Framework Convention on Climate Change (FCCC) reports that total glacier volume in year 2000 had reduced by about 20% since the 1960s. The same report predicts that, for the most likely climate change scenarios, the area of glaciation will reduce by between 64 and 95% between years 2000 and 2100.

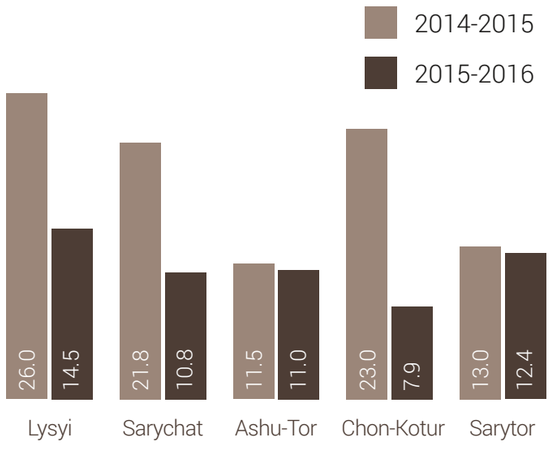
It is estimated that approximately 200 million tonnes of ice is lost each year on the Ak-Shyirak mountain massif (on which Kumtor is located) due to climate change effects (Petrakov, 2013).

Glacier Monitoring & Studies

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 glacier included in recent years. Glacier flow rates typically follow a seasonal pattern, being faster in warmer months and slower in winter.

The Davydov glacier moves faster compared to the Lysyi and Sarytor glaciers, although its overall movement is not specifically monitored because ice is regularly unloaded from its base. Comparison of the retreat of the observed glaciers for the periods 2014-2015 and 2015-2016 is shown in Fig. 5.6. For comparison, the Chon-Kotur Glacier, located outside the concession area, moved 30.9 metres in the same period.

Fig. 5.6 Retreating Glaciers Comparison (m/year)



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.

In 2014, we commenced a 5-year long-term (2014-2018) glacier and hydro-meteorological 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 Context

Measures to manage glaciers and ice have been a feature of mining operations at Kumtor from the beginning of the project in 1994, and the subject of frequent Kyrgyz regulatory oversight and approval, as well as review by international technical and environmental experts.

In late 2012, Kumtor received claims for alleged damage relating to disposal of waste rock on glaciers. These have not yet been resolved and we will continue to liaise with the Kyrgyz government on these and other matters.

Fig. 5.7 Average Glacier Movement Speed (m/day)

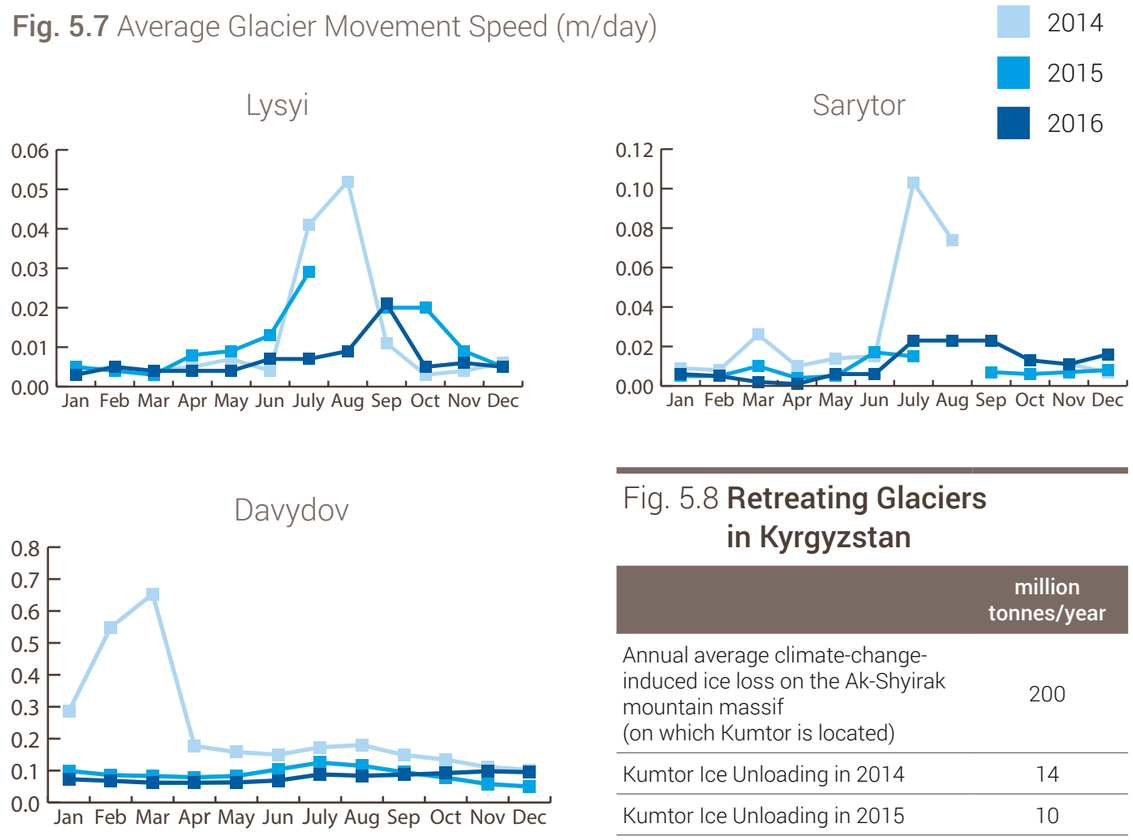
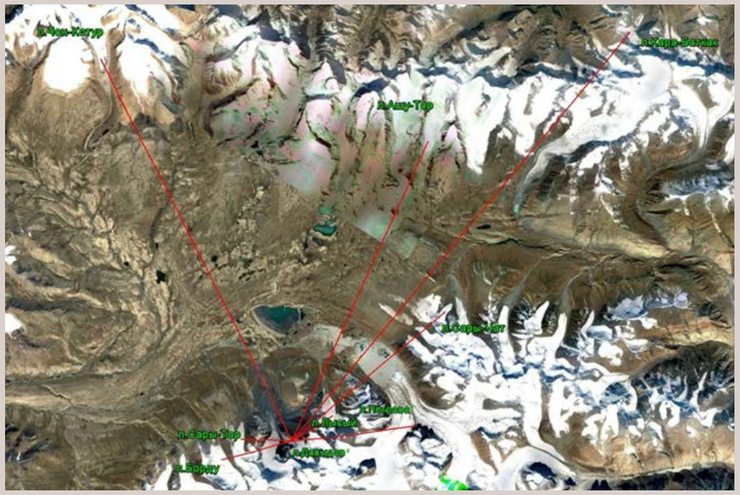


Fig. 5.8 **Retreating Glaciers in Kyrgyzstan**

	million tonnes/year
Annual average climate-change-induced ice loss on the Ak-Shyirak mountain massif (on which Kumtor is located)	200
Kumtor Ice Unloading in 2014	14
Kumtor Ice Unloading in 2015	10
Kumtor Ice Unloading in 2016	10

GLACIER RESEARCH AND ASSESSMENT OF TECHNOGENIC IMPACTS ON AK-SHYIRAK MASSIF GLACIERS

Studies of the Ak-Shyirak 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-Shyirak massif in the late 1950s - early 1960s. was 436 km^2 (Katalog lednikov SSSR [Glacier Catalogue of the USSR] 1969, 1970).



In 2016, KGC continued funding the multi-year long-term (2014-2018) glacier and hydro-meteorological monitoring program covering KGC concession area and basins of Arabel and Uchkol rivers. The study was conducted by two research groups. One group was represented by the Kyrgyz Institute of Water Problems and Hydropower (IWPH) of the KR National Academy of Sciences and the second group was represented by the research experts from the Moscow State University named after M.V. Lomonosov (MSU) and Institute of Geography, Russian Academy of Sciences (IG RAS).

Studies conducted by IWPH scientific team in 2016 continued research from previous two years and based on the multi-year long-term glacier and hydro-meteorological monitoring program covering KGC concession area. In 2016 an additional object of observations became the Bordu glacier.

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

The main conclusions from the observations in 2016

From all observed glaciers of a northern macroslope of the Ak-Shyirak ridge (Sarytor, Lysyi, Sarychat, Bordu) underwent the greatest ablation the Lysyi glacier. A negative mass balance of glaciers on the KGC concession area in 2014-2015 and 2015-2016 seasons in comparison with the period 1985-1989 is most associated with a significant increase in the average annual air temperature (2.3 °C). Associate this phenomenon with the activities of the mine is not yet possible due to the short time-series mass balance observations and lack of mass balance data from 1990 to 2014. The glacier degradation of Ashu-Tor, Chon-Kotur, Sarychat and Bordu glaciers caused mainly natural reasons without the obvious negative impact of the KGC activities. Greater glacier surface contamination with dust on the Lysyi glacier possibly related to the technogenic activities of the Kumtor mine. It should be recognized as an unavoidable fact that the technogenic impact of the mine on the Lysyi glacier will continue as long as the mining process is under way. Glacier runoff from the Sarytor Glacier in 2015 was 1.952 million m^3 in volume (depth of runoff – 737 mm). Taking into account that the average annual water flow of the Naryn River at the Uch-Kurgan gauging station (40 km from the mouth) is 429 m^3/s (13.5 billion m^3 in volume), the runoff from the Sarytor Glacier in the general runoff of the Naryn river represents just approximately 0.0145%. Thus, the runoff from the Sarytor Glacier does not significantly affect the runoff of the Naryn River. It should be considered that, in general, the impact of the mine on the glaciers of the Arabel and Uch-kol river basins is not very significant.

The continuation of mining at Kumtor depends on our ability to manage and remove the ice in the vicinity of the open pit and other infrastructure throughout the life of the mine. We have also adjusted our practices over the years. In response to concerns raised by some stakeholders, we no longer deposit waste rock on glaciers and now segregate waste rock and ice and avoid co-disposal. Ice removed by Kumtor as part of its mining process is deposited back on other ice fields. In 2016, approximately 10 million tonnes of ice was removed from the Davydov Glacier and placed in these dedicated areas. Ice removal will need to continue in the future to provide ongoing safe access to the ore body as mining progresses.

In this context, the considerable mechanical impact of the mine to the Davydov glacier (removal of its lower part) balanced the technogenic impact of the mine through the dust contamination of the surrounding glaciers. Thus, this impact should not be an obstacle to restraining the pace of production activity of the KGC.

THE STUDY OF THE TECHNOGENIC IMPACT ON GLACIERS OF THE AK-SHYIRAK MASSIF

In 2016, the research experts from MSU and IG RAS investigated level of study of the technogenic impact on glaciers.

Any production has a negative impact on the environment. The Kumtor mine carries out both a direct impact on the glaciers of the massif, consisting in the mechanical removement of ice, as well as an indirect impact, as a dust contamination caused by dust emissions from operations. Technogenic impact of the mine on glaciers is considered in the works (Kuzminchenok, 2012a; 2012b; Torgoev, 2016; Kronenberg, 2013; Petrakov et al., 2016)

Direct impact

KGC removes ice from the toe of the Davydov Glacier in order to provide safe access to the ore. However, mining a glacial zone and removing of glacial ice for the extraction of minerals has not only occurred at Kumtor (Citterio et al., 2009; Colgan, Arenson, 2013). However, it should be noted that the ice transported from the Davydov Glacier is not actually lost – but preserved in dedicated ice dumps. Waste rock plays the role as an isolator of ice against atmospheric influences and leads to its better preservation in comparison with natural conditions. So the actual impacts from Kumtor are even smaller as climate change results in irrevocable ice loss, whilst the decrease due to the technogenic impact results in the shrinkage of the glacier volume but not in the loss of ice resources of the Ak-Shyirak Massif itself. The assessment (Petrakov et al., 2016) allowed us to state that the decrease in the volume of glaciers in the Ak-Shyirak massif in 2003-2013 95% was due to climatic reasons and only about 5% by direct technogenic impact. These data are not unique. For example, over the past few decades, Tajikistan's glaciers have decreased almost threefold, and this process is actively continuing because of climate warming and increased greenhouse gas emissions. According to of Tajik scientists, out of 14 thousand glaciers, one thousand completely disappeared and the glacial cover in the Pamir in the next decade will decrease by another 30% as a result of climatic changes that observed in recent years.

Indirect impact

The indirect impact of mining operations on glaciers is complicated issue. The conducted assessment based only on a probable contribution of the mine to acceleration of degradation of nearby glaciers.

It should be noted that the glaciers of Central Asia (Takeuchi, Li, 2008) are characterized by a high level of natural dust contamination. Deserts and semi-deserts of Central Asia are the second source of natural dust in the world (after the Sahara and Arabia). In spring and autumn dust emission to atmosphere is most active in the Taklamakan desert, in the summer - in the deserts of the Kara-Kum, Kyzyl Kum, Kum Moyun. The wind actively transports dust particles from the deserts of Kazakhstan and Central Asia to the Tien Shan mountains. The phenomenon of dusty haze near the Ak-Shyirak massif in the summer observed even in the XIX century. Kaulbars A.V. (1875) associated this phenomenon with the strengthening of the western wind. The dust deposits on the glaciers surface that leads to contamination.

According to some estimates, in nival-glacial Tien-Shan zone deposited annually 1 mm layer of dust (Stepanov, 1961). The strong dust contamination of glaciers and, respectively, low albedo was noted at an albedo survey of glaciers in Soviet period. Thus, according to partially published data by Konovalov V. G. and Lebedeva I. M. on some glaciers of the Pskem ridge (the Western Tien Shan) the albedo varied from 0.06 to 0.22 (the Ayutor-2 glacier), from 0.08 to 0.21 (tongue) and 0.40 (zone of accumulation) on the Chotan-2 glacier. The Urumqi №1 glacier average value of albedo was equal 0.14 (Takeuchi, Li, 2008). The authors of the study emphasized that such values are typical for the continental glaciers of Asia. Thus, high dust contamination and low albedo of glacial ice is very common in the region.

Another source of dust is bare soils located in close proximity to the glaciers, slopes valleys and partially covered by grass surfaces on the syrt. These surfaces also deposit migrated dust from the deserts. On windy days, dust particles from the slopes rise into the air and partially deposit on the surface of glaciers. Quantitative estimates of the contribution of dust from the surrounding slopes in dust contamination of glaciers are not exist, but we can assume that the level of dust contamination of glacier surface will decrease with lengthen of distance from the slopes.

The assessment of the indirect impact of mining operations on the surrounding glaciers can be done in three ways:

- By monitoring the ablation or mass balance of several glaciers located at a different distance from the Central Pit;
- By monitoring the level of dust contamination of the surface of glaciers at a different distance from the Central Pit;
- By monitoring the albedo of the surface of glaciers at a different distance from the Central Pit.

The previous research (Kuzmichenok, 2012b) based on field study supports the conclusion that the impact of dust emissions from mining operations on glaciers surrounding the pit was minor.

Existing indirect assessments of the role of technogenic dust in the retreat of Ak-Shyirak glaciers vary from “negligible” (Petrakov et al., 2016) to “technogenic dust component is comparable to its natural sources” (Torgoev, 2016).

5.4 | PETROV LAKE WATER BALANCE

Water balance of the Petrov Lake was assessed based on data of water flow in the river, as well as consumption and discharge of water to determine the total volume of water used at the Mill in 2016.

To determine the impact of water intake by the Kumtor Mine on the water balance of the Petrov Lake, the Company took measurements at water outflow points from the lake. We used readings from sensors installed immediately at the Petrov lake for measurement of water level fluctuations, water metres 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 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 estimated using the following formula:

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

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 2016, according to measurements at the flume within the period from April to October comprised 107.55 million m^3.

Effluent Treatment Plant. Volume of water discharged from ETP is determined by summing up readings of flowmeters installed at the pumping station #3. Total volume comprised 4.14 million m^3 (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 11.35 million m^3.

Consumption of water at the Mill, Camp, etc. The total water consumption by the Mill and the camp was measured by flow meters at the pumping station on Petrov Lake and the STP. In 2016, the total volume of consumed water by all the facilities of the Mine (including water used for dust suppression) was 5.25 million m^3.

Precipitation and evaporation. Volume of water evaporated from the lake was estimated according to Meyer's equation (equation for determination of evaporation from water surface). Evaporation throughout March-September comprised 158.5 mm or 0.64 million m^3 from the surface of the Petrov Lake. 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 413.5 mm, the volume of water in Petrov Lake increased by 1.67 million m^3.

Changes in volume of accumulated water. When comparing the start and end of the year, the level of water in the Petrov Lake remained without changes at the initial elevation of 3731.53 m.

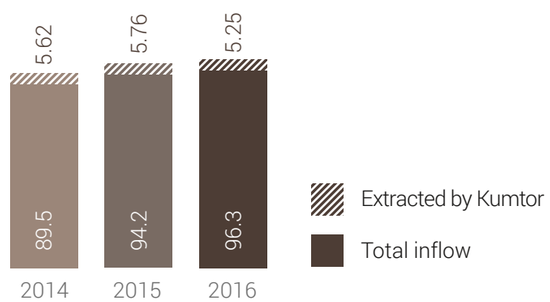
Final Estimates. Using the formula provided previously, the total estimated inflow into Petrov Lake in 2016 was 96.3 million m^3.

This estimated volume of inflow into Petrov Lake was somewhat less than that estimated in previous years. In fact, a major part of estimated inflow reduction, as compared to estimations of previous years, is due to colder weather throughout the season at the Mine.

Conclusion. The volume of water consumed by the Mine in 2016 comprised approximately 5.5% of total inflow into the lake. The above estimations of the water balance over Petrov Lake demonstrate that the amount of water consumed by the mine facilities for production, domestic use and other needs is negligible.

The key data on consumption and diversion of water, as well as on treatment of discharges, are shown in Figure 4.17-4.18, 5.2.

Fig. 5.9 Petrov Lake inflow vs amount extracted by Kumtor Mine (M m^3)



RISKS OF PETROV LAKE OUTBURST AND PREVENTIVE ACTIVITIES CONDUCTED BY THE COMPANY

Understanding the concerns of state and regulatory authorities and also the public, KGC carries out continuous monitoring of the water level in Petrov Lake, water flow in the Kumtor River and the temperature of the natural moraine dam.

In 2015, KGC commissioned the Canadian consulting company "BGC" to develop an early warning system for the potential outburst of the moraine dam at Petrov Lake. The system was successfully introduced in 2015, and has been annually reviewed and updated since.

The basis of this system is regular comparison of the water flow in the Kumtor River, with the estimated water discharge calculated by the mathematical model of dependence between the water level of Petrov Lake and the water discharge in the river.

In case this difference exceeds a specified amount, it the extra flow in the Kumtor River could be caused by leaking or infiltration through the natural dam body and further investigation is required.

In addition, over the past few years KGC has repeatedly taken steps to prepare project solutions to lower the water level in Petrov Lake. Currently, KGC together with JSC "Kyrgyzsuudolboor" is working on various options to make this a reality.

In 2015, by request of KGC, the head of the research and design laboratory "Stability of geotechnical objects", Ph.D. Chukin B.A. developed recommendations for a system of instrumental monitoring of the condition of the natural dam of Petrov Lake. KGC is currently conducting monitoring, in accordance with these recommendations.

6 SOCIAL RESPONSIBILITY

6.1 | STAKEHOLDER ENGAGEMENT

Effective stakeholder engagement is essential to managing our social responsibility. We have established structured processes to effectively listen to and communicate with our stakeholders, including regulators, shareholders, 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.

In June, Bishkek Inter-District Court made a decision restricting KGC to transfer assets. The decision was taken upon the appeal of the SIETS and is connected to the environmental claims by the State Agency. By the date of publishing of report the decision was still in place. From June 2016 all contributions on behalf of KGC to support sustainable development projects, as well as donations were suspended. The KGC Donations Committee meetings did not take place since June 2016 due to the court restriction. All parties seeking for donations from KGC are being informed in written about the current situation not allowing KGC to render support. Partner organizations implementing KGC-funded development projects in the region have suspended their activities after the court decision came to power.

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.

We have faced a series of allegations and claims regarding environmental impacts and technical aspects of the mine operation. This context means that public and media interest in KGC's activities remains high.

Structured Dialogue

Our local engagement is maintained through our Regional Information Centres. The Centres have been established in the Jeti-Oguz and Ton districts, and in the city of Balykchy. 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 tender processes, scholarship opportunities and etc.

Community relations 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 (eg. schools, medical centres, youth groups), 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 and others. In these meetings KGC management raised issues about operations and define plans of investment projects in liaison with local communities. Decisions are made together with 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.

In recognition of the increased interest in KGC's activities, we update our corporate website (**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 which we post on our website and through social media channels, such as Youtube and Facebook (as **Kumtor Gold Company**).

> "In 2016 we continued to host one-day mine site visits for interested parties."

On a regular basis, we produce a multi-lingual newsletter, In Touch, and occasional brochures on specific issues, such as environmental and operational safety (all also available on our website). 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.

In 2016, we tried to educate young schoolchildren on environmental issues through comics published in children's newspaper Ai-Danek, which is being disseminated in all regions of KR. We produced 24 issues of environmental comics.

In 2016 we continued to host one-day mine site visits for interested parties. We gave site tours for 62 groups, including state agencies, government, local authorities, partner organizations, teachers and students from Issyk-Kul-based and national universities. The program for these groups usually includes visits to all major locations of operation. Department managers escort groups to their locations and address their questions and concerns there and then. Every group visits Camp, Mill, Open Pit, Petrov Lake, Tailings Dam and Water treatment plants. Taking into account that our Marshalling yard is located in Balykchy city – employees of the Yard hosted separate open doors events to schoolchildren of Balykchy, where they got acquainted with the work process and got responses to their questions. We will continue organizing visits to our sites for all interested parties.

As part of Kumtor Ambassadors Program, KGC employees also help SD Department to strengthen capacity of local community representatives, who are involved in Social Investment Projects implemented in the region. On a quarterly basis, we continued to host Microcredit Agencies Supervisory Board Meetings; where KGC managers in sustainability, finance and risks spheres hold five seats. They help to maintain right systems in place and monitor implementation of agreed programs to improve the work of all three MCAs.

Senior Management supported Youth Mean Business Project by attending conferences organized by the implementing partner of the Project, Eurasia Foundation in Central Asia held in Issyk-Kul region and Bishkek.

We continued our cooperation with International Business Council and took part in every Council's management Board Meetings. IBC is the biggest multisector organization uniting top mining companies operating in the country.

Throughout year SD team, as well as Training and Environment Department representatives took part in the GIZ's Mineral Resources for Development Project's bi-monthly meetings, dedicated to a variety of topics, including community relations, training, local procurement, and environment.

KGC HR Department representatives also took part in the Business Advisory Council (BAC) for the School of Economics & Business Administration AUCA (SEBA). The purpose of the SEBA Business Advisory Council is to help the American University of Central Asia's Departments of Economics & Business Administration maintain and deepen ties with business and other stakeholders. The meetings of the BAC will be held twice a year.

KUMTOR AMBASSADORS PROGRAM

In 2016 Kumtor Ambassador Program was a key to maintain our relations with local communities. KGC employs 3,485 people including contractors. It is one of the biggest stakeholder groups, who could provide accurate and credible information about KGC's

activities to interested stakeholders. Unable to support implementation of some of the communities ideas financially - our corporate volunteering program united KGC employees from all locations to help needy communities and communicate with our stakeholders, answering their questions about the mine, and addressing concerns.

In 2016, employees and contractors of all divisions volunteered 3,000 hours to support the Program. More than 30 actions have taken place during the reporting period throughout Issyk-Kul and Chui regions. Some examples include:

- Guest lectures held by employees in schools and universities to raise awareness about KGC's activities, production process, and work done to minimize the effect of mining operations to environment;
- A number of clean-up days in beach areas. One of the clean-up days was held in a pass, where travelers, public transportation and KGC's transport stops for planned breaks;
- Kumtor Employees Funded Repair Works in the Burn Unit's Wards of the Bishkek Research Center of Trauma and Orthopedics. Ambassadors spent a month in the Unit during their weekends to reconstruct the Unit.
- Together with local youth movement in Karakol employees have produced birds houses from waste wood and installed them in parks of the city with local school children and university students.
- A number of one-day mine site visits took place for representatives from schools, universities, organizations and business associations. Various employees escorted the groups during the visit to address raised questions and describe production process.

Issyk-Kul Regional Development Fund

As part of its Operating Agreement, KGC contributes 1% of gross annual revenues to the Issyk-Kul Development Fund. This fund is governed by an oversight and steering committee, which includes local government representatives and NGOs. The fund is designed to develop the socioeconomic infrastructure in 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 $53.6 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 how project selections are made, and funds are being spent. We are aware of these concerns and continue to encourage the fund to be more transparent, and work closely with Transparency International (a global coalition against corruption) on this issue.

KGC has a seat at the IKDF Supervisory Board and has a right to coordinate 50% of overall funds to ensure a transparent and fair spending of the selected projects in the interests of social and economic development of the Issyk-Kul region, especially of communities located on the southern coast of Lake Issyk-Kul, including the town of Balykchy. The Supervisory Board meetings take place once in a quarter.

Fig. 6.1 **Annual Contribution to Issyk-Kul Region Development Fund**

units	2014	2015	2016
Million US$	7.4	7.1	6.2

In 2016 authorities of the Issyk-Kul region have been raising concern of the future of the IKDF and were developing a new mechanisms to allow portion of deducted funds to be saved to a post-closure period and dedicated to a more sustainable and profit-oriented projects. KGC will continue working closely with local communities and government representatives in the region to establish a mutually agreed mechanisms.

Assessing Impacts

Apart from regular monitoring and evaluation processes embedded in each project and donation supported by the company, we regularly conduct impact assessment and perception study in our focus areas – Jeti-Oguz and Ton districts and the city of Balykchy. In 2016 we have conducted a planned bi-yearly perception survey in the region. In 2017 we continued gathering results with the local research company. Stakeholder Engagement Strategy and plan are based on these studies and quarterly review of major stakeholders and their concerns, documented in internal online Kumtor-Connect software system, updated by regional community relations officers, and members of other departments dealing with publicity. Based on analysis and studies we have formulated a summary of stakeholder concerns in Fig. 6.2. (see p. 88)

Fig. 6.2 **Summary of Stakeholder Concerns**

Stakeholders	Topic	Report Section Where Discussed
Kyrgyz Republic Government and Parliament	■ Changing legal agreements ■ Claims and changes to the legislation (glaciers, Water Code) ■ Project benefits ■ Waste Management and permits for new waste dump	■ President's Message ■ Economic Responsibility ■ Waste Rock and Ice ■ Social Responsibility
Various Commissions, Government Agencies and Local Communities	■ Economic benefits ■ Environmental impacts ■ Waste rock management ■ Tailings dam displacement ■ Impacts on glaciers ■ Glacial lake outburst flood ■ Mine closure and its funding	■ President's Message ■ Economic Responsibility ■ Social Responsibility ■ Environmental Sections ■ Case Studies ■ Tailings Management ■ Waste Rock and Ice ■ Mine Closure
Local Communities, Youth, Vulnerable Groups	■ Employment opportunities ■ Environmental impacts ■ Water resources ■ Community support, projects and donations	■ President's Message ■ Social Responsibility ■ Local Procurement ■ Water Use and Treatment
Local Businesses	■ Supplying goods and services	■ President's Message ■ Economic Responsibility ■ Local Procurement ■ Social Responsibility
Employees and Contractors	■ Employment conditions ■ Benefits ■ Health, safety and well-being	■ President's Message ■ People ■ Occupational Health & Safety
Conservation NGOs	■ Environmental impacts ■ Biodiversity strategy ■ Mine closure	■ President's Message ■ Environment sections ■ Mine Closure

KGC Grievance Mechanism

As the major company operating in the Kyrgyz Republic, KGC receives complaints and requests ranging from dust related to truck traffic, to requests for jobs, building roads and procurement-related issues. 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 highlighted in the Environmental Monitoring Section. KGC also experienced temporary road blocks in 2012 and 2013, but none in 2014 -2016. Protests typically involved demands for a greater distribution of the mine's profits and benefits. Negotiations between Centerra and KR Government actively continued in 2016. Overall, we note that the frequency and scale of road blocks have been diminishing. Since 2013, we have been using a new IT-supported management system, Kumtor Connect, to further improve our approach and recording of stakeholder engagement, governance of community investment spending, and managing grievance and commitments.

Grievances on sustainability issues are dealt in accordance with the accepted grievance acceptance mechanisms, described further in the section. In 2016 KGC received 3 grievances and resolved all of them during the year.

We understand the importance of raised concerns and their timely resolution. We will continue to dedicate our efforts to mitigate related risks.

KGC's Sustainable Development Department has four information centres in the Issyk-Kul region, and community representatives and local authorities contact our CROs for any information. In their turn, they report all issues raised by communities to the SD Director and VP on Risks, Compliance and SD. We have a free phone line available 24/7, 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 environment-related issues can be directly sent to the VP Risk & Compliance, and Environment Director via **environment@kumtor.com**. All grievances and issues raised are also reported directly to the KGC senior management.

KUMTOR GRIEVANCE PROCEDURE

Kumtor Gold Company works hard to follow national and international guidelines and to build good community relationships. However, in a company of Kumtor's size, grievances will inevitably arise from time to time. We care about our workers and our community and strive to respond to all legitimate grievances in a consistent and transparent manner.

To process everyone's complaints fairly we have a strict procedure in place:

1 RECEIVE COMPLAINT OF GRIEVANCE
Complaints and grievances can be made through an email or letter, over the phone, in person, or other ways not listed here. once the grievance has been logged, a response will be issued, in most cases, within 30 days.

2 LOG AND ACKNOWLEDGE
The complainant receives a receipt with a unique grievance number acknowledging that Kumtor has received the complaint and it is being processed. ***The complainant must sign off on the receipt to acknowledge they have received their grievance number.***

3 PRELIMINARY ASSESSMENT
The severity and applicability of the grievance is assessed. The investigational approach is decided and parties are assigned to carry out the investigation.

4 INVESTIGATE
The grievance is investigated and a decision as to the legitimacy of the grievance is reached. In legitimate circumstances, options for resolving the conflict are identified.

5 RESPOND
A response is issued, outlining the findings of the investigation and the proposed resolution of the conflict. ***The complainant must sign off on the response. This does not mean they agree with the proposed solutions, it only acknowledges that they received a response.***

Responses may include acknowledgment of fault; changes in company procedures; or in rare cases, some form of compensation

Complainant satisfied

Complainant NOT satisfied

7 GRIEVANCE RESOLVED SUCCESSFULLY
The complainant agrees to one of the proposed solutions.

6 CONSIDER REVIEW OR APPEAL
Other possiple solutions are proposed.

8 REDRESS GRIEVANCE
The agreed upon solution is implemented.

COMPLAINT CLOSED OUT

Conflict resolved

GRIEVANCE MAY BE REVIEWED BY INDEPENDENT THIRD PARTIES

Conflict cannot be resolved

KUMTOR KYMTOP

6.2 | COMMUNITY INVESTMENT PROJECTS

Our aim is for our community investments to generate sustainable local benefits.

We believe that it is important to provide 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 it a priority have a structured and planned approach in community investment 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 size 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. This approach would help lessen the effects of Kumtor's mine closure. 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 to 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.

A key criterion for project selection is the principle of sustainability, which refers to the lasting effects of the project beyond the end of KGC's funding. If a project cannot be deemed to be sustainable and able to continue - or continue to generate benefits - beyond our funding period, then it will not be selected for implementation.

In June 2016, all the social investment payments had been stopped due to the judgment of the Inter-District Court of Bishkek, which banned KGC to transfer its assets. However, before June 2016 we launched new projects and continue implementation of the old ones.

Fig. 6.3 **Sponsorships & Sustainable Development Projects**

units	2014	2015	2016
Million US$	4.5	2.0	0.7

KGC INVESTMENT IN SUSTAINABLE DEVELOPMENT 2016

YOUTH MEAN BUSINESS

Total budget ($)

** the number in brackets shows actual spend*

Goals

Create and strengthen opportunities for youth to succeed in business development and self-employability initiatives.

Target group and area

Youth aged 20-28 living in Issyk-Kul oblast with sector experience and motivation to open up and expand own business.

Achieved results

Local start-up businesses

- 18 Funded
- 16 Operated
- 9 Potentially profitable
- 7 To be improved
- 2 Failed

Job fair

- 1,000 Vacanies
- 700 Visited

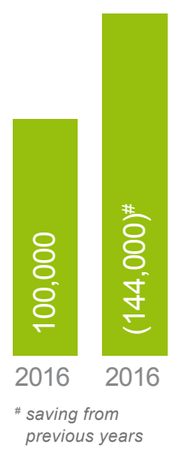
Trainings

- 4/100 For unemployed
- 2/57 For business implementers

- 1 blog for youth business created and maintained
- 3 business start-up centers established

KARAGAT PLUS

Total budget ($)



 # saving from previous years

Goals

Improve the economic situation of rural population in Issyk-Kul oblast through a market oriented and diversified fruit and berry production, fostered relations with buyers.

Target group and area

Farmers, processors, collection points, nurseries, vocational schools of Issyk-Kul oblast.

Achieved results

Trainings

- 2,046 Drip irrigation
- 846 Greenhouses construction
- 51 For farmers

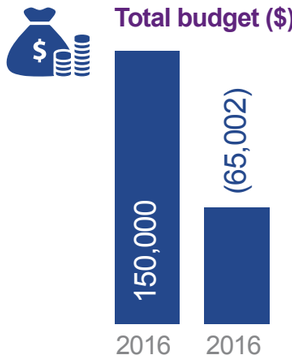
Seedlings

- 28,000 Distributed
- 35,000 Reproduced

- 4 demonstration greenhouses constructed on the base of vocational schools, 7 social greenhouses constructed on the base of the social institutions, 10 farmers got loans from Kumtor MCAs for building greenhouses
- 8 farmers got loans for constructing storages of agricultural produce. 162 tons stored.
- 29 contracts signed with local intermediaries and processors for delivery of 1,414 tons of berries
- 44 demonstration plots with drip irrigation system created around Issyk-Kul oblast (4 in vocational schools and 40 in pilot villages)
- 80 farmer groups created, 1,200 people engaged with farmers groups
- 20 collection points operated
- Over 6,800 people visited Karagat Fest, 242 tons of berries sold during fest within 3 years.

ONE VILLAGE ONE PRODUCT

Total budget ($)



Goals

Combine the efforts of private entrepreneurs and local communities to develop the economic potential of the Issyk-Kul region, through the production of goods from existing local resources.

Target group and area

Community Based Organizations (CBO) focused on felt and food production of Djety-Oguz and Ton regions.

Achieved results

- 78 CBOs from 20 villages involved (total around 800 people)
- 34 trainings for 300 people held
- 300 people involved as raw material suppliers
- 2 felt workshops renovated and equipped
- Environmentally-friendly products sold on 24 sales points of Karakol and Bishkek
- Handicrafts supplied for stores of Japan and Europe

GREEN POINT

Total budget ($)

Goals

Promote tools of “green economy” through the organization of youth employment in the field of ecological business by establishing pilot projects and involvement of people in solid waste management in Issyk-Kul oblast.

Target group and area

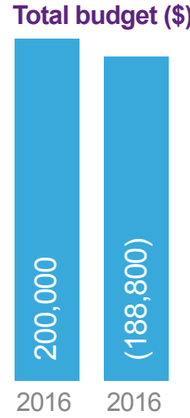
Local youth, vocational schools of Issyk-Kul oblast.

Achieved results

- 80 youth involved
- 5 waste collection points opened providing job places
- 2 eco beaches built
- 3 eco activities held
- All equipment required for opening 3 workshops on manufacturing trash tanks and bicycle parking lots as well as eco-bags and paper bags, purchased

WATER INFRASTRUCTURE

Total budget ($)



Goals

Increasing irrigation water volume and significantly expanding areas under irrigation.

Increasing yield and thereby increase income of farmers

Target group and area

Youth aged 20-28 living in Issyk-Kul oblast with sector experience and motivation to open up and expand own business.

Achieved results

- In 2016, we have cleaned and restored the irrigation system in the villages of Al-Oston, Yrdyk, Tosor, Ak-Dobo, Lipenka and Kyzyl-Suu in Djeti-Oguz region. In Tort-Kul village we have continued reservoir cleaning.
- 35,000 cubic meters of silt and soil have been removed from two daily runoff pounds and water settling ponds in the course of works. And the total length of cleared irrigation ditches has reached 33,370 meters in Djety-Oguz region.
- 125,000 cubic meters of soil have been cleared in the large water reservoir in Tort-Kul village, Ton region.

COMMUNITY OWNED PROJECTS (COP)

Total budget ($)

Goals

Create and strengthen opportunities for youth to succeed in business development and self-employability initiatives.

Target group and area

Youth aged 20-28 living in Issyk-Kul oblast with sector experience and motivation to open up and expand own business.

Achieved results

- Kumtor contributed to the purchase of an artificial sport turf for the new football field in Ak-Sai village, built by the residents themselves.
- Project for families of children with disabilities support implemented by Shoola Kol PF Rehabilitation Centre. The project included training for both, parents and children.
- Support of kindergarten in Kara-koo village, Ton region by purchasing all equipment and furniture required for its operating.

REGIONAL SCHOLARSHIP PROGRAM

The Kumtor Regional Scholarship Program provides students completing high school and wishing to pursue a vocational career the opportunity to apply for one of 20 Scholarships. The successful applicants are under full scholarship that includes tuition, accommodation, meals and a monthly stipend while they attend Technical Vocational School #27 or Technical School #91 in Bishkek.

In 2016, full scholarships were awarded to 11 students to study at Technical School #91 where they graduate with the profession of Cook/Baker. Technical School #27 has worked closely with KGC to establish a program that incorporates school based instruction with practical training in the Heavy Duty workshop or the Mill Maintenance area at the Kumtor Mine site.

Currently KGC is sponsoring 31 students, with 8 in the first year, 12 in the second year and 11 in the third year The program takes 3 years to complete with graduates earning the profession auto mechanic.

Supporting Businesses

We support the development of local businesses in a number of ways. Of these, one of the most important is 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 of individual suppliers becoming overly dependent 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-financing and credit program, which supports and enables local microcredit agencies in Jeti-Oguz, Ton, and Balykchy by offering favorable lending rates for small enterprises and farming businesses. The interest rates of these programs are the lowest in Kyrgyzstan. Between 2006 and 2016, KGC invested more than $4 million. We are working hard to unite international organizations that invest in the Issyk-Kul Region to develop a comprehensive approach in addressing regional development issues.

We continued to purchase a range of natural jams from JICA's One Village – One Product Program members from different communities of Issyk-Kul. Equipment purchased by KGC in 2013 is still used by local producers in terms of both OVOP program and Karagat+ Project, which also continued its work in 2016.

Donations and Charitable Support

In addition to our sustainable community development programs, we provide one-off donations, usually in form of in kind 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 and may be supported as long as they are compliant to our Donations Policy, available at **http://www.kumtor.kg/en/social-responsibility/donations/**

In order to ensure a transparent and strictly governed donation process, a donation committee consisting of the vice-presidents of the company and KGC Sustainable Development Director under the chairmanship of the KGC president, meets once a month to review all applications and approve those meeting the criteria. Our donations are made through goods or equipment procured by KGC and provided to the recipients. Follow up monitoring visits ensure that the donations are used for the intended purpose.

The key donations in 2016 were:

- A group of KGC employees visited the Kok-Jayik mobile jailoo kindergarten to donate stationeries and textbooks the kindergarten needs for regular operation. Assistance to mobile kindergartens organized in Jety-Oguz and Ton districts, Issyk-Kul province, has become the company's traditional event.
- Kumtor became the partner of the initiative and rendered the sponsorship directed for the purchase of the GAZ-66 truck with the cabin for bee farm Altyn Aary in Ak-Dobo village, Djety-Oguz region. This truck is necessary for transportation of the platform with hives in warm season to mountainous areas for improving the honey quality and increasing the harvest. This project was designed to promote local bee farming and obtaining ecological benefits.
- In March, the company supported event devoted to the World Wildlife Conservation Day. As part of the action, schoolchildren set fifty birdhouses in the city parks and sent some part to the Karakol Zoo, the only one in the Kyrgyz Republic that was funded by KGC within the social investment projects.
- KGC supported sport activities initiated by local youth. Thus, sport uniform and inventory were purchased and transferred to PF "Youth council of Jety-Oguz", PF "Toolu oroon koomu- Ton", Balykchy Federation of Sambo and Ton regional sport department. In addition, Kumtor supported regional tournaments and championships.
- Following the tradition KGC rendered financial aid to different public organizations for celebrating Victory Day and International Children's Day.

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.

BMY - 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 forth impact of their activities on the environment, consumers, employees, communities, and stakeholders.

Currencies - Kyrgyz som (KGS): 2016 average exchange rate 1 USD = 69.90 KGS.

Cyanide - A chemical compound containing carbon and nitrogen used to dissolve gold from ore EBRD - European Bank for Reconstruction and Development.

Derived Air Concentration (DAC) - A derived limit on the activity concentration in air (in Bq/m^3) 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** 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_2 equivalents (CO_2e).

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."

GJ - Gigajoules (1GJ = one billion (10^9) joules).

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 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.

km - Kilometres/Kilometres.

KR - The Kyrgyz Republic.

KR NAS - Kyrgyz National Academy of Sciences.

KGC - Kumtor Gold Company.

Kyrgyz Som (KGS) - Currency of Kyrgyzstan (see 'Currencies' for exchange rate).

Liter/Litre - International System unit of volume.

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.

masl - Metres above sea level.

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.

Meter/Metre (m) - International System unit of length.

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).

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 work 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

	2014	2015	2016
Gold Produced (kg)	17,657	16,195.40	17,136.78
Gold Sold (kg)	17,454	17,453.80	16,993.15
KGC's share in KR GDP (%)	7.8	6.8	8.0
KGC's share in the aggregate industrial output	23.1	22.5	23.4

Direct economic value generated and distributed

	2014	2015	2016
Revenues from Gold sales	694,590,808	604,521,845	687,805,172
Other income [a]	2,134,531	5,029,607	1,926,887
Operating costs (Goods and Services) [b]	288,327,187	235,845,312	195,295,968
Corporate administration costs	-	-	-
Exploration costs	-	-	-
Capital expenditure [c]	88,847,144	64,642,771	75,778,978
Other operating costs	1,845,042	1,572,558	2,304,654
Employee and contractor wages and benefits	118,579,207	105,111,954	108,861,856
Payments to providers of funds	-	-	135,000,000
Taxes and Royalties	97,242,713	84,633,058	96,292,724
Community donations and investments	5,114,257	2,203,078	1,176,986
Economic value retained	96,769,787	115,542,721	75,020,894

Notes:

****** Data has been prepared on an accrual basis and non-cash costs have been ignored.*

***a)** Other income includes income from financial investments, sale of assets, and other services.*

***b)** Includes capitalized overburden stripping costs.*

***c)** Excludes capitalized overburden stripping costs.*

Major consumables

	2014	2015	2016
Cement & lime	10,081	8,194	8,628
Reagents & chemicals	11,980	10,686	10,971
Grinding balls	8,628	8,025	9,871
Diesel (x1000 liters/yr)	137,599	119,559	123,846
Explosives	37,140	28,227	24,602

Local procurement in context

	2014	2015	2016
Total Payments for Goods and Services#	377,760,751	279,731,777	256,188,105
Local Payments for Goods and Services#	79,750,616	59,336,002	58,439,328
Local Payments for Goods and Services as% of Total	21%	21%	23%
Local Payments for Goods and Services as% of Adjusted Gross*	58%	57%	55%

 # These figures include the fees paid to the Kyrgyzaltyn Refinery

** Excluding original equipement manufacturer (OEM) capital equipment and parts, major consumables, and reagents that are not available for purchase in the Kyrgyz Republic and fuel import from Russia. This is slightly different to the figures included in the Direct Economic Value Generated and Distributed Table because it is based on actual invoices paid (including advance payments) and does not differentiate between operating costs and capital expenditure.*

Environmental Performance Indicators

	2014	2015	2016
Direct Energy Consumption (GJ)			
Diesel (litres/yr)	137,600,875	119,540,637	123,846,319
Petrol (litres/yr)	423,318	370,998	409,574
Explosives (tonnes/yr)	39,869	28,227	24,602
Indirect Energy Consumption (GJ)			
Electricity (GJ/yr)	1,006,518	1,021,070	1,034,037
Electricity (MWh)	279,588	283,631	287,233
Direct GHG Emissions (Scope 1) (tonnes CO_2e)	376,509	326,396	337,028
Indirect GHG Emissions (Scope 2) (tonnes CO_2e)	24,324	24,676	25,102
GHG intensity ratio (tonnes CO_2e/oz gold)	0.71	0.67	0.66

***Notes:** The 2013 and 2014 Scope 1 emission calculations were updated to account for the explosives emission factors defined in Table 4 of the Australian Government Department of Climate Change, National Greenhouse Accounts (NGZ) Factors, Jan 2008.*

Kumtor Mine Emissions Table (tonnes/year)

Pollutant	MAE Standard 2016	Actual 2016
Dust that contains SiO_2 20-70%	1,113.6	618.2641
Hydrogen cyanide	0.0008	0.0008
Sodium hydroxide	0.3516	0.3627
Calcium oxide dust (lime)	0.5892	1.4690
Carbon (soot)	0.0845	0.0781
Welding aerosol	0.3120	0.4216
Manganous oxide	0.0424	0.0573
Tetrafluorosilane (fluorides)	0.0136	0.0189
Hydrocarbon	3.4833	3.7557
Carbon oxide	48,8865	29.5715
Nitrogen dioxide	79.2213	46.6396
Hydrogen fluoride (fluorides)	0.00114	0.00144
Sulfur dioxide	1.0502	1.1281
Ammonia	0.7787	0.8028
Hydrochloride	0.0000257	0.000026
Silica compositions	0.0136	0.0189
Total:	**1,248.4954**	**702.6402**

Waste management

	2014	2015	2016
Industrial waste - total (tonnes)	7,424	5,637	6,996
Industrial waste - recycled (tonnes)	7,795	5,562	8,828
Hazardous waste - total (tonnes)	125	110	697
Hazardous waste - recycled (tonnes)	25	13	5*
Waste Tires	1,051	1,154	861.5

***Note:** An additional 7.6 tonnes of batteries were recycled from temporary storage areas.*

Water Use and Treatment (mil. m^3)

	2014	2015	2016
Sources of Water			
Total Water Extracted from Petrov Lake	5.62	5.76	5.25
Pit water pumped to the Mill	0.56	0.64	1.01
Pit water pumped to the environment	8.2	10.9	12.75
Water used for Domestic Purposes			
Water Used for Camp domestic purposes (from Petrov Lake)	0.14	0.15	0.13
Water Used for MIll domestic purposes (from Petrov Lake)	0.02	0.19	0.02
Water used for Process/Mill			
Raw water used at Mill (from Petrov Lake)	5.4	5.32	5.06
Total water used at Mill (Petrov Lake + Pit water)	5.96	5.96	6.07
Water internally recycled at Mill	5.5	5.33	6.50
Ore Feed to Mill	5,839,623	5,782,419	6,303,032
Raw Water Intensity Ratio (Liters/tonne)	924	921	803
Water used for Dust Supression			
Water used for Dust Supression	0.07	0.09	0.04
Wastewater Discharged to Environment			
Treated wastewater discharged from ETP	4.70	4.84	4.14
Treated wastewater discharged from STP	0.14	0.12	0.10
Net water usage	0.79	0.79	1.01

Social Performance Indicators

	2014	2015	2016
Training Hours by Gender			
Average/Employee		27.02	35.4
Total Employee Training Hours		71,628	94,334
Total Number of Employees		2,650	2,665
Average/Female Employee		6.43	20.38
Total Female Employee Training Hours		2,316	7,073
Total Number of Female Employees		360	347
Average/Male Employee		30.26	37.64
Total Male Employee Training Hours		69,313	87,261
Total Number of Male Employees		2,290	2,318
Training Hours by Employee Category			
Average/Senior Management		14.32	45.17
Total Training Hours Provided to Senior Management		702	1,897
Total Number of Senior Management		49	42
Average/Middle Management		18.44	39.25
Total Training Hours Provided to Middle Management		5,846	11,539
Total Number of Middle Management		317	294
Average/Funtional Employee		28.47	34.69
Total Training Hours Provided to Funtional Employees		65,031	80,898
Total Number of Funtional Employees		2,284	2,332
Health and Safety			
Annual medicals	2,398	2,440	2,485
Pre-employment medicals	238	424	254
Total visits	43,837	40,558	40,104
Reduction in overall vehicle accidents	17	12	11
Reduction in high-potential injury risk - light vehicle accidents	4	2	3
In-pit heavy versus light vehicle collisions	4	2	2
Injuries due to vehicle accidents	2	1	1
Hours worked	5,981,799	5,734,240	5,712,626
Lost time injuries (LTI's)	4	3	9
Medical aid	3	3	2
First aid	16	16	17
Days lost to injury	6,093	52	6,349
LTI frequency rate	0.13	0.10	0.33
LTI severity rate	203	1.81	222.48
Reportable Injury Rate (RIF)	0.23	0.21	0.39
Incidents w/Property damage	38	31	31

**Compared to 2015, the large variance in the table for days lost to injury and the LTI severity rate in 2016 is due to the fatality and lost time injury that occurred at the Mill. Based on international standards, an automatic 6,000 lost work days is counted for the fatality.*

Employee Demographics

	2014	2015	2016
Standard national entry level wages and those paid by Kumtor			
Kyrgyz minimum wage per hour	5.40	5.8	6.33
Kumtor entry-level wage per hour	73.34	78.2	86.2
Kumtor entry-level to Kyrgyz minimum wage	14 : 1	13 : 1	14 : 1
Staffing at the Kumtor Mine (as at Dec each year)			
Kyrgyz national (Total)	2,550	2,470	2,488
-men	2,192	2,142	2,165
-women	358	328	323
Expat staff (Total)	99	80	71
-men	98	80	71
-women	1	0	0
Full time staff Total (Kyrgyz + Expat)	2,649	2,550	2,559
-men	2,290	2,222	2,236
-women	359	328	323
Contractors (Total)	600	586	926
Total staff (Full time staff + Contractors)	3,249	2,843	3,485
Proportion of Kyrgyz national as full time staff*	96%	97%	97%
Total Number and Rates of New Employee Hires and Employee Turnover by Gender and Region			
Bishkek	48	19	17
Bakykchi	9	2	10
Karakol	12	6	7
Jeti-Oguz	40	30	52
Ton	17	3	21
Other Regions	30	16	19
Women (from all)	28	11	9
Total	184	87	126
Employee Turnover (%)	6.15	5.64	3.7
Return to Work and Retention Rates After Parental Leave (Female employees)			
Entitled to parental Leave	27	22	8
Returned from parental leave	17	16	15

Notes:

** Number of employees for 2014 changed due to clarifications and improvement of counting system and now are accurate.*

GRI CONTENT INDEX

Materiality Disclosures Kumtor Gold Company — Jun. 2017 Service

Economical and Operational Indicators

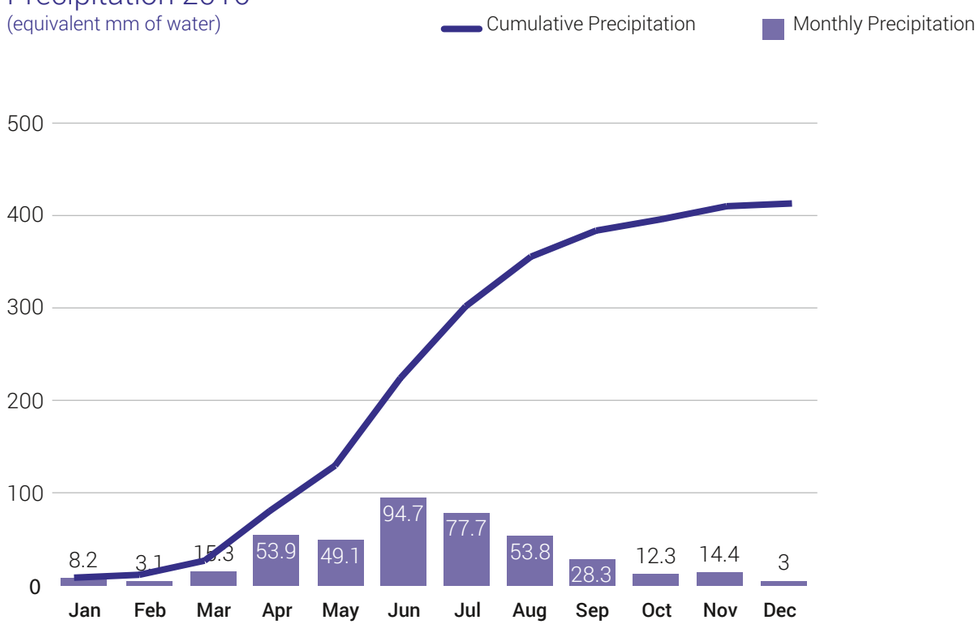
Indicator	Description	Omissions
GRI 101: Foundation		
GRI 102: General Disclosures		
Organizational Profile		
102-1 Name of the organization	About Kumtor Mine (p.2)	-
102-2 Activities, brands, products, and services	About Kumtor Mine (p.2); Operations Overview (p.8-9); Economic Value (p.22)	-
102-3 Location 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	Operations Overview (p.8-9); Economic Value (p.22-23); Workplace Practices (p.34)	-
102-8 Information on employees and other workers	Workplace Practices (p.34-35)	-
102-9 Supply chain	Local Procurement (p.24-25)	-
102-10 Significant changes to the organization and its supply chain	No significant change has been occured neither in company's operational or financial structure nor supply chain;	-
102-11 Precautionary principle or approach	Disclaimer Regarding Forward-Looking Statements (p.122)	-
102-12 External initiatives	Governance (p.12-13)	-
102-13 Membership of associations	Governance (p.12-13)	-
Strategy		
102-14 Statement from senior decision-maker	Message From the President (p.4-7)	-
Ethics and Integrity		
102-16 Values, principles, standards, and norms of behavior	Business Ethics (p.20-21)	-
Governance		
102-18 Governance structure	Governance (p.12-13)	-
Stakeholder Engagement		
102-40 List of stakeholder groups	Stakeholder Engagement (p.84-87)	-
102-41 Collective bargaining agreements	Collective Bargaining (p.32)	-
102-42 Identifying and selecting stakeholders	Stakeholder Engagement (p.84-87)	-
102-43 Approach to stakeholder engagement	Stakeholder Engagement (p.84-85)	-
102-44 Key topics and concerns raised	Environmental Claims (p.14); Stakeholder Engagement (p.86-87)	-
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.17-19)	-
102-47 List of material topics	Materiality Assessment (p.18-19)	-
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)	-
102-52 Reporting cycle	About This Report (p.2)	-
102-53 Contact point for questions regarding the report	Contacts (p.123)	-

Indicator	Description	Omissions
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.104-105)	-
102-56 External assurance	Disclaimer Regarding Forward-Looking Statements (p.122)	-
Material Issues		
Indicator	**Description**	**Omissions**
Water Management		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-15); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16); Environmental Responsibility (p.44); Water Use and Treatment (p.70-71)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16); Environmental Monitoring (p.46-49)	-
GRI 303: Water 2016	303-1 Water withdrawal by source		-
	303-2 Water sources significantly affected by withdrawal of water		-
	303-3 Water recycled and reused		-
GRI 306: Effluents and Waste 2016	306-1 Disclosure 306-1 Water discharge by quality and destination		-
Biodiversity		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-15); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16); Environmental Responsibility (p.44); Biodiversity (p.50)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16); Environmental Monitoring (p.46-47)	-
GRI 304: 2016	304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	Biodiversity (p.50-53)	
	304-2 Significant impacts of activities, products, and services on biodiversity	Biodiversity (p.50-53)	
	304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	Biodiversity (p.54)	-
Waste and Hazardous Material Management		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-15); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16); Environmental Responsibility (p.44); Waste Management (p.60-61)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16); Environmental Monitoring (p.46-47)	-
GRI 306: Effluents and Waste 2016	306-2 Waste by type and disposal method	Waste Management (p.62); Performance Data (p.101)	
	306-3 Significant spills	Environmental Incidents (p.15)	
G4 Sector Supplement	G4-MM3	Unprocessed Waste Rock (p.63); Tailing Management (p.64-65)	
Legal Compliance		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-14); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16);	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16)	-

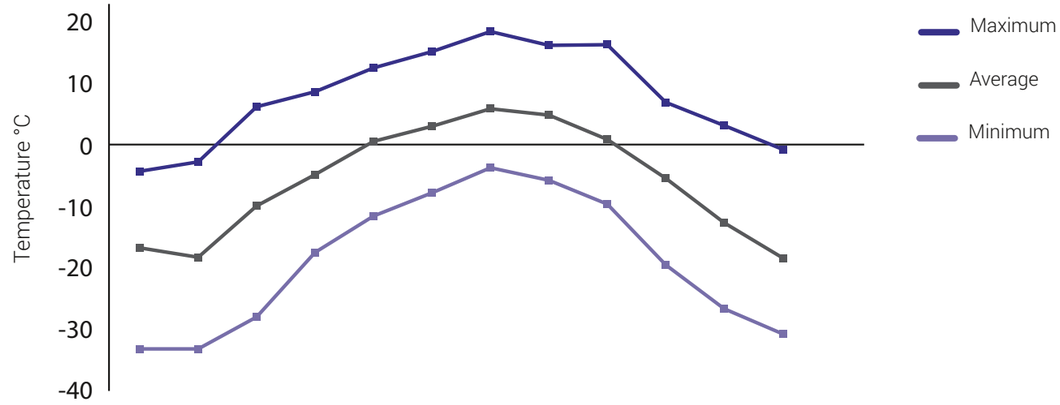
Indicator	Description	Omissions
Legal Compliance		
GRI 307: Environmental Compliance 2016	307-1 307-1 Non-compliance with environmental laws and regulations	Compliance (p.14)	-
Ethical Conduct and Anti-Corruption		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-14); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16); Business Ethics (p.20-21)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16)	-
GRI 205: Anti-Corruption 2016	205-2 205-2 Communication and training about anti-corruption policies and procedures	Business Ethics (p.20-21)	-
Fostering Local Economies		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-14); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16); Local Procurement (p.24-31)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16)	-
GRI 201: Economic Performance 2016	201-1 201-1 Direct economic value generated and distributed	Economic Performance (p.22-23)	-
GRI 204: Procurement Practices 2016	204-1 204-1 Proportion of spending on local suppliers	Local Procurement (p.24-25)	-
Local Communities		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-14); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16); Stakeholder Engagement (p.84-87)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16)	-
GRI 413: Local Communities 2016	413-1 Operations with local community engagement, impact assessments, and development programs	Stakeholder Engagement (p.84-87);	
Occupational Health and Safety		
GRI 103: Management Approach 2016	103-1 Explanation of the material topic and its boundary	Materiality Assessment (p.18-19)	-
	103-2 The management approach and its components	Governance Model (p.13-14); Sustainability Management (p.16); Risk Management and Continuing Improvement (p.16); Collective Bargaining (p.28-29); Occupational Health and Safety (p.40-41)	-
	103-3 Evaluation of the management approach	Governance Model (p.14); Risk Management and Continuing Improvement (p.16)	-
GRI 403: Occupational Health and Safety 2016	403-2 Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	Occupational Health and Safety (p.43)	-
	403-3 Workers with high incidence or high risk of diseases related to their occupation	Occupational Health and Safety (p.40-42)	-
	403-4 Health and safety topics covered in formal agreements with trade unions	Collective Bargaining (p.28-29)	-

APPENDIX

Precipitation 2016
(equivalent mm of water)

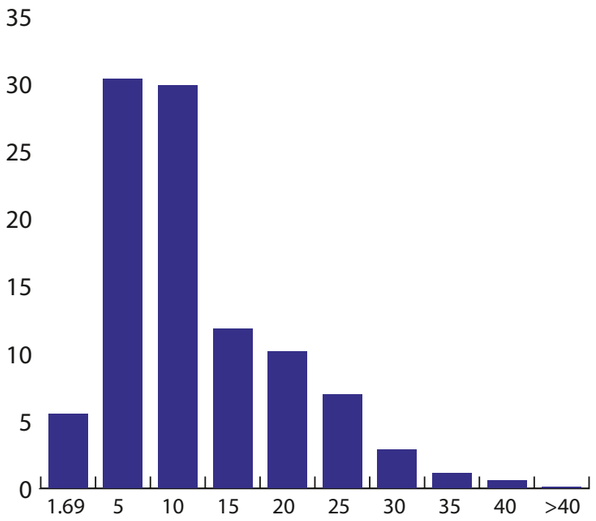


Average Monthly Temperatures in 2016

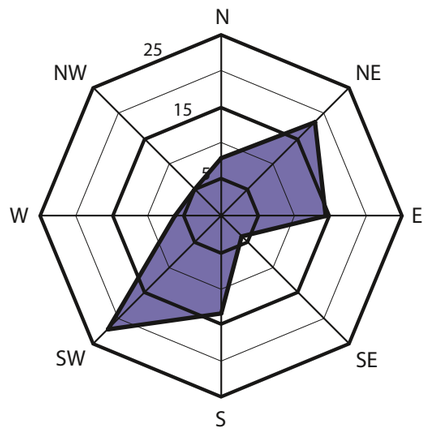


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	-32.7	-32.7	-27.6	-17.3	-11.5	-7.8	-3.8	-5.8	-9.6	-19.3	-26.3	-30.3
Maximum	-4.4	-2.9	5.9	8.3	12.1	14.7	17.9	15.7	15.8	6.6	2.9	-0.9
Average	-16.6	-18.1	-9.9	-4.9	0.4	2.8	5.6	4.59	0.7	-5.5	-12.6	-18.2

Wind Speed and Direction 2016
(km/hour)



Distribution of Wind Direction 2016 (%)



Kumtor Weather Station Summary 2016

2016		HOURLY AVERAGE READINGS FOR 2016										AVERAGE 5 SECOND READING			
					TEMPERATURE ºC										
		W. Spd. 10 m, km/h	W. dir. deg. True N	W. Spd. 0.5 m, km\h	Avg./h	Max., 5 s.	Min., 5 s.	Rel. hum.,%	Dew.Point, 0C	Solar rad., KW/m²	hr./rdg. Total precip., mm	Temp. 0C	Rel. hum.,%	Dew.Point, 0C	Barom. Press., mbar
JAN	max	26.3	358.2	0.0	-4.3	-3.1	-5.4	92.0	-10.9	0.49		-4.9	92.2	-11.0	659.3
	min	0.1	0.3	0.0	-29.3	-27.9	-31.0	26.7	-43.7	0.002		-30.1	26.5	-43.3	645.6
	avg	5.6	117.1	0.0	-16.7	-15.3	-18.0	65.2	-23.5	0.10		-16.7	65.1	-23.5	652.6
	tot										8.2				
FEB	max	37.7	358.9	0.0	-0.4	2.5	-2.4	90.2	-11.6	0.63		-0.6	90.5	-11.9	666.0
	min	0.0	0.6	0.0	-34.0	-32.4	-34.7	21.7	-45.5	0.002		-33.1	22.5	-46.0	644.4
	avg	6.9	136.8	0.0	-16.5	-14.9	-17.8	58.8	-24.6	0.14		-16.5	58.9	-24.6	656.1
	tot										3.1				
MAR	max	32.3	359.0	0.0	3.8	4.3	3.4	96.4	-3.9	0.73		3.7	96.3	-4.1	662.5
	min	0.0	0.1	0.0	-21.0	-19.9	-22.4	28.7	-26.9	0.002		-21.6	29.1	-28.0	645.4
	avg	7.8	180.2	0.0	-7.8	-6.8	-8.8	66.1	-13.6	0.17		-7.8	66.0	-13.6	655.6
	tot										15.3				
APR	max	33.9	359.9	0.0	5.8	6.3	5.1	99.7	-0.1	0.96		5.7	99.7	-0.5	661.9
	min	0.34	0.4	0.0	-14.9	-14.3	-15.5	31.2	-19.3	0.002		-15.0	30.7	-19.1	652.2
	avg	9.9	187.6	0.0	-3.4	-2.7	-4.1	74.6	-7.5	0.19		-3.4	74.6	-7.5	657.0
	tot										53.9				
MAY	max	37.2	359.8	0.0	9.3	10.3	8.6	99.2	2.6	1.11		9.45	99.20	1.42	662.60
	min	0.1	3.4	0.0	-9.1	-8.7	-9.5	27.9	-14.7	0.002		-8.81	26.48	-16.06	653.00
	avg	13.1	197.3	0.0	0.5	1.2	-0.3	72.0	-4.0	0.24		0.45	71.91	-4.06	657.70
	tot										49.1				
JUN	max	33.45	359.70	0.0	16.3	16.7	15.8	99.3	4.9	1.07		16.1	99.3	4.9	665.1
	min	0.11	0.62	0.00	-3.3	-2.8	-3.8	19.5	-9.1	0.002		-3.0	19.7	-9.7	655.2
	avg	11.29	182.44	0.0	4.7	5.5	3.9	69.7	-0.5	0.24		4.7	69.7	-0.5	660.8
	tot										94.7				
JUL	max	39.0	359.8	0.0	16.6	18.0	15.5	98.4	5.6	1.08		16.3	98.2	5.7	664.9
	min	0.0	1.0	0.0	-1.9	-1.3	-2.4	19.3	-8.0	0.002		-1.9	17.9	-9.2	654.8
	avg	11.7	183.1	0.0	5.8	6.6	5.0	68.7	0.5	0.22		5.8	68.7	0.5	659.4
	tot										77.7				
AUG	max	37.3	359.9	0.00	13.00	13.98	11.94	99.30	4.45	1.04		13.3	99.3	4.4	665.0
	min	0.0	2.4	0.00	-3.90	-3.32	-4.32	24.25	-7.22	0.002		-3.5	23.6	-7.2	655.9
	avg	8.9	183.9	0.00	4.37	5.17	3.62	69.87	-0.66	0.21		4.4	69.9	-0.7	661.1
	tot										53.8				
SEP	max	35.4	356.9	0.0	11.9	12.5	11.5	99.8	1.7	1.03		11.9	99.7	2.0	665.0
	min	0.0	1.5	0.00	-4.5	-4.3	-4.7	17.3	-11.3	0.002		-4.5	16.9	-11.8	656.7
	avg	9.3	164.6	0.0	2.7	3.5	1.9	69.2	-2.6	0.20		2.7	69.2	-2.6	661.2
	tot										28.3				
OCT	max	49.2	355.3	0.0	8.5	9.5	8.0	98.8	-0.3	0.85		8.7	98.6	-0.3	664.8
	min	0.1	9.0	0.00	-20.5	-19.9	-20.9	16.2	-27.9	0.002		-20.2	16.4	-28.0	651.6
	avg	13.3	174.5	0.0	-6.0	-5.2	-6.7	64.5	-12.2	0.16		-6.0	64.6	-12.2	657.8
	tot										12.3				
NOV	max	41.5	357.7	0.0	2.5	3.1	2.2	94.0	-6.4	0.69		2.4	94.0	-6.6	663.2
	min	0.0	3.6	0.00	-27.4	-26.2	-28.7	17.7	-37.0	0.002		-27.2	17.5	-37.3	647.8
	avg	10.0	146.7	0.0	-12.0	-11.0	-13.1	66.2	-18.3	0.11		-12.0	66.3	-18.3	656.2
	tot										14.1				
DEC	max	36.5	355.1	0.0	-1.9	-0.9	-2.6	95.7	-5.6	0.50		-1.8	96.0	-5.8	661.7
	min	0.1	2.7	0.00	-29.2	-28.3	-30.4	30.3	-37.5	0.002		-29.3	28.0	-37.8	645.0
	avg	8.1	128.1	0.0	-14.2	-12.9	-15.6	67.0	-20.4	0.09		-14.3	67.1	-20.4	654.2
	tot										3.0				
Yearly	Max	49.2	359.9	0.0	16.6	18.0	15.8	99.8	5.6	1.11		16.3	99.7	5.7	666.0
	Min	0.0	0.1	0.0	-34.0	-32.4	-34.7	16.2	-45.5	0.0		-33.1	16.4	-46.0	644.4
	Avg	15.5	175.2	0.0	-4.9	-4.0	-5.7	62.7	-12.1	0.34		-4.9	62.5	-12.3	657.2
	tot										413.5				

Radionuclides and Heavy Metals in Dust Samples - Mine Site

Station	Zn (ng/m³)	CN (ng/m³)	S (ng/m³)	As (ng/m³)	Ni (ng/m³)	Se (ng/m³)	U (ng/m³)	Sr-90 (mBq/m³)	Pb-210 (mBq/m³)	Ra-226 (mBq/m³)
TLV[1]	1,600,000	5,000,000	330,000	10,000	200,000	200,000	200,000			
DAC[2]								300,000	8,000	4,000
A1.1	9,519	0.207	14	1.79	12.4	0.097	2.28	0.069	0.352	0.048
A1.2a	1,176	0.131	131	3.53	7.8	0.150	1.83	0.065	0.366	0.020
A1.3a	4,125	0.180	108	3.48	8.4	0.132	1.74	0.060	0.372	0.042
A1.4	1,130	0.202	336	4.31	12.8	0.188	2.15	0.067	0.491	0.067
A1.5a	6,133	0.137	32	3.98	8.2	0.144	1.99	0.069	0.446	0.027
A1.6	6,060	0.182	17	4.86	7.9	0.170	1.82	0.061	0.668	0.024

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_2 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/m³)	CN (ng/m³)	S (ng/m³)	As (ng/m³)	Ni (ng/m³)	Se (ng/m³)	U (ng/m³)	Sr-90 (mBq/m³)	Pb-210 (mBq/m³)	Ra-226 (mBq/m³)
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	8,186	0.823	411	5.35	9.5	0.247	2.88	0.411	0.658	0.165
Barskoon #2	8,773	0.886	315	6.20	35.4	0.310	3.32	0.443	0.886	0.044
Barskoon #3	8,701	0.809	389	4.86	14.2	0.243	2.59	0.405	0.809	0.121

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_2 and ZnO.

2. DAC's have been sourced from the 1999 International Atomic Energy Agency (IAEA) safety standards.

W1.1 Petrov Lake (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	4.7	3.6	4.1	3.6	4.9	8.8	7.7	7.3	7.2	7.4	4.5	1.6
Conductivity	mS/cm	0.237	0.131	0.183	0.143	0.853	0.571	0.122	0.891	0.149	0.666	0.991	0.966
pH		8.5	8.7	8.2	8.4	8.3	8.3	8.8	8.4	8.9	8.6	8.3	7.6
Major Constituents													
Calcium	mg/L	11.3	14.6	20.5	17.2	12.7	18.8	11.4	17.3	17.6	16.4	17.8	17.7
Chloride	mg/L	0.800	0.800	0.600	0.800	0.600	0.500	0.600	0.600	0.500	0.600	0.600	0.700
Carbonate	mg/L	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Bicarbonate	mg/L	39.0	39.5	43.0	40.0	29.0	41.0	43.0	39.0	39.5	38.0	54.0	42.0
Potassium	mg/L	1.12	1.44	1.75	1.47	1.05	2.52	1.33	3.09	2.96	2.57	2.37	1.66
Magnesium	mg/L	1.94	2.39	3.22	2.73	2.02	3.90	2.41	4.31	4.24	3.83	3.78	3.38
Sodium	mg/L	1.47	1.79	2.16	1.69	1.38	2.24	1.27	2.55	2.38	2.24	2.34	1.69
Sulphate	mg/L	16.0	16.5	17.0	17.0	11.0	19.0	19.0	18.0	19.0	19.0	18.0	19.0
Hardness - Total	mg/L	48.0	48.0	48.0	49.0	34.0	50.0	50.0	49.0	48.0	47.0	50.0	55.0
Alkalinity - Total	mg/L	31.8	32.3	35.0	32.8	23.8	33.4	34.8	31.8	32.1	31.0	43.8	34.2
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	0.300	0.465	0.390	0.460	0.130	3.57	4.40	2.13	4.86	4.57	2.47	1.11
Arsenic - Total	mg/L	0.00400	0.00225	0.000500	0.000500	0.00200	0.00400	0.00800	0.00200	0.00236	0.00200	0.000500	0.00200
Barium - Total	mg/L	0.0270	0.0315	0.0240	0.0260	0.0330	0.0870	0.110	0.0740	0.113	0.105	0.0650	0.0400
Beryllium - Total	mg/L	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000300	0.000100	0.000100	0.000100	0.000100	0.000100
Cadmium - Total	mg/L	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000270	0.000150	0.000150	0.000150
Cobalt - Total	mg/L	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200
Chromium - Total	mg/L	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.0110	0.0100	0.00800
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00600	0.00250	0.00250	0.00500	0.00500	0.00250
Fluoride - Total	mg/L												
Iron - Total	mg/L	0.286	0.329	0.252	0.295	0.272	2.32	2.93	1.69	4.07	3.12	1.71	0.503
Mercury - Total	mg/L	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250
Manganese - Total	mg/L	0.0150	0.0155	0.0100	0.0120	0.0340	0.0620	0.0870	0.0610	0.110	0.0830	0.0490	0.0210
Molybdenum - Total	mg/L	0.00200	0.00450	0.00200	0.00200	0.00200	0.00200	0.00200	0.00200	0.00500	0.00400	0.00200	0.00500
Nickel - Total	mg/L	0.00500	0.0115	0.00250	0.00800	0.00600	0.00900	0.00250	0.00250	0.0149	0.0100	0.00250	0.00700
Lead - Total	mg/L	0.00100	0.00100	0.00400	0.00100	0.0100	0.00100	0.00500	0.00300		0.00600	0.00500	0.00100
Antimony - Total	mg/L	0.000500	0.000500	0.000500	0.000500	0.000500	0.000500	0.000500	0.000500	0.000840	0.000500	0.000500	0.000500
Selenium - Total	mg/L	0.000500	0.000500	0.000500	0.000500	0.000500	0.000500	0.000500	0.000500	0.00163	0.000500	0.000500	0.00100
Vanadium - Total	mg/L	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00600	0.00300	0.00300	0.00300
Zinc - Total	mg/L	0.00900	0.00650	0.0140	0.00400	0.00400	0.0140	0.0260	0.00600	0.0255	0.0100	0.00900	0.00400
Nutrients													
Ammonia - N	mg/L	0.0200	0.0200	0.0200	0.0200	0.0800	0.0200	0.0600	0.0200	0.0200	0.0200	0.0200	0.0200
Nitrite - N	mg/L	0.00300	0.00200	0.00200	0.00300	0.00300	0.000500	0.00100	0.000500	0.000500	0.00300	0.00100	0.00400
Nitrate - N	mg/L	0.400	0.350	0.300	0.300	0.300	0.200	0.300	0.300	0.300	0.300	0.300	0.300
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L	65.0	68.5	69.0	62.0	63.0	97.0	103	105	105	96.0	74.0	82.0
TSS Total Suspended Solids	mg/L	0.500	0.750	2.00	1.00	1.00	21.0	52.0	56.0	59.0	34.0	14.0	2.00
Turbidity	NTU	0.950	7.98	11.0	10.0	6.20	65.0	110	140	125	95.0	45.0	17.0
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

W1.3 Kumtor River above ETP Discharge (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				0.9	2.8	12.4	5.6	6.0	6.4	1.7	1.4	
Conductivity	mS/cm				1.52	3.68	0.551	0.188	0.371	0.152	0.551	0.356	
pH					8.2	7.9	8.8	8.5	8.4	8.5	8.1	8.2	
Major Constituents													
Calcium	mg/L				99.4	43.4	57.4	17.3	20.0	20.8	42.1	38.7	
Chloride	mg/L				9.20	4.60	3.10	3.80	0.800	0.700	2.50	2.00	
Carbonate	mg/L				0.500	0.500	0.500	0.500	0.500	7.00	0.500	0.500	
Bicarbonate	mg/L				120	86.0	78.0	62.0	44.0	52.0	74.0	76.0	
Potassium	mg/L				3.31	1.95	2.16	1.20	2.84	2.05	1.84	2.00	
Magnesium	mg/L				57.4	16.1	26.1	3.23	5.20	5.32	19.8	15.5	
Sodium	mg/L				6.99	4.38	2.58	2.43	2.47	1.98	2.81	2.81	
Sulphate	mg/L				310	88.0	168	23.0	24.0	28.0	110	95.0	
Hardness - Total	mg/L				425	160	200	70.0	60.0	61.0	180	150	
Alkalinity - Total	mg/L				100	71.0	64.0	51.0	35.8	42.6	60.0	62.5	
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				14.0	14.8	8.62	4.66	1.96	3.75	2.68	0.320	
Arsenic - Total	mg/L				0.0170	0.0110	0.0110	0.00900	0.00150	0.00200	0.00200	0.000500	
Barium - Total	mg/L				0.272	0.195	0.150	0.113	0.0605	0.0900	0.0740	0.0290	
Beryllium - Total	mg/L				0.000700	0.000700	0.000100	0.000300	0.000100	0.000100	0.000100	0.000100	
Cadmium - Total	mg/L				0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	
Cobalt - Total	mg/L				0.0140	0.0100	0.00800	0.00200	0.00850	0.00200	0.00200	0.00200	
Chromium - Total	mg/L				0.0290	0.00400	0.00400	0.00400	0.00400	0.00400	0.0110	0.00800	
Copper - Total	mg/L				0.0330	0.00250	0.0200	0.00500	0.00500	0.00250	0.00250	0.00250	
Fluoride - Total	mg/L												
Iron - Total	mg/L				27.4	18.6	14.1	3.43	1.85	2.96	1.82	0.297	
Mercury - Total	mg/L				0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	
Manganese - Total	mg/L				0.787	0.438	0.427	0.289	0.882	0.0830	0.0830	0.0150	
Molybdenum - Total	mg/L				0.0110	0.00600	0.00700	0.00600	0.00400	0.00800	0.00500	0.00800	
Nickel - Total	mg/L				0.0850	0.0260	0.0250	0.0230	0.0398	0.0250	0.0130	0.0260	
Lead - Total	mg/L				0.0180	0.0230	0.0100	0.00700	0.00250		0.00300	0.00300	
Antimony - Total	mg/L				0.00400	0.000500	0.000500	0.000500	0.00375	0.000500	0.000500	0.000500	
Selenium - Total	mg/L				0.00600	0.000500	0.000500	0.00300	0.00325	0.00304	0.000500	0.000500	
Vanadium - Total	mg/L				0.0210	0.0220	0.00300	0.00300	0.00300		0.00300	0.00300	
Zinc - Total	mg/L				0.0560	0.0680	0.0290	0.0230	0.0170	0.0147	0.0140	0.00500	
Nutrients													
Ammonia - N	mg/L				0.300	0.100	0.220	0.0200	0.0200	0.0400	0.0200	0.0200	
Nitrite - N	mg/L				0.00500	0.00500	0.000500	0.00200	0.00300	0.000500	0.00300	0.00100	
Nitrate - N	mg/L				2.90	0.900	1.60	0.200	0.300	0.300	0.800	0.600	
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L				630	236	323	122	98.0	116	251	159	
TSS Total Suspended Solids	mg/L				922	633	402	154	104	54.0	66.0	15.0	
Turbidity	NTU				600	400	340	150	110	130	70.0	19.0	
Trace Constituents													
Cyanide - Free	mg/L				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	0.0360	0.00250	0.00250	0.00250	
Cyanide - WAD	mg/L				0.00250	0.00250	0.00250	0.00250	0.00800	0.00250	0.00250	0.00250	

W3.4 Lysyi Creek above Kumtor River (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	3.4	1.0	1.4	1.6	4.0	8.0	5.7	6.9	5.5	1.4	0.8	1.4
Conductivity	mS/cm	0.908	3.52	2.71	0.931	1.17	1.47	1.52	1.44	1.24	1.67	1.78	2.44
pH		7.6	8.2	8.3	8.1	8.4	8.2	8.1	8.4	8.3	7.9	8.1	8.3
Major Constituents													
Calcium	mg/L	102	214	254	111	134	138	160	164	180	207	229	231
Chloride	mg/L	10.9	18.5	35.4	9.36	11.8	7.06	6.45	6.08	7.50	11.3	11.2	24.3
Carbonate	mg/L	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Bicarbonate	mg/L	277	508	631	169	164	110	108	131	165	225	260	413
Potassium	mg/L	4.58	10.8	16.7	3.59	3.73	3.91	4.24	4.15	4.88	4.96	5.89	8.39
Magnesium	mg/L	56.6	154	199	57.2	77.8	108	121	117	134	157	174	180
Sodium	mg/L	15.9	22.2	43.4	9.94	11.9	5.53	4.58	5.09	6.98	10.0	11.6	24.3
Sulphate	mg/L	189	767	865	306	420	665	792	740	786	952	932	1060
Hardness - Total	mg/L	433	1180	1400	464	581	780	888	850	920	1180	1260	1120
Alkalinity - Total	mg/L	228	415	518	139	134	90.6	88.4	107	135	185	214	341
Total Metals													
Silver - Total	mg/L	0.00150	0.00188	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150
Aluminum - Total	mg/L	0.200	0.120	0.265	2.96	7.50	6.73	8.02	2.86	1.33	1.04	0.396	0.0633
Arsenic - Total	mg/L	0.00100	0.00138	0.00125	0.00390	0.0112	0.0126	0.0165	0.00575	0.00270	0.00475	0.00170	0.00133
Barium - Total	mg/L	0.0413	0.0550	0.0822	0.108	0.146	0.116	0.146	0.0660	0.0394	0.0388	0.0326	0.0310
Beryllium - Total	mg/L	0.000100	0.000100	0.000100	0.000280	0.000450	0.000360	0.000350	0.000125	0.000100	0.000100	0.000100	0.000100
Cadmium - Total	mg/L	0.000150	0.000150	0.000150	0.000150	0.000188	0.000200	0.000212	0.000150	0.000150	0.000150	0.000150	0.000150
Cobalt - Total	mg/L	0.00200	0.00200	0.00200	0.00540	0.00850	0.0284	0.0308	0.0145	0.00720	0.00475	0.00200	0.00200
Chromium - Total	mg/L	0.00400	0.00500	0.00500	0.00400	0.00950	0.00900	0.00400	0.00400	0.00400	0.00625	0.00540	0.00400
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.00810	0.0139	0.0147	0.0164	0.0101	0.00790	0.00250	0.00250	0.00367
Fluoride - Total	mg/L												
Iron - Total	mg/L	0.411	0.260	0.416	4.96	12.8	12.2	15.8	5.40	2.10	2.04	0.799	0.128
Mercury - Total	mg/L	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000312	0.000250	0.000250
Manganese - Total	mg/L	0.0380	0.0550	0.0678	0.417	0.530	2.11	2.15	1.38	0.805	0.567	0.119	0.0623
Molybdenum - Total	mg/L	0.00200	0.0108	0.0145	0.00840	0.00500	0.00580	0.00875	0.00600	0.00620	0.00550	0.00600	0.00667
Nickel - Total	mg/L	0.00367	0.0110	0.0222	0.0369	0.0420	0.101	0.132	0.0752	0.0534	0.0425	0.0206	0.0127
Lead - Total	mg/L	0.00933	0.00100	0.00550	0.00920	0.0185	0.00900	0.0110	0.00350	0.00600	0.00300	0.00200	0.00100
Antimony - Total	mg/L	0.000833	0.000625	0.000875	0.000700	0.00425	0.00220	0.000875	0.00238	0.000500	0.00100	0.000800	0.000500
Selenium - Total	mg/L	0.00333	0.00200	0.00250	0.00420	0.00525	0.00520	0.00525	0.00525	0.00648	0.00775	0.00860	0.00650
Vanadium - Total	mg/L	0.00300	0.00300	0.00300	0.00560	0.0110	0.0100	0.00300	0.00400	0.00300	0.00300	0.00300	0.00300
Zinc - Total	mg/L	0.0113	0.00850	0.0180	0.0222	0.0398	0.0332	0.0428	0.0182	0.0164	0.0175	0.0100	0.00800
Nutrients													
Ammonia - N	mg/L	0.0200	0.0200	0.0600	0.152	0.260	0.368	0.485	0.295	0.184	0.0900	0.0200	0.293
Nitrite - N	mg/L	0.00467	0.00275	0.00450	0.00260	0.00550	0.000500	0.000500	0.000625	0.00290	0.000875	0.00220	0.00150
Nitrate - N	mg/L	0.300	1.92	2.72	1.68	4.20	3.90	4.22	3.60	4.50	5.90	5.94	6.67
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L	544	1600	1960	659	826	1130	1290	1250	1380	1730	1840	1990
TSS Total Suspended Solids	mg/L	48.0	40.0	15.2	801	528	563	652	297	79.6	122	74.4	25.0
Turbidity	NTU	19.2	14.0	10.2	773	366	454	413	144	45.4	36.8	13.0	10.6
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

T8.1 Tailings Pond - Feed to ETP (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	0.4	0.6	1.0	1.4	5.9	11.6	12.4	12.8	10.0	3.0	15.4	3.4
Conductivity	mS/cm	3.98	4.20	4.14	3.28	3.18	2.81	2.71	2.82	2.76	2.88	3.04	3.02
pH		9.7	10.2	11.6	10.5	10.4	10.3	9.7	9.7	9.7	9.8	10.2	9.2
Major Constituents													
Calcium	mg/L	222	164	92.1	136	100	107	101	93.3	91.5	77.7	72.5	72.4
Chloride	mg/L	24.8	26.3	21.7	20.5	16.8	18.0	18.5	19.8	21.5	22.3	35.2	22.2
Carbonate	mg/L	24.5	31.3	89.0	84.0	37.0	17.0	6.50	6.50	5.62	10.0	12.8	32.0
Bicarbonate	mg/L	59.5	47.3	14.0	0.500	24.5	53.8	86.0	102	112	108	106	67.2
Potassium	mg/L	142	111	117	104	78.9	87.0	82.6	85.0	90.2	82.4	90.5	86.1
Magnesium	mg/L	8.32	5.71	2.01	3.52	4.29	5.46	6.31	7.30	7.87	7.02	7.11	6.80
Sodium	mg/L	712	560	628	538	420	448	437	446	470	431	465	448
Sulphate	mg/L	1,490	1,450	977	1,080	942	938	971	924	919	902	952	915
Hardness - Total	mg/L	531	508	275	362	294	281	275	269	250	250	246	309
Alkalinity - Total	mg/L	89.6	91.2	186	144	82.4	72.5	82.1	95.0	104	106	107	96.5
Total Metals													
Silver - Total	mg/L	0.124	0.0780	0.0400	0.0620	0.0820	0.0760	0.0958	0.0885	0.0848	0.0777	0.0844	0.0920
Aluminum - Total	mg/L	0.210	0.217	0.890	0.760	0.258	0.200	0.172	0.172	0.165	0.227	0.214	0.215
Arsenic - Total	mg/L	0.0180	0.0200	0.0273	0.0150	0.00925	0.00550	0.00550	0.00300	0.00350	0.00567	0.00620	0.00550
Barium - Total	mg/L	0.0398	0.0410	0.0430	0.0425	0.0310	0.0278	0.0258	0.0255	0.0238	0.0283	0.0226	0.0208
Beryllium - Total	mg/L	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100
Cadmium - Total	mg/L	0.00165	0.00157	0.00187	0.00190	0.00108	0.00110	0.00108	0.000812	0.000688	0.00103	0.00118	0.00112
Cobalt - Total	mg/L	0.0662	0.0367	0.0223	0.00933	0.0364	0.0469	0.0419	0.0416	0.0533	0.0558	0.0538	0.0642
Chromium - Total	mg/L	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00400	0.00533	0.00480	0.00400
Copper - Total	mg/L	36.0	41.2	36.4	28.2	32.9	35.4	34.9	32.1	30.9	29.1	33.0	34.2
Fluoride - Total	mg/L											31.1	
Iron - Total	mg/L	3.91	3.94	6.64	2.74	2.74	1.17	0.711	0.656	0.432	0.350	0.366	0.811
Mercury - Total	mg/L	0.00920	0.00950	0.0130	0.0100	0.00677	0.00658	0.00490	0.00708	0.00718	0.00773	0.00898	0.00852
Manganese - Total	mg/L	0.0148	0.0110	0.00933	0.0150	0.00725	0.00800	0.0132	0.0188	0.0165	0.0197	0.0122	0.0102
Molybdenum - Total	mg/L	0.407	0.440	0.462	0.433	0.331	0.321	0.347	0.323	0.308	0.313	0.326	0.329
Nickel - Total	mg/L	0.676	0.625	0.497	0.325	0.481	0.520	0.504	0.485	0.475	0.459	0.535	0.567
Lead - Total	mg/L	0.0100	0.00400	0.00367	0.00850	0.00925	0.00150	0.00875	0.00125	0.00400	0.00367	0.00160	0.00225
Antimony - Total	mg/L	1.49	1.48	2.41	1.34	1.10	1.07	0.934	0.835	0.783	0.766	0.836	0.834
Selenium - Total	mg/L	0.0388	0.0410	0.0423	0.0405	0.0268	0.0262	0.0270	0.0270	0.0278	0.0243	0.0300	0.0315
Vanadium - Total	mg/L	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300	0.00300
Zinc - Total	mg/L	0.0258	0.0133	0.0423	0.0357	0.0236	0.0193	0.0111	0.00406	0.00517	0.0235	0.00660	0.00875
Nutrients													
Ammonia - N	mg/L	21.2	22.3	19.5	15.5	12.1	11.0	12.2	13.2	13.3	14.3	19.1	19.5
Nitrite - N	mg/L	0.235	0.155	0.0575	0.195	0.209	0.300	0.256	0.313	0.450	0.319	0.418	0.368
Nitrate - N	mg/L	26.5	27.7	26.7	24.0	20.2	19.2	20.0	18.9	17.3	16.8	18.4	18.8
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L	2,980	2,970	2,650	2,600	2,050	2,030	2,480	1,920	2,000	1,980	2,090	2,130
TSS Total Suspended Solids	mg/L	2.12	2.33	21.3	8.00	7.50	4.00	2.75	4.25	3.00	4.67	0.800	0.625
Turbidity	NTU	1.78	1.63	11.1	7.30	6.40	6.00	5.75	7.98	4.95	6.00	0.930	0.850
Trace Constituents													
Cyanide - Free	mg/L	11.8	13.3	25.5	19.0	16.7	12.7	8.11	5.31	4.55	2.51	3.86	3.92
Cyanide - Total	mg/L	73.5	80.7	127	85.4	64.1	50.1	42.7	38.3	34.4	31.0	36.4	36.5
Cyanide - WAD	mg/L	59.5	58.0	77.3	61.6	53.5	47.0	40.0	35.5	33.0	28.3	34.0	35.5

T8.4 ETP Discharge into Kumtor River (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C						9.9	12.3	13.1	8.9	6.2		
Conductivity	mS/cm						2.53	3.34	3.33	2.95			
pH							7.5	7.4	7.7	7.0	6.7		
Major Constituents													
Calcium	mg/L					55.5	75.0	92.1	64.3	51.5	49.2		
Chloride	mg/L					13.0	15.0	18.0	18.8	20.9	21.0		
Carbonate	mg/L					6.00	0.500	0.500	1.62	0.500	0.500		
Bicarbonate	mg/L					74.0	86.0	65.0	56.0	65.3	64.0		
Potassium	mg/L					33.8	53.8	79.2	77.2	77.5	76.7		
Magnesium	mg/L					5.91	6.84	6.06	7.19	7.37	7.72		
Sodium	mg/L					309	431	586	560	565	557		
Sulphate	mg/L					680	990	1310	1180	1170	1130		
Hardness - Total	mg/L					190	225	266	195	161	160		
Alkalinity - Total	mg/L					71.5	70.8	53.2	48.1	53.5	52.4		
Total Metals													
Silver - Total	mg/L					0.00500	0.00150	0.00150	0.00150	0.00150	0.00150		
Aluminum - Total	mg/L					0.840	0.325	0.122	0.0675	0.0950	0.0880		
Arsenic - Total	mg/L					0.00400	0.00300	0.00450	0.00275	0.00250	0.00480		
Barium - Total	mg/L					0.0430	0.0385	0.0265	0.0170	0.0173	0.0182		
Beryllium - Total	mg/L					0.000100	0.000100	0.000100	0.000100	0.000100	0.000100		
Cadmium - Total	mg/L					0.000400	0.000500	0.000900	0.000712	0.000775	0.000800		
Cobalt - Total	mg/L					0.0250	0.0305	0.0550	0.0402	0.0452	0.0424		
Chromium - Total	mg/L					0.00400	0.00600	0.00650	0.00400	0.00588	0.00480		
Copper - Total	mg/L					0.267	0.273	0.376	0.118	0.0981	0.0888		
Fluoride - Total	mg/L												
Iron - Total	mg/L					1.39	0.720	0.620	0.310	0.258	0.267		
Mercury - Total	mg/L						0.00200	0.00228	0.00552	0.00515			
Manganese - Total	mg/L					0.0670	0.0530	0.0385	0.0125	0.0153	0.0202		
Molybdenum - Total	mg/L					0.148	0.182	0.291	0.270	0.272	0.264		
Nickel - Total	mg/L					0.0150	0.0190	0.0370	0.0112	0.00925	0.00980		
Lead - Total	mg/L					0.00700	0.00100	0.00425	0.00100	0.00273	0.00120		
Antimony - Total	mg/L					0.361	0.468	0.596	0.541	0.487	0.442		
Selenium - Total	mg/L					0.0100	0.0150	0.0192	0.0218	0.0206	0.0188		
Vanadium - Total	mg/L					0.00300	0.00300	0.00300	0.00300	0.00300	0.00300		
Zinc - Total	mg/L					0.00600	0.00550	0.00600	0.00312	0.00445	0.00340		
Nutrients													
Ammonia - N	mg/L					18.2	23.5	31.2	31.2	28.7	26.2		
Nitrite - N	mg/L					0.0547	0.158	0.480	0.478	0.689	0.788		
Nitrate - N	mg/L					6.53	10.9	17.5	16.2	15.2	14.0		
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L					1320	1800	2320	2160	2200	2120		
TSS Total Suspended Solids	mg/L					28.0	15.0	3.00	3.38	2.66	1.90		
Turbidity	NTU					0.000	17.2	2.46	1.82	1.03	1.49		
Trace Constituents													
Cyanide - Free	mg/L					0.0320	0.0150	0.0130	0.0160	0.0178	0.0174		
Cyanide - Total	mg/L					0.110	0.240	0.360	0.575	0.246	0.166		
Cyanide - WAD	mg/L					0.0360	0.0230	0.0280	0.0235	0.0299	0.0264		

W1.4 Kumtor River Flume (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				1.4	4.3	10.6	5.3	5.9	6.8	0.9	0.5	
Conductivity	mS/cm				0.578	3.96	0.306	0.304	0.645	0.342	0.394	0.393	
pH					8.1	8.0	8.9	8.0	8.3	8.5	8.1	7.9	
Major Constituents													
Calcium	mg/L				55.3	48.1	34.3	21.0	19.6	28.4	44.0	46.7	
Chloride	mg/L				7.40	6.20	2.10	1.70	0.700	1.70	3.20	3.00	
Carbonate	mg/L				0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	
Bicarbonate	mg/L				98.0	90.0	58.0	47.0	41.0	52.0	80.0	88.0	
Potassium	mg/L				2.79	2.17	1.70	2.81	2.75	4.22	2.21	2.45	
Magnesium	mg/L				23.8	18.6	11.9	6.72	5.17	9.65	19.5	19.1	
Sodium	mg/L				6.00	5.55	2.18	14.1	2.45	21.5	5.17	4.22	
Sulphate	mg/L				128	97.0	73.0	98.0	24.0	88.0	112	95.0	
Hardness - Total	mg/L				210	180	120	100	85.0	95.0	180	180	
Alkalinity - Total	mg/L				81.0	73.5	47.2	38.8	33.2	42.8	66.0	72.5	
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				7.93	8.99	8.78	6.00	2.15	4.41	2.21	0.390	
Arsenic - Total	mg/L				0.00800	0.00600	0.00900	0.0110	0.00200	0.00200	0.00200	0.000500	
Barium - Total	mg/L				0.132	0.119	0.142	0.131	0.0710	0.105	0.0650	0.0410	
Beryllium - Total	mg/L				0.000300	0.000400	0.000100	0.000500	0.000100	0.000100	0.000100	0.000100	
Cadmium - Total	mg/L				0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	
Cobalt - Total	mg/L				0.00600	0.00400	0.00600	0.00600	0.00200	0.00200	0.00200	0.00200	
Chromium - Total	mg/L				0.0250	0.00400	0.00400	0.00400	0.00400	0.00400	0.0100	0.00900	
Copper - Total	mg/L				0.0240	0.00250	0.0190	0.0180	0.00500	0.00700	0.00250	0.00250	
Fluoride - Total	mg/L												
Iron - Total	mg/L				12.7	10.8	12.7	5.57	1.89	3.91	1.63	0.398	
Mercury - Total	mg/L				0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	
Manganese - Total	mg/L				0.333	0.289	0.329	0.261	0.0900	0.133	0.0800	0.0240	
Molybdenum - Total	mg/L				0.0160	0.00500	0.00200	0.0100	0.00800	0.0110	0.00200	0.00500	
Nickel - Total	mg/L				0.0560	0.0180	0.0170	0.0240	0.00250	0.00900	0.00250	0.00800	
Lead - Total	mg/L				0.0110	0.0220	0.0120	0.00900	0.00400		0.00500	0.00400	
Antimony - Total	mg/L				0.00200	0.000500	0.000500	0.0170	0.0130	0.0154	0.000500	0.00200	
Selenium - Total	mg/L				0.00300	0.000500	0.000500	0.000500	0.000500	0.00500	0.000500	0.000500	
Vanadium - Total	mg/L				0.0120	0.0130	0.00300	0.0110	0.00300		0.00300	0.00300	
Zinc - Total	mg/L				0.0310	0.0410	0.0330	0.0330	0.00700	0.0158	0.000500	0.00700	
Nutrients													
Ammonia - N	mg/L				0.160	0.160	0.200	0.840	0.920	0.920	0.0800	0.0600	
Nitrite - N	mg/L				0.00400	0.00400	0.000500	0.0110	0.0180	0.0180	0.00200	0.00100	
Nitrate - N	mg/L				1.10	0.800	0.800	0.900	0.300	0.800	0.800	0.800	
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L				321	265	169	199	188	210	248	212	
TSS Total Suspended Solids	mg/L				452	498	708	410	95.0	76.0	58.0	10.0	
Turbidity	NTU				290	280	340	260	110	110	55.0	12.0	
Trace Constituents													
Cyanide - Free	mg/L				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	0.0320	0.0320	0.0200	0.00250	0.00250	
Cyanide - WAD	mg/L				0.00250	0.00250	0.00250	0.00700	0.00800	0.00250	0.00250	0.00250	

W4.1 UDD at Headwater of Arabel Suu Diversion Ditch (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C							13.3		9.7			
Conductivity	mS/cm							0.120		0.155			
pH								9.2		7.8			
Major Constituents													
Calcium	mg/L							18.5					
Chloride	mg/L							2.00					
Carbonate	mg/L							0.500					
Bicarbonate	mg/L							50.0					
Potassium	mg/L							0.530					
Magnesium	mg/L							2.05					
Sodium	mg/L							1.35					
Sulphate	mg/L							6.00					
Hardness - Total	mg/L							50.0					
Alkalinity - Total	mg/L							41.0					
Total Metals													
Silver - Total	mg/L												
Aluminum - Total	mg/L							0.270					
Arsenic - Total	mg/L												
Barium - Total	mg/L							0.00700					
Beryllium - Total	mg/L							0.000100					
Cadmium - Total	mg/L							0.000150					
Cobalt - Total	mg/L												
Chromium - Total	mg/L												
Copper - Total	mg/L							0.00250					
Fluoride - Total	mg/L												
Iron - Total	mg/L							0.665					
Mercury - Total	mg/L							0.000250					
Manganese - Total	mg/L												
Molybdenum - Total	mg/L												
Nickel - Total	mg/L							0.0140					
Lead - Total	mg/L							0.00100					
Antimony - Total	mg/L												
Selenium - Total	mg/L												
Vanadium - Total	mg/L												
Zinc - Total	mg/L							0.00400					
Nutrients													
Ammonia - N	mg/L							0.0800					
Nitrite - N	mg/L							0.000500					
Nitrate - N	mg/L							0.0500					
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L							59.0					
TSS Total Suspended Solids	mg/L							10.0					
Turbidity	NTU							8.00					
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

W4.3.1 Discharge of UDD Settling Pond into Kumtor River (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C							11.9		5.0			
Conductivity	mS/cm							0.177		0.159			
pH								8.6		8.6			
Major Constituents													
Calcium	mg/L							21.9					
Chloride	mg/L							2.90					
Carbonate	mg/L							0.500					
Bicarbonate	mg/L							56.0					
Potassium	mg/L							0.620					
Magnesium	mg/L							2.75					
Sodium	mg/L							1.58					
Sulphate	mg/L							7.00					
Hardness - Total	mg/L							60.0					
Alkalinity - Total	mg/L							46.6					
Total Metals													
Silver - Total	mg/L												
Aluminum - Total	mg/L							0.210					
Arsenic - Total	mg/L												
Barium - Total	mg/L							0.0110					
Beryllium - Total	mg/L							0.000100					
Cadmium - Total	mg/L							0.000150					
Cobalt - Total	mg/L												
Chromium - Total	mg/L												
Copper - Total	mg/L							0.00600					
Fluoride - Total	mg/L												
Iron - Total	mg/L							0.311					
Mercury - Total	mg/L							0.000250					
Manganese - Total	mg/L												
Molybdenum - Total	mg/L												
Nickel - Total	mg/L							0.0170					
Lead - Total	mg/L							0.00100					
Antimony - Total	mg/L												
Selenium - Total	mg/L												
Vanadium - Total	mg/L												
Zinc - Total	mg/L							0.00600					
Nutrients													
Ammonia - N	mg/L							0.200					
Nitrite - N	mg/L							0.000500					
Nitrate - N	mg/L							0.0500					
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L							75.0					
TSS Total Suspended Solids	mg/L							11.0					
Turbidity	NTU							7.10					
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

W2.6 Chon Sarytor (new channel) above Kumtor River (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	1.3	0.9	2.4	1.7	1.9	4.2	10.6	11.8	10.7	3.7	0.5	0.9
Conductivity	mS/cm	5.04	7.13	4.98	1.67	1.39	1.95	2.17	2.39	1.30	1.70	2.89	4.76
pH		7.6	8.1	6.7	8.3	8.4	8.1	8.1	8.3	8.7	8.0	7.9	7.8
Major Constituents													
Calcium	mg/L	744	788	492	338	255	269	274	322	341	434	597	521
Chloride	mg/L	65.7	54.4	33.0	17.5	10.6	8.84	11.0	15.5	15.8	21.0	29.8	29.2
Carbonate	mg/L	0.500	0.500	0.500	0.500	1.88	0.500	3.62	0.500	0.500	0.500	0.500	110
Bicarbonate	mg/L	733	668	465	242	176	169	205	232	242	318	478	393
Potassium	mg/L	89.0	86.7	50.4	23.2	12.1	11.6	17.1	19.8	22.6	25.9	44.2	40.5
Magnesium	mg/L	712	642	366	181	107	88.6	134	155	165	211	353	314
Sodium	mg/L	99.4	85.9	50.8	24.0	14.7	11.9	16.9	19.8	21.9	28.8	47.7	45.0
Sulphate	mg/L	3,290	3,250	2,000	1,120	738	710	930	1,010	1,080	1,420	2,120	2,150
Hardness - Total	mg/L	4,980	4,660	3,210	1,580	1,050	945	1,220	1,310	1,430	1,940	2,980	3,220
Alkalinity - Total	mg/L	599	547	381	199	146	139	174	190	198	260	342	412
Total Metals													
Silver - Total	mg/L	0.00150	0.00240	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00380	0.00150	0.00150	0.00150
Aluminum - Total	mg/L	0.205	0.120	0.0825	11.8	54.8	40.6	25.9	34.0	24.3	11.5	1.20	1.82
Arsenic - Total	mg/L	0.00200	0.00360	0.00275	0.00960	0.0398	0.0366	0.0262	0.0275	0.0188	0.0115	0.00275	0.00350
Barium - Total	mg/L	0.136	0.0848	0.0440	0.138	0.534	0.392	0.236	0.238	0.222	0.150	0.0600	0.0820
Beryllium - Total	mg/L	0.000100	0.000100	0.000100	0.000440	0.00150	0.00112	0.00118	0.00150	0.00122	0.000275	0.000100	0.000100
Cadmium - Total	mg/L	0.000433	0.000510	0.000412	0.000410	0.000582	0.000410	0.000575	0.000650	0.000510	0.000562	0.000275	0.000425
Cobalt - Total	mg/L	0.0177	0.0312	0.0150	0.0158	0.0485	0.0370	0.0238	0.0288	0.0224	0.0142	0.0155	0.0232
Chromium - Total	mg/L	0.00567	0.00400	0.00400	0.0180	0.0782	0.0220	0.00400	0.00400	0.00400	0.00925	0.00400	0.0108
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.0226	0.101	0.0811	0.0414	0.0312	0.0360	0.0134	0.00250	0.00250
Fluoride - Total	mg/L												
Iron - Total	mg/L	0.193	0.169	0.168	16.9	78.2	60.6	34.4	45.2	29.9	13.5	1.25	1.66
Mercury - Total	mg/L	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250
Manganese - Total	mg/L	1.70	2.51	1.28	0.992	2.73	2.20	1.48	1.52	1.57	1.17	1.40	2.05
Molybdenum - Total	mg/L	0.115	0.110	0.0678	0.0312	0.0162	0.0220	0.0412	0.0328	0.0472	0.0428	0.0568	0.0680
Nickel - Total	mg/L	0.149	0.200	0.123	0.0704	0.142	0.0968	0.0885	0.0672	0.0900	0.0728	0.122	0.176
Lead - Total	mg/L	0.00567	0.00200	0.00150	0.0168	0.0658	0.0440	0.0298	0.0335	0.0275	0.0150	0.00200	0.00125
Antimony - Total	mg/L	0.00867	0.00780	0.00562	0.00360	0.00150	0.00190	0.00250	0.00225	0.00190	0.00300	0.00525	0.00575
Selenium - Total	mg/L	0.0317	0.0204	0.0110	0.00800	0.00588	0.00440	0.00800	0.00775	0.00857	0.00675	0.0110	0.0120
Vanadium - Total	mg/L	0.00300	0.00300	0.00300	0.0192	0.0825	0.0708	0.0232	0.0535	0.0272	0.00375	0.00300	0.00400
Zinc - Total	mg/L	0.00833	0.0120	0.0308	0.0526	0.213	0.155	0.0972	0.0702	0.0788	0.0430	0.0140	0.0225
Nutrients													
Ammonia - N	mg/L	14.7	14.8	10.4	4.56	2.56	2.26	4.98	2.47	2.78	3.26	6.52	7.90
Nitrite - N	mg/L	0.00433	0.00210	0.000875	0.00500	0.0110	0.000700	0.000625	0.000625	0.00300	0.00538	0.00625	0.00950
Nitrate - N	mg/L	332	272	166	70.0	39.0	29.4	47.0	51.0	57.4	84.5	140	148
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L	7,970	7,190	4,660	2,240	1,520	1,390	1,760	1,980	2,170	2,960	4,580	4,780
TSS Total Suspended Solids	mg/L	369	47.2	56.0	697	5,520	4,940	2,720	2,370	2,620	1,050	119	142
Turbidity	NTU	22.2	15.7	44.8	665	3,280	3,240	2,050	2,050	1,780	606	75.5	23.0
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	0.00588	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	0.00312	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250

POR1 Sump Collection Point for Central Pit Waters Prior to Discharge (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				1.9	3.6	5.2	5.2	3.8	4.0	1.7	1.1	1.7
Conductivity	mS/cm				0.805	1.34	1.10	0.717	0.988	0.697	0.606	1.31	1.35
pH					8.4	8.7	8.1	8.5	8.2	8.7	8.0	8.4	8.5
Major Constituents													
Calcium	mg/L				60.3	113	123	87.2	83.3	67.1	143	151	129
Chloride	mg/L				4.17	6.60	4.96	3.54	2.63	1.88	6.33	6.90	7.20
Carbonate	mg/L				0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	34.1
Bicarbonate	mg/L				47.7	83.0	86.8	79.6	82.7	80.8	130	138	103
Potassium	mg/L				3.08	4.27	4.32	3.73	3.67	2.87	5.67	4.81	4.20
Magnesium	mg/L				25.7	59.3	73.6	40.7	44.0	30.1	60.2	74.3	62.4
Sodium	mg/L				4.34	8.61	6.47	6.86	4.11	5.45	22.3	29.0	25.0
Sulphate	mg/L				183	432	509	304	267	196	563	578	548
Hardness - Total	mg/L				247	525	585	345	350	270	633	667	731
Alkalinity - Total	mg/L				39.1	68.0	71.4	65.5	67.7	66.7	107	113	114
Total Metals													
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150	0.00150
Aluminum - Total	mg/L				0.853	1.16	1.20	8.08	3.37	2.75	0.983	0.573	0.280
Arsenic - Total	mg/L				0.00183	0.00500	0.00280	0.0128	0.00533	0.00483	0.00700	0.0107	0.0110
Barium - Total	mg/L				0.0380	0.0410	0.0354	0.112	0.0640	0.0822	0.375	0.0270	0.0250
Beryllium - Total	mg/L				0.000100	0.000100	0.000100	0.000380	0.000200	0.000117	0.000100	0.000100	0.000100
Cadmium - Total	mg/L				0.000400	0.000150	0.000250	0.000150	0.000150	0.000150	0.000233	0.000233	0.000212
Cobalt - Total	mg/L				0.00200	0.00367	0.0128	0.00960	0.00400	0.00200	0.00200	0.00200	0.00200
Chromium - Total	mg/L				0.00533	0.00867	0.00400	0.00400	0.00400	0.00483	0.00867	0.00700	0.00400
Copper - Total	mg/L				0.00333	0.00367	0.00570	0.0143	0.0117	0.00500	0.00650	0.00250	0.00250
Fluoride - Total	mg/L												
Iron - Total	mg/L				1.79	2.46	2.00	12.6	4.77	3.73	2.20	1.32	0.592
Mercury - Total	mg/L				0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000567	0.000250	0.000250
Manganese - Total	mg/L				0.101	0.217	0.618	0.456	0.283	0.129	0.191	0.114	0.0908
Molybdenum - Total	mg/L				0.0220	0.0457	0.0304	0.0240	0.0197	0.0212	0.0607	0.0657	0.0640
Nickel - Total	mg/L				0.0125	0.0303	0.0972	0.0392	0.0303	0.0182	0.0307	0.0340	0.0458
Lead - Total	mg/L				0.00367	0.00700	0.00180	0.00920	0.00300	0.00480	0.0117	0.00167	0.00225
Antimony - Total	mg/L				0.00500	0.00533	0.00480	0.00560	0.00367	0.00825	0.0490	0.0533	0.0455
Selenium - Total	mg/L				0.00467	0.00433	0.00380	0.00220	0.000500	0.00300	0.00100	0.00150	0.00350
Vanadium - Total	mg/L				0.00300	0.00300	0.00300	0.00960	0.00433	0.00383	0.00300	0.00300	0.00300
Zinc - Total	mg/L				0.0330	0.0190	0.0188	0.0346	0.0190	0.0165	0.0180	0.00967	0.00950
Nutrients													
Ammonia - N	mg/L				1.33	0.873	0.752	0.572	0.673	0.183	0.927	0.273	0.165
Nitrite - N	mg/L				0.00300	0.00283	0.000600	0.000900	0.00533	0.000750	0.00167	0.00233	0.00338
Nitrate - N	mg/L				3.10	5.47	5.04	2.74	3.00	1.63	3.73	1.63	1.75
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L				371	730	884	539	512	397	934	997	956
TSS Total Suspended Solids	mg/L				71.0	76.0	21.8	434	90.3	93.3	56.0	74.3	26.5
Turbidity	NTU				33.5	51.3	26.6	383	93.3	92.5	63.0	32.7	14.5
Trace Constituents													
Cyanide - Free	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250
Cyanide - Total	mg/L				0.00800	0.00617	0.00250	0.00320	0.00900	0.00360	0.00617	0.00250	0.00312
Cyanide - WAD	mg/L				0.00500	0.00250	0.00250	0.00250	0.00767	0.00250	0.00367	0.00250	0.00250

SWS.3 Kichi Sarytor above Kumtor River (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				4.9	4.5	5.9	5.9	6.3	9.9	4.5		
Conductivity	mS/cm				1.83	1.59	1.65	1.19	1.30	1.34	1.78		
pH					7.9	8.4	8.2	8.2	8.2	8.7	8.3		
Major Constituents													
Calcium	mg/L				122	133	129	85.4	93.2	100	180		
Chloride	mg/L				8.80	7.30	5.46	2.75	3.25	4.60	7.57		
Carbonate	mg/L				0.500	0.500	0.500	0.500	0.500	0.500	2.33		
Bicarbonate	mg/L				84.0	119	113	80.0	92.2	104	155		
Potassium	mg/L				3.91	4.10	3.80	2.80	3.68	3.59	4.04		
Magnesium	mg/L				227	157	175	89.8	88.6	111	284		
Sodium	mg/L				5.32	8.27	4.77	3.01	4.46	9.35	9.14		
Sulphate	mg/L				1050	822	870	479	454	545	1540		
Hardness - Total	mg/L				1120	975	970	550	550	640	1710		
Alkalinity - Total	mg/L				68.0	97.8	92.5	66.0	75.6	85.2	130		
Total Metals													
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150	0.00200	0.00150		
Aluminum - Total	mg/L				10.5	6.66	9.95	10.8	10.4	3.06	4.81		
Arsenic - Total	mg/L				0.0100	0.0100	0.00960	0.0180	0.0168	0.00360	0.00867		
Barium - Total	mg/L				0.0950	0.0755	0.0956	0.133	0.165	0.0852	0.0820		
Beryllium - Total	mg/L				0.000400	0.000250	0.000100	0.000500	0.000700	0.000120	0.0000667		
Cadmium - Total	mg/L				0.000150	0.000212	0.000150	0.000188	0.000250	0.000150	0.000150		
Cobalt - Total	mg/L				0.0250	0.0132	0.0232	0.0195	0.0195	0.0126	0.0310		
Chromium - Total	mg/L				0.0200	0.00675	0.00400	0.00400	0.00400	0.00400	0.0113		
Copper - Total	mg/L				0.0160	0.0124	0.0180	0.0166	0.0192	0.00450	0.00700		
Fluoride - Total	mg/L												
Iron - Total	mg/L				17.5	10.9	14.6	17.5	15.7	4.33	10.0		
Mercury - Total	mg/L				0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250		
Manganese - Total	mg/L				3.16	1.07	1.40	1.07	1.02	0.870	2.28		
Molybdenum - Total	mg/L				0.0140	0.0440	0.0160	0.0132	0.0172	0.0186	0.0177		
Nickel - Total	mg/L				0.0850	0.0580	0.103	0.0730	0.0472	0.0516	0.124		
Lead - Total	mg/L				0.0100	0.0160	0.00740	0.0118	0.00950	0.00425	0.00533		
Antimony - Total	mg/L				0.00300	0.00712	0.00240	0.00400	0.00425	0.00970	0.0103		
Selenium - Total	mg/L				0.00700	0.00475	0.00340	0.00312	0.00138	0.00316	0.00450		
Vanadium - Total	mg/L				0.0160	0.0100	0.00900	0.00900	0.0148	0.00425	0.00300		
Zinc - Total	mg/L				0.0440	0.0348	0.0426	0.0430	0.0400	0.0130	0.0327		
Nutrients													
Ammonia - N	mg/L				1.10	0.480	0.532	0.385	0.485	0.336	0.327		
Nitrite - N	mg/L				0.00400	0.00475	0.000500	0.000500	0.000625	0.000800	0.000667		
Nitrate - N	mg/L				2.00	3.28	3.38	2.48	2.35	1.58	2.33		
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L				1,700	1,420	1,450	802	816	928	2,550		
TSS Total Suspended Solids	mg/L				418	1,210	507	547	822	88.2	196		
Turbidity	NTU				350	935	285	440	625	69.6	182		
Trace Constituents													
Cyanide - Free	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250		
Cyanide - Total	mg/L				0.00250	0.00412	0.00250	0.00250	0.00838	0.00850	0.00250		
Cyanide - WAD	mg/L				0.00250	0.00250	0.00250	0.00250	0.00638	0.00440	0.00250		

SWW1 Sarytor Glacier Lake Outflow at Weir (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C					5.3	4.8	5.3	6.4	4.1	3.4		
Conductivity	mS/cm					1.46	1.44	1.69	1.58	0.994	1.38		
pH						8.7	8.2	8.1	8.2	8.6	7.6		
Major Constituents													
Calcium	mg/L					122	103	101	110	85.0	165		
Chloride	mg/L					2.90	2.92	1.88	2.80	1.84	4.57		
Carbonate	mg/L					0.500	0.500	0.500	0.500	0.500	0.500		
Bicarbonate	mg/L					113	98.8	85.0	103	100	182		
Potassium	mg/L					3.10	2.47	1.93	2.58	2.40	4.00		
Magnesium	mg/L					168	201	180	179	135	468		
Sodium	mg/L					3.21	2.24	1.50	2.18	2.11	3.99		
Sulphate	mg/L					830	1000	1010	845	608	2260		
Hardness - Total	mg/L					950	1080	1040	931	700	2420		
Alkalinity - Total	mg/L					94.2	81.8	69.6	84.5	82.0	150		
Total Metals													
Silver - Total	mg/L					0.00150	0.00150	0.00150	0.00150	0.00150	0.00233		
Aluminum - Total	mg/L					0.120	2.08	1.97	1.68	0.771	1.04		
Arsenic - Total	mg/L					0.00283	0.00370	0.00700	0.00275	0.00140	0.00433		
Barium - Total	mg/L					0.0210	0.0354	0.0415	0.0430	0.0356	0.102		
Beryllium - Total	mg/L					0.000100	0.000100	0.000150	0.000100	0.000100	0.000100		
Cadmium - Total	mg/L					0.000150	0.000150	0.000150	0.000150	0.000150	0.000150		
Cobalt - Total	mg/L					0.00200	0.0210	0.0258	0.0128	0.00616	0.0247		
Chromium - Total	mg/L					0.00400	0.00400	0.00400	0.00400	0.00480	0.00567		
Copper - Total	mg/L					0.00367	0.00420	0.00250	0.00250	0.00400	0.00250		
Fluoride - Total	mg/L												
Iron - Total	mg/L					0.220	3.18	3.00	1.56	0.863	1.69		
Mercury - Total	mg/L					0.000250	0.000250	0.000250	0.000250	0.000250	0.000250		
Manganese - Total	mg/L					0.288	1.50	1.99	1.13	0.682	3.16		
Molybdenum - Total	mg/L					0.00533	0.00660	0.00400	0.00425	0.00360	0.0113		
Nickel - Total	mg/L					0.0273	0.113	0.122	0.0672	0.0376	0.144		
Lead - Total	mg/L					0.00933	0.00160	0.00250	0.00225	0.00550	0.0110		
Antimony - Total	mg/L					0.00167	0.000500	0.000500	0.000500	0.000500	0.000667		
Selenium - Total	mg/L					0.00333	0.00360	0.00275	0.00150	0.00304	0.00483		
Vanadium - Total	mg/L					0.00300	0.00300	0.00300	0.00300	0.00300	0.00300		
Zinc - Total	mg/L					0.0103	0.0174	0.0145	0.0110	0.0187	0.00900		
Nutrients													
Ammonia - N	mg/L					0.120	0.156	0.125	0.0550	0.0360	0.120		
Nitrite - N	mg/L					0.00300	0.000800	0.000500	0.000625	0.000800	0.000667		
Nitrate - N	mg/L					1.57	0.980	0.525	1.00	0.700	2.30		
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L					1,380	1,630	1,540	1,350	987	3,500		
TSS Total Suspended Solids	mg/L					18.3	97.6	175	77.5	22.4	62.7		
Turbidity	NTU					9.23	63.4	114	77.5	21.6	44.0		
Trace Constituents													
Cyanide - Free	mg/L					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		
Cyanide - WAD	mg/L					0.00250	0.00250	0.00250	0.00250	0.00250	0.00250		

W1.5.1 Kumtor River Just Downstream of Kumtor Concession Area - Voluntary Compliance Point (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				1.6	2.8	7.2	10.3	7.0	8.9	1.9	0.5	
Conductivity	mS/cm				0.682	0.490	0.536	0.461	0.560	0.563	0.467	0.923	
pH					8.6	8.3	8.6	8.3	8.6	8.6	8.3	8.2	
Major Constituents													
Calcium	mg/L				79.2	44.6	44.8	38.4	39.8	41.2	80.3	89.2	
Chloride	mg/L				13.6	9.50	6.45	2.68	4.60	3.67	9.55	8.45	
Carbonate	mg/L				0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	
Bicarbonate	mg/L				117	88.5	71.5	56.8	60.0	61.0	108	118	
Potassium	mg/L				5.19	2.34	2.89	3.87	3.96	5.17	3.20	4.02	
Magnesium	mg/L				32.4	14.5	24.8	17.1	19.0	18.0	67.8	47.2	
Sodium	mg/L				8.38	4.52	12.6	18.7	19.3	27.0	8.12	9.67	
Sulphate	mg/L				171	71.5	144	130	134	144	370	280	
Hardness - Total	mg/L				293	158	192	156	160	159	475	400	
Alkalinity - Total	mg/L				96.7	72.1	58.9	46.8	49.4	126	89.9	96.5	
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				0.677	2.28	4.04	5.39	4.72	3.94	1.96	0.380	
Arsenic - Total	mg/L				0.00117	0.00425	0.00500	0.00900	0.00350	0.00233	0.00275	0.000750	
Barium - Total	mg/L				0.0427	0.0528	0.0752	0.109	0.107	0.0912	0.0618	0.0370	
Beryllium - Total	mg/L				0.000100	0.0000750	0.0000750	0.000180	0.000100	0.000100	0.000100	0.000100	
Cadmium - Total	mg/L				0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	
Cobalt - Total	mg/L				0.00200	0.00275	0.00525	0.00640	0.00400	0.00450	0.00300	0.00200	
Chromium - Total	mg/L				0.00400	0.00725	0.00400	0.00720	0.00500	0.00400	0.00550	0.00800	
Copper - Total	mg/L				0.00667	0.00675	0.0135	0.0129	0.00525	0.00417	0.00462	0.00250	
Fluoride - Total	mg/L												
Iron - Total	mg/L				0.882	3.18	4.16	7.28	4.06	3.42	1.82	0.318	
Mercury - Total	mg/L				0.000250	0.000250	0.000250	0.000360	0.000250	0.000320	0.000250	0.000250	
Manganese - Total	mg/L				0.114	0.125	0.286	0.306	0.219	0.154	0.306	0.0740	
Molybdenum - Total	mg/L				0.00567	0.00525	0.00800	0.0116	0.00975	0.0142	0.00875	0.0125	
Nickel - Total	mg/L				0.0103	0.0130	0.0170	0.0177	0.0120	0.0112	0.0192	0.0180	
Lead - Total	mg/L				0.00300	0.0102	0.00475	0.00580	0.00600	0.00600	0.00175	0.00100	
Antimony - Total	mg/L				0.00383	0.000500	0.0105	0.0129	0.0150	0.0183	0.00475	0.00500	
Selenium - Total	mg/L				0.00400	0.00175	0.00112	0.000500	0.00188	0.00233	0.000625	0.00175	
Vanadium - Total	mg/L				0.00300	0.00425	0.00600	0.00360	0.00525	0.00360	0.00300	0.00300	
Zinc - Total	mg/L				0.00533	0.00850	0.0188	0.0292	0.0152	0.0164	0.00988	0.00400	
Nutrients													
Ammonia - N	mg/L				0.327	0.0900	0.725	0.980	0.763	1.19	0.260	0.240	
Nitrite - N	mg/L				0.00150	0.00350	0.00250	0.00570	0.00975	0.0868	0.00212	0.00150	
Nitrate - N	mg/L				5.10	1.20	1.35	1.30	1.98	1.85	3.10	4.80	
Phosphate as P - Total	mg/L								0.0900	0.0575	0.0600	0.0100	
Solids													
TDS Total Dissolved Solids	mg/L				433	244	315	277	284	296	684	569	
TSS Total Suspended Solids	mg/L				36.3	153	247	429	181	86.3	75.8	13.5	
Turbidity	NTU				34.3	105	124	224	140	92.3	61.2	22.5	
Trace Constituents													
Cyanide - Free	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	
Cyanide - Total	mg/L				0.00367	0.00250	0.0148	0.0246	0.0240	0.0257	0.00388	0.00250	
Cyanide - WAD	mg/L				0.00250	0.00250	0.00688	0.00860	0.00662	0.00533	0.00250	0.00250	

W6.1 Arabel Suu River - 6km from Kumtor Concession Area (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				1.5		8.0	11.8	11.8	10.6	1.1		
Conductivity	mS/cm				0.401		0.169	0.305	0.170	0.188	0.295		
pH					8.3		8.8	8.5	8.7	8.9	8.2		
Major Constituents													
Calcium	mg/L				62.5	42.0	27.9	37.5		32.7	35.7		
Chloride	mg/L				27.0	16.0	2.90	5.35		2.40	6.00		
Carbonate	mg/L				0.500	0.500	0.500	0.500		0.500	0.500		
Bicarbonate	mg/L				90.0	90.0	70.0	84.0		72.0	86.0		
Potassium	mg/L				3.92	0.840	0.700	0.800		1.32	0.750		
Magnesium	mg/L				9.33	4.31	3.07	4.32		4.40	4.77		
Sodium	mg/L				6.40	3.72	1.48	2.44		2.01	2.53		
Sulphate	mg/L				61.0	13.0	12.0	23.0		23.0	32.0		
Hardness - Total	mg/L				170	110	70.0	100		85.0	120		
Alkalinity - Total	mg/L				73.5	74.5	57.5	69.0		58.5	70.5		
Total Metals													
Silver - Total	mg/L						0.00150	0.00150		0.00150			
Aluminum - Total	mg/L				0.190	0.0400	1.88	0.590		1.17	0.140		
Arsenic - Total	mg/L						0.00400	0.00500		0.00100			
Barium - Total	mg/L				0.0250	0.0120	0.0300	0.0160		0.0190	0.0190		
Beryllium - Total	mg/L				0.000100	0.000100	0.000100	0.000100		0.000100	0.000100		
Cadmium - Total	mg/L				0.000150	0.000150	0.000150	0.000150		0.000150	0.000150		
Cobalt - Total	mg/L						0.00200	0.00200		0.00200			
Chromium - Total	mg/L						0.00400	0.00400		0.00400			
Copper - Total	mg/L				0.00250	0.00250	0.0100	0.00250		0.00250	0.00250		
Fluoride - Total	mg/L												
Iron - Total	mg/L				0.194	0.0900	2.80	0.674		1.75	0.237		
Mercury - Total	mg/L				0.000600	0.000250	0.000250	0.000250		0.000250	0.000250		
Manganese - Total	mg/L						0.0980	0.0245		0.0400			
Molybdenum - Total	mg/L						0.00200	0.00200		0.00200			
Nickel - Total	mg/L				0.00700	0.0330	0.0100	0.0120		0.00250	0.0130		
Lead - Total	mg/L				0.00300	0.00100	0.00600	0.00150			0.00100		
Antimony - Total	mg/L				0.000500		0.000500	0.000500		0.00100			
Selenium - Total	mg/L						0.000500	0.00175		0.000500			
Vanadium - Total	mg/L						0.00300	0.00300					
Zinc - Total	mg/L				0.00900	0.0330	0.0120	0.00500		0.00300	0.000500		
Nutrients													
Ammonia - N	mg/L				0.0200	0.0200	0.100	0.0200		0.0200	0.0200		
Nitrite - N	mg/L				0.00300	0.00400	0.000500	0.000500		0.000500	0.000500		
Nitrate - N	mg/L				0.200	0.0500	0.200	0.125		0.100	0.200		
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L				266	153	93.0	127		105	151		
TSS Total Suspended Solids	mg/L				3.00	1.00	120	10.5		23.0	4.00		
Turbidity	NTU				3.70	1.00	70.0	21.0		38.0	5.70		
Trace Constituents													
Cyanide - Free	mg/L				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		
Cyanide - WAD	mg/L				0.00250	0.00250	0.00250	0.00250		0.00250	0.00250		

W1.6 Kumtor River above Taragay River (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				0.9	3.6	9.6	10.5	4.7				
Conductivity	mS/cm				0.751	0.350	0.398	0.365	0.357				
pH					8.4	8.1	8.6	8.3	8.5				
Major Constituents													
Calcium	mg/L				99.1	35.5	41.6	36.7	35.0				
Chloride	mg/L				20.0	8.80	5.60	2.20	2.70				
Carbonate	mg/L				0.500	0.500	0.500	0.500	0.500				
Bicarbonate	mg/L				150	88.0	80.0	66.0	60.0				
Potassium	mg/L				5.68	1.59	1.45	2.79	2.88				
Magnesium	mg/L				41.6	11.8	19.7	12.9	15.1				
Sodium	mg/L				12.7	3.55	2.69	11.3	11.3				
Sulphate	mg/L							100					
Hardness - Total	mg/L				375	150	160	140	140				
Alkalinity - Total	mg/L				124	71.5	66.5	53.5	49.8				
Total Metals													
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150				
Aluminum - Total	mg/L				0.800	1.76	4.75	8.72	3.92				
Arsenic - Total	mg/L				0.000500	0.00400	0.00500	0.0150	0.00300				
Barium - Total	mg/L				0.0560	0.0470	0.0880	0.171	0.0950				
Beryllium - Total	mg/L				0.000100	0.000100	0.000100	0.000500	0.000100				
Cadmium - Total	mg/L				0.00100	0.000150	0.000150	0.000150	0.000150				
Cobalt - Total	mg/L				0.00200	0.00200	0.00200	0.00800	0.00200				
Chromium - Total	mg/L				0.00400	0.00400	0.00400	0.00400	0.00400				
Copper - Total	mg/L				0.0220	0.00250	0.0110	0.0260	0.00250				
Fluoride - Total	mg/L												
Iron - Total	mg/L				1.14	2.34	6.56	12.4	3.79				
Mercury - Total	mg/L				0.000250	0.000250	0.000250	0.000250	0.000250				
Manganese - Total	mg/L				0.0940	0.113	0.221	0.415	0.151				
Molybdenum - Total	mg/L				0.00700	0.00200	0.00400	0.00800	0.0100				
Nickel - Total	mg/L				0.0100	0.00800	0.0140	0.0280	0.0170				
Lead - Total	mg/L				0.00500	0.00700	0.00900	0.0110	0.00300				
Antimony - Total	mg/L				0.00200	0.000500	0.000500	0.00800	0.00700				
Selenium - Total	mg/L				0.000500	0.000500	0.000500	0.000500	0.00100				
Vanadium - Total	mg/L				0.00300	0.00300	0.00800	0.00300	0.00300				
Zinc - Total	mg/L				0.00900	0.00800	0.0160	0.0450	0.00900				
Nutrients													
Ammonia - N	mg/L				0.380	0.0200	0.0200	0.560	0.500				
Nitrite - N	mg/L				0.00100	0.00400	0.0100	0.00400	0.00400				
Nitrate - N	mg/L				6.50	0.800	0.700	0.900	0.900				
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L				558	116	234	216	223				
TSS Total Suspended Solids	mg/L				61.0	110	355	733	122				
Turbidity	NTU				26.0	65.0	160	270	110				
Trace Constituents													
Cyanide - Free	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250				
Cyanide - Total	mg/L				0.00250	0.00250	0.00250	0.0120	0.0260				
Cyanide - WAD	mg/L				0.00250	0.00250	0.00250	0.00600	0.00250				

W1.7 Taragay River below Kumtor River (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C				1.1	6.3	11.8	12.2	5.4				
Conductivity	mS/cm				0.636	0.250	0.252	0.232	0.301				
pH					8.0	8.3	8.7	9.3	8.4				
Major Constituents													
Calcium	mg/L				76.5	30.7	33.8	30.8	33.1				
Chloride	mg/L				22.0	7.20	4.70	2.30	3.30				
Carbonate	mg/L				0.500	0.500	0.500	0.500	0.500				
Bicarbonate	mg/L				180	88.0	78.0	64.0	66.0				
Potassium	mg/L				3.47	1.03	1.07	1.71	2.07				
Magnesium	mg/L				27.0	6.15	8.71	7.96	10.5				
Sodium	mg/L				17.3	2.93	2.29	6.81	7.15				
Sulphate	mg/L							52.0					
Hardness - Total	mg/L				275	110	110	100	110				
Alkalinity - Total	mg/L				146	72.5	64.5	53.0	54.0				
Total Metals													
Silver - Total	mg/L				0.00150	0.00150	0.00150	0.00150	0.00150				
Aluminum - Total	mg/L				0.290	0.730	5.54	4.80	3.26				
Arsenic - Total	mg/L				0.000500	0.00300	0.00600	0.0110	0.00200				
Barium - Total	mg/L				0.0460	0.0250	0.0720	0.0880	0.0650				
Beryllium - Total	mg/L				0.000100	0.000100	0.000100	0.000300	0.000300				
Cadmium - Total	mg/L				0.000800	0.000150	0.000150	0.000150	0.000150				
Cobalt - Total	mg/L				0.00200	0.00200	0.00500	0.00400	0.00200				
Chromium - Total	mg/L				0.00400	0.00400	0.00400	0.00400	0.00400				
Copper - Total	mg/L				0.0160	0.00250	0.0120	0.0120	0.00900				
Fluoride - Total	mg/L												
Iron - Total	mg/L				0.448	1.02	8.31	6.40	3.79				
Mercury - Total	mg/L				0.000250	0.000250	0.000250	0.000250	0.000250				
Manganese - Total	mg/L				0.0320	0.0430	0.237	0.209	0.110				
Molybdenum - Total	mg/L				0.00600	0.00200	0.00200	0.00400	0.00500				
Nickel - Total	mg/L				0.0140	0.00700	0.0100	0.0170	0.00600				
Lead - Total	mg/L				0.00400	0.00700	0.00800	0.00700	0.00300				
Antimony - Total	mg/L				0.00100	0.000500	0.000500	0.0100	0.00400				
Selenium - Total	mg/L				0.00200	0.000500	0.000500	0.00100	0.000500				
Vanadium - Total	mg/L				0.00300	0.00300	0.00900	0.00300	0.00300				
Zinc - Total	mg/L				0.00700	0.00400	0.0200	0.0280	0.0190				
Nutrients													
Ammonia - N	mg/L				0.100	0.0200	0.0600	0.360	0.240				
Nitrite - N	mg/L				0.00100	0.00400	0.00700	0.000500	0.00100				
Nitrate - N	mg/L				2.20	0.300	0.300	0.500	0.600				
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L				392	138	140	139	175				
TSS Total Suspended Solids	mg/L				47.0	34.0	324	202	90.0				
Turbidity	NTU				22.0	30.0	180	150	95.0				
Trace Constituents													
Cyanide - Free	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250				
Cyanide - Total	mg/L				0.00250	0.00250	0.00250	0.00800	0.0130				
Cyanide - WAD	mg/L				0.00250	0.00250	0.00250	0.00250	0.00250				

W1.8 Naryn River 1km upstream of Naryn (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C												
Conductivity	mS/cm												
pH													
Major Constituents													
Calcium	mg/L	48.0	50.6	52.4	51.2	41.9	39.3	37.6	45.5	50.5	51.5	51.7	51.9
Chloride	mg/L	5.50	5.25	5.30	5.92	4.03	2.96	2.38	3.10	3.77	4.98	5.36	5.55
Carbonate	mg/L	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	44.1
Bicarbonate	mg/L	142	140	135	135	125	114	106	112	125	144	153	116
Potassium	mg/L	1.32	1.38	1.48	1.59	1.23	1.41	1.39	1.50	1.54	1.30	1.44	1.39
Magnesium	mg/L	14.5	14.8	15.3	14.7	11.4	9.99	9.69	12.3	13.9	14.4	14.9	14.3
Sodium	mg/L	7.99	7.84	8.57	7.65	4.93	4.08	4.24	5.65	7.22	7.00	7.71	7.85
Sulphate	mg/L	66.5	61.0	57.0	56.2	43.0	45.2	48.5	57.0	62.0	65.8	68.6	71.2
Hardness - Total	mg/L	185	175	172	176	143	136	138	146	163	182	192	198
Alkalinity - Total	mg/L	117	114	111	110	101	93.5	86.9	92.5	102	118	125	132
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	0.0770	0.145	0.455	0.458	3.24	5.77	7.17	6.02	0.787	0.118	0.280	0.120
Arsenic - Total	mg/L	0.00125	0.00125	0.00125	0.00175	0.00433	0.0112	0.00662	0.00310	0.00167	0.00162	0.00180	0.000625
Barium - Total	mg/L	0.0555	0.0505	0.0505	0.0530	0.0740	0.110	0.136	0.115	0.0520	0.0490	0.0552	0.0515
Beryllium - Total	mg/L	0.000100	0.000100	0.000100	0.000100	0.000100	0.000140	0.000100	0.000120	0.000100	0.000100	0.000100	0.000100
Cadmium - Total	mg/L	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150
Cobalt - Total	mg/L	0.00200	0.00200	0.00200	0.00200	0.00200	0.00520	0.00475	0.00340	0.00200	0.00200	0.00200	0.00200
Chromium - Total	mg/L	0.00400	0.00400	0.00600	0.00400	0.00400	0.00500	0.00400	0.00400	0.00400	0.00400	0.00560	0.00400
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.00312	0.00333	0.00340	0.00488	0.00380	0.00250	0.00250	0.00250	0.00250
Fluoride - Total	mg/L												
Iron - Total	mg/L	0.198	0.262	0.596	0.630	3.87	8.59	9.44	7.14	1.06	0.160	0.290	0.166
Mercury - Total	mg/L	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250
Manganese - Total	mg/L	0.0125	0.00950	0.0270	0.0312	0.128	0.258	0.327	0.234	0.0383	0.0160	0.0208	0.0150
Molybdenum - Total	mg/L	0.00200	0.00200	0.00200	0.00275	0.00500	0.00200	0.00200	0.00280	0.00267	0.00275	0.00200	0.00200
Nickel - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00583	0.0124	0.00875	0.00810	0.00400	0.00412	0.00250	0.00250
Lead - Total	mg/L	0.00100	0.00100	0.00200	0.00425	0.0127	0.0112	0.00600	0.00520	0.00250	0.00175	0.00260	0.00150
Antimony - Total	mg/L	0.000500	0.000750	0.00125	0.000500	0.00100	0.00190	0.000750	0.000500	0.00133	0.000875	0.000500	0.000500
Selenium - Total	mg/L	0.000500	0.000750	0.00175	0.00238	0.00167	0.000600	0.000500	0.00180	0.00117	0.000625	0.00210	0.00150
Vanadium - Total	mg/L	0.00300	0.00300	0.00300	0.00300	0.00300	0.00440	0.00575	0.00880	0.00300	0.00300	0.00300	0.00300
Zinc - Total	mg/L	0.0100	0.00500	0.0355	0.00725	0.0227	0.0235	0.0270	0.0254	0.0123	0.00525	0.00800	0.00650
Nutrients													
Ammonia - N	mg/L	0.0200	0.0200	0.0200	0.0200	0.0200	0.0320	0.115	0.0680	0.0600	0.0200	0.0200	0.0200
Nitrite - N	mg/L	0.00200	0.00300	0.00250	0.00212	0.00467	0.000600	0.000875	0.000900	0.00267	0.00250	0.00160	0.00300
Nitrate - N	mg/L	0.800	0.700	0.550	0.500	0.433	0.420	0.475	0.560	0.567	0.575	0.640	0.675
Phosphate as P - Total	mg/L								0.105	0.0567	0.0150	0.0360	0.0112
Solids													
TDS Total Dissolved Solids	mg/L	233	222	220	227	187	178	180	190	201	228	235	248
TSS Total Suspended Solids	mg/L	4.50	6.00	34.5	47.2	195	1280	644	516	54.3	6.25	14.4	5.50
Turbidity	NTU	3.10	4.30	25.5	34.5	137	1050	340	232	36.3	3.38	4.05	1.92
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

W1.8F Naryn River below Naryn STP Discharge (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C												
Conductivity	mS/cm												
pH													
Major Constituents													
Calcium	mg/L	47.5	52.0	51.8	52.1	43.2	44.7	38.0	47.2	52.7	52.9	53.0	59.1
Chloride	mg/L	5.90	6.20	6.15	6.78	4.77	5.98	4.48	3.96	5.43	5.78	7.02	6.72
Carbonate	mg/L	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	40.4
Bicarbonate	mg/L	142	140	138	139	128	139	110	117	132	145	160	124
Potassium	mg/L	1.25	1.42	1.46	1.57	1.24	1.61	1.28	1.56	1.58	1.36	1.47	1.45
Magnesium	mg/L	14.6	15.0	15.2	14.9	11.9	11.8	10.6	12.7	14.6	15.0	15.2	16.0
Sodium	mg/L	8.35	8.97	9.40	8.68	6.04	7.60	7.32	6.50	9.15	8.04	9.54	9.06
Sulphate	mg/L	68.0	65.0	59.5	58.0	45.3	55.6	60.2	57.6	63.0	66.2	69.2	73.0
Hardness - Total	mg/L	185	180	172	176	147	182	142	148	167	182	194	202
Alkalinity - Total	mg/L	116	114	114	114	105	114	91.1	95.6	108	120	131	134
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	0.0860	0.195	0.725	0.768	2.72	6.21	7.74	4.69	0.540	0.132	0.106	0.106
Arsenic - Total	mg/L	0.00125	0.00125	0.00125	0.00200	0.00500	0.0111	0.00788	0.00260	0.00133	0.000875	0.00180	0.000875
Barium - Total	mg/L	0.0545	0.0535	0.0525	0.0580	0.0673	0.120	0.147	0.0978	0.0600	0.0515	0.0538	0.0525
Beryllium - Total	mg/L	0.000100	0.000100	0.000100	0.000100	0.000100	0.000120	0.000100	0.000120	0.000100	0.000100	0.000100	0.000100
Cadmium - Total	mg/L	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150	0.000150
Cobalt - Total	mg/L	0.00200	0.00200	0.00200	0.00200	0.00200	0.00480	0.00500	0.00320	0.00200	0.00200	0.00200	0.00200
Chromium - Total	mg/L	0.00600	0.00400	0.00400	0.00500	0.00400	0.00480	0.00400	0.00400	0.00400	0.00400	0.00480	0.00400
Copper - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00312	0.00380	0.00250	0.00250	0.00250	0.00250
Fluoride - Total	mg/L												
Iron - Total	mg/L	0.218	0.252	0.924	0.964	3.26	9.35	10.1	5.21	0.748	0.188	0.212	0.118
Mercury - Total	mg/L	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250	0.000250
Manganese - Total	mg/L	0.0120	0.0130	0.0355	0.0405	0.107	0.264	0.352	0.164	0.0310	0.0165	0.0140	0.0122
Molybdenum - Total	mg/L	0.00200	0.00200	0.00200	0.00300	0.00200	0.00200	0.00200	0.00320	0.00200	0.00250	0.00200	0.00200
Nickel - Total	mg/L	0.00250	0.00250	0.00250	0.00250	0.00400	0.0139	0.00850	0.00670	0.00667	0.00450	0.00490	0.00250
Lead - Total	mg/L	0.00100	0.00100	0.00200	0.00350	0.0140	0.0120	0.00350	0.00380	0.00200	0.00100	0.00260	0.00100
Antimony - Total	mg/L	0.000500	0.000500	0.00125	0.000500	0.000500	0.000700	0.000750	0.000500	0.000667	0.000875	0.000500	0.000500
Selenium - Total	mg/L	0.000500	0.000500	0.00275	0.00350	0.00183	0.000800	0.000500	0.00200	0.00167	0.00138	0.00150	0.00250
Vanadium - Total	mg/L	0.00300	0.00300	0.00300	0.00300	0.00300	0.00440	0.00675	0.00700	0.00300	0.00300	0.00300	0.00300
Zinc - Total	mg/L	0.00650	0.00600	0.0495	0.00800	0.0140	0.0233	0.0285	0.0228	0.0160	0.00875	0.0106	0.00875
Nutrients													
Ammonia - N	mg/L	0.0200	0.0200	0.0200	0.0200	0.0200	0.0440	0.100	0.0840	0.0800	0.0450	0.0200	0.0200
Nitrite - N	mg/L	0.00200	0.00350	0.00125	0.00262	0.00533	0.000900	0.000875	0.00130	0.00267	0.00275	0.00130	0.00250
Nitrate - N	mg/L	0.750	0.750	0.650	0.525	0.600	0.760	0.575	0.660	0.867	0.650	0.880	0.800
Phosphate as P - Total	mg/L								0.0750	0.0367	0.0175	0.0180	0.0162
Solids													
TDS Total Dissolved Solids	mg/L	240	238	230	226	197	249	200	195	220	236	243	258
TSS Total Suspended Solids	mg/L	2.50	8.00	39.5	53.8	163	924	678	268	39.0	6.75	2.70	5.00
Turbidity	NTU	2.10	6.75	34.5	39.3	117	822	320	198	31.9	4.08	1.72	2.00
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

P5.2N Tap Water at the New Camp (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	11.6	10.1	10.3	9.8	9.7	16.1	15.3	14.0	15.1	12.5	11.8	14.1
Conductivity	mS/cm	0.118	0.142	0.130	0.119	0.168	0.107	0.134	0.136	0.150	0.222	0.251	0.134
pH		7.0	7.3	7.7	7.9	7.9	7.8	7.6	7.8	7.8	7.3	7.3	7.3
Major Constituents													
Calcium	mg/L	16.2		16.2				21.5				16.8	
Chloride	mg/L	1.10		0.800		1.00		1.50				0.750	
Carbonate	mg/L	0.500		0.500		0.500		0.500				0.500	
Bicarbonate	mg/L	27.0		29.0		18.0		19.0				27.5	
Potassium	mg/L	1.33		1.24				2.37				1.28	
Magnesium	mg/L	2.58		2.61				3.70				3.32	
Sodium	mg/L	2.10		1.93				2.02				1.80	
Sulphate	mg/L	26.0		26.0		22.0		36.0				29.5	
Hardness - Total	mg/L	50.0		49.0		35.0		49.0				49.5	
Alkalinity - Total	mg/L	22.2		24.2		14.8		15.4				22.6	
Total Metals													
Silver - Total	mg/L	0.00150		0.00150		0.00150		0.00150				0.00150	
Aluminum - Total	mg/L	0.0925	0.0238	0.0450	0.0570	0.0875	0.548	0.0775	0.0150	0.0512	0.0600	0.0188	0.0546
Arsenic - Total	mg/L	0.00100		0.000500		0.00100		0.00200				0.000500	
Barium - Total	mg/L	0.0210		0.0180		0.0160		0.0240				0.0190	
Beryllium - Total	mg/L	0.000100		0.000100		0.000100		0.000100				0.000100	
Cadmium - Total	mg/L	0.000900		0.000150		0.000150		0.000150				0.000150	
Cobalt - Total	mg/L	0.00200		0.00200		0.00200		0.00200				0.00200	
Chromium - Total	mg/L	0.00400		0.0130		0.00400		0.00400				0.00400	
Copper - Total	mg/L	0.00338	0.00338	0.00250	0.00250	0.00250	0.0115	0.00562	0.00512	0.00562	0.00250	0.00250	0.00642
Fluoride - Total	mg/L	0.182		0.108		0.0980		0.0460				0.0930	
Iron - Total	mg/L	0.0890	0.0650	0.0690	0.0618	0.0562	0.0605	0.112	0.0792	0.0765	0.0830	0.0902	0.0799
Mercury - Total	mg/L	0.000250		0.000250		0.000250		0.000250				0.000250	
Manganese - Total	mg/L	0.00400		0.00300		0.00200		0.00500				0.00350	
Molybdenum - Total	mg/L	0.00500		0.00700		0.00200		0.00200				0.00200	
Nickel - Total	mg/L	0.00900		0.0170		0.00250		0.00800				0.00250	
Lead - Total	mg/L	0.00600		0.00400		0.00400		0.00100				0.00100	
Antimony - Total	mg/L	0.000500		0.00600		0.000500		0.000500				0.000500	
Selenium - Total	mg/L	0.00200		0.00200		0.000500		0.00200				0.000750	
Vanadium - Total	mg/L	0.00300		0.00300		0.00300		0.00300				0.00300	
Zinc - Total	mg/L	0.0180		0.0170		0.0100		0.0100				0.0130	
Nutrients													
Ammonia - N	mg/L	0.0200		0.0200		0.0200		0.0200				0.0200	
Nitrite - N	mg/L	0.00500		0.000500		0.00400		0.00100				0.000750	
Nitrate - N	mg/L	0.400		0.300		0.300		0.300				0.350	
Phosphate as P - Total	mg/L											0.00500	
Solids													
TDS Total Dissolved Solids	mg/L	73.2	72.0	73.8	70.8	58.5	57.0	79.5	73.2	71.5	73.0	72.5	84.8
TSS Total Suspended Solids	mg/L	0.500	0.500	1.12	0.800	0.750	1.38	1.38	0.500	0.625	0.500	0.500	0.500
Turbidity	NTU	0.325	0.220	0.375	0.310	0.538	1.89	0.638	0.412	0.412	0.338	0.300	0.675
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

P5.3 Mill Kitchen Tap (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C	14.1	10.9	11.9	12.2	10.2	12.7	17.0	14.8	14.5	13.9	11.7	13.9
Conductivity	mS/cm	0.133	0.125	0.111	0.139	0.202	0.107	0.156	0.147	0.136	0.170	0.137	0.177
pH		7.3	7.3	7.6	7.9	8.0	8.1	7.7	7.8	7.8	7.4	7.4	7.5
Major Constituents													
Calcium	mg/L			16.9				21.2				17.2	
Chloride	mg/L			1.00		1.90		2.00				2.15	
Carbonate	mg/L			0.500		0.500		0.500				0.500	
Bicarbonate	mg/L			21.0		9.00		30.0				26.0	
Potassium	mg/L			1.75				1.74				1.54	
Magnesium	mg/L			2.69				3.75				3.22	
Sodium	mg/L			1.81				2.98				2.40	
Sulphate	mg/L			32.0		24.0		28.0				33.0	
Hardness - Total	mg/L			48.0		31.0		49.0				49.5	
Alkalinity - Total	mg/L			17.0		7.00		24.8				21.6	
Total Metals													
Silver - Total	mg/L			0.00150		0.00150		0.00150				0.00150	
Aluminum - Total	mg/L	0.115	0.0425	0.0375	0.0630	0.312	0.689	0.0288	0.0275	0.0300	0.0412	0.0150	0.0400
Arsenic - Total	mg/L			0.000500		0.00200		0.000500				0.000500	
Barium - Total	mg/L			0.0170		0.0150		0.0320				0.0190	
Beryllium - Total	mg/L			0.000100		0.000100		0.000100				0.000100	
Cadmium - Total	mg/L			0.000150		0.000150		0.000150				0.000150	
Cobalt - Total	mg/L			0.00200		0.00200		0.00200				0.00200	
Chromium - Total	mg/L			0.00400		0.00400		0.00400				0.00400	
Copper - Total	mg/L	0.0122	0.0138	0.0145	0.0108	0.0185	0.0192	0.0252	0.0138	0.0255	0.00825	0.00338	0.0127
Fluoride - Total	mg/L			0.0720		0.0720		0.0850				0.0840	
Iron - Total	mg/L	0.129	0.0985	0.0888	0.0410	0.0475	0.0642	0.0835	0.0865	0.335	0.0478	0.0780	0.0730
Mercury - Total	mg/L			0.000250		0.000250		0.000250				0.000250	
Manganese - Total	mg/L			0.00400		0.00400		0.00600				0.00400	
Molybdenum - Total	mg/L			0.00200		0.00200		0.00200				0.00200	
Nickel - Total	mg/L			0.00250		0.00500		0.00900				0.00250	
Lead - Total	mg/L			0.00100		0.00400		0.00100				0.00100	
Antimony - Total	mg/L			0.000500		0.000500		0.00100				0.000500	
Selenium - Total	mg/L			0.000500		0.000500		0.00300				0.000500	
Vanadium - Total	mg/L			0.00300		0.00300		0.00300				0.00300	
Zinc - Total	mg/L			0.0260		0.0140		0.0150				0.00700	
Nutrients													
Ammonia - N	mg/L			0.0200		0.0200		0.0200				0.0200	
Nitrite - N	mg/L			0.000500		0.00400		0.000500				0.000750	
Nitrate - N	mg/L			0.300		0.200		0.300				0.250	
Phosphate as P - Total	mg/L											0.00500	
Solids													
TDS Total Dissolved Solids	mg/L	73.0	72.8	73.0	79.0	60.0	54.2	76.8	70.0	74.2	74.0	76.0	88.0
TSS Total Suspended Solids	mg/L	0.500	0.500	1.25	0.800	1.12	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Turbidity	NTU	0.525	0.400	0.362	0.300	1.11	0.362	0.575	0.888	0.300	0.325	0.300	0.262
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 (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C						7.8	18.7	19.3	13.6			
Conductivity	mS/cm						0.896	0.365	0.487	0.370			
pH							8.3	7.1	7.8	8.0			
Major Constituents													
Calcium	mg/L						146	22.6	17.0				
Chloride	mg/L						126	66.5	33.5	59.5			
Carbonate	mg/L						0.500	0.500	5.25				
Bicarbonate	mg/L						175	250	405				
Potassium	mg/L						5.56	19.9	10.5				
Magnesium	mg/L						38.8	4.58	3.50				
Sodium	mg/L						62.2	128	164				
Sulphate	mg/L						147	122	104	118			
Hardness - Total	mg/L						425	61.0	57.5				
Alkalinity - Total	mg/L						144	205	340				
Total Metals													
Silver - Total	mg/L						0.00150	0.00150					
Aluminum - Total	mg/L						0.170	0.200					
Arsenic - Total	mg/L						0.00300	0.000500					
Barium - Total	mg/L						0.0590	0.0160					
Beryllium - Total	mg/L						0.000100	0.000100					
Cadmium - Total	mg/L						0.000150	0.000150					
Cobalt - Total	mg/L						0.00200	0.00200					
Chromium - Total	mg/L						0.00400	0.00400					
Copper - Total	mg/L						0.00250	0.0100					
Fluoride - Total	mg/L												
Iron - Total	mg/L						0.545	0.319					
Mercury - Total	mg/L												
Manganese - Total	mg/L						0.298	0.0360					
Molybdenum - Total	mg/L						0.00200	0.00200					
Nickel - Total	mg/L						0.00250	0.0100					
Lead - Total	mg/L						0.00100	0.00300					
Antimony - Total	mg/L						0.000500	0.000500					
Selenium - Total	mg/L						0.000500	0.00300					
Vanadium - Total	mg/L						0.00300	0.00300					
Zinc - Total	mg/L						0.0120	0.104					
Nutrients													
Ammonia - N	mg/L						0.510	0.247	0.410	2.19			
Nitrite - N	mg/L						0.0930	0.0694	0.407	0.0522			
Nitrate - N	mg/L						0.750	5.39	6.75	23.7			
Phosphate as P - Total	mg/L								1.80	3.38			
Solids													
TDS Total Dissolved Solids	mg/L						644	517	504	565			
TSS Total Suspended Solids	mg/L						9.50	11.8	9.50	10.5			
Turbidity	NTU						12.7	10.7	8.72	6.05			
Trace Constituents													
Cyanide - Free	mg/L												
Cyanide - Total	mg/L												
Cyanide - WAD	mg/L												

TPX-FILTER End of Tailings Spigot - Pressure Filtered (2016)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Data													
Temperature	°C												
Conductivity	mS/cm												
pH		11.6	11.5	11.6	11.5	11.4	11.4	11.5	11.4	11.4	11.4	11.6	11.9
Major Constituents													
Calcium	mg/L												
Chloride	mg/L												
Carbonate	mg/L												
Bicarbonate	mg/L												
Potassium	mg/L												
Magnesium	mg/L												
Sodium	mg/L												
Sulphate	mg/L	630	511	530	606	620	522	830	700	502	570	605	698
Hardness - Total	mg/L												
Alkalinity - Total	mg/L												
Soluble Metals (As the tailings slurry samples must be pressure filtered prior to laboratory analysis, the results are thus representative of the soluble fraction rather than total)													
Silver - Soluble	mg/L												
Aluminum - Soluble	mg/L												
Arsenic - Soluble	mg/L												
Barium - Soluble	mg/L												
Beryllium - Soluble	mg/L												
Cadmium - Soluble	mg/L												
Cobalt - Soluble	mg/L	0.0287	0.00200	0.0540	0.0542	0.0365	0.0630	0.0620	0.0510	0.00600	0.00750	0.00700	0.0510
Chromium - Soluble	mg/L												
Copper - Soluble	mg/L	2.92	3.92	32.7	20.9	37.8	33.1	7.12	1.20	4.29	2.78	10.4	27.8
Fluoride - Soluble	mg/L												
Iron - Soluble	mg/L	10.6	2.07	14.3	5.01	20.3	20.3	38.0	20.0	0.736	1.09	2.73	4.66
Mercury - Soluble	mg/L												
Manganese - Soluble	mg/L												
Molybdenum - Soluble	mg/L												
Nickel - Soluble	mg/L	0.187	0.379	0.394	0.460	0.439	0.462	0.0845	0.139	0.518	0.386	0.322	2.69
Lead - Soluble	mg/L												
Antimony - Soluble	mg/L												
Selenium - Soluble	mg/L												
Vanadium - Soluble	mg/L												
Zinc - Soluble	mg/L	0.0307	0.0803	0.0188	0.0112	0.0255	0.0609	0.00633	0.00875	0.0310	0.0385	0.0870	0.0577
Nutrients													
Ammonia - N	mg/L	9.32	7.38	8.80	10.0	7.10	7.52	11.2	7.50	9.24	7.98	8.62	32.7
Nitrite - N	mg/L	0.0140	0.0240	0.0553	0.0570	0.0320	0.0318	0.0500	0.0715	0.106	0.114	1.93	1.07
Nitrate - N	mg/L	25.8	19.5	19.7	21.2	17.0	16.2	21.3	22.2	18.2	17.0	21.5	163
Phosphate as P - Total	mg/L												
Solids													
TDS Total Dissolved Solids	mg/L												
TSS Total Suspended Solids	mg/L												
Turbidity	NTU												
Trace Constituents													
Cyanide - Free	mg/L	25.7	35.3	31.2	38.5	28.4	42.1	30.1	28.7	30.2	30.0	37.5	70.8
Cyanide - Total	mg/L	134	139	179	110	143	170	231	159	87.2	79.7	106	148
Cyanide - WAD	mg/L	76.0	90.1	89.9	76.4	80.2	83.9	72.9	64.1	64.0	68.3	82.8	115

MAD and MAC Limits 2016

Parameter	Units	T8.4 (MAD Limit)	SDP (MAD Limit)	W1.5.1 (MAC Limit - Communal Use)
Chlorine (Cl)	mg/L		350	350
Magnesium (Mg)	mg/L	50		50
Sodium (Na)	mg/L	808.6		200
Sulphate (SO_4)	mg/L	1904.4	500	500
Silver (Ag)	mg/L			0.05
Aluminium (Al)	mg/L			0.5
Arsenic (As)	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 (Cd)	mg/L			0.001
Cobalt (Co)	mg/L			0.1
Chromium (Cr)	mg/L			0.05
Copper (Cu)	mg/L	1		1
Fluorine (F)	mg/L			1.5
Iron (Fe)	mg/L	1.8		0.3
Mercury (Hg)	mg/L			0.0005
Manganese (Mn)	mg/L	0.29		0.1
Molybdenum (Mo)	mg/L	1.014		0.25
Nickel (Ni)	mg/L	0.039		0.02
Lead (Pb)	mg/L			0.01
Antimony (Sb)	mg/L			0.005
Selenium (Se)	mg/L			0.01
Silicon (Si)	mg/L			10
Vanadium (V)	mg/L			0.1
Zinc (Zn)	mg/L	1		1
Ammonia Nitrogen (NH_3-N)	mg/L	23.48	2.5	1.5
Nitrite Nitrogen (NO_2-N)	mg/L		1	3.3
Nitrate Nitrogen (NO_3-N)	mg/L		10.6	45
WAD Cyanide (CN-WAD)	mg/L			0.035
Free Cyanide (CN-F)	mg/L	0.128		
Total Suspended Solids (TSS)	mg/L	77.7	185.6	
Biochemical Oxygen Demand (BOD5)	mg/L		16.83	
MBAS	mg/L		0.5	0.5
Hydrocarbons	mg/L			0.3

Laboratory Detection Limit

Parameter	Units	Method Detection Limit
Major Constituents		
Ca	mg/L	0.05
Cl	mg/L	0.5
CO_3	mg/L	1
HCO_3	mg/L	1
K	mg/L	0.09
Mg	mg/L	0.05
Na	mg/L	0.05
SO_4	mg/L	0.1
T-Hardness	mg/L	1
T-Alkalinity	mg/L	1
Total Metals		
Ag	mg/L	0.003
Al	mg/L	0.03
As	mg/L	0.0003
Ba	mg/L	0.001
Be	mg/L	0.0002
Cd	mg/L	0.0003
Co	mg/L	0.004
Cr	mg/L	0.008
Cu	mg/L	0.005
F	mg/L	0.005
Fe	mg/L	0.001
Hg	mg/L	0.0003
Mn	mg/L	0.001
Mo	mg/L	0.004
Ni	mg/L	0.005
Pb	mg/L	0.002
Sb	mg/L	0.001
Se	mg/L	0.001
Si	mg/L	
V	mg/L	0.006
Zn	mg/L	0.001
Nutrients		
Un-ionized NH_3		
NH_3	mg/L	0.04
NO_3-N	mg/L	0.001
NO_2-N	mg/L	0.1
T-PO_4	mg/L	0.01
TKN	mg/L	
Solids		
Turb-L	NTU	0.35
TDS	mg/L	1
TSS	mg/L	1
Trace Constituents		
CN-F	mg/L	0.005
CN-T	mg/L	0.005
CN-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. 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, 2016 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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