Looking to the Stars
How to Create Responsible Night Lighting at the Stibnite Gold Project & Mitigate Light Pollution
Prepared for Midas Gold Idaho, October 30, 2018
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Staring at the night sky has guided ships, fueled dreams and inspired fields of scientific study for millennia. In Idaho, if you look up at night, you will be blessed with the beauty of a star-studded sky. It is an iconic piece of our outdoor experience. At Midas Gold, it is important to our team that we do our part to protect this part of our state's heritage.

We are fortunate to be building a company in a state where there are individuals, cities and companies who are committed to reducing light pollution. Through the research of Benjamin Banet and the guidance of some of Idaho's leaders in dark skies initiatives, we now have a blueprint to help guide our engineers as we try to limit light pollution during operations at the Stibnite Gold Project. We hope you will enjoy reading Benjamin's report and learning how Midas Gold, and other companies, can help protect our dark skies.

Thank you to everyone who helped put this work together. We promise you we will continue to stare up at the stars in the night sky and let them, and you, inspire us.

As part of their commitment to environmental responsibility, Midas Gold Idaho, Inc. will strive to minimize their impact on Idaho's starry skies.

The Key Ways for Midas Gold to Mitigate Light Pollution:

1. Develop a comprehensive lighting plan
2. Select appropriate lights based on Correlated Color Temperature (CCT) and Color Rendering Index (CRI)
3. Ensure lights are shielded
4. Customize lights to the worksite
5. Install lights properly
6. Conduct active lighting management
7. Maintain a long-term monitoring plan

Light pollution is truly one of the easiest forms of environmental degradation to mitigate as it can literally be turned off with the flick of a switch. While it will not be possible for Midas Gold to turn all the lights off at night, if the company lights only what is needed, when it is needed with the appropriate amount of light it will go a long way to meeting the goal of helping the environment.

WHAT IS LIGHT POLLUTION?
Humans are dramatically affecting the nighttime environment on the planet. Changes to natural nighttime lighting levels caused by humans are known as light pollution.

A 2010 study determined that 94 percent of North Americans live under a night sky that is at least twice as bright as its natural level. Seventy percent of the population experiences a night sky that is four times brighter than its natural level.

We face four different types of light pollution - glare, light trespass, clutter and skyglow (Chepesiuk 2009; IDA 2009).

GLARE
Excessive brightness that causes visual discomfort and difficult seeing.

LIGHT TRESPASS
Occurs when light designed to illuminate one area travels beyond its useful range.

CLUTTER
Excessive groupings of bright lights that are often confusing and over-illuminate an area.

SKYGLOW
General brightening of the night sky over developed areas that originates from wasted light.
LIGHT POLLUTION

THE CASE FOR CAN MITIGATE

rhythms of day and night in an ecosystem.
The surrounding landscape. This before and after

IMPROVE WORKER SAFETY

When wildlife is exposed to artificial light

the impact on both the quality of light at a site and

rendering, the ability to distinguish between different colors accurately. When tasks require

in unsafe levels of glare, wasted power and unnecessary light pollution. Today, LED lighting

areas. LED lights use controlled beam patterns. This important upgrade in efficiency allows

One-size-fits-all lighting formulas used to be the norm. Unfortunately, this typically results

180º, compared to a traditional bulb which emits light at 360º. Legacy lighting technology

1/2 a/2 b/c f/d e/f g/h i/j k/l m/n o/p q/r s/2 t/2 u/v w/x y/z

This wasted light leads to higher utility

costs. Virtually all manufacturers make

This will enable workers to operate machinery safely and efficiently, reduce

magnesium is unique and needs its own lighting solution –

Next, Midas Gold must select the right lights for each area of the site. One of the first

in the United States is wasted (Gallaway et

According to the U.S. Department of

Energy, roughly 30 percent of the lighting

company could save roughly a third on its

environment with heavy machinery, steep

slopes, explosives, and other mining

worksite (Wren, Shepperd, Staples 2015).

imagine a fixed position?

mobilize or is it

implied for different LMAs.

NEEDED FOR ALL TASKS AT THE SITE.

According to the U.S. Department of

Office 2013). In situations where it is

dramatically decreased (BLM-WY State

Light that shines towards the sky or off

to an active site so little to no light is wasted.

Midas Gold needs to start with

an honest and thorough assessment of

lighting needs at the Stibnite Gold Project site.

PROTECT ECOSYSTEMS

Reducing Light Pollution

Light pollution has various negative impacts on wildlife. For example, some species of birds

are disoriented by light pollution and collide with buildings or other objects. This can cause

severe injury or death. Other species are attracted to artificial light, leading to a decrease in

migration, reproduction or

animal’s natural patterns of foraging,

communication. Responsible lighting

PROTECT ECOSYSTEMS

worker safety.

Visible light impacts the environment with heavy machinery, steep

slopes, explosives, and other mining

worksite, all efforts should be made to keep

horizontally-aimed light towers

typically emitted light in circular patterns, which led to over-lighting or under-lighting

imposed for different LMAs.

essential for all tasks at the site.

Directing light to where it is needed is particularly important to keep light below the

40º horizontal plane so it is focused on the

active site. Midas Gold should aim to have zero light

be directed where it is needed.

Midas

3

neighboring areas.

PROPER-SIZE TEMPERATURE & HUMIDITY

imagine a fixed position?

implied for different LMAs.

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imagine a fixed position?

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Responsible lighting needs to be carried on throughout the life of the Stibnite Gold Project to ensure work areas are being illuminated only when necessary. In the past, legacy lighting technology was left on all night long because of warm-up and cool down times. LED lights reach full brightness immediately, so they can be switched on or off as needed without delay.

LED technology can easily be integrated with switches, timers, and motion sensors in a process known as network lighting to ensure lights are on when needed and off when not. Network lighting control systems give site managers tools to monitor lighting remotely, track maintenance, detect outages, dim lights and more (CA Lighting Technology Center 2014). Network control systems will enable Midas Gold to maximize the potential benefits of LED technology.

Midas Gold should monitor lighting over the years to ensure the best lighting management protocols are being followed and light output falls within an expected range. Publicly-available remote sensing data of the earth at night gives Midas Gold a straightforward, non-biased way to measure the total amount of light being generated from the site. If changes are detected from these high-level observations, site managers on the ground know adjustments must be made.

Midas Gold can download remote sensing data and use geographic information systems software to analyze lighting changes and determine if there are trends. Values should be roughly identical over the years, except for slightly higher light output during the winter months due to increased reflectance from snow. As activity increases or shifts to other areas of the project site, values will inherently change. However, if there is an upwards trend in the data that is not easily explained, a lighting audit should be conducted to determine what fixtures could be contributing to increased skyglow with the goal of eliminating the cause and redirecting light downward to where activity is taking place.