



# CRITICAL MINERALS

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When the DEIS was released by the U.S. Forest Service in August of 2020, our company was called Midas Gold. Since then, we have changed our name to better reflect our values and our project. Today, we are proud to be Perpetua Resources.

## ANTIMONY AT STIBNITE

- In its 2014 Prefeasibility Study, Midas Gold indicated the Stibnite Gold Project will produce over 100 million pounds of antimony.<sup>1</sup>
- The Stibnite Mining District is home to the largest known antimony deposit in the United States.
- Stibnite provided approximately 90% of the U.S. antimony supplies during WWII and the Korean War because Japan's invasion of China cut off supplies to the US, so production at the site was deemed critical to the war effort.

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- Antimony is considered a critical mineral by the U.S. government for its use in national defense, aerospace and energy industries. The U.S. Geologic Survey (USGS) has cited a growing demand for minerals like antimony due to new and emerging technologies and that the domestic supply is limited and at risk with no current domestic production or strategic stockpile.<sup>2</sup>
- According to the USGS, there was zero U.S. domestic mine production of antimony in 2019 and there is only one processing facility in Montana producing minor amounts of antimony metal and oxide from recycled materials and imported feedstock. As a result, America is dependent on imports to meet its antimony needs.<sup>3</sup>
- The Department of Defense noted the importance of antimony for defense applications in 2013, when it ranked antimony number two in the list of strategic and non-fuel defense material shortfalls and predicted a shortfall of 20,500 tons in a four-year period. The Department of Defense recommended strategic stockpiling approximately 11,000 tons of antimony to address this shortfall, which has not occurred.<sup>4</sup>
- Today, China is the leading source of antimony for the United States, followed by Russia and Tajikistan. Antimony from the Stibnite Gold Project can provide the strategically important



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industrial material to the United States and balance reliance on foreign sources.<sup>5</sup>

- Most of the world's antimony is produced in China and, a continually changing political climate can cause uncertainties in the supply chain. In 2013, China imposed restrictions on the export of antimony-based products for several years, reducing availability and increasing prices. More recently, China has mentioned restricting exports of critical and rare earth minerals as part of its trade negotiations.<sup>6</sup>

## USES

- Antimony acts as a hardening agent in metals and a fire retardant. It has numerous industrial uses from the petroleum refining and chemical industry, high tech electronics, green energy production, fire retardant formulations used in nearly all consumer and industrial plastics, and in a wide variety of military applications.
- The use of antimony as a fire retardant and in steel hardening during World War II is credited for saving as many as a million American lives and shortening the way by a year.<sup>7, 8</sup>
- The military relies heavily on antimony. It is used in high tech electronics such as night vision goggles, communications equipment, infrared sensors, explosives formulations and ammunition primers. It is used in hardening lead in bullets and shrapnel, in armor piercing projectiles, and in nuclear weapons and nuclear power plants on submarines and warships. It helps remove impurities in glass and is important in the production of military binoculars, precision optics and laser sighting and survey equipment.
- Because of its hardening properties and protection against corrosion, antimony is heavily used in battery production, nuclear energy, wind turbines and marine ship building.<sup>9</sup> Without antimony, the metals needed for these industries would be less resilient and more susceptible to failure.
- Antimony's natural flame-retardant properties make it important in the paint and coating industries, where antimony is added to increase fire protection, and extensively used in plastics for its flame-retardant properties.
- Antimony helps to make glass clear and doesn't impact the color of it, so it has become key in the solar industry as well as the production of cell phone and computer screens.<sup>10</sup>
- Antimony is under intense study because of its unique physical properties. It is being investigating for its potential uses in lithium ion batteries, infrared photodetection,

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semiconductors, LED lighting, fuel cells and other advanced technologies.<sup>11</sup>

## FOOTNOTES

1. "China is also the world's major producer of a number of other mineral commodities that are essential in high-tech applications, renewable energy, and national security, including antimony, bismuth, fluorspar, germanium, graphite, and indium (Price, 2013)". Critical Mineral Resources of the United States— An Introduction, <https://pubs.usgs.gov/pp/1802/a/pp1802a.pdf>
2. Midas Gold Pre-Feasibility Study [https://www.midasgoldcorp.com/site/assets/files/2119/amended\\_techreport.pdf](https://www.midasgoldcorp.com/site/assets/files/2119/amended_techreport.pdf)
3. 2020 Mineral Commodities Summary, U.S. Geological Survey, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020.pdf>
4. Strategic and Critical Materials 2013 Report on Stockpile Requirements, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics January 2013, [https://mineralsmakelife.org/assets/images/content/resources/Strategic\\_and\\_Critical\\_Materials\\_2013\\_Report\\_on\\_Stockpile\\_Requirements.pdf](https://mineralsmakelife.org/assets/images/content/resources/Strategic_and_Critical_Materials_2013_Report_on_Stockpile_Requirements.pdf)
5. 2020 Mineral Commodities Summary, U.S. Geological Survey, <https://pubs.usgs.gov/periodicals/mcs2020/mcs2020.pdf>
6. China Raises Threat of Rare-Earths Cutoff to U.S., Foreign Policy, May 2019 <https://foreignpolicy.com/2019/05/21/china-raises-threat-of-rare-earth-mineral-cutoff-to-us/>
7. Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply Edited by Klaus J. Schulz, John H. DeYoung, Jr., Robert R. Seal II, and Dwight C. Bradley, Chapter C: Antimony <https://pubs.usgs.gov/pp/1802/c/pp1802c.pdf>
8. Congressional Record: Proceedings and Debates of the 84th Congress, Second Session, Volume 102, Part 3, page 4118, March 7, 1956
9. A Crosswalk of Mineral Commodity End Uses and North American Industry Classification System (NAICS) Codes, J. J. Barry, G. Matos, and W. Menzie, U.S. Geological Survey Open File Report 2015-1163.
10. United States mineral resources. M. Miller, 1973, Antimony, in D. Brobst, and W. Pratt, eds.: U.S.



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Geological Survey Professional Paper 820, p. 45–50, accessed October 6, 2015, at <http://pubs.er.usgs.gov/publication/pp820>

11. Lithium–antimony–lead liquid metal battery for grid-level energy storage, K. Wang, K. Jiang, B. Chung, T. Ouchi, P. Burke, D. Boysen, D. Bradwell, H. Kim, U. Muecke, and D. Sadoway, 2014. *Nature*, October 16, 2014. Vol. 514, pp 348–350.