ALASKA'S MINERALS: A STRATEGIC NATIONAL IMPERATIVE

A SWOT APPROACH - 2022

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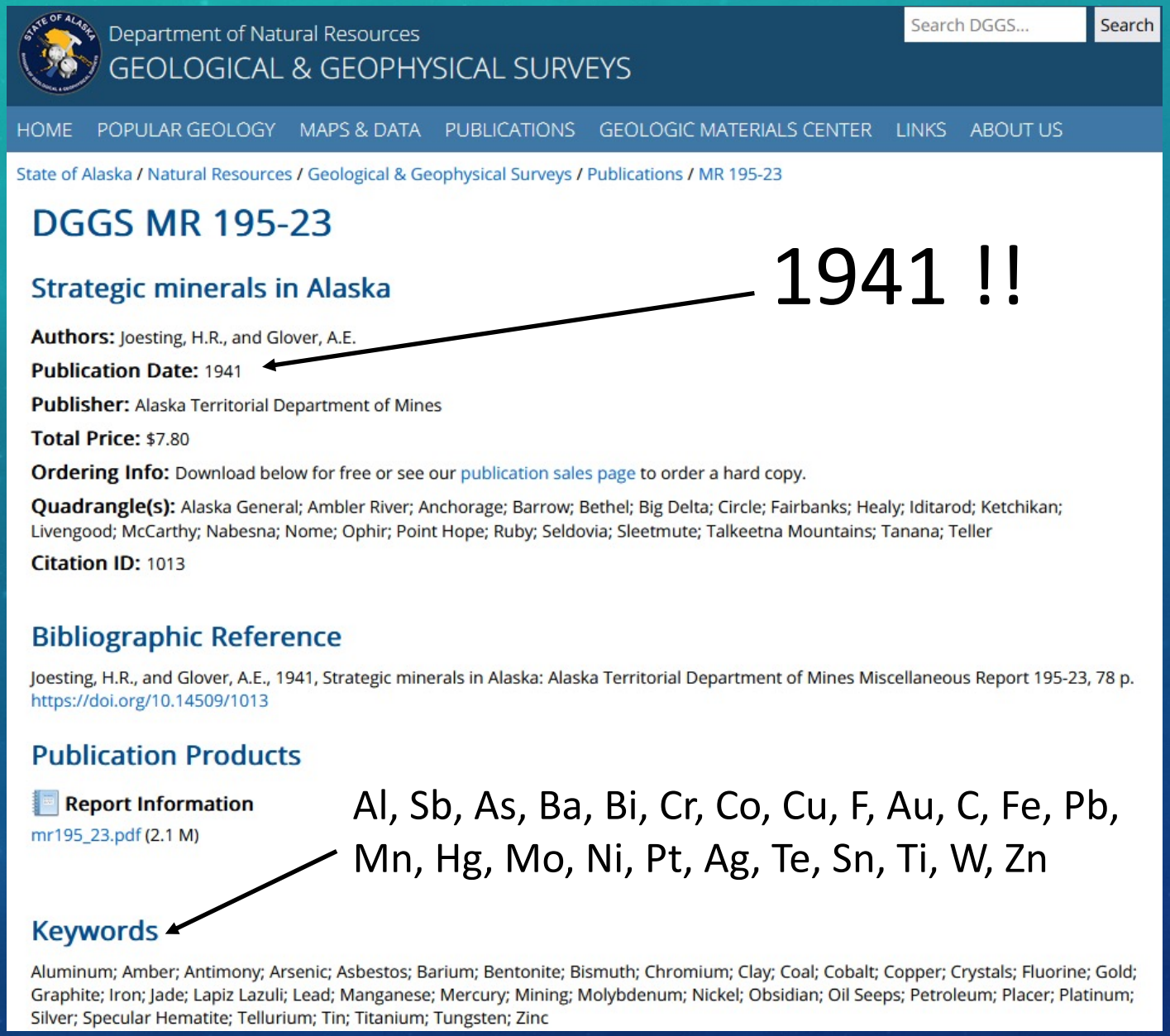
August 22, 2022

https://www.nbcnews.com/slideshow/disconnect-reality-modern-conveniences-dalton-highway-n808726

SCM: NOT A NEW IDEA



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DGGS MR 195-23

Strategic minerals in Alaska

1941 !!

Authors: Joesting, H.R., and Glover, A.E.

Publication Date: 1941

Publisher: Alaska Territorial Department of Mines

Total Price: $7.80

Ordering Info: Download below for free or see our publication sales page to order a hard copy.

Quadrangle(s): Alaska General; Ambler River; Anchorage; Barrow; Bethel; Big Delta; Circle; Fairbanks; Healy; Iditarod; Ketchikan; Livengood; McCarthy; Nabesna; Nome; Ophir; Point Hope; Ruby; Seldovia; Sleetmute; Talkeetna Mountains; Tanana; Teller

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FOCUS

My effort today is based on a SWOT analysis (Strengths-Weaknesses-Opportunities-Threats). It is focused on only four of the many Alaskan parameters as they relate to the SCM space:

1. Market Dynamics: the pros and cons of small-volume markets, their price and demand volatility and their risk of being monopoly/cartel-manipulated
2. Access and Infrastructure: the good, the bad and the ugly for Alaska's extractive industries
3. Seasonality: impacts early to mid-stage exploration and development, impacts from supply-chain and labor issues, etc.
4. Messaging: Alaska's mining image has been created by others, who often demonize the mining industry while simultaneously demanding, perhaps unwittingly, more metals for the new green economy

ALASKA'S SCM STRENGTHS

1. Market Dynamics: No significant strengths
2. Access and Infrastructure: Ready access to Pacific Rim
3. Seasonality: No significant strengths
4. Messaging: No significant strengths

PS: Don't despair, Alaska has opportunities that we can turn into strengths!

ALASKA'S SCM WEAKNESSES

1. Market Dynamics: Higher cost curve, small volume SCM use equates to higher price and demand volatility. Marginal prospects struggle to compete in a down market
2. Access and Infrastructure: air-only prospects, limited road access, few year-around deep water ports, limited grid-based electricity favors higher grade, lower cost-curve deposits
3. Seasonality: Exploration efforts are largely restricted to summer season, particularly in roadless areas. Wetlands and sensitive floral/faunal zones may also require seasonal restrictions. Supply chain issues and labor shortages also a continuing concern.
4. Messaging: Increasing focus on SCMs across the globe has largely bypassed Alaska. Legislative support, DGGS/USGS efforts and AIDEA involvement, while beneficial, have largely gone unnoticed

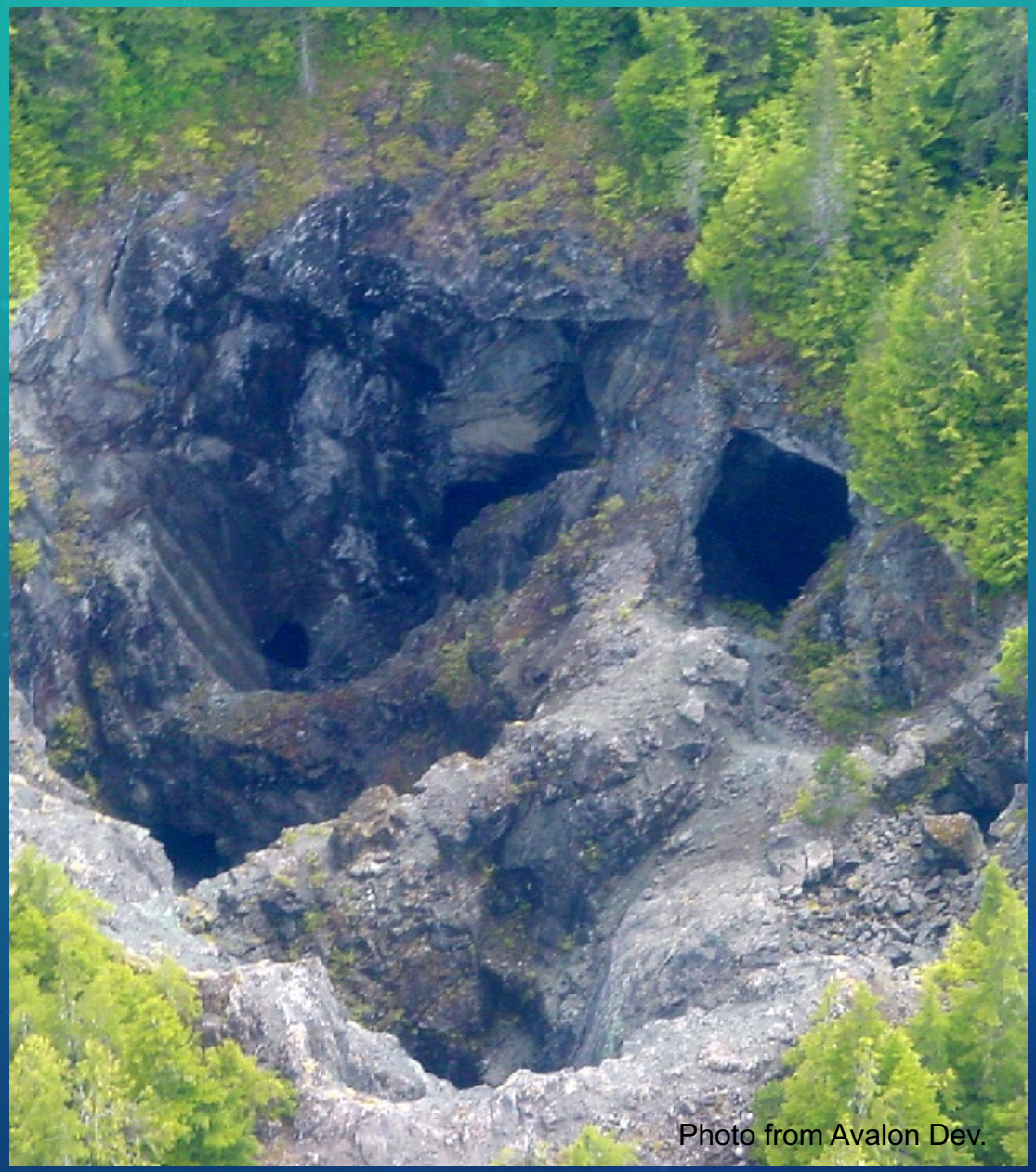
ALASKA'S SCM OPPORTUNITIES

1. Market Dynamics: Over 2,500 under-explored SCM prospects, some with metals that previously had little or no economic value or commercial use. Most have had little or no modern exploration
2. Access and Infrastructure: Ambler Road will access SCM resources: Cu, Zn and Co. Opportunities to utilize Alaska's abundant geothermal, hydro, wind and solar resources for zero-carbon electrical power. Stop removing lands from extractive industry development and re-open portions of conservation units with high SCM potential
3. Seasonality: Leverage past cold-climate engineering expertise for use at new SCM deposits: Alaskans know how to work in Alaska!
4. Messaging: Alaska must create a financial, technical, regulatory and social climate that supports long-term mining investments and responsible project development

ALASKA'S SCM THREATS

1. Market Dynamics: SCM cartels and/or monopolies could render Alaskan SCM deposits untenable
2. Access and Infrastructure: Lack or roads, power and related infrastructure threaten viability of SCM sector. Large and growing acreage closed to mineral entry further harms future potential.
3. Seasonality: Continued supply chain issues threaten to turn seasonal programs into multi-year programs, resulting in negative short and long-term economic impacts
4. Messaging: Alaska has fallen behind its peers in the SCM industry: only 2 Alaska SCM prospects are active, both over 10 years old. The mining industry has been demonized: virtually every mining project that reaches an advanced stage of development has been subject to one or more legal challenge

SALT CHUCK MINE, SE ALASKA



- Salt Chuck mine produced Cu, Ag & Pd from 1917-1926
- During that period it became the largest Pd producer in the U.S.
- Pd prices dropped from $155/oz in 1917 to $77/oz by 1926
- Salt Chuck closed in 1926, partly due to crash of Pd prices, never re-opened
- Post WWI metals crash affected most metals: remote, small volume producers, could not compete.

MT. PASS REE MINE, CALIFORNIA

MOLYCORP VS CHINESE REE MONOLOPY

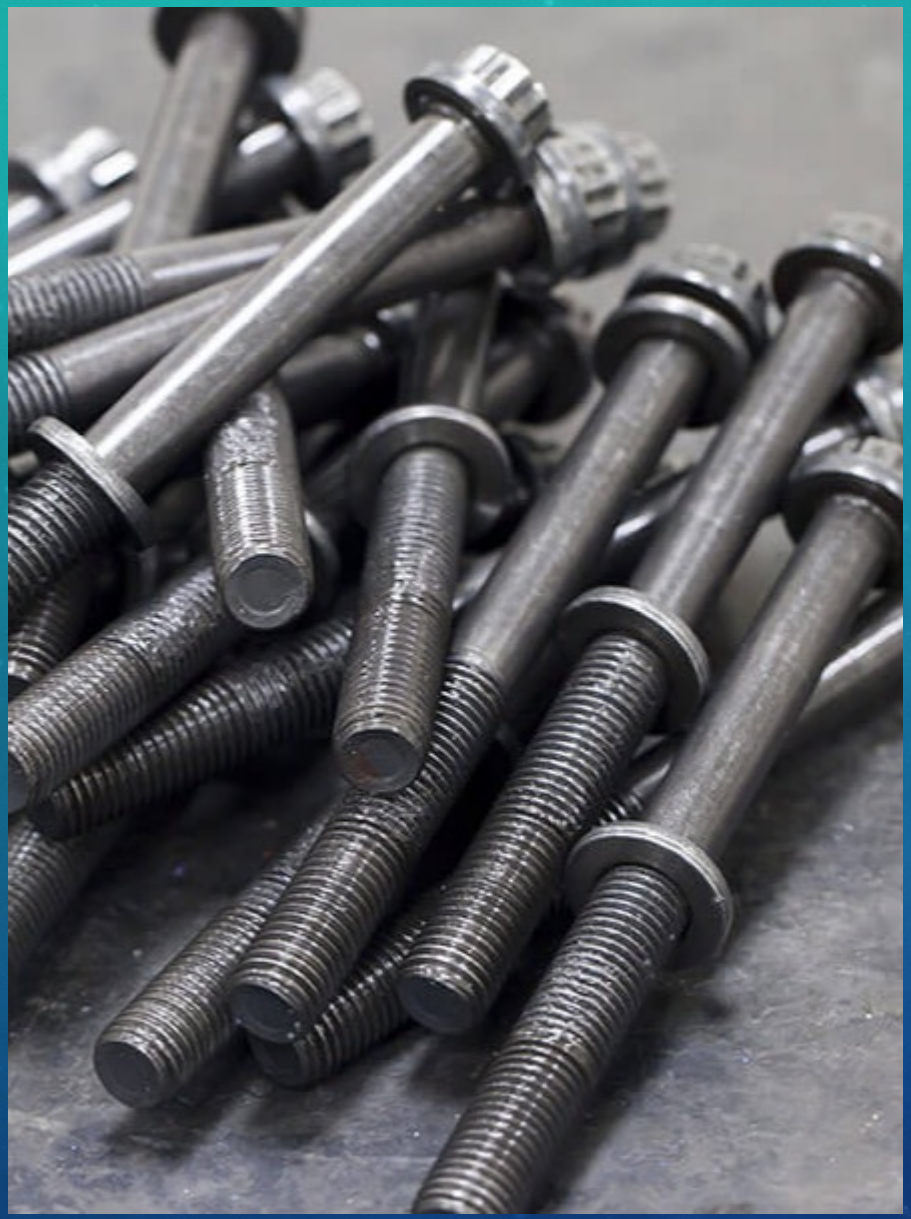
- Mountain Pass mine in California was the only significant US REE producer from the early 1950s until 2001.
- The mine was closed, for both economic and technical reasons from 2001 to 2010.
- Molycorp went public in 2010 and restarted production at Mt. Pass in 2011 with plans to dramatically ramp up production. Molycorp stock quickly rose from $14 to $77/share. The future looked bright.
- China eased export restrictions on REEs, prices fell , and in 2015 Molycorp declared bankruptcy and closed the Mt. Pass mine.
- Assets were purchased by private investors, some of which were Chinese domiciled.
- Mining was resumed by MP Materials which sells its production to Shenghe Resources Holding Co., a partially PRC-controlled enterprise.

SCM AS CO-PRODUCTS

Sylvanite (Au-Ag telluride)
Emperor Gold Mine, Fiji
Photo by Jason McEvoy

- Many of today's high-demand SCMs were discarded in the past because they were not economic to recover or had no significant industrial applications.
- Examples include Te, Se, In, Ta, Sc, Ga, Ge, Zr, etc.
- High tech demand, new recovery technology and dramatically higher prices have caused companies to revisit old tailings and waste sites to recover these SCMs and employ primary recovery circuits at operating mines
- Example: Kennecott has started tellurium recovery at its Bingham Canyon copper mine in Utah, making it one of two tellurium producers in the U.S.

NEEDED AT GOODNEWS BAY, ALASKA



www.tfgusa.com/high-strength-bolts-for-structural-bolting

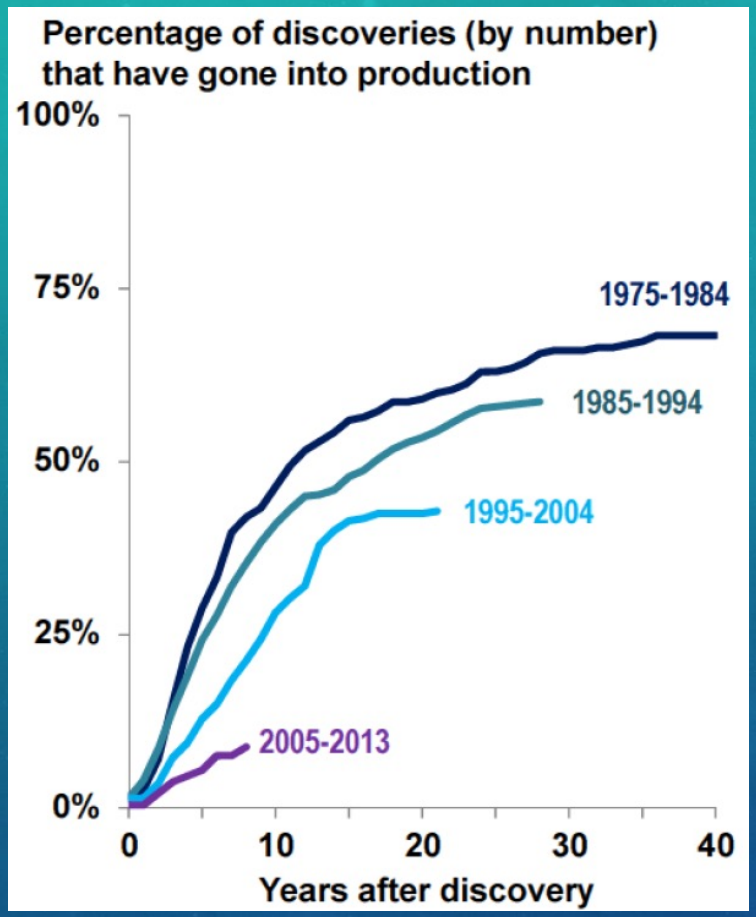
- You are mining placer platinum in the Goodnews Bay area of SW Alaska
- Your dozer Is broken down and you need grade 9 bolts to get it up and running. Time is critical
- Each bolt will cost you $2
- You can air freight the bolts to Bethel for a nominal cost
- The cost of getting the bolts from Bethel to Goodnews Bay, via a chartered single engine aircraft, is $1,100!
- This is what limited infrastructure means to remote Alaskan operations

ALASKA'S ACHILLES HEEL

https://nordural.is/en/environment-and-society/

- Lack of year-around access and modern infrastructure place Alaska at a distinct disadvantage compared to other potential SCM producing jurisdictions.
- Last major road constructed in Alaska was the Dalton Highway, constructed 1974 (not counting 1 lane Tanana spur)
- Port MacKenzie started construction in 1999
- Electricity production in 2020 was derived from natural gas fueled (42%), hydroelectric (28%), petroleum (16%), coal (12%), and other renewables, mostly wind and biomass (3%).
- Nordural is one of several "green" aluminum smelters in Iceland that powers itself with geothermal and hydro power. And there are no aluminum mines in Iceland!

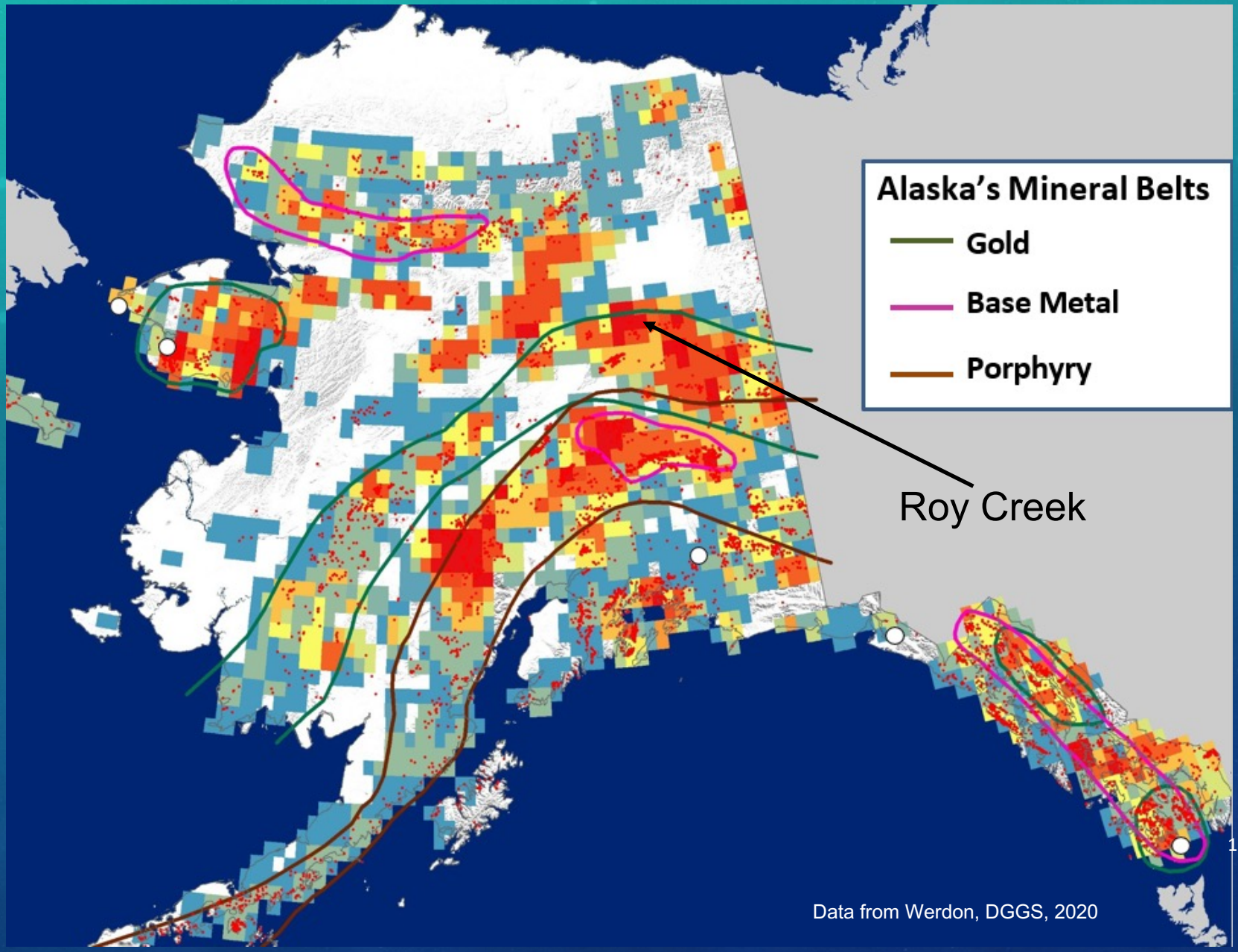
PERMITTING: THE 800 LB GORILLA



Data from Schodde, 2014

- How long would it take to permit and build the Dalton Highway and Trans-Alaska Pipeline today?
- How long would it take to permit the 323-mile George Parks Highway, completed in 1971?
- Would our current Congress approved construction of the Delong Mts. Trans. System road, 52 miles long, completed in 1989?
- Mine permitting has taken longer and longer, with most projects taking 15-25 years to move from discovery to production
- Discovery-to-production timeline must be reduced without decreasing quality of engineering or ESG oversight

CRITICALITY-WEIGHTED SCM POTENTIAL



ROY CREEK GEOCHEM

		Elemental Avg, PPM	Oxide Equivalent	Conversion	PPM Oxide	% REO + Y_2O_3
light	La	46,8[illegible]0	La_2O_3	.85	55,060	24.7
	Ce	7[illegible],600	CeO_3	.90	8[illegible],450	39.6
	Pr	8,800	Pr_6O_{11}	.83	10,[illegible]00	4.8
	Nd	27,700	Nd_2O_3	.[illegible]	32,2[illegible]0	14.4
	Sm	4,500	Sm_2O_3	.8[illegible]	5,23[illegible]	2.3
	Eu	1,080	Eu_2O_3	.86	1,260	0.6
HEAVY	Gd	4,580	Gd_2O_3	.87	5,260	2.3
	Tb	524	Tb_4O_7	.85	616	0.3
	Dy	2,490	Dy_2O_3	.87	2,860	1.3
	Ho	450	Ho_2O_3	.87	517	0.2
	Er	1,100	Er_2O_3	.84	1,31[illegible]	0.6
	Tm	129	Tm_2O_3	.88	1[illegible]0	0.1
	Yb	4[illegible]0	Yb_2O_3	.88	[illegible]00	0.2
	Lu	58	Lu_2O_3	.88	66	Tr
	Y	15,[illegible]00	Y_2O_3	.79	18,987	8.5
	Total REE+Y	193,251		Total REO + Y_2O_3	223,076	99.9

Data from Burton, 1981

WHAT DOES THE MINING INDUSTRY NEED?

- Alaska needs to market its SCM potential world-wide, focusing on its over 2,500 SCM prospects, its under-explored nature and its propensity to host world-class mineral deposits
- Alaska and the Federal government need to improve Alaska's transportation and electrical generation systems to insure that access and electrical power meet the State's future needs
- Alaska and the Federal government need to revise the regulatory regime to insure timely, fair and predictable process from exploration through reclamation
- Alaska and the Federal government need to stop closing lands to the extractive industries, and open selected portions of CSUs to allow SCM exploration and development .
- Alaska and the Federal government need to continue funding to the DGGS and USGS for basic geologic mapping, geochemical sampling and geophysical surveys to provide background information on its SCM potential

Image from Avalon Development