Patagonia Area Resource Alliance (PARA) ✦ Arizona Mining Reform Coalition ✦ Borderlands Restoration Network ✦ Center for Biological Diversity ✦ Earthworks ✦ Friends of the Santa Cruz River ✦ Friends of Sonoita Creek ✦ Sierra Club (Grand Canyon Chapter) ✦ Tucson Audubon

December 14, 2022

***Via Certified Mail, Return Receipt Requested***
***[7010 1060 0002 1869 7295]***

**and Email (heinz.rachel@azdeq.gov)**

Arizona Department of Environmental Quality
Water Quality Division
Attn: Rachel Heinz
1110 W. Washington St.
Phoenix, AZ 85007

***Re: Comments on Proposed Renewal of AZPDES Permit (AZ0026387) for Arizona Minerals, Inc.***

To Whom It May Concern:

On behalf of the Patagonia Area Resource Alliance (PARA) and the above listed organizations, please accept these comments and objections to the request by Arizona Minerals, Inc. (AMI) to renew its existing Arizona Pollutant Discharge Elimination System (AZPDES) Permit No. AZ0026387 for the "January Mine Hermosa Project Water Treatment Plant" in Santa Cruz County, Arizona ("Draft Permit" or "Permit").[1] The current AZPDES permit is scheduled to expire on January 7, 2023.

For the reasons set forth in these comments, the Draft Permit cannot be issued. ADEQ must reevaluate the Draft Permit in light of the Arizona Court of Appeals' recent decision in *San Carlos Apache Tribe v. State of Arizona* (No. 1 CA-CV 21-0295, Nov. 15, 2022). The Hermosa Project has "new sources" of discharge as defined in the Clean Water Act and regulations at 40 C.F.R. §§ 122.2 and 122.29 and A.A.C. R18-9-A901(25). Because of these new sources, the Draft Permit cannot issue until ADEQ updates the Total Maximum Daily Load (TMDLs) for Alum Gulch (and Harshaw Creek). Additionally, ADEQ must address certain additional issues with the Draft Permit, discussed here.

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[1] ADEQ Public Notice – Renewal of AZPDES Permit AZ0026387 for the January Mine Hermosa Project Water Treatment Plant in Santa Cruz County https://azdeq.gov/node/9226

## Overview

This AZPDES Permit was first issued to AMI in January 2018. It authorized discharge of treated water from Water Treatment Plant 1 (WTP1) to Alum Gulch via Outfall 001. In August 2021, the AZPDES Permit was amended to add discharge of treated water from a new Water Treatment Plant 2 (WTP2) to Harshaw Creek via Outfall 002. AMI has recently applied to renew this AZPDES Permit, which is scheduled to expire in January 2023. These comments address this Draft Permit for renewal.

Although the title of ADEQ's Public Notice (*see* FN1) refers to only one singular water treatment plant, the current AZPDES Permit authorizes discharges to two different water bodies from two different water treatment plants. First is the discharge of up to 0.172 million gallons per day (MGD) of treated mine drainage water (including from the historically contaminated January Adit), stormwater, and tailings seepage collected in the underdrain collection pond (UCP) from Water Treatment Plant 1 (WTP1) into Alum Gulch. Second is the discharge of up to 6.48 MGD of treated mine drainage water, tailings seepage, groundwater, core cutting water, drilling water, and stormwater from Water Treatment Plant 2 (WTP2) into Harshaw Creek.[2]

In addition, after dewatering and depressurization of the aquifer and <u>during the term of the Permit</u>, AMI plans to construct exploration mine shafts and related infrastructure to develop the large zinc, lead, and silver deposits located deep underground this historic mine site.

### I. AMI's Activities are a "New Source" and an AZPDES Permit Cannot Issue – and Discharge to Outfall 001 Cannot Occur – Until the Alum Gulch TMDL Is Updated

#### A. Summary of Historic Mining

Mining activities have occurred intermittently at the Hermosa Project site since at least the early 1870s. ASARCO last operated the site from 1925 to 1949 (as the "Trench Camp" or January-Norton" Mine). Shown right is a view of the Trench Camp Mill site from the 1930s. Historical mine records from the 1940s held by the AZ Geological Survey show that operations were relatively small. Both the mine site and mill employed about 200 people

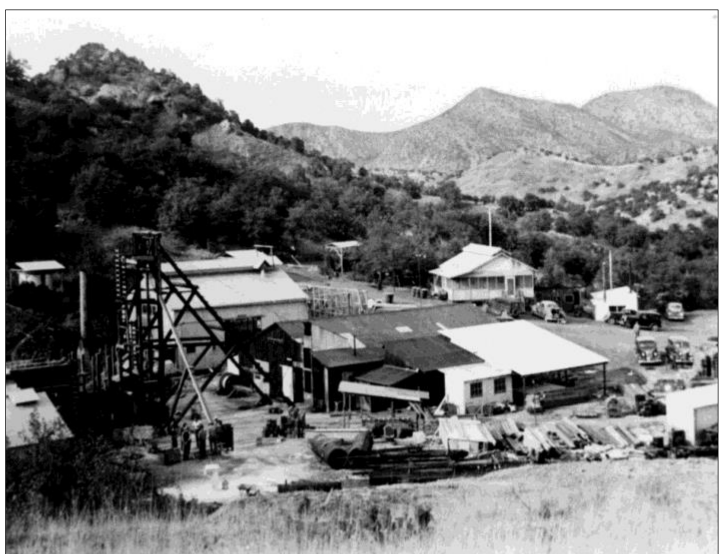

Photo from https://tucson.com/news/local/mine-tales-trench-mines-history-may-have-begun-with-indian-and-jesuit-miners/article_94be15ff-7dc5-5ca8-808a-73a15a57076d.html

[2] *See* Fact Sheet at 3.

and produced about 75 tons per day. ("This mine is a small mine producing, say 75 tons a day..."). [3]

### B. Summary of Current Mining

The current Hermosa Project mine site is unrecognizable from the historical operation. Upon acquiring portions of the former property from ASARCO and ASARCO Multi-State Environmental Custodial Trust in 2016 nearly seven decades later, AMI began radical changes to the nature of the historic mining site. This included construction of a new active water treatment plant (WTP1) for treating seepage and runoff and water from historic contaminated January Adit mine workings and relocated tailings (TSF). The "historic underground works […] referred to as the January Adit"[4] are not integrated with existing plant facilities but are contaminated historic workings simply managed for remediation purposes only as a condition of AMI obtaining this property. They also constructed infrastructure for discharge into Alum Gulch (Outfall 001) and a new underdrain collection pond (UCP) in approximately 2018.[5,6] The project also includes multiple exploratory drilling locations, a planned major expansion of the TSF, current construction of a new second water treatment plant (WTP2), needed to treat mine water from deep wells that AMI is constructing to substantially dewater the underlying aquifer for exploratory mining purposes.

A current aerial view of the Hermosa Project mine site from October 2022 (source: PARA collection)

[3] http://docs.azgs.az.gov/OnlineAccessMineFiles/S-Z/TrenchSantacruz140b.pdf
[4] *See* APP P-512235 Amendment Application at 2 (August 2020) at 196.
[5] *See* Fact Sheet from 2017 AZPDES Permit at 2.
[6] *See* FN4 at 2 (August 2020) (referencing applications submitted in 2017 to construct a new tailings storage facility, a new underdrain collection pond, and a new WTP1).

All of this work is being performed to facilitate exploration and the development of a large-scale industrial mine that will – during the life of this Permit – require the construction of two large mine shafts and related technology, that in no way resembles the prior mining site.

In fact, AMI describes the Taylor and Clark deposits on the Hermosa Project as "[o]ne of the largest undeveloped zinc-lead resources in the world, and the largest in America."[7] South32 CEO Graham Kerr stated "'We are designing the Taylor deposit to be our first 'next generation mine', using automation and new technology".[8] Two exploration shafts will be developed during the life of the proposed AZPDES permit, with mine production to begin in FY27.[9] In fact, South32 announced earlier this year that "shaft development is expected to commence in FY24. First production is targeted in FY27 with surface infrastructure, orebody access, initial production and tailings storage expected on patented lands [the site at issue in this Draft Permit] which require state-based approvals."[10] The purpose of these exploration shafts is to develop a large and previously untouched polymetallic mineral deposit (the zinc-lead-silver Taylor sulphide deposit).

ADEQ is plainly aware of AMI's plans for the mine site, as noted in its Fact Sheet at 3:

> AMI is conducting exploration activities to more fully assess the economic and technical viability of mining the underground polymetallic mineral deposit (primarily targeting zinc, lead, silver and manganese). This will be accomplished largely through advancement of **two exploration shafts**, which will necessitate **dewatering of the local aquifer** in the vicinity of the shafts to allow for their safe advancement. The VRP and exploration activities will require the continued use of water treatment plant 1 (WTP1) and the construction and use of water treatment plant 2 (WTP2). [Emphasis added].

### C. What is a "Mine" and what is a "New Source"?

PARA has previously explained to ADEQ that AMI's existing and planned mine workings, structures, and facilities are "new sources" under 40 C.F.R. §§ 122.22 and 122.29, and R18-9-A901(25), as they involve new facilities, new structures, and new sources of discharge completely unrelated to the old ASARCO mine site. ADEQ remains intentionally blind to these facts, concluding instead in the Fact Sheet at 5:

> The mine was first established before promulgation of the 1982 effluent limitation guidelines applicable to ore mining and dressing, 40 CFR Part

[7] *See* Exhibit AMADEQ-103 at p.6 (Jan. 4, 2022).
[8] *See* South32 Hermosa Project Update Press Release at 1 (January 17, 2022), **Attachment A.**
[9] *See* FN8 at 4.
[10] *See* FN8 at 4.

> 440, Subpart J, and accordingly is not a "new source" as defined in 33 U.S.C. § 1316 (a)(2) and 40 CFR Part 122.2. The mine workings and historic tailings at the site date back to the first half of the 20th century. For this reason, ADEQ is considering the discharge from WTP1 and WTP2 to be an existing source rather than a new source or a new discharger under A.A.C. R18-9-A901.24 or R18-9-A901.25. [Emphasis added].

A plain reading of ADEQ's statement quickly reveals the scope and breadth of ADEQ's overreach. Essentially, ADEQ concludes that because there was historic mining at the site many decades prior to the 1982 effluent limitations imposed under the Clean Water Act, every single future activity (including exploration and shaft development for the removal of metal ore or minerals at the site) can **never be** a "new source" under 33 U.S.C. § 1316 (a)(2) and 40 CFR Part 122.2, even if AMI's current mine plan is totally unrelated to and not a continuation of the prior "mine" and even if they will be developing entire new deposits, located at depths that could not have been accessed by the historic mine.

ADEQ's conclusion is not only an inaccurate representation of the facts, it also misstates the law and requirements of the Clean Water Act. For the reasons discussed below, ADEQ must revise its analysis to comply with the law – and thus, it must conclude that the mine activities to be conducted under the current permit are a "new source" subject to the 1982 effluent limitations imposed by 40 CFR Part 440, Subpart J. And because the requirements of Subpart J apply to these new source activities, ADEQ must complete its Total Maximum Daily Load (TMDL) study for Alum Gulch (and, as discussed later in these comments, Harshaw Creek) before it can issue a permit to discharge under the Clean Water Act.

First, contrary to ADEQ's sweeping use of the word "mine" to encompass all past and future mine activities at this site (thus conveniently making AMI/South32's activities merely a continuation of the historic mine and thus never subject to new source regulation), in fact, the definition of a "mine" under the federal Clean Water Act found at 40 C.F.R. § 440.132(g) is much more precise:

> "Mine" is an active mining area, including all land and property placed under, or above the surface of such land, used in or resulting from the work of extracting metal ore or minerals from their natural deposits by any means or method, including secondary recovery of metal ore from refuse or other storage piles, wastes, or rock dumps and mill tailings derived from the mining, cleaning, or concentration of metal ores.

Here, there can be no reasonable doubt that AMI's "next generation mine" will require the construction of (among other things): (1) at least two exploratory shafts for the removal of the deep ore/mineral deposits; and (2) deep mine dewatering and depressurization wells needed to maintain these shafts. AMI has also constructed WTP1 and is currently constructing the much larger WTP2, which will discharge effluent from the dewatering/depressurization wells, as well as seepage from the TSF and other mine impacted water, to Alum Gulch/Harshaw Creek respectively under the proposed Permit. It is difficult to understand how these new shafts/wells and related developments (which have nothing to do with the historic ASARCO mine and which access deep untapped mineral deposits) can be anything but a "new source."

**i. "New Source" is Defined at 40 C.F.R. § 122.2 and R18-9-A901(25)**

The EPA federal regulations implementing the Clean Water Act define "new source" and the criteria for determination of "new sources." Specifically, 40 C.F.R. § 122.2 defines "New Source" as follows:

> *New source* means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants," the construction of which commenced:
> (a) After promulgation of standards of performance under section 306 of CWA which are applicable to such source, or
> (b) After proposal of such standards of performance in accordance with section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal.

This federal definition of "new source" has been largely adopted into the Arizona Administrative Code implementing the AZPDES Program at R18-9-A901(25) as follows:

> 25. "New source" means any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:
>     a. After the promulgation of standards of performance under section 306 of the Clean Water Act (33 U.S.C. 1316) that are applicable to the source, or
>     b. After the proposal of standards of performance in accordance with section 306 of the Clean Water Act (33 U.S.C. 1316) that are applicable to the source, but only if the standards are promulgated under section 306 (33 U.S.C. 1316) within 120 days of their proposal.

**ii. "New Source Determination" Criteria at 40 C.F.R. § 122.29**

40 C.F.R. § 122.29(b) outlines the following criteria for new source determination.[11]

[11] In addition, to be a new source Section § 122.29 (b)(2) provides, "[a] source meeting the requirements of paragraphs (b)(1)(i), (ii), or (iii) of this section is a new source only if a new source performance standard is independently applicable to it" (emphasis added). Because it is beyond dispute that new source performance standards for mines producing

(b) *Criteria for new source determination*

(1) Except as otherwise provided in an applicable new source performance standard, a source is a "new source" if it meets the definition of "new source" in § 122.2, and

(i) It is constructed at a site at which no other source is located; or

(ii) It totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or

(iii) Its processes are substantially independent of an existing source at the same site. In determining whether these processes are substantially independent, the Director shall consider such factors as the extent to which the new facility is integrated with the existing plant; and the extent to which the new facility is engaged in the same general type of activity as the existing source.

(2) A source meeting the requirements of paragraphs (b)(1)(i), (ii), or (iii) of this section is a new source only if a new source performance standard is independently applicable to it. If there is no such independently applicable standard, the source is a new discharger. See § 122.2.

(3) Construction on a site at which an existing source is located results in a modification subject to § 122.62 rather than a new source (or a new discharger) if the construction does not create a new building, structure, facility, or installation meeting the criteria of paragraph (b)(1) (ii) or (iii) of this section but otherwise alters, replaces, or adds to existing process or production equipment.

(4) Construction of a new source as defined under § 122.2 has commenced if the owner or operator has:

(i) Begun, or caused to begin as part of a continuous on-site construction program:

(A) Any placement, assembly, or installation of facilities or equipment; or

(B) Significant site preparation work including clearing, excavation or removal of existing buildings, structures, or facilities which is necessary for the placement, assembly, or installation of new source facilities or equipment; or

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copper, lead, zinc, gold, silver, and molybdenum, codified at 40 C.F.R. Subpart J, are applicable here, *see* 40 C.F.R. § 440.100(a)(1), PARA need not offer any additional argument on this matter here. See also Fact Sheet at 5.

(ii) Entered into a binding contractual obligation for the purchase of facilities or equipment which are intended to be used in its operation with a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility engineering, and design studies do not constitute a contractual obligation under the paragraph.

As discussed below, the new mine structures and facilities are "new sources" meeting the requirements of §122.29(b)(1)(iii) and they are subject to new source performance standards pursuant to 40 C.F.R. § 440.100(a)(1).

### D. The New Structures and Facilities Producing Mine Drainage to Outfall 001 Are "New Sources"

As discussed briefly above, the fact that historic mining has occurred previously at the Hermosa Project site does not forever exempt any of its new mine workings, shafts, structures, and facilities from being considered a "new source" under the Clean Water Act.

Most of the new project features constructed or proposed by AMI (the tailings storage facility and underdrain collection pond, the two new major wastewater treatment plants, and two new massive exploration decline shafts) can, both collectively and separately, be considered "mines" per 40 C.F.R. § 440.132(g) as they are "used in or resulting from the work of extracting metal ore or minerals." These are components of a radically new large-scale mining operation using new technology and techniques, and they are substantially independent from existing sources at the site per §122.29(b)(1)(iii).

First, the proposed and newly constructed facilities are all brand-new components of a newly proposed mining operation designed to access deep, untouched ore bodies using new technology. Second, evidence provided throughout these comments shows plainly that AMI's "next generation mine" is simply incomparable to the small-scale historic mining operations of the prior century.

### E. The Arizona Court of Appeals Recently Addressed the Issue of "New Source"

The Arizona Court of Appeals recently addressed this "new source" question in a case that is remarkedly similar to AMI's permit facts. In *San Carlos Apache Tribe v. State of Arizona, et al,*[12] the Court rejected ADEQ's sweeping conclusion that the Resolution Copper Mine near Superior Arizona – which also involved modern mining techniques

[12] *See* San Carlos Apache Tribe v. State of Arizona, et al. (No. 1 CA-CV 21-0295, Nov. 15, 2022) at ¶1 – 2, **Attachment B.**

applied to an historic mine site – was not a "new source" subject to post-1982 effluent limitations under the Clean Water Act.

> "The [Clean Water Act] treats the new mine shaft as a "new source" because it is substantially independent of the non-contiguous original deposit at the mining site. In short, Resolution radically changed the nature of its existing mining site when it added the new mine shaft – a 7,000-foot-deep shaft designed to use a different mining technique to access a previously untouched, massive copper ore deposit that Resolution predicts will "supply more than 25% of America's demand for [copper] over the next 40 years."
>
> As a result, before the Arizona Department of Environmental Quality (ADEQ) issues a permit to allow Resolution to operate the new mine shaft, ADEQ must adopt Total Maximum Daily Loads (TMDLs) for Resolution's discharge of stormwater and non-stormwater – including treated mine water, industrial water, and seepage pumping – into Queen Creek near the town of Superior because Queen Creek is "impaired" for copper under the CWA."

The Court of Appeals also rejected the blanket argument by ADEQ regarding 'existing sources' as follows:

> "[T]he State's argument denying 'that any new buildings, structures, facilities, or installations constructed at a copper mine that began operations before Subpart J was promulgated' is not a new source is inconsistent with the regulatory framework and EPA guidance."[13]

As discussed in detail in these comments, the Hermosa Project includes similar features considered by the Court of Appeals in its decision. Like the Resolution Copper project, the Hermosa Project also involves (1) an historic mine site, (2) the nature of which is now being radically changed, (3) to access previously untouched ore body(ies), (4) using new modern technology, and (5) most critically, requiring new structures and facilities whose characteristics meet the Clean Water Act definition of "new source" under 40 C.F.R. 122.2.

The Court of Appeals determined that shaft 10 was built by Resolution Copper "to expand its mining site to begin mining the new, untouched ore body" and that existing structures were insufficient for this purpose (Decision at ¶59). The Court of Appeals concluded that "shaft 10 – though not completely independent from other sources – is substantially separate to be classified as a new source under § 122.29(b)(1)(iii). Shaft 10, thus, is a new source and Resolution's mining site is subject to NSPS under 40 C.F.R. § 440.104(a)." *San Carlos Apache Tribe v. State of Arizona, et al.* at ¶ 61.

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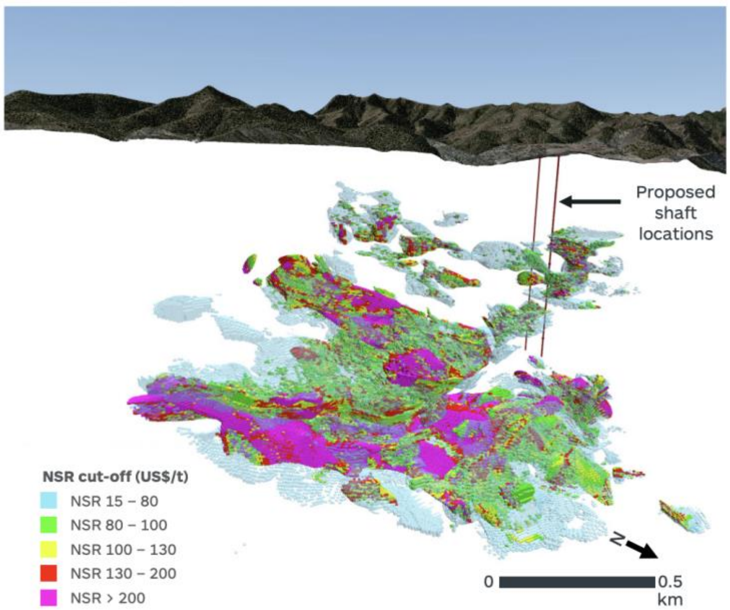
[13] *See San Carlos Apache Tribe v. State of Arizona, et al.* at ¶ 60.

The Hermosa Project, like Resolution, is a "large scale, highly productive underground mine" (emphasis added) and the Taylor Deposit development option will be a "globally significant producer" of metals.[14] Similar to Resolution Copper's shaft 10, the proposed dual exploration mine shafts are also planned "to support future operations", along with other planned infrastructure.[15] Resolution Copper's shaft 10 is approximately 6,943 feet deep, an unprecedented depth and the deepest continuous mine shaft in the United States. Drill hole depths for the Hermosa Project "vary between 550m [1,804 ft] and 2,000m [6,561.68 ft]."[16]

Figure 1: Taylor Mineral Resource




The graphic on the left[17] shows the two proposed exploration mine shafts at the Hermosa Project relative to the locations of the deep, untouched ore bodies. As discussed previously, development of these shafts is "expected to commence in FY24."[18]

In both instances, the companies are undertaking titanic-scale mining operations which are exponentially larger than any historic operation and intended to target previously-untouched ore deposits using new technologies.

In both instances, these radical new structures are "new sources" proposing to discharge into impaired waterways with incomplete TMDLs.

### F. The Alum Gulch TMDL Must Be Updated <u>Before</u> the AZPDES Permit Is Renewed

As a new source, ADEQ cannot issue the proposed Permit to AMI until a TMDL is completed. As an initial matter, the TMDL report for Alum Gulch (Headwaters to Sonoita Creek) from 2003 (listing impairment from cadmium, copper, low pH, and zinc) is nearly 20 years old.[19] Even ADEQ has acknowledged that it is "required by law to review and

[14] *See* FN8 at 3.
[15] *See* FN8 at 39.
[16] *See* FN8 at 26.
[17] *See* FN8 at 5.
[18] *See* FN8 at 4.
[19] *See* Alum Gulch TMDL, HUC No. 1505031-561A (June 30, 2003)

update the existing TMDLs every 5 years. At present, every existing TMDL is more than 5 years old and has not been reviewed or updated."[20] This means that the Alum Gulch TMDL is significantly outdated, and there is no evidence it has even been reviewed since it was first issued. Furthermore, ADEQ also admits that this TMDL backlog "is hindering ADEQ's ability to restore important sources of water used for drinking, recreation, industry and other activities across the state." [21]

Significantly, in addition to having a grossly outdated TMDL for Alum Gulch, ADEQ recently determined that Alum Gulch is impaired for another contaminant that was not considered in the old TMDL. According to the 2022 Water Quality in Arizona 305(b) Assessment Report[22] as well as the Fact Sheet at 7, Alum Gulch is now <u>newly impaired</u> for lead (2022). Given that the proposed AZPDES Permit renewal here proposes to discharge effluent into Alum Gulch via Outfall 001 that contains certain amounts of lead (see Draft Permit at 3, Table 1(a)), the TMDL absolutely <u>must</u> be updated <u>before</u> the AZPDES Permit is renewed to address this new impairment. Anything less than this violates the Clean Water Act and Arizona's obligations to implement the NPDES program. Once again, the Draft Permit parallels ADEQ's failures in the Resolution Copper case. Specifically, in *San Carlos Apache Tribe*, the Court of Appeals concluded:

> "Because shaft 10 is a "new source" within the meaning of 40 C.F.R. § 122.2, ADEQ may not renew the permit until: (1) ADEQ finalizes a TMDL plan for the receiving water segment; (2) Resolution demonstrates the existence of sufficient copper load allocations to allow for the proposed discharge; and (3) Resolution demonstrates the existence of water quality compliance schedules for the segment. *See* 40 C.F.R. § 122.4(i); *Pinto Creek*, 504 F.3d at 1012."
>
> *San Carlos Apache Tribe v. State of Arizona, et al.* at ¶63.

The Court of Appeals was clear – a current and complete TMDL must <u>precede</u> (come before) issuance of an AZPDES Permit where the receiving water is impaired. Thus, because the Hermosa Project is a "new source" subject to post 1982 effluent limits and TMDL requirements, ADEQ <u>cannot</u> renew AMI's AZPDES Permit until the Alum Gulch TMDL is reviewed and updated in its entirety and a waste load allocation has been performed for this new impairment. Anything less violates the Clean Water Act and Arizona's implementation of the NPDES program.

[20] *See* ADEQ Executive Budget Request (EBR) Fiscal Year 2024 (Sept. 1, 2022) at 109.
[21] *See* FN20.
[22] *See* 2024 Status of Water Quality in Arizona 305(B) Assessment Report.

## II. The Draft AZPDES Permit Cannot Issue – And Discharge to Outfall 002 Cannot Occur – Until the Harshaw Creek TMDL Is Updated

The TMDL report for Harshaw Creek (Headwaters to 31º27'43.9", 110º43'21.1") from 2003 is also nearly 20 years old.[23] As discussed above, ADEQ recently acknowledged that it is "required by law to review and update the existing TMDLs every 5 years. At present, every existing TMDL is more than 5 years old and has not been reviewed or updated." [24]

This means the Harshaw Creek TMDL has not been reviewed or updated since its issuance. This also means that ADEQ's statement in the Fact Sheet that the segment of lower Harshaw Creek receiving discharge from Outfall 002 "is not on the 303(d) list and there are no TMDL issues associated" (Fact Sheet at 7) is based on outdated information which has not been reviewed in nearly 20 years. This is a failure of ADEQ to perform its obligations under the Clean Water Act.

As ADEQ is aware (and PARA has shown and requested in prior comments) Harshaw Creek currently contains sources of contaminants from legacy mining. As ADEQ has noted, the region "is covered with abandoned mine workings and mining residue."[25] The historic Lead Queen Mine recently breached, spilling mine waste into an unnamed tributary of lower Harshaw Creek, turning the waters orange.[26] ADEQ principal hydrogeologist Daniel Reeder has acknowledged that this historic Lead Queen Mine adit drains "into the lower portion of Harshaw Creek."[27] In fact, as ADEQ is aware and has testified to, the Forest Service has conducted remediation activities and is actively monitoring lower Harshaw Creek below the historic Lead Queen Mine adit.[28]

To be sure, ADEQ is aware that upper and lower Harshaw Creek are connected, and that there are historic mine drainage impairments into lower Harshaw Creek. This situation is well-documented, including regarding low pH and high metal concentrations in wells along lower Harshaw Creek, such as in the Red Rock Ranch area of lower

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[23] *See* Harshaw Creek TMDL, HUC No. 1505031-025A (June 30, 2003)
[24] *See* ADEQ Executive Budget Request (EBR) Fiscal Year 2024 (Sept. 1, 2022) at 109.
[25] *See* AMADEQ-58 at ADEQ00085; AMADEQ-59 at ADEQ00135 (exhibits jointly submitted by AMI and ADEQ *In the Matter of: Chris Werkhoven and Patagonia Area Resource Alliance, et al.*, AZOAH Case No. 21-004-WQAB/21-006-WQAB).
[26] *See* Tr 1/14/22 (Day 5): p. 122 through p.129; *see also* p.136, ln.3-6 (testimony of C.Shafer from AZOAH Case No. 21-004-WQAB/21-006-WQAB).
[27] *See* Tr 1/18/22 (Day 6): p.164, ln.17-19 (testimony of D.Reeder from AZOAH Case No. 21-004-WQAB/21-006-WQAB).
[28] *See* Tr 1/18/22 (Day 6): p.137, ln.14-16; p.163, ln.9-25 to p.164, ln.17-19; (testimony of D. Reeder from AZOAH Case No. 21-004-WQAB/21-006-WQAB).

Harshaw Creek, where there are multiple wells with low pH and "dangerously high metal concentration."[29]

As discussed above, ADEQ has admitted that this TMDL backlog "is hindering ADEQ's ability to restore important sources of water used for drinking, recreation, industry and other activities across the state." [30] A plain reading of this statement indicates that ADEQ is failing to meet its legal obligations under the Clean Water Act. In order to fulfill these legal obligations, ADEQ must conduct a holistic review of and update the Harshaw Creek TMDL to include the entirety of Harshaw Creek.

Accordingly, a new TMDL must be prepared for the entire 14.4-mile length (both upper and lower reaches) of Harshaw Creek. And, as discussed above in relation to Allum Gulch discharges, until a TMDL has been completed, ADEQ should not issue an AZPDES for discharge to Harshaw Creek from this new source.

## III. The Sampling Plan Should Be Clarified

PARA was pleased to see the Effluent Limitation monitoring frequencies for discharges from Outfalls 001 and 002 listed in Tables 1(a) and 1(b) increased from quarterly to monthly. However, there are additional factors which must be considered. For the reasons discussed below, ADEQ must amend the AZPDES permit materials to clarify the sampling plan.

Tables 1(a) and 1(b) set forth Effluent Limitation monitoring requirements for discharges from Outfalls 001 and 002 from which samples are to be taken (see Draft Permit at 3 and 4). Footnotes 10 and 8 to these tables (respectively) require that "pH must be measured at the time of sampling and does not require use of a certified laboratory". Footnotes 7 to these tables (both) require that "The discharge must be tested for hardness at the same time that these metal samples are taken." The Fact Sheet at 13 clarifies that hardness will be measured as $CaCO_3$ (calcium carbonate). Tables 2(a) and 2(b) also set forth Assessment Level monitoring requirements for discharges from Outfalls 001 and 002 (see Draft Permit at 5 and 6). Footnotes 6 to these tables also require that samples be tested for hardness at the same time the samples are taken.

However, the AZPDES Permit draft materials fail to prescribe any specific requirements for how these samples must be handled after collection, and what their allowable hold times (time between sample collection and sample analysis) should be. The Draft Permit must clarify this, outlining how these samples should be stored and transported and how soon the samples must be tested by an outside laboratory following

[29] *See* ADEQ Response to PARA's APP Permit Appeal dated Sept. 23, 2021, PARA-O at pdf p.14 (exhibit submitted by PARA in AZOAH Case No. 21-004-WQAB/21-006-WQAB); *see also* AMADEQ-91 ("K. Brown Report") at ADEQ01031 (exhibits jointly submitted by AMI and ADEQ in AZOAH Case No. 21-004-WQAB/21-006-WQAB).
[30] *See* FN11.

collection. This is important for preserving the integrity of the sample's contents and obtaining valid test results that accurately represent the makeup of these discharge water samples.

## IV. Hardness

While PARA was pleased to see the *sampling* frequencies for discharges from Outfalls 001 and 002 listed in Tables 1(a) and 1(b) increased from quarterly to monthly (see *above*), the use of measured influent hardness to *calculate* these permit limits is unhelpful in determining the relevant concentration limits for the permit.

Tables 1(a) and 1(b) in the Draft Permit at 3 and 4 (for Outfalls 001 and 002 respectively) include maximum allowable discharge limitations ("Concentration Limits") for the following four metals with hardness-dependent water quality criteria: cadmium, copper, lead, and zinc. The higher the hardness, the less toxic these metals are to aquatic life. Conversely, at low hardness the metals are the most toxic to aquatic life. Using the measured hardness of the effluent (vs. Influent) is a critical step in calculating the relevant Concentration Limits for both Outfalls 001 and 002.

Table 1.a. Effluent Limitations and Monitoring Requirements for Outfall 001

The Concentration Limits for cadmium, copper, lead, and zinc in Table 1(a) (Draft Permit at 3) are calculated using a hardness of 400 mg/L as $CaCO_3$, which is the highest hardness that can be used to calculate the standards, as noted in Footnote 7. The use of such a high hardness value is based on the expected high hardness of the influent to the mine water treatment plant. However, the relevant monitoring location is in the effluent, or discharge, after the mine water has been treated. Therefore, the following sentences should be **deleted** from Footnote 7:

> "The hardness of the influent that will be treated by WTP1 is very high (estimated influent concentrations provided in the application are 610-2000 mg/L). Therefore, a hardness value of 400 mg/L (the maximum allowable hardness value that can be used to calculate standards, per Title 18, Chapter 11, Article 1, Appendix B, footnote d(ii)) was used to calculate the applicable limits for the hardness dependent metals."

In addition, the next sentence in Footnote 7: "This number may be adjusted once effluent hardness data becomes available" (emphasis added) should be modified to reflect the requirement to use the measured hardness value of the effluent at the time of sample collection, and should be revised to state:

> "The maximum allowable discharge limitations (Concentration Limits) shall be calculated using the measured hardness of the effluent sample."

Therefore, Footnote 7 for Table 1(a) (Draft Permit at 3) should read in full:

> "The discharge must be tested for hardness at the same time that these metal samples are taken. The maximum allowable discharge limitations

(Concentration Limits) for cadmium, copper, lead, and zinc shall be calculated using the measured hardness of the effluent sample. Please see the hardness definition in Appendix A, Part B."

In addition to using the measured hardness, the Concentration Limits for cadmium will need to take the 2003 Alum Gulch TMDL WLA into account (see Footnote 8), and the Concentration Limits for copper and zinc will need to take the WQBELs into account (see Footnote 9).

The treatment approach for water treatment plant WTP1 in Alum Gulch is briefly described in the Fact Sheet at 4. WTP1 uses ultrafiltration, which typically results in a discharge with low solute concentrations, including calcium and magnesium (the primary components of hardness). Because of the ultrafiltration step, WTP1 effluent will have a substantially lower hardness than the influent. If numeric limits are needed as an example in Table 1.a, using a hardness of 100 mg/L as $CaCO_3$ would be a more appropriate hardness value to use for calculating the Concentration Limits. As an example, the federal chronic aquatic life criterion value for total recoverable zinc at 100 mg/L hardness is 120 μg/L, while the value at 400 mg/L hardness is 388 μg/L.[31]

Table 1.b. Effluent Limitations and Monitoring Requirements for Outfall 002

The Concentration Limits for cadmium, copper, lead, and zinc in Table 1(b) (Draft Permit at 4) were calculated using a hardness of 258 mg/L as $CaCO_3$. As noted in Footnote 7, "Limits listed are based on the lower range of estimated WTP2 influent hardness of 258 mg/L as $CaCO_3$." Again, the values should not be based on the influent hardness because the relevant monitoring location is the effluent from WTP2.

The treatment approach for water treatment plant WTP2 in the Harshaw Creek drainage is briefly described in the Fact Sheet at 4. WTP2 will use an experimental two-step process that includes suspended solids removal and clarification to precipitate metals and separate solids (Step 1) and an ion exchange and electroreduction step to remove selenium (Step 2). The extent to which WTP2 treatment will modify the influent hardness is unknown. However, the measured hardness must be used to calculate the relevant Concentration Limits for Table 1(b) in the final AZPDES permit. Consequently, Footnote 7 in Table 2(b) should be modified to read:

"The discharge must be tested for hardness at the same time that these metal samples are taken. The maximum allowable discharge limitations (Concentration Limits) for cadmium, copper, lead, and zinc shall be calculated using the measured hardness of the effluent sample. Please see the hardness definition in Appendix A, Part B."

[31] U.S. EPA, 2004. National Recommended Water Quality Criteria, Office of Water, Office of Science and Technology (4304T). https://www.epa.gov/sites/default/files/2015-06/documents/nrwqc-2004.pdf

## V. Sampling for Assessment Levels Should Be 1x/Monthly, Not 1x/Quarterly

Tables 2(a) and 2(b) (Draft Permit at 5 and 6) show the monitoring frequency for Assessment Level (AL) parameters is only once per quarter. For the reasons discussed below, the monitoring frequency for the Assessment Level Monitoring listed in Tables 2(a) and 2(b) should be increased from quarterly to monthly.

Because of the large uncertainties associated with the composition of the water from the deep dewatering wells and related mine infrastructure, more frequent sampling of the Outfall 001 and 002 discharge is required. In addition to a lack of knowledge about the parameters that will be present and their concentrations in the mine water, potential seasonal variability in mine water chemistry has not been evaluated. Monitoring only one time in a three-month period (quarterly) will not be able to capture seasonal variability or any changes in mine water quality due to pulling water from different parts of the mine.

For the first AZPDES cycle (five years), collecting and analyzing samples on a monthly basis, as is the case for effluent limitations and monitoring, will provide a more robust set of data that could be used to understand the temporal and spatial (within the mine) variability in assessment parameter concentrations. Sampling for most of the assessment parameters can use the same bottles as those used for the parameters required for Tables 1(a) and 1(b); however, cyanide and nitrogen would be exceptions and will require separate sample bottles, preservation, and handling.

The use of blasting agents in the underground mine will result in the presence of nitrogen compounds in mine-influenced water. The most common blasting agent is ammonium nitrate-fuel oil (ANFO). The use of ANFO produces highly elevated concentrations of nitrate (nitrate/nitrite as N) and ammonia in mine-influenced water from mines. Therefore, determining nitrate+nitrite (as N) and ammonia is recommended for the Assessment Level parameters (rather than Total Kjeldahl nitrogen).

In addition to the above, expressing quarterly sampling results for Assessment Levels as monthly averages (as the Fact Sheet at 9 suggests) could potentially lead to misleading data. This arbitrary division of single quarterly sampling results into three so-called “monthly averages” could mask or conceal high concentrations that would otherwise “trigger evaluation of Reasonable Potential (RP) by ADEQ” (Draft Permit at 5 and 6). Using a monthly sampling frequency for Assessment Levels would obviate this confusion and bias.

## VI. Outfall 002 Assessment Levels in Table 2(b) Must Also Include Boron & Barium

Among the parameters listed in Table 2(a) Assessment Level Monitoring for Outfall 001 discharges include limits for Boron and Barium (see Draft Permit at 5). However, these two elements are missing from the list of parameters at Table 2(b) Assessment Level Monitoring from Outfall 002. (see Draft Permit at 6).

Reasons for including these parameters for Outfall 001 but not Outfall 002 in the Draft Permit are unclear. Instead, both tables must include Assessment Levels for Boron and Barium.

## VII. Total Recoverable and Dissolved Concentrations Must Be Reported

Discharge limits for metals, with the exception of Chromium VI, are for total recoverable metals (*see, e.g*., Draft Permit, Footnotes 2 in Tables 1.a and 1.b). The draft Permit proposes using metal translators to calculate total recoverable permit limits from dissolved criteria for metals (Fact Sheet at 8). The Fact Sheet at 23 also allows the permittee to perform a translator study to demonstrate what portion of the metal in the effluent will be present in dissolved form in the receiving water. If accepted by ADEQ, the results of the study may be used to modify the effluent limits for the metals studied. The proportion of dissolved metal, which is more bioavailable than particulate metal, can vary substantially depending on many factors that affect the amount of suspended sediment in a sample (*e.g.,* storms, infiltration of eroded soils). Measuring both dissolved and total recoverable metals in effluent samples for one year will provide a site-specific dataset to supplement translator studies conducted by the permittee.

## VIII. Dewatering the Aquifer is an Ongoing Concern

ADEQ previously stated that 90-100 percent of the inflow to WTP2 will come from AMI's extensive planned dewatering activities, including depressurization wells.[32] Similarly, ADEQ explains that AMI's exploration activities "will be accomplished largely though advancement of two exploration shafts, which will necessitate dewatering of the local aquifer in the vicinity of the shafts" and that "WTP2 is designed and will be constructed primarily to treat water from depressurization wells, underground dewatering pumps, and operational water services."[33]

As expressed in prior comments, PARA is gravely concerned about AMI's mine activities, particularly its dewatering activities in this region, which are specifically designed to dewater the aquifer for industrial extractive purposes.

Given the importance of the Patagonia Mountains and the existence of immense biodiversity in this region, the depletion of the aquifer will almost certainly harm or even destroy numerous springs and seeps, and other surface water features, at a time when the existence of these critical water resources and the habitat they support are already under pressure from drought and climate change. The groundwater-dependent ecosystems (GDE) are valuable, and the loss of these GDEs should not be lightly brushed aside by ADEQ or AMI. While these comments are directed at the ADEQ's potential issuance of a renewed AZPDES Permit to AMI to discharge mine dewatering and depressurization waters to Alum Gulch and Harshaw Creek, it must be acknowledged

[32] *See* 2021 AZPDES Permit amendment, Statement of Basis at 2.
[33] *See* Fact Sheet at 3

that the water to be permanently removed from these aquifers is currently an important part of the function and health of this important and biodiverse place.

## IX. Statement of Interests of Commentators

**Patagonia Area Resource Alliance** is a grassroots organization of volunteer community members committed to protecting and preserving the Patagonia, Arizona area. It is a watchdog organization that monitors the activities of industrial developers such as mining corporations, as well as government agencies, to make sure their actions have long-term, sustainable benefits to our public lands, our watershed, and our regional ecosystem.

**Arizona Mining Reform Coalition** works in Arizona to improve state and federal laws, rules, and regulations governing hard rock mining to protect communities and the environment. AMRC works to hold mining operations to the highest environmental and social standards to provide for the long term environmental, cultural, and economic health of Arizona.

The **Center for Biological Diversity** is a non-profit public interest organization with an office located in Tucson, Arizona, representing more than 1.7 million members and supporters nationwide dedicated to the conservation and recovery of threatened and endangered species and their habitats. The Center has a long-standing interest in projects of ecological significance undertaken in the National Forests of the Southwest, including mining projects.

**Tucson Audubon** is a 501(c)(3) member-supported community organization established in 1949. The organization promotes the protection and stewardship of southern Arizona's biological diversity through the study and enjoyment of birds and the places they live. Tucson Audubon provides practical ways for people to protect and enhance habitats for birds and other wildlife; and maintains its deep investment in Patagonia through the Paton Center for Hummingbirds along Sonoita Creek, a significant resource at risk due to proposed upstream mining activities.

**Friends of Santa Cruz River** is a non-profit organization dedicated to ensuring the continued flow of the Santa Cruz River, the life-sustaining quality of its waters, and the protection of the riparian biological community it supports.

**Borderlands Restoration Network ("BRN")** is a Patagonia-based nonprofit that works to grow a local restorative economy by rebuilding healthy ecosystems, restoring habitat for plants and wildlife, and reconnecting our border communities to the land through shared learning. Our work is primarily focused on protecting and restoring wildlife corridors and the surface waters of Sonoita Creek and surrounding watersheds.

**Friends of Sonoita Creek** is a non-profit organization dedicated to protecting and restoring the water and natural habitat of the Sonoita Creek Watershed. We inform residents and visitors about its importance to life forms and relationship to the geography through hands on activities, presentations, hikes, and collaboration with kindred organizations.

**Earthworks** is a nonprofit organization dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions. Earthworks stands for clean air, water and land, healthy communities, and corporate accountability. We work for solutions that protect both the Earth's resources and our communities.

**Sierra Club (Grand Canyon Chapter).** The Sierra Club is one of the largest and most influential grassroots environmental organizations in the U.S., with more than 3.5 million members and supporters. In addition to protecting every person's right to get outdoors and access the healing power of nature, the Sierra Club works to promote clean energy, safeguard the health of our communities, protect wildlife, and preserve our remaining wild places through grassroots activism, public education, lobbying, and legal action. The Grand Canyon Chapter of the Sierra Club, representing 16,000 members, has a long history of public education and advocacy to protect the lands and waters of Arizona.

Sincerely,

**Patagonia Area Resource Alliance**

Carolyn Shafer

Carolyn Shafer, Mission Coordinator and Board Member
P.O. Box 1044
Patagonia, AZ 85624
(520) 477-2308
parawatchdogs@gmail.com
and on behalf of

Roger Featherstone
Arizona Mining Reform Coalition
PO Box 43565
Tucson, AZ 85733-3565
(520) 777-9500
roger@AZminingreform.org

Kurt Vaughn, Ph.D., Executive Director
Borderlands Restoration Network
P.O. Box 121
Patagonia, AZ 85624
kvaughn@borderlandsrestoration.org

Allison N. Melton
Center for Biological Diversity
P.O. Box 3024
Crested Butte, CO 81224
(970) 309-2008
amelton@biologicaldiversity.org

Ian Bigley, Southwest Circuit Rider
Earthworks
1612 K St. NW #904
Washington, DC, 20006
Phone: (775) 772-8393
ibigley@earthworksaction.org

Ben Lomeli, President
Friends of Santa Cruz River
PO Box 4275
Tubac, AZ 85646
riverfriends@foscraz.com

Robert Proctor, President
Friends of Sonoita Creek
PO Box 4508
Rio Rico, AZ 85648
sonoitacreek@gmail.com

Sandy Bahr, Director
Sierra Club Grand Canyon Chapter
514 W. Roosevelt St.
Phoenix, AZ 85003
Sandy.bahr@sierraclub.org

David Robinson, Conservation Advocate
Tucson Audubon Society
300 E. University Blvd., Suite 120
Tucson, AZ 85705
(213) 924-1518
drobinson@tucsonaudubon.org

Enclosures

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CC: Jennifer Varin, USFS Watershed Program Manager, Coronado National Forest Supervisor's Office
(jennifer.varin@usda.gov)

Tomas Torres, Water Division Director, U.S. EPA, Region IX
(torres.tomas@epa.gov)

Elizabeth Sablad, NPDES Permits Section Manager, U.S. EPA
(sablad.elizabeth@epa.gov)

# Attachment A

17 January 2022

South32 Limited
(Incorporated in Australia under the *Corporations Act 2001* (Cth))
(ACN 093 732 597)
ASX / LSE / JSE Share Code: S32 ADR: SOUHY
ISIN: AU000000S320
south32.net

# HERMOSA PROJECT UPDATE

**Conference call at 11.00am Australian Western Standard Time, details overleaf.**

**South32 Limited (ASX, LSE, JSE: S32; ADR: SOUHY) (South32)** is pleased to provide an update following completion of a pre-feasibility study (PFS) for the Taylor Deposit, which is the first development option at our 100% owned Hermosa project located in Arizona, USA.

The PFS results support Taylor's potential to be the first development of a multi-decade operation, establishing Hermosa as a globally significant producer of metals critical to a low carbon future, delivering attractive returns over multiple stages. An initial development case demonstrates a sustainable, highly productive zinc-lead-silver underground mine and conventional process plant, in the first quartile of the industry cost curve[1].

The Taylor Deposit will progress to a feasibility study, including work streams designed to unlock additional value by optimising operating and capital costs, extending the life of the resource and further assessing options identified to target a carbon neutral operation. Completion of the feasibility study and a final investment decision to construct Taylor are expected in mid CY23.

Separately, a scoping study[a] for the spatially linked Clark Deposit has confirmed the potential for a separate, integrated underground mining operation producing battery-grade manganese, as well as zinc and silver. Clark has the potential to underpin a second development stage at Hermosa, with future studies to consider the opportunity to integrate its development with Taylor, potentially unlocking further operating and capital efficiencies.

While exploration drilling to date has been focused on the Taylor and Clark Deposits, we have continued to complete surface geophysics, soil sampling and other exploration programs across our land package. This work has resulted in the definition of a highly prospective corridor including Taylor and Clark as well as the Peake and Flux exploration targets[b] which will be prioritised for drill testing in CY22.

Further details of the Taylor PFS are contained in the attached report and accompanying presentation.

South32 Chief Executive Officer, Graham Kerr said: "The Taylor Deposit provides an important first development option for our Hermosa project in Arizona, USA. The project has the potential to sustainably produce the metals critical for a low carbon future across multiple decades from different deposits.

"Completing the pre-feasibility study for the Taylor Deposit is an important milestone that demonstrates its potential to be a globally-significant and sustainable producer of base and precious metals in the industry's first cost quartile. Beyond Taylor, Clark offers the potential to realise further value from our investment in Hermosa through the production of battery-grade manganese, a mineral designated as critical in the United States.

"Additional exploration targets around Taylor and Clark are indicative of further upside while the broader land package contains highly prospective areas for polymetallic and copper mineralisation.

"We are designing the Taylor Deposit to be our first 'next generation mine', using automation and technology to minimise our impact on the environment and to target a carbon neutral operation in line with our goal of achieving net zero operational carbon emissions by 2050.

"The future development of Taylor provides a platform from which to realise Hermosa's immense potential. It will further strengthen our portfolio and align with the already substantial growth in production of metals critical to a low carbon future that we have embedded in the portfolio over the past six months."

[a] The references to the scoping study in respect of the Clark Deposit are to be read in conjunction with the cautionary statement in footnote 2 on page 18 of this announcement.
[b] The references to the Exploration Target for the Hermosa project (including Peake) are to be read in conjunction with the cautionary statement in footnote 3 on page 18 of this announcement.

**Conference call**

South32 will hold a conference call at 11.00am Australian Western Standard Time (2.00pm Australian Eastern Daylight Time) on 17 January 2022 to provide an update of the Hermosa project including Q&A, the details of which are as follows:

**Conference ID**

Please pre-register for this call at link.

**Website**

A replay of the conference call will be made available on the South32 website.

## HERMOSA PROJECT

Hermosa is a polymetallic development option located in Santa Cruz County, Arizona, and is 100% owned by South32. It comprises the zinc-lead-silver Taylor sulphide deposit (Taylor Deposit), the zinc-manganese-silver Clark oxide deposit (Clark Deposit) and an extensive, highly prospective land package with the potential for further polymetallic and copper mineralisation. Hermosa is well located with excellent access to skilled people, services and transport logistics.

We have completed a PFS for the Taylor Deposit, our first development option at Hermosa. The Taylor Deposit is a large, carbonate replacement massive sulphide deposit which extends to a depth of approximately 1,200m over an approximate strike length of 2,500m and width of 1,900m. The Mineral Resource estimate for the Taylor Deposit is 138Mt, averaging 3.82% zinc, 4.25% lead and 81 g/t silver[4]. The deposit remains open at depth and laterally, offering further exploration potential.

The preferred mine design applied to the PFS is a dual shaft access mine which prioritises higher grade mineralisation early in the mine's life. The mining method is longhole open stoping, with the geometry of the orebody enabling the operation of multiple concurrent mining areas. This supports our assumption of an initial 22 year resource life[5] with high mining productivity. Ramp up to nameplate capacity[(c)] of up to 4.3 million tonnes per annum (Mtpa)[7] is expected to be achieved in a single stage. The process design applies a conventional sulphide ore flotation circuit producing separate zinc and lead concentrates with substantial silver credits.

In addition to the current Mineral Resource estimate for Taylor, we have defined an Exploration Target ranging from 10 to 95Mt[3] indicating the potential for further exploration upside. The exploration opportunity at Taylor includes depth and extensional opportunities as well as new prospects in proximity to the deposit. We have identified an Exploration Target at depth to the Taylor Deposit known as Peake, with initial drilling results returning copper and polymetallic mineralisation. Further drilling at Peake is planned in CY22.

Separately, we have completed a scoping study for the spatially linked Clark Deposit, confirming the potential for an underground mining operation producing battery-grade manganese, as well as zinc and silver. We are undertaking a PFS for Clark to increase our confidence in the mining and processing assumptions of a preferred development option and customer opportunities in the rapidly growing battery-grade manganese markets.

The Clark Deposit is interpreted as the upper oxidised, manganese-rich portion of the mineralised system that hosts Taylor. As we advance both our Taylor and Clark studies, we maintain the option to merge this work and assess an integrated underground mining operation. While such a scenario would require separate processing circuits to produce base and precious metals, and battery-grade manganese, an integrated development has the potential to unlock further operating and capital efficiencies.

Our third focus at Hermosa remains on unlocking value through exploration of our regional scale land package. Through the completion of surface geophysics, soil sampling, mapping and interpretation of recently acquired data, we have identified a highly prospective corridor which will be prioritised for future drilling. Within this corridor, we plan to drill the Flux prospect following receipt of required permits, anticipated in the second half of CY22. The Flux prospect is located down-dip of a historic mining area that has the potential for carbonate hosted, Taylor-like mineralisation[8].

## STRATEGIC ALIGNMENT

We continue to actively reshape our portfolio for a low carbon future, investing in opportunities that increase our exposure to base and precious metals, with strong demand fundamentals and low carbon production intensity. The Taylor Deposit is our most advanced development option at the Hermosa project, which has the potential to provide a multi-decade platform at the operation that would further improve the Group's exposure to the metals required for the transition to a low carbon future.

[c] The references to all Production Targets and resultant financial forecast information in this announcement is to be read in conjunction with the cautionary statement in footnote 6 on page 18 of this announcement. The key facts and material assumptions to support the reasonable basis for this information is provided in Annexure 2 of this announcement.

## SUSTAINABLE DEVELOPMENT

Sustainable development is at the heart of our purpose at South32 and forms an integral part of our strategy. The Taylor Deposit has been designed as our first "next generation mine" using automation and technology to drive efficiencies, minimise our impact and reduce carbon emissions. We have completed initial work programs and studies with respect to our communities, cultural heritage, environment and water, and any future development at Hermosa will be consistent with our approach to sustainable development.

The Taylor Deposit has been designed as a low-carbon operation, with the feasibility study to target the further potential to achieve carbon neutrality. This may be achieved through identified options to access 100% renewable energy from local providers, and the potential use of battery electric vehicles and underground equipment. The development of the Taylor Deposit would be consistent with our commitment to a 50% reduction in our operational carbon emissions by FY35 and net zero by 2050.

## CAPITAL MANAGEMENT FRAMEWORK

A final investment decision for the Taylor Deposit and its potential tollgate to construction will be assessed within our unchanged capital management framework. Our framework, which prioritises investment in safe and reliable operations, an investment grade credit rating and returns to shareholders via our ordinary dividends, also seeks to establish and pursue options that create enduring value for shareholders, such as capital investments in new projects. Our preferred funding mechanism for any future developments at Hermosa will be consistent with our commitment to an investment grade credit rating through the cycle that supports our strong balance sheet.

## PFS HIGHLIGHTS

The PFS results demonstrate Taylor's potential to be a globally significant producer of green metals critical to a low carbon future, in the first quartile of the industry cost curve. Taylor has the potential to underpin a regional scale opportunity at Hermosa, with ongoing activities to unlock additional value from the Clark Deposit and exploration opportunities across the regional land package.

- **Our initial development scenario outlines the potential for a large scale, highly productive underground mine**
  - Dual shaft access which prioritises higher grade ore in early years
  - Proposed mining method is low technical risk, employing longhole open stoping with paste backfill
  - Single stage ramp-up to nameplate production of up to 4.3Mtpa
  - Conventional sulphide ore flotation circuit
- **Potential to be a globally significant producer of metals for a low carbon future**
  - PFS estimates annual average production ~111kt zinc, ~138kt lead and ~7.3Moz silver (~280kt zinc equivalent (ZnEq)[9], with output ~20% higher across the years of steady state production[10]
  - Zinc is used in renewable energy infrastructure such as solar and wind for energy conversion and to protect against corrosion; silver is a key element used in solar panels; while lead demand is expected to be supported by its use in renewable energy storage systems
- **Potential for a low cost operation in the industry's first quartile**
  - Average Operating unit costs ~US$81/t ore milled (all-in sustaining cost (AISC)[11] ~US$(0.05)/lb ZnEq) benefitting from high underground productivity
- **Directs capital to establish a multi-decade base metals operation and platform for growth at Hermosa**
  - Project capital of ~US$1,230M (direct) and ~US$470M (indirect) to establish the first development option
  - Low sustaining capital ~US$40M per annum
  - Potential to realise capital efficiencies through an integrated development of Taylor and Clark
- **A large Mineral Resource with substantial exploration potential**
  - Taylor Deposit supports an initial resource life of ~22 years, and remains open at depth and laterally
  - 10 to 95Mt Exploration Target identified, indicating the potential for further exploration upside
  - Copper-lead-zinc-silver mineralisation intercepted at the proximal Peake prospect
- **Pursues the sustainable development of critical metals**
  - We are investing in local programs and partnerships that reflect the priorities of our communities
  - We are committed to working with Native American tribes to protect cultural resources
  - We have completed key biodiversity, ecosystem and water studies
  - We are pursuing a pathway to net zero carbon emissions with identified options for renewable energy

## FURTHER OPPORTUNITIES TO UNLOCK VALUE

Reflecting the early stage nature of the project we have identified numerous opportunities to unlock further value at Taylor that will be pursued prior to a final investment decision. Opportunities identified include the potential to:

- Extend the resource life, which is underpinned by the current Taylor Mineral Resource estimate and does not include the further potential identified in our Exploration Target.
- Reduce operating costs through:
  - Further optimisation of the mining schedule, power consumption and comminution circuit;
  - Supplying smelters in the Americas to realise a material reduction in transport costs; and
  - Adopting emerging technologies and further automation opportunities, targeting enhanced productivity.
- Reduce capital costs through further optimisation of the shaft design, construction and procurement.
- Achieve a carbon neutral operation through access to 100% renewable energy from local suppliers.
- Integrate the underground development with the Clark Deposit.

## NEXT STEPS

Taylor will now progress to a feasibility study which is targeted for completion in mid CY23. To maintain the preferred development path in the PFS, critical path items including construction and installation of infrastructure to support additional orebody dewatering is planned to commence in H2 FY22. Total pre-commitment capital expenditure associated with dewatering of approximately US$55M is expected in H2 FY22, with further investment expected in FY23. This expenditure is included in the growth capital estimate in Table 1 below.

The PFS assumes a single stage ramp-up to the nameplate production rate. Based on the PFS schedule, and subject to a final investment decision and receipt of required permits, shaft development is expected to commence in FY24. First production is targeted in FY27 with surface infrastructure, orebody access, initial production and tailings storage expected on patented lands which require state-based approvals. Surface disturbance and additional tailings storage on unpatented land will require completion of the National Environmental Policy Act (NEPA) process with the United States Forest Service (USFS). The project may benefit from the classification of metals found at Hermosa as critical minerals in the United States. Zinc is proposed to be added as a critical mineral by the U.S. Geological Survey while manganese (found at the Clark Deposit) already has this designation.

## PFS SUMMARY RESULTS

Key PFS outcomes are summarised below. Given the project's early stage nature, the accuracy level in the PFS for operating costs and capital costs is -15% / +25%. The cost estimate has a base date of H1 FY22. Unless stated otherwise, currency is in US dollars (real) and units are in metric terms.

**Table 1: Key PFS outcomes**

| | | | |
|---|---|---|---|
| **Production** | Nameplate production capacity | Mtpa | ~4.3 |
| | Resource life | Years | ~22 |
| | Head grades (average) | %, g/t | 4.1% Zn, 4.5% Pb, 82 g/t Ag |
| | Annual payable zinc production (average / steady state[10]) | kt | ~111 / ~130 |
| | Annual payable lead production (average / steady state) | kt | ~138 / ~166 |
| | Annual payable silver production (average / steady state) | Moz | ~7.3 / ~8.7 |
| | **Annual payable ZnEq production[9] (average / steady state)** | kt | **~280 / ~340** |
| **Operating costs** | Operating unit costs (per tonne ore milled) | US$/t | ~81 |
| | Operating unit costs (per lb ZnEq) | US$/lb ZnEq | ~(0.71) |
| **Capital expenditure** | Direct growth capital | US$M | ~1,230 |
| | Indirect growth capital | US$M | ~470 |
| | Sustaining capital (annual average) | US$M | ~40 |

## TAYLOR DEPOSIT PFS

The PFS for the Taylor Deposit provides confirmation that it is a technically robust project that has the potential to deliver an attractive return on investment. The PFS is based on an underground zinc-lead-silver mine development using longhole open stoping and a conventional sulphide ore flotation circuit producing separate zinc and lead concentrates, with silver by-product credits. The preferred development scenario is based on a mining and processing rate of up to 4.3Mtpa, with a resource life of approximately 22 years.

The PFS was completed with input from consultants including Fluor for the process plant and on-site infrastructure, SRK Consulting for geological and technical reviews, Stantec for mining studies, NewFields for hydrogeology, Montgomery & Associates for dewatering and tailings, Black and Veatch, and BQE for water treatment design and CPE for off-site roads. The PFS has been subject to an independent peer review.

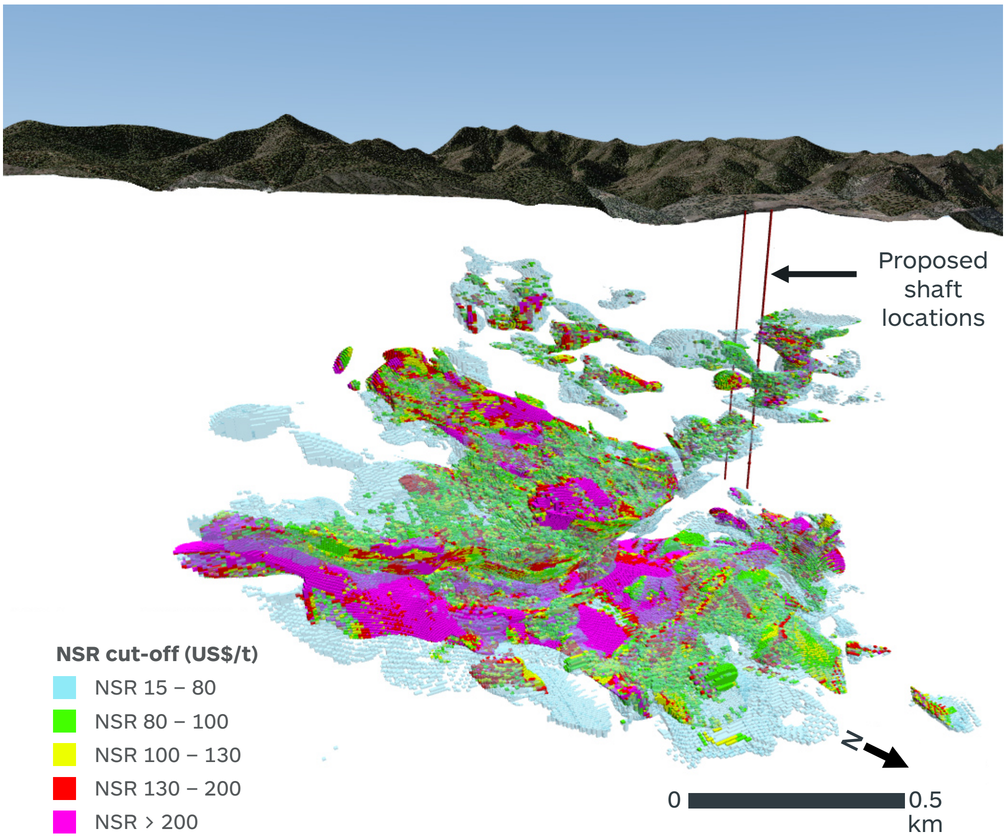
### Mineral Resource estimate

The Taylor Deposit is a carbonate replacement style zinc-lead-silver massive sulphide deposit. It is hosted in Permian carbonates of the Pennsylvanian Naco Group of south-eastern Arizona. The Taylor Deposit comprises the upper Taylor sulphide (Taylor Mains) and lower Taylor deeps (Taylor Deeps) domains that have a general northerly dip of 30° and are separated by a low angle thrust fault.

The Taylor Mineral Resource estimate is reported in accordance with the JORC Code (2012) at 138Mt, averaging 3.82% zinc, 4.25% lead and 81 g/t silver with a contained 5.3Mt of zinc, 5.9Mt of lead and 360Moz of silver. The Mineral Resource estimate is reported using a net smelter return (NSR) cut-off value of US$80/t for material considered extractable by underground open stoping methods.

The Taylor Deposit has an approximate strike length of 2,500m and a width of 1,900m. The stacked profile of the thrusted host stratigraphy extends 1,200m from near-surface and is open at depth and laterally. It is modelled as one of the first carbonate replacement deposit occurrences in the region, with all geological and geochemical information acquired to date being consistent with this model.

**Figure 1: Taylor Mineral Resource**



## Exploration Target

The Taylor Mineral Resource is within a highly prospective mineralised system and is open at depth and laterally, offering the potential for further exploration upside.

We have completed work aimed at developing an unconstrained, spatial view of the Exploration Target at the Taylor Deposit, considering extensional and near-mine exploration potential.

The Hermosa project has sufficient distribution of drill data to support evaluation of the size and quality of Exploration Targets. Tables of individual drill hole results are provided in Annexure 1 of this announcement, as well as a listing of the total number of holes and metres that support the assessment of the Exploration Target size and quality.

The tonnage represented in defining Exploration Targets is conceptual in nature. There has been insufficient exploration to define a Mineral Resource and it is uncertain if further exploration will result in the determination of a Mineral Resource. It should not be expected that the quality of the Exploration Targets is equivalent to that of the Mineral Resource.

Estimations were performed using resource range analysis, in which deterministic estimates of potential volumes and grades are made over a range of assumptions on continuity and extensions that are consistent with available data and generic models of carbonate replacement, skarn and vein styles of mineralisation.

The estimates are supported by exploration results from prospects in and around the Taylor Mineral Resource. These results are all of carbonate replacement, skarn, and vein styles of mineralisation and are currently explored at varying degrees of maturity and exploration drilling density.

Outcomes for the Exploration Target are provided in Table 2 below. The mid case Exploration Target is approximately 45Mt.

**Table 2: Ranges for the Exploration Target for Taylor sulphide mineralisation (as at 31 December 2021)**

| | Low Case | | | | Mid Case | | | | High Case | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mt | % Zn | % Pb | g/t Ag | Mt | % Zn | % Pb | g/t Ag | Mt | % Zn | % Pb | g/t Ag |
| **Sulphide** | **10** | **3.8** | **4.2** | **81** | **45** | **3.4** | **3.9** | **82** | **95** | **3.6** | **4.0** | **79** |

Notes:

a) Net smelter return cut-off (US$80/t): Input parameters for the NSR calculation are based on South32's long term forecasts for zinc, lead and silver pricing, haulage, treatment, shipping, handling and refining charges. Metallurgical recovery assumptions are 90% for zinc, 91% for lead, and 81% for silver.

b) All masses are reported as dry metric tonnes (dmt). All tonnes and grade information have been rounded to reflect relative uncertainty of the estimate, hence small differences may be present in the totals.

**Peake prospect**

Our drilling programs at the Taylor Deposit have focused on improving confidence in the mine plan for the potential development, extending the resource and testing near-mine exploration prospects.

As part of our work on near-mine exploration targets, we have intersected the skarn hosted copper-lead-zinc-silver Peake prospect, located south of the Taylor Deposit at a depth of approximately 1,300-1,500m. To date, 13 drill holes have been completed at Peake, a deeper zone prospective for copper mineralisation, returning results that intersected copper, lead, zinc and silver. The geological model interpreted from these results and other recently acquired data indicates the potential for a continuous structural and lithology-controlled system connecting Taylor Deeps and Peake. Further exploration drilling is planned in CY22.

Selected exploration drilling results from the Peake prospect are shown in Table 3 below.

**Table 3: Selected Peake drilling results**

| Hole ID | From (m) | To (m) | Cut off | Width (m) | Zinc (%) | Lead (%) | Silver (ppm) | Copper (%) |
|---|---|---|---|---|---|---|---|---|
| **HDS-540** | 1279.2 | 1389.0 | 0.2% Cu | 109.7 | 0.1 | 0.3 | 15 | 0.62 |
| | Including | | | | | | | |
| | 1303.6 | 1309.7 | 0.2% Cu | 6.1 | 0.2 | 0.4 | 61 | 3.48 |
| **HDS-552** | 1308.2 | 1384.7 | 0.2% Cu | 76.5 | 0.2 | 0.4 | 25 | 1.52 |
| | Including | | | | | | | |
| | 1309.9 | 1328.6 | 0.2% Cu | 18.8 | 0.1 | 0.2 | 40 | 2.77 |
| | And | | | | | | | |
| | 1364.3 | 1384.7 | 0.2% Cu | 20.4 | 0.1 | 0.3 | 37 | 2.44 |
| **HDS-661** | 1322.2 | 1374.6 | 0.2% Cu | 52.4 | 0.1 | 1.1 | 105 | 1.73 |
| | Including | | | | | | | |
| | 1322.2 | 1346.0 | 0.2% Cu | 23.8 | 0.1 | 0.8 | 81 | 3.32 |
| | Including | | | | | | | |
| | 1322.2 | 1330.1 | 0.2% Cu | 7.9 | 0.1 | 0.4 | 81 | 7.89 |
| | 1386.8 | 1460.6 | 0.2% Cu | 73.8 | 0.5 | 0.7 | 67 | 1.06 |
| | Including | | | | | | | |
| | 1399.6 | 1410.3 | 0.2% Cu | 10.7 | 0.7 | 1.5 | 227 | 2.84 |
| **HDS-717** | 1456.6 | 1466.7 | 0.2% Cu | 10.1 | 0.5 | 1.0 | 78 | 2.57 |

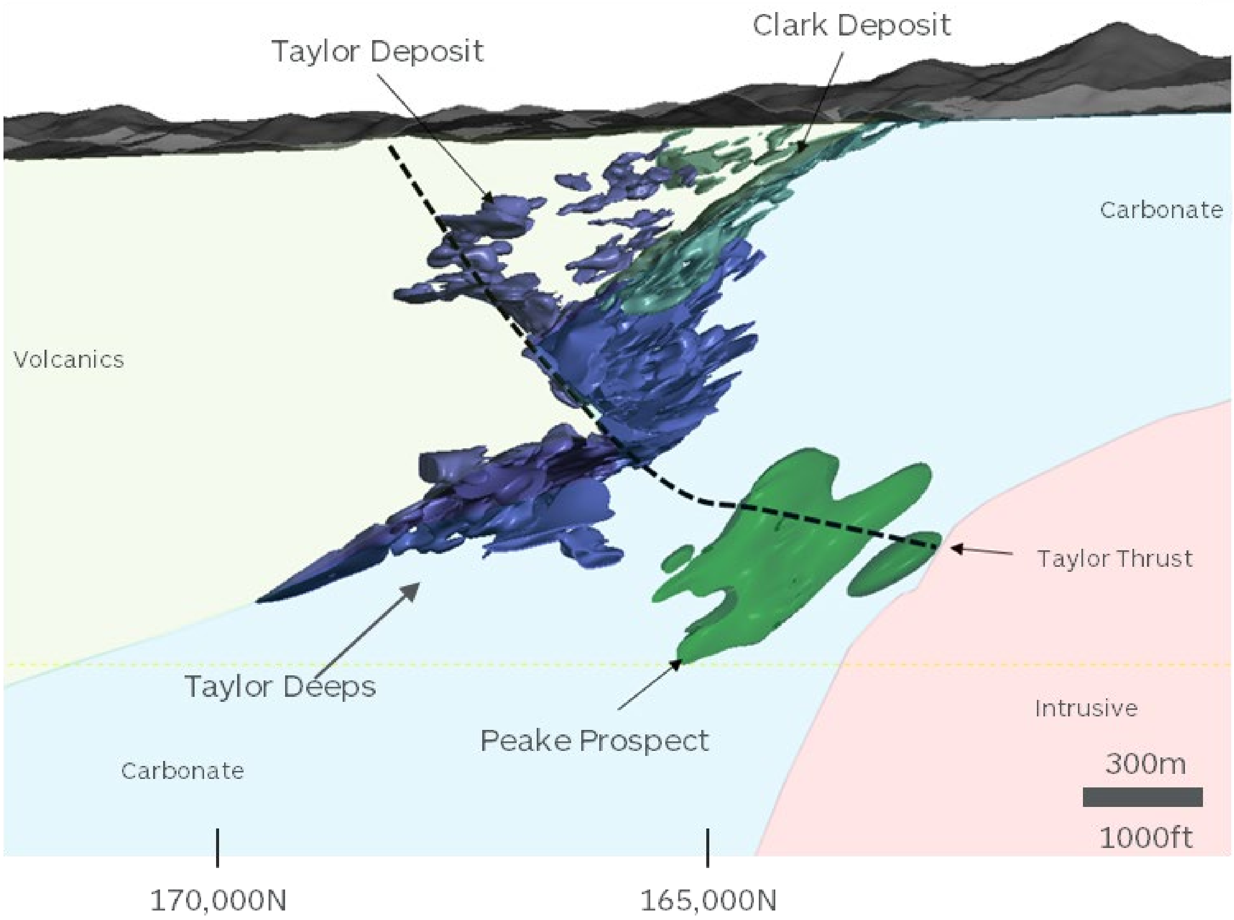
All exploration drilling results from the Peake prospect are shown in Table 4 below. All drill intersections used to define the Exploration Target are included in Annexure 1 of this announcement.

**Table 4: All Peake drilling results**

| Hole ID | From (m) | To (m) | Cut off | Width (m) | Zinc (%) | Lead (%) | Silver (ppm) | Copper (%) |
|---|---|---|---|---|---|---|---|---|
| **HDS-535** | No significant intersection | | | | | | | |
| **HDS-540** | 1279.2 | 1389.0 | 0.2% Cu | 109.7 | 0.1 | 0.3 | 15 | 0.62 |
| | Including | | | | | | | |
| | 1303.6 | 1309.7 | 0.2% Cu | 6.1 | 0.2 | 0.4 | 61 | 3.48 |
| | 1469.7 | 1488.0 | 0.2% Cu | 18.3 | 0.0 | 0.0 | 10 | 0.63 |
| **HDS-545** | No significant intersection | | | | | | | |
| **HDS-549** | 1169.5 | 1175.6 | 0.2% Cu | 6.1 | 1.5 | 1.6 | 312 | 1.92 |
| **HDS-551** | 1100.6 | 1111.6 | 0.2% Cu | 11.0 | 0.0 | 0.2 | 10 | 0.39 |
| | 1254.9 | 1280.8 | 0.2% Cu | 25.9 | 0.0 | 0.0 | 10 | 0.54 |
| | 1294.5 | 1372.8 | 0.2% Cu | 78.3 | 0.0 | 0.1 | 10 | 0.51 |
| **HDS-552** | 1265.8 | 1273.9 | 0.2% Cu | 8.1 | 0.2 | 0.5 | 27 | 0.39 |
| | 1308.2 | 1384.7 | 0.2% Cu | 76.5 | 0.2 | 0.4 | 25 | 1.52 |

| Hole ID | From (m) | To (m) | Cut off | Width (m) | Zinc (%) | Lead (%) | Silver (ppm) | Copper (%) |
|---|---|---|---|---|---|---|---|---|
| | Including | | | | | | | |
| | 1309.9 | 1328.6 | 0.2% Cu | 18.8 | 0.1 | 0.2 | 40 | 2.77 |
| | And | | | | | | | |
| | 1364.3 | 1384.7 | 0.2% Cu | 20.4 | 0.1 | 0.3 | 37 | 2.44 |
| | 1478.9 | 1484.8 | 0.2% Cu | 5.9 | 1.0 | 1.5 | 57 | 0.41 |
| **HDS-557** | No significant intersection | | | | | | | |
| **HDS-661** | 1298.4 | 1305.2 | 2% ZnEq | 6.7 | 0.6 | 3.4 | 249 | 0.89 |
| | 1322.2 | 1374.6 | 0.2% Cu | 52.4 | 0.1 | 1.1 | 105 | 1.73 |
| | Including | | | | | | | |
| | 1322.2 | 1346.0 | 0.2% Cu | 23.8 | 0.1 | 0.8 | 81 | 3.32 |
| | Including | | | | | | | |
| | 1322.2 | 1330.1 | 0.2% Cu | 7.9 | 0.1 | 0.4 | 81 | 7.89 |
| | 1386.8 | 1460.6 | 0.2% Cu | 73.8 | 0.5 | 0.7 | 67 | 1.06 |
| | Including | | | | | | | |
| | 1399.6 | 1410.3 | 0.2% Cu | 10.7 | 0.7 | 1.5 | 227 | 2.84 |
| | And | | | | | | | |
| | 1424.0 | 1446.9 | 0.2% Cu | 22.9 | 0.5 | 0.6 | 45 | 1.24 |
| | 1555.1 | 1573.1 | 0.2% Cu | 18 | 3.2 | 1.4 | 87 | 0.37 |
| **HDS-662** | 1316.4 | 1329.2 | 0.2% Cu | 12.8 | 3.4 | 4.4 | 137 | 0.95 |
| | 1540.8 | 1546.7 | 2% ZnEq | 5.9 | 5.9 | 2.1 | 250 | 0.45 |
| **HDS-663** | 1580.1 | 1591.8 | 0.2% Cu | 11.7 | 0.1 | 0.0 | 16 | 0.95 |
| | 1615.9 | 1651.1 | 0.2% Cu | 35.2 | 1.1 | 0.1 | 27 | 0.56 |
| **HDS-691** | 1343.6 | 1353.6 | 2% ZnEq | 10.1 | 3.8 | 3.5 | 61 | 0.47 |
| | 1384.7 | 1395.4 | 0.2% Cu | 10.7 | 2.7 | 2.9 | 38 | 1.03 |
| | 1405.9 | 1415.2 | 0.2% Cu | 9.3 | 0.5 | 0.7 | 11 | 0.26 |
| | 1421.3 | 1452.1 | 0.2% Cu | 30.8 | 0.7 | 0.8 | 22 | 0.59 |
| | 1463.6 | 1509.7 | 0.2% Cu | 46.0 | 0.4 | 0.5 | 21 | 0.43 |
| | 1540.6 | 1549.3 | 0.2% Cu | 8.7 | 0.3 | 0.9 | 51 | 0.61 |
| | 1563.9 | 1581.3 | 0.2% Cu | 17.4 | 0.2 | 0.2 | 23 | 0.55 |
| | 1662.7 | 1677.9 | 0.2% Cu | 15.2 | 2.8 | 1.1 | 155 | 1.19 |
| | 1683.4 | 1692.6 | 2% ZnEq | 9.1 | 1.5 | 0.3 | 45 | 0.13 |
| | 1732.0 | 1735.2 | 2% ZnEq | 3.2 | 6.2 | 0.3 | 107 | 0.18 |
| | 1994.6 | 1997.4 | 2% ZnEq | 2.7 | 1.7 | 0.3 | 54 | 0.08 |
| **HDS-717** | 1065.3 | 1072.4 | 0.2% Cu | 7.2 | 3.5 | 2.7 | 22 | 0.21 |
| | 1306.1 | 1318.3 | 0.2% Cu | 12.2 | 1.8 | 1.8 | 63 | 0.82 |
| | 1444.1 | 1466.7 | 0.2% Cu | 22.6 | 1.7 | 1.7 | 46 | 1.38 |
| | Including | | | | | | | |
| | 1456.6 | 1466.7 | 0.2% Cu | 10.1 | 0.5 | 1.0 | 78 | 2.57 |
| | 1517.9 | 1522.2 | 2% ZnEq | 4.3 | 3.0 | 1.8 | 49 | 0.03 |
| | 1718.6 | 1727.0 | 0.2% Cu | 8.4 | 1.0 | 0.1 | 39 | 1.99 |
| | 1754.1 | 1763.3 | 2% ZnEq | 9.1 | 1.4 | 0.5 | 42 | 0.13 |
| **HDS-763** | 1429.8 | 1439.6 | 2% ZnEq | 9.8 | 2.3 | 0.1 | 3 | 0.02 |

**Figure 2: Peake prospect**



## Mining

The PFS design for Taylor is a dual shaft mine which prioritises early access to higher grade mineralisation, supporting ZnEq average grades of approximately 12%[9] in the first five years of the mine plan. The proposed mining method, longhole open stoping, maximises productivity and enables a single stage ramp-up to our preferred development scenario of up to 4.3Mtpa. In the PFS schedule, shaft development is expected to commence in FY24 with first production targeted in FY27 and nameplate production in FY30.

Ore is expected to be mined in an optimised sequence concurrently across four independent mining areas, crushed underground and hoisted to the surface for processing. The mine design contemplates two shaft stations, one for logistics and access, and the other for material handling. The primary haulage material handling level is expected to be located at a depth of approximately 800m.

The operation would be largely resourced with a local owner-operator workforce, with a mining fleet consisting of jumbo drills, rock bolters, production drills, load, haul and dump machines and haulage trucks. Taylor's feasibility study will evaluate the potential use of battery electric underground equipment and trucks within the mining fleet, bringing further efficiency benefits, reducing diesel consumption and carbon emissions.

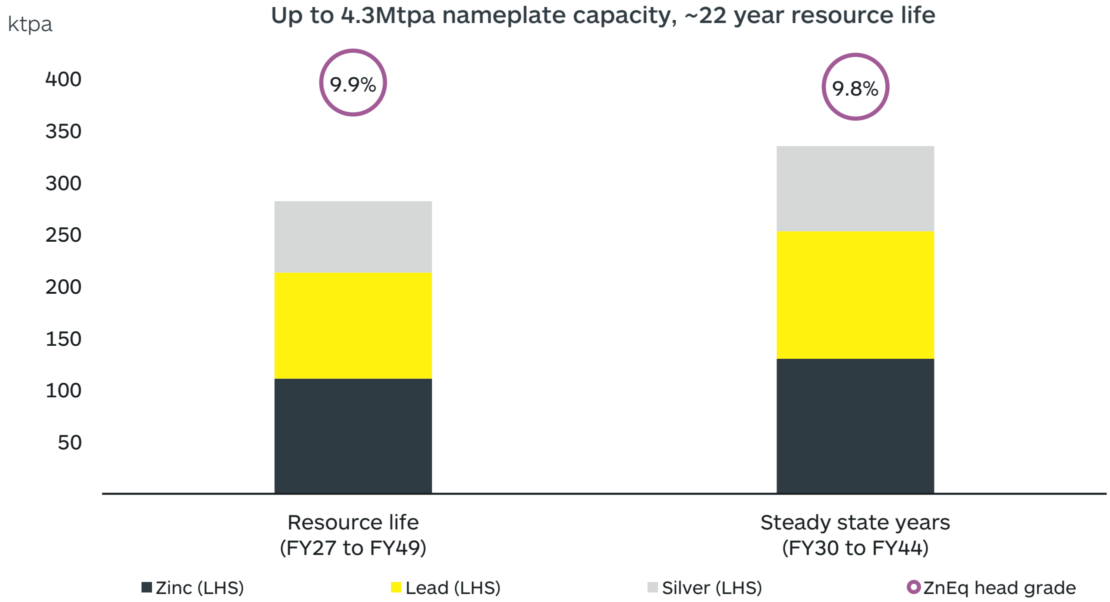
## Processing

The PFS process plant design is based on a sulphide ore flotation circuit to produce separate zinc and lead concentrates, with silver by-product credits. The flowsheet adheres to conventional principles with a primary crusher, crushed ore bins, comminution circuit, sequential flotation circuit, thickening and filtration. Tailings are processed by either filtration and drystacking, or by converting to paste and returning them underground. Approximately half of the planned tailings will be sent underground as paste fill, reducing the surface environmental footprint.

Pre-flotation and pre-float concentrate cleaning steps have been included in the plant design to prevent magnesium oxide and talc from affecting flotation performance and concentrate quality. Jameson cell technology is proposed to be used in place of some traditional mechanical flotation cells to enhance recoveries. Once filtered, concentrate would be loaded directly into specialised bulk containers.

The PFS processing facility has design recoveries of 90% for zinc and 91% for lead, and target concentrate grades of 53% for zinc and 70% for lead. Silver primarily reports to the lead concentrate, with a design recovery of 81%. The zinc concentrate is considered mid-grade with relatively high silver content for zinc, and the lead concentrate is considered high-grade. Indicative production rates in the PFS are shown in Figure 3.

**Figure 3: Payable ZnEq production and head grade**




The PFS mine ramp-up enables nameplate capacity to be reached in FY30. Annual average payable production is ~111kt zinc, ~138kt lead and ~7.3Moz silver (~280kt ZnEq[9]). Production over the steady state years (FY30 to FY44) is expected to be approximately 20% higher, averaging ~130kt zinc, ~166kt lead and ~8.7Moz silver (~340kt ZnEq[9]).

**Site infrastructure**

PFS capital includes estimates for non-processing infrastructure, including required tailings, power and water infrastructure.

**Figure 4: Site infrastructure**


The tailings storage facilities (TSF) have been designed in accordance with South32's Dam Management Standard, with our approach being consistent with the International Council on Mining and Metals (ICMM) Tailings Governance Framework. We are also progressing work on compliance with the Global Industry Standard on Tailings Management. Approximately half of the tailings produced will be thickened and filtered and sent back underground as paste backfill, reducing the surface environmental footprint. The remaining filtered tailings will be placed in one of two dry stack TSFs. The first facility is located on patented land and is an expansion to the existing TSF which was constructed as part of the voluntary remediation program completed in CY20. This already completed work established a state-of-the-art dry stack facility which will provide initial tailings capacity to support the commencement of operations. The PFS contemplates a second purpose-built facility on unpatented land, requiring Federal permits.

Future site power needs are expected to be met through transmission lines connecting to the local grid. Grid power is currently generated from a combination of coal, natural gas and renewables including solar, hydro and wind power. We have commenced discussions in relation to securing 100% renewable energy for the project, with options for grid-based renewable energy as well as new solar power projects to be advanced through the feasibility study.

Orebody dewatering is a critical path activity in the PFS schedule and capital expenditure has been committed to support construction and the installation of its related infrastructure, commencing from H2 FY22. The hydrogeological studies completed in the PFS and the design of the required water wells and infrastructure have been completed to feasibility-stage standards to support the execution of these early works.

Water treatment requirements are expected to met through two proposed water treatment plants (WTP). WTP1 is already installed and treatment upgrades are expected to be commissioned in Q3 FY22, while WTP2 is expected to be commissioned in Q4 FY23.

**Logistics**

Hermosa is well located with existing nearby infrastructure for both bulk rail and truck shipments to numerous North American ports. The transportation of concentrates is expected to be a combination of trucking to a rail transfer facility (for subsequent rail transfer to port) and directly to port, for shipping to Asian and European smelters. Specialised bulk containers will be used to eliminate dust exposure from the time of load out until discharge to the ocean vessel. The expected trucking route in the PFS includes the construction of a connecting road to a state highway and other upgrades to road infrastructure.

PFS shipping costs assume transportation of concentrate to Asia and Europe. During feasibility we will continue to investigate the potential to supply smelters in the Americas, substantially lowering our assumed transport logistics and shipping costs.

**Operating cost estimates**

The PFS includes estimates for mining, processing, general and administrative operating costs.

Mining costs (~US$35/t ore processed) include all activities related to underground mining, including labour, materials, utilities and maintenance. Processing costs (~US$13/t ore processed) include consumables, labour and power. General and administrative costs (~US$10/t ore processed) include head office corporate costs and site support staff. Other costs (~US$23/t ore processed) include shipping and transport (~US$16/t ore processed), marketing and royalties, with private net smelter royalties averaging 2.4% (~US$4/t ore processed).

Average PFS operating unit costs of ~US$81/t ore processed (~US$77/t at steady state production) reflect the high productivity rates expected from concurrently mining multiple independent underground areas and the benefit from access to local, skilled service providers.

Average PFS Operating unit costs expressed on a zinc equivalent basis of ~US$(0.71)/lb and AISC[11] of ~US$(0.05)/lb place the Taylor Deposit in the first quartile of the industry cost curve[1].

**Table 5: Operating unit costs – $t/ore processed**

| Item | US$/t ore processed |
|---|---|
| Mining | ~35 |
| Processing | ~13 |
| General and administrative | ~10 |
| Other (including royalties) | ~23 |
| **Total** | **~81** |

**Table 6: Operating unit costs – $/lb ZnEq**

| Item | $/lb ZnEq |
|---|---|
| Mining | ~0.51 |
| Processing | ~0.19 |
| General and administrative | ~0.15 |
| Other (including royalties) | ~0.33 |
| **Operating unit costs** | **~1.18** |
| Lead and silver credits | ~(1.89)[12] |
| **Zinc equivalent operating unit costs** | **~(0.71)** |

**Capital cost estimates**

Direct PFS capital expenditure estimates to construct Taylor are shown below. The construction period following a final investment decision is expected to be approximately four years. Indirect costs include contingency, owner's and engineering, procurement, and construction management (EPCM) costs to support the project. The Group will also continue to incur ongoing costs for work being undertaken across the broader Hermosa project that will be separately guided.

**Table 7: Growth capital expenditure (from 1 January 2022)**

| Item | US$M |
|---|---|
| Mining | ~565 |
| Surface facilities | ~440 |
| Dewatering | ~225 |
| **Direct costs** | **~1,230** |
| Indirect costs (including contingency) | ~470 |
| **Total** | **~1,700** |

Mining capital expenditure includes the shafts (~US$310M), development, mobile equipment and infrastructure. Surface facilities includes the processing plant (~US$350M), tailings and utilities. The capital estimate reflects assumptions for key inputs including steel, cement and labour as at H1 FY22.

Additional capital is included in the PFS estimates for critical path orebody dewatering. The direct capital expenditure estimate of US$225M includes expenditure directly attributable to water wells and a second required water treatment plant. A further ~US$140M of owner's costs across the period of dewatering are included within indirect costs (~US$470M).

Further value engineering work in the feasibility study will target a potential reduction in capital costs through further optimisation of the shaft design, construction and procurement.

Sustaining capital expenditure is expected to average approximately US$40M per annum and primarily relates to mine development.

**Development approvals**

The Hermosa project's mineral tenure is secured by 30 patented mining claims totaling 228 hectares that have full surface and mineral rights owned by South32. The patented land is surrounded by 1,957 unpatented mining claims totaling 13,804 hectares. The surface rights of the unpatented mining claims are administered by the USFS under multiple-use regulatory provisions.

The initial PFS mine development and surface infrastructure, including the processing plant, on-site power and the first TSF are designed to be located on patented mining claims. As a result, construction and mining of the Taylor Deposit can commence with approvals and permits issued by the State of Arizona. Several required permits for dewatering are already held, with the timeframe to receive the remaining State-based approvals expected to take up to approximately two years. Surface disturbance and additional tailings storage on unpatented land will require completion of the NEPA process with the USFS, in order to receive a Record of Decision (RoD). The ramp-up to nameplate production assumed in the PFS could take longer than contemplated if the RoD was delayed, as production may need to be slowed so tailings capacity could be restricted to patented lands until the RoD is received.

## Our approach to sustainability at Hermosa

Sustainable development is at the heart of our purpose at South32 and forms an integral part of our strategy. Our commitment to sustainable development is embedded in the approach we are adopting at Taylor.

We have developed a comprehensive stakeholder identification, analysis and engagement plan. Our key stakeholders include local communities within Santa Cruz County, Native American tribes with historic affiliation around the project area, and county, state and federal government agencies.

### *Partnering with local communities*

We have developed a community investment plan for Hermosa. Key investment initiatives include a South32 Hermosa Community Fund developed in partnership with the Community Foundation for South Arizona, community sponsorships and grants to community programs that reflect the priorities of the communities around Hermosa. In addition to community investment programs, we have established local procurement and employment plans designed to provide direct economic benefits for our communities.

### *Preserving cultural heritage*

We are committed to working with Native American tribes who have a historic affiliation with the area around the Hermosa project. While there are no Native American trust lands near Hermosa, historic habitation or use of the region by Indigenous Peoples may establish culturally significant connections. We have completed initial surveys for cultural resources on both our patented lands and unpatented mining claims and will continue to engage with Native American tribes who have historic affiliations to gain a more thorough understanding of sensitive cultural resources.

### *Managing our environmental impact*

An environmental management plan (EMP) has been developed for Hermosa that is consistent with the South32 Environment Standard. Key aspects of the EMP include baseline studies, risk assessments and mapping of key features with respect to biodiversity, ecosystems and water. The baseline studies have included several biological studies and surveys, including for species listed under the *Endangered Species Act* (ESA) and USFS sensitive species, as well as monitoring of surface water, ground water and air quality. The ongoing collection, analysis and modelling of baseline information and survey data will align with the South32 Environment Standard and support the required permits and approvals for Hermosa.

Hermosa is in a semi-arid environment, with most rainfall occurring in the “monsoon” season of July through October. Water resource monitoring and management plans have been developed to support an understanding of the baseline conditions and numerical modelling of surface and groundwater resources. Additional studies are planned for completion as part of the Taylor feasibility study.

### *Targeting net zero carbon operational emissions*

Taylor has been designed as a low carbon operation, with the primary sources of carbon emissions being residual diesel consumption and grid power. We have identified several opportunities to improve this starting position, with active discussions to secure 100% renewable energy for site power and the feasibility study to include further evaluation of the potential use of battery electric vehicles and underground mining equipment. We are testing technology solutions to support this, with a trial of electric vehicles planned at our Cannington zinc-lead-silver mine during FY22 and our ongoing participation in the Electric Mine Consortium[13].

### *Commodities for a low carbon future*

The proposed development of Taylor is consistent with our focus on reshaping our portfolio for a low carbon future, increasing our exposure to base and precious metals and reducing our carbon intensity.

The metals produced at Taylor are expected to play a role in supporting global decarbonisation. Zinc demand is expected to benefit from an increase in renewable energy infrastructure such as solar, where it allows for higher energy conversion, and wind, given its use in protecting key elements from corrosion. Silver is used in solar panels due to its superior electrical conductivity and has higher intensity of use in electric vehicles compared to internal combustion engine (ICE) cars. In the medium term, the ongoing growth in ICE vehicles sales will continue to see demand for lead-acid batteries grow, with lead demand also expected to be supported by its use in renewable energy storage systems.

**Taylor project summary**

Key PFS assumptions and outcomes are summarised below.

**Table 8: Taylor PFS assumptions**

| | |
|---|---|
| **Mining** | |
| Mineral Resource estimate | 138Mt averaging 3.82% zinc, 4.25% lead and 81g/t silver |
| Resource life | ~22 years |
| Mining method | Longhole open stoping with paste backfill |
| Mined ore grades | Zinc 4.1%, Lead 4.5%, Silver 82g/t |
| **Processing** | |
| Mill capacity | ~4.3Mtpa |
| Concentrates | Separate zinc and lead concentrates with silver credits |
| Zinc recoveries (in zinc concentrate) | ~90% |
| Lead recoveries (in lead concentrate) | ~91% |
| Silver recoveries (in lead concentrate) | ~81% |
| Metal payability | Zinc ~85%, Lead ~95%, Silver ~95% (in lead concentrate) |
| Zinc concentrate grade | ~53% |
| Lead concentrate grade | ~70% |
| **Payable metal production** | |
| Zinc | ~2.4Mt (~111kt annual average) |
| Lead | ~3.0Mt (~138kt annual average) |
| Silver | ~160Moz (~7.3Moz annual average) |
| Zinc equivalent[9] | ~6.2Mt (~280kt annual average) |
| **Capital costs** | |
| Direct capital expenditure | ~US$1,230M |
| Indirect capital expenditure | ~US$470M |
| Sustaining capital expenditure | ~US$40M annual average |
| **Schedule** | |
| First production | FY27 |
| Steady state production | FY30-FY44 |
| **Operating costs** | |
| Mining costs | ~US$35/t ore processed |
| Processing costs | ~US$13/t ore processed |
| General and administrative costs | ~US$10/t ore processed |
| Other operating unit costs | ~US$23/t ore processed (incl. royalties) |
| Operating unit costs | ~US$81/t ore processed |
| Zinc equivalent operating unit cost | ~(US$0.71/lb) ZnEq (incl. lead and silver credits) |
| All-in sustaining cost[11] | ~(US$0.05)/lb ZnEq (incl. lead and silver credits) |
| **Fiscal terms** | |
| Corporate tax rate[14] | ~26% |
| Royalties | Average 2.4% private net smelter royalties |

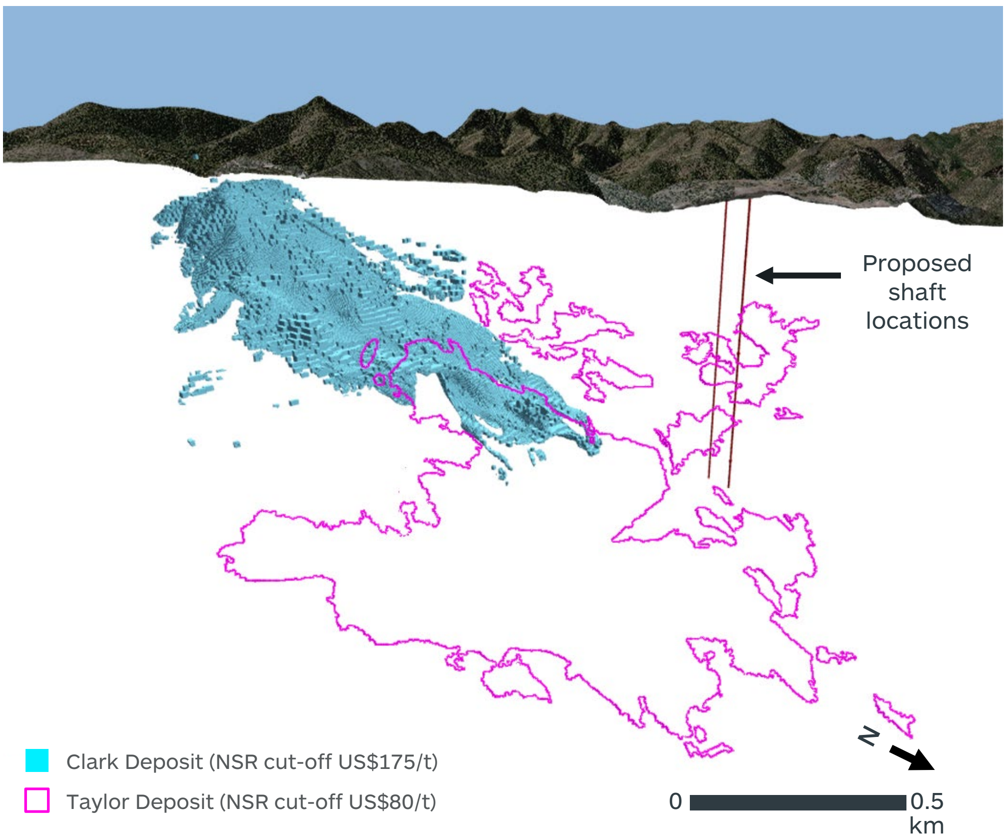
## CLARK DEPOSIT SCOPING STUDY

Clark is a manganese-zinc-silver oxide deposit located adjacent, and up-dip of the Taylor Deposit, which has a Mineral Resource estimate of 55 million tonnes, averaging 9.08% manganese, 2.31% zinc and 78 g/t silver using a NSR cut-off of US$175/t[4] in accordance with the JORC Code. The Clark Deposit is interpreted as the upper oxidised, manganese-rich portion of the mineralised system, with the resource extending from near surface to a depth of approximately 600m.

The Clark Deposit has the potential to underpin a second development at Hermosa. We recently completed a scoping study[2] for the Clark Deposit which has confirmed viable flowsheets to produce battery-grade manganese, in the form of electrolytic manganese metal (EMM) or high purity manganese sulphate monohydrate (HPMSM). Clark has advanced to a PFS for a potential underground mine development using longhole open stoping accessed from existing patented mining claims. The PFS is designed to increase confidence in our technical and operating assumptions and customer opportunities in the rapidly growing battery-grade manganese markets. The first phase of the PFS is expected to be completed in late CY22, at which point a preferred development pathway will be selected. Many areas of the PFS, including mine planning, hydrogeology, infrastructure, sustainability and permitting will benefit from work completed in the Taylor PFS.

Our study work will also review the potential to pursue an integrated development of Taylor and Clark. An integrated development would comprise underground mining operations for Taylor and Clark with separate processing circuits to produce base and precious metals, and battery-grade manganese. An integrated development has the potential to realise operating and capital efficiencies.

**Figure 5: Clark and Taylor deposits**

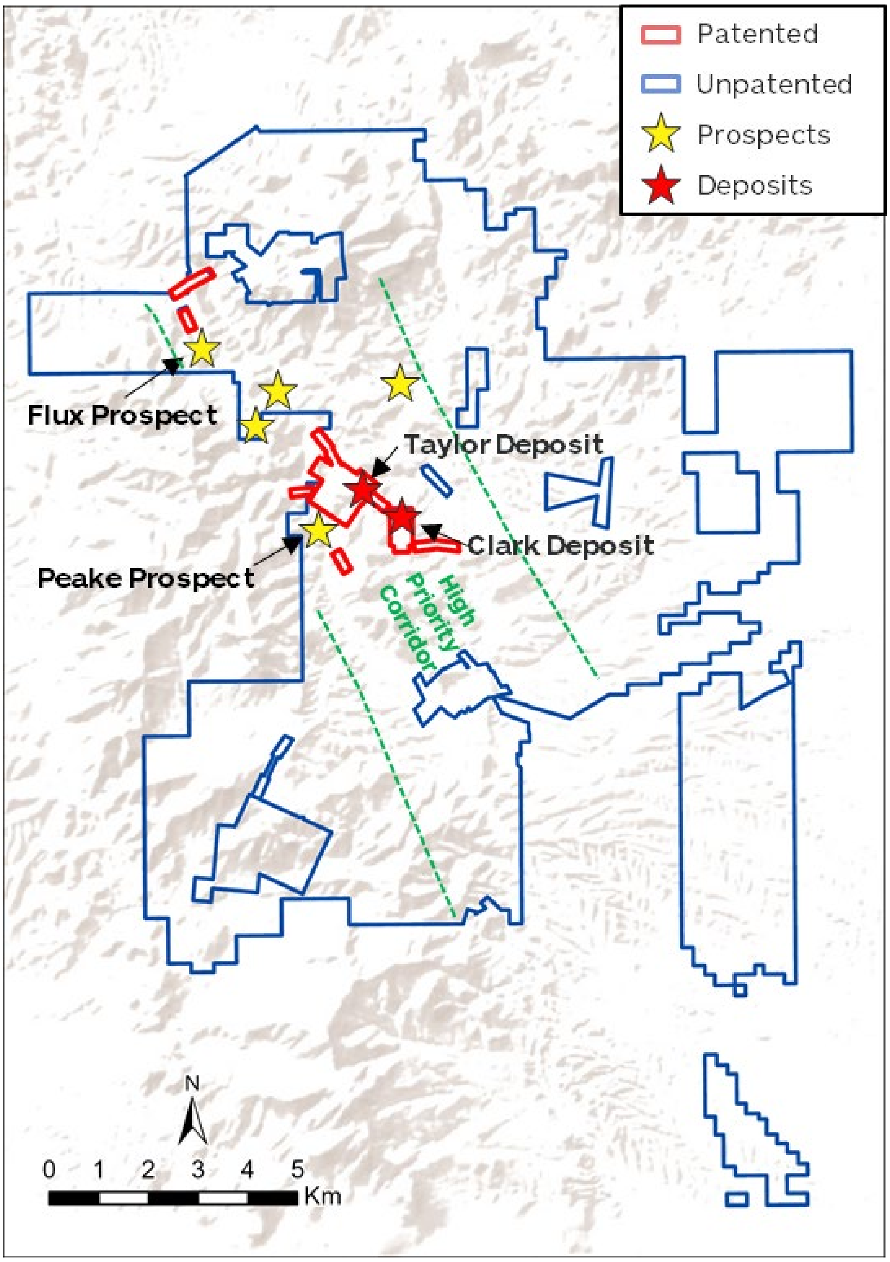


## REGIONAL EXPLORATION

Our third area of focus at Hermosa is unlocking value through exploration of our highly prospective regional land package. Since our initial acquisition, we have increased our tenure by 66%, consolidating our position in the most prospective areas. We have completed surface geophysics, soil sampling, mapping and other exploration activity, resulting in the definition of a highly prospective corridor across our land package which will be prioritised for future testing.

Within this highly prospective corridor, we plan to drill test the Flux prospect in the second half of CY22 following the receipt of required permits. The Flux prospect is located down-dip of an historic mining area in carbonates that could host Taylor-like mineralisation[8]. Our ongoing exploration strategy will focus on identifying, permitting and drilling new exploration targets across the land package while continuing to refine our understanding of the regional geology.

**Figure 6: Regional exploration**



## FOOTNOTES

1. Based on Taylor's estimated all-in sustaining costs (AISC) in the PFS and the Wood Mackenzie Lead/Zinc Asset Profiles. AISC includes operating unit costs (including royalties), treatment and refining charges (TCRCs), and sustaining capital expenditure.
2. Clark Deposit scoping study cautionary statement: The scoping study referred to in this announcement is based on low-level technical and economic assessments and is insufficient to support estimation of Ore Reserves or to provide assurance of an economic development case at this stage, or to provide certainty that the conclusions of the scoping study will be realised. The study is based on 60% Indicated and 40% Inferred Mineral Resources (refer to footnote 4 for the cautionary statement).
3. Competent Persons Statement and cautionary statement – Exploration Results and Exploration Target: The information in this announcement that relates to Exploration Results and Exploration Targets for Hermosa (including Peake) is based on information compiled by David Bertuch, a Competent Person who is a Member of The Australasian Institute of Mining and Metallurgy and is employed by South32. Mr Bertuch has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr. Bertuch consents to the inclusion in the report of the matters based on his information in the form and context in which it appears. The JORC Table 1 (sections 1 and 2) related to the Exploration Results and Exploration Targets is included in Annexure 1. In respect of those Exploration Targets, the potential quantity and grade is conceptual in nature. There has been insufficient exploration to determine a Mineral Resource and there is no certainty that further exploration work will result in the determination of Mineral Resources.
4. Mineral Resource Statements for the Taylor and Clark deposits: The information in this announcement that relates to Mineral Resources for the Taylor and Clark deposits is extracted from South32's FY21 Annual Report (www.south32.net) published on 3 September 2021. The information was prepared by a Competent Person in accordance with the requirements of the JORC Code. South32 confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement, and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. South32 confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.
5. Resource life is estimated using Mineral Resources (extracted from South32's FY21 Annual Report published on 3 September 2021 and available to view on www.south32.net) and Exploration Target (details of which are available in this announcement) converted to a run-of-mine basis using conversion factors, divided by the nominated run-of-mine production rate on a 100% basis. Whilst South32 believes it has a reasonable basis to reference this resource life and incorporate it within its Production Targets, it should be noted that resource life calculations are indicative only and do not necessarily reflect future uncertainties such as economic conditions, technical or permitting issues. Resource life is based on our current expectations of future results and should not be solely relied upon by investors when making investment decisions.
6. Production Targets Cautionary Statement: The information in this announcement that refers to the Production Target and forecast financial information is based on Measured (20%), Indicated (62%) and Inferred (14%) Mineral Resources and Exploration Target (4%) for the Taylor Deposit. All material assumptions on which the Production Target and forecast financial information is based is available in Annexure 1. The Mineral Resources underpinning the Production Target have been prepared by a Competent Person in accordance with the JORC Code (refer to footnote 4 for the cautionary statement). All material assumptions on which the Production Target and forecast financial information is based is available in Annexure 2. There is low level of geological confidence associated with the Inferred Mineral Resources and there is no certainty that further exploration work will result in the determination of Indicated Mineral Resources or that the Production Target will be realised. The potential quantity and grade of the Exploration Target is conceptual in nature. In respect of the Exploration Target used in the Production Target, there has been insufficient exploration to determine a Mineral Resource and there is no certainty that further exploration work will result in the determination of Mineral Resources or that the Production Target itself will be realised. The stated Production Target is based on South32's current expectations of future results or events and should not be solely relied upon by investors when making investment decisions. Further evaluation work and appropriate studies are required to establish sufficient confidence that this target will be met. South32 confirms that inclusion of 18% tonnage (14% Inferred Mineral Resources and 4% Exploration Target) is not the determining factor of the project viability and the project forecasts a positive financial performance when using 82% tonnage (20% Measured and 62% Indicated Mineral Resources). South32 is satisfied, therefore, that the use of Inferred Mineral Resources and Exploration Target in the Production Target and forecast financial information reporting is reasonable.
7. Preferred case design capacity based on Taylor PFS outcomes.
8. Flux Exploration Target: The information in this announcement that relates to the Exploration Target for Flux is extracted from "South32 Strategy and Business Update" published on 18 May 2021 and is available to view on www.south32.net. The information was prepared by a Competent Person in accordance with the requirements of the JORC Code. South32 confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement. South32 confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.
9. Payable zinc equivalent was calculated by aggregating revenues from payable zinc, lead and silver, and dividing the total revenue by the price of zinc. Average metallurgical recovery assumptions are 90% for zinc, 91% for lead and 81% for silver in lead concentrate. FY21 average index prices for zinc (US$2,695/t), lead (US$1,992/t) and silver (US$25.50/oz) (excluding treatment and refining charges) have been used.
10. Based on steady state production years (FY30 to FY44).
11. AISC includes Operating unit costs (including royalties), TCRCs and sustaining capital expenditure.
12. Lead and silver credits are calculated using FY21 average index prices for lead (US$1,992/t) and silver (US$25.50/oz).
13. South32 is a founding member of the Electric Mine Consortium, which aims to accelerate progress towards a fully electrified zero carbon, zero particulates, mine. More information is available at www.electricmine.com.
14. Federal tax of 21.0% and Arizona state tax of 4.9% of taxable income, subject to applicable allowances. Hermosa has an opening tax loss balance of approximately US$83M as at 30 June 2020. Property and severance taxes are also expected to be paid. Based on the PFS schedule, we expect to commence paying income taxes from FY29.

**About us**

South32 is a globally diversified mining and metals company. Our purpose is to make a difference by developing natural resources, improving people's lives now and for generations to come. We are trusted by our owners and partners to realise the potential of their resources. We produce bauxite, alumina, aluminium, metallurgical coal, manganese, nickel, silver, lead and zinc at our operations in Australia, Southern Africa and South America. With a focus on growing our base metals exposure, we also have two development options in North America and several partnerships with junior explorers around the world.


Investor Relations

Alex Volante
T +61 8 9324 9029
M +61 403 328 408
E Alex.Volante@south32.net

Tom Gallop
T +61 8 9324 9030
M +61 439 353 948
E Tom.Gallop@south32.net

Media Relations

James Clothier
M +61 413 391 031
E James.Clothier@south32.net

Jenny White
T +44 20 7798 1773
M +44 7900 046 758
E Jenny.White@south32.net


Further information on South32 can be found at www.south32.net.

Approved for release by Graham Kerr, Chief Executive Officer
JSE Sponsor: UBS South Africa (Pty) Ltd
17 January 2022

**Forward-looking statements**

This release contains forward-looking statements, including statements about trends in commodity prices and currency exchange rates; demand for commodities; production forecasts; plans, strategies and objectives of management; capital costs and scheduling; operating costs; anticipated productive lives of projects, mines and facilities; and provisions and contingent liabilities. These forward-looking statements reflect expectations at the date of this release, however they are not guarantees or predictions of future performance. They involve known and unknown risks, uncertainties and other factors, many of which are beyond our control, and which may cause actual results to differ materially from those expressed in the statements contained in this release. Readers are cautioned not to put undue reliance on forward-looking statements. Except as required by applicable laws or regulations, the South32 Group does not undertake to publicly update or review any forward-looking statements, whether as a result of new information or future events. Past performance cannot be relied on as a guide to future performance. South32 cautions against reliance on any forward looking statements or guidance, particularly in light of the current economic climate and the significant volatility, uncertainty and disruption arising in connection with COVID-19.

**Annexure 1: JORC Code Table 1**

HERMOSA PROJECT – EXPLORATION RESULTS

The following table provides a summary of important assessment and reporting criteria used for the reporting of Taylor sulphide exploration results for the Hermosa project, which is located in southern Arizona, USA (Figure 1), in accordance with the Table 1 checklist in The Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves (The JORC Code, 2012 Edition) on an 'if not, why not' basis.

**Section 1 Sampling Techniques and Data**

*(Criteria in this section apply to all succeeding sections.)*

| Criteria | Commentary |
|---|---|
| *Sampling techniques* | • The drilling that supports the exploration results is located outside of the current Taylor Mineral Resource estimate declared as at 30 June 2021 in the South32 Annual Report. A total of 53 diamond drill holes (HQ/NQ) totalling 73,632 metres have been drilled across the Taylor sulphide mineralisation. In order to define mineralisation continuity, the drilling information used to inform the resource is used for geological interpretation of the exploration results. In addition, the geological model also reflects input from near-surface reverse circulation (RC) drilling. All drilling is at predominantly 1.5m (5') intervals on a half core basis.<br>• A heterogeneity study is yet to be concluded to determine sample representivity.<br>• Core is competent and sample representivity is monitored using predominantly quarter or half core field duplicates submitted at a rate of approximately 1:40 samples. Field duplicates located within mineralisation envelopes demonstrate 70–90% performance to within 30% of original sample splits.<br>• Core assembly, interval mark-up, recovery estimation (over the 3m drill string) and photography all occur prior to sampling and follow documented procedures.<br>• Sample size reduction during preparation involves crushing and splitting of HQ (95.6mm) or NQ (75.3mm) half-core. |
| *Drilling techniques* | • Data used for exploration results is based on logging and sampling of HQ diamond core, reduced to NQ in areas of difficult drilling. Triple and split-tube drilling methods were also employed in cases where conditions required these mechanisms to improve recovery.<br>• All drill core has been oriented using the Boart Longyear 'Trucore' system since mid-August 2018. In Q3 FY20, acoustic televiewer data capture was implemented for downhole imagery for the majority of drilling to improve orientation and geotechnical understanding. Structural measurements from oriented drilling have been incorporated in geological modelling to assist with fault interpretation. |
| *Drill sample recovery* | • Prior to October 2018, core recovery was determined by summation of individual core pieces within each 3m drill string. Recovery for the drill string has since been measured after oriented core alignment and mark-up.<br>• Core recovery is recorded for all diamond drill holes. Recovery of holes for the ranging and targeting exercise exceeds 96%.<br>• Poor core recovery can occur when drilling overlying oxide material and in major fault zones. To maximise recovery, drillers vary speed, pressure and composition of drilling muds, reduce HQ to NQ core size and use triple tube and '3 series' drill bits.<br>• When core recovery is compared to Zn, Pb and Ag grades for both a whole data set and within individual lithology, there is no discernible relationship.<br>• Correlation analysis suggests there is no relationship between core recovery and depth except where structure is considered. There are isolated cases where lower recovery is localised at intersections of the Taylor sulphide carbonates with a major thrust structure. |
| *Logging* | • The entire length of core is photographed and logged for lithology, alteration, structure, rock quality designation (RQD), and mineralisation.<br>• Logging is both quantitative and qualitative; there are a number of examples including estimation of mineralisation percentages and association of preliminary interpretative assumptions with observations.<br>• All logging is peer reviewed against core photos and in the context of current geological interpretation and surrounding drill holes during geological model updates.<br>• Logging is to a level of detail to support the exploration results. |

| Criteria | Commentary |
|---|---|
| *Sub-sampling techniques and sample preparation* | • Sawn half core and barren whole core samples are taken on predominantly 1.5m intervals for the entire drill hole after logging. Mineralisation is highly visual. Sampling is also terminated at litho-structural and mineralogical boundaries to reduce the potential for boundary/dilution effects at a local scale.<br>• Sample lengths can vary between 0.75m and 2.3m. The selection of the sub-sample size is not supported by sampling studies.<br>• Sample preparation has occurred offsite at an ISO17025-certified laboratory since the Taylor sulphide deposit discovery. This was initially undertaken by Skyline until 2012, then by Australian Laboratory Services (ALS). Samples submitted to ALS are generally 4–6kg in weight. Sample size reduction during preparation involves crushing of HQ (95.6mm) or NQ (75.3mm) half or whole core, splitting of the crushed fraction, pulverisation, and splitting of the sample for analysis. A detailed description of this process is as follows:<br>  o The entire half or whole core samples are crushed and rotary split in preparation for pulverisation. Depending on the processing facility, splits are done via riffle or rotary splits for pulp samples.<br>  o Fine crushing occurs until 70% of the sample passes 2mm mesh. A 250g split of finely crushed sub-sample is obtained via rotary or riffle splitter and pulverised until 85% of the material is less than 75µm. These 250g pulp samples are taken for assay, and 0.25g splits are used for digestion.<br>• ALS protocol requires 5% of samples to undergo a random granulometry QC test. Samples are placed on 2 micron sieve and processed completely to ensure the passing mesh criteria is maintained. Pulps undergo similar tests with finer meshes. Results are loaded to an online portal for review to client.<br>• Sample preparation precision is also monitored with blind laboratory duplicates assayed at a rate of 1:50 submissions.<br>• Coarse crush preparation duplicate pairs show that 80% of all Zn and Ag pairs for sulphide mineralisation report within +/-20% of original samples. Performance drops off for Pb mineralisation, with less than 70% of duplicates reporting within the +/-20% limits.<br>• More than 85% of pulp duplicates report within a 10% variance for Zn and Ag within all pulp duplicates. Performance for Pb is demonstrably poorer, similar to the preparation duplicates, with less than 80% of all pulp duplicates reporting within this tolerance.<br>• Sub-sampling techniques and sample preparation are adequate for providing quality assay data for declaring exploration results but will benefit from planned studies to optimise sample selectivity and quality control procedures. |
| *Quality of assay data and laboratory tests* | • Samples of 0.25g from pulps are processed at ALS Vancouver using ME-ICP61, where these are totally digested using a four-acid method followed by analysis with a combination of Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) and Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES) determination for 33 elements. Overlimit values for Ag, Pb, Zn, and Mn utilise OG-62 analysis. In November 2020, Hermosa switched to the analytical method ME-MS61 for the four acid 48 element assay for additional elements and improved detection limits alongside the addition of overlimit packages of S-IR07 for S and ME-ICP81 for Mn. Digestion batches of 36 samples plus four internal ALS control samples (one blank, two CRM, and one duplicate) are processed using a four-acid digestion. Analysis is done in groups of three larger digestion batches. Instruments are calibrated for each batch prior to and following the batch.<br>• ALS internal QA/QC samples are continuously monitored for performance. In the case of a blank failure, for example, the entire batch is redone from the crushing stage. If one CRM fails, data reviewers internal to ALS examine the location of the failure within the batch and determine how many samples around the failure should be reanalysed. If both CRMs fail, the entire batch is rerun. No material failures have been observed from the data.<br>• Coarse and fine-grained certified silica blank material submissions, inserted at the beginning and end of every work order of approximately 200 samples, indicate a lack of systematic sample contamination in sample preparation and ICP solution carryover. While systematic contamination issues are not observed for the blanks, the nature of the blanks themselves and suitability for use in QA/QC for polymetallic deposits is in question.<br>  o Failures for blanks are noted at greater than ten times detection limit or recommended upper limit for the certified blank material for each analyte, failures range from 0% for Ag (>5ppm), 1% for Cu (>10ppm), 3.5% for Pb (>20ppm), and 7.5% for Zn (>20ppm), and indicate that the blanks themselves are not truly suited for |

| Criteria | Commentary |
| --- | --- |
| | polymetallic deposits. In particular, a coarse blank submitted from 2017–2018 demonstrated consistent contamination above detection limits for Zn, Cu, Mn, and other elements. This has since been replaced with a better performing coarse blank of the end of 2018.<br>o The nature of the blanks and the failures observed are very low for Ag and Cu, and failures for blanks for Zn and Pb are in the hundreds of ppm. No consistent bias has been observed and the magnitude of impacts at the low end for the blanks are very limited. It is not likely to impact the exploration results.<br>• A range of certified reference materials (CRM) are submitted at a rate of 1:40 samples to monitor assay accuracy. The CRM failure rate is very low, ranging from 0.1% to 1.3% depending on analyte, demonstrating reliable laboratory accuracy.<br>• External laboratory pulp duplicates and CRM checks have been submitted to the Inspectorate (Bureau Veritas) laboratory in Reno from November 2017 to 2018 and resumed in March 2021 at a rate of 1:100 to monitor procedural bias. Between 84% and 89% of samples for Zn, Pb and Ag were within expected tolerances of +/-20% when comparing three-acid (Inspectorate) and four-acid (ALS) digest methods. No significant bias was determined.<br>• The nature and quality of assaying and laboratory procedures are appropriate for supporting disclosure of exploration results. |
| *Verification of sampling and assaying* | • Core photos of the entire hole are reviewed by alternative company personnel (modelling geologists) to verify significant intersections and finalise geological interpretation of core logging.<br>• Sampling is recorded digitally and uploaded to an Azure SQL project customised database (Plexer) via an API provided by the ALS laboratory and the external laboratory information management system (LIMS). Digital transmitted assay results are reconciled upon upload to the database.<br>• No adjustment to assay data has been undertaken. |
| *Location of data points* | • Drill hole collar locations are surveyed by registered surveyors using a GPS Real Time Kinematic (RTK) rover station correlating with the Hermosa project RTK base station and Global Navigation Satellite Systems with up to 1cm accuracy.<br>• Downhole surveys prior to mid-August 2018 were taken with a 'TruShot' single shot survey tool every 76m and at the bottom of the hole. From 20 June 2018 to 14 August 2018, surveys were taken at the same interval with both the single shot and a Reflex EZ-Gyro, before the Reflex EZ-Gyro was used exclusively.<br>• The Hermosa project uses the Arizona State Plane (grid) Coordinate System, Arizona Central Zone, International Feet. The datum is NAD83 with the vertical heights converted from the ellipsoidal heights to NAVD88 using GEOID12B.<br>• All drill hole collar and downhole survey data was audited against source data.<br>• Survey collars have been compared against a one-foot topographic aerial map. Discrepancies exceeding 1.8m were assessed against a current aerial flyover and the differences attributed to surface disturbance from construction development and/or road building.<br>• Survey procedures and practices result in data location accuracy suitable for mine planning. |
| *Data spacing and distribution* | • Drill hole spacing ranges from 60m to 600m. The spacing supplies sufficient information for assessment of exploration results.<br>• Geological modelling has determined that drill spacing is sufficient to establish the degree of geological and grade continuity necessary to support review of exploration results. |
| *Orientation of data in relation to geological structure* | • For geological modelling, mineralisation varies in dip between 30°NW in the upper Taylor Sulphide domain and between 20°N and 30°N in the lower Taylor Deeps and the Peake Copper-Skarn prospect. Most drilling is oriented vertically and at a sufficiently high angle to allow for accurate representation of grade and tonnage using three-dimensional modelling methods.<br>• There is indication of sub-vertical structures, possibly conduits for or offsetting mineralisation, which have been accounted for at a regional scale through the integration of mapping and drilling data. Angled, oriented core drilling introduced from October 2018 |

| Criteria | Commentary |
|---|---|
| | is designed to improve understanding of the relevance of these structures to mineralisation. |
| *Sample security* | • Samples are tracked and reconciled through a sample numbering and dispatch system from site to the ALS sample distribution and preparation facility in Tucson. The ALS LIMS assay management system provides an additional layer of sample tracking from the point of sample receipt. Movement of sample material from site to the Tucson distribution and preparation facility is a combination of ALS dedicated transport and project contracted transport. Distribution to other preparation facilities and Vancouver is managed by ALS dedicated transport.<br>• Assays are reconciled and results processed in an Azure SQL project customised database (Plexer) which has password and user level security.<br>• Core is stored in secured onsite storage prior to processing. After sampling, the remaining core, returned sample rejects and pulps are stored at a purpose-built facility that has secured access.<br>• All sampling, assaying and reporting of results are managed with procedures that provide adequate sample security. |
| *Audits or reviews* | • CSA Global audited the sampling methodology and database for the FY21 Mineral Resource estimate and noted that the sampling and QA/QC measures showed the database to be adequate.<br>• An internal database audit was undertaken in February 2019 for approximately 10% of all drilling intersecting sulphide mineralisation (24 of 242 holes). Data was validated against original data sources for collar, survey, lithology, alteration, mineralisation, structure, RQD and assay (main and check assays). The overall error rates across the database were found to be very low. Isolated issues included the absence of individual survey intervals and minor errors in collar survey precision. All were found to have minimal impact on resource estimation.<br>• Golder and Associates completed an independent audit of the exploration results including QA/QC of reported drillholes outside the FY21 Taylor Sulphide Mineral Resource estimate, adherence to the Resource Range Analysis process, inputs, assumptions and outcomes. Outcomes are considered appropriate for public reporting of exploration results. |

**Section 2 Reporting of Exploration Results**
*(Criteria listed in the preceding section also apply to this section.)*

| Criteria | Commentary |
|---|---|
| *Mineral tenement and land tenure status* | • The Hermosa project mineral tenure (Figure 2) is secured by 30 patented mining claims totalling 228 hectares that have full surface and mineral rights owned fee simple. These claims are retained in perpetuity by annual real property tax payments to Santa Cruz County in Arizona and have been verified to be in good standing until 31 August 2022.<br>• The patented land is surrounded by 1,957 unpatented lode mining claims totalling 13,804 hectares. These claims are retained through payment of federal annual maintenance fees to the Bureau of Land Management (BLM) and filing record of payment with the Santa Cruz County Recorder. Payments for these claims have been made for the period up to their annual renewal on or before 1 September 2022.<br>• Title to the mineral rights is vested in South32's wholly owned subsidiary Arizona Minerals Inc. (AMI). No approval is required in addition to the payment of fees for the claims. |
| *Exploration done by other parties* | • ASARCO LLC (ASARCO) acquired the Property in 1939 and completed intermittent drill programs between 1940 and 1991. ASARCO initially targeted silver and lead mineralisation near historical workings of the late 19th century. ASARCO identified silver-lead-zinc bearing manganese oxides in the manto zone of the overlying Clark Deposit between 1946 and 1953.<br>• Follow-up rotary air hammer drilling, geophysical surveying, detailed geological, and metallurgical studies on the manganese oxide manto mineralisation between the mid-1960s and continuing to 1991 defined a heap leach amenable, low-grade manganese |

| Criteria | Commentary |
|---|---|
| | and silver resource, reported in 1968 and updated in 1975, 1979 and 1984. The ASARCO drilling periods account for 98 drill holes from the database.<br>• In March 2006, AMI purchased the ASARCO property and completed a re-assay of pulps and preliminary $SO_2$ leach tests on the manto mineralisation to report a Preliminary Economic Assessment (PEA) in February 2007. Drilling of RC and diamond holes between 2006 and 2012 focused on the Clark Deposit (235 holes) and early definition of the Taylor Deposit sulphide mineralisation (16 holes), first intersected in 2010. Data collected from the AMI 2006 campaign is the earliest information contributing to estimation of the Taylor Deposit Mineral Resource.<br>• AMI drill programs between 2014 and August 2018 (217 diamond holes) focused on delineating Taylor Deposit sulphide mineralisation, for which Mineral Resource estimates were reported in compliance to NI 43-101 (Foreign Estimate) in November 2016 and January 2018. |
| *Geology* | • The regional geology is set within Lower-Permian carbonates, underlain by Cambrian sediments and Proterozoic granodiorites. The carbonates are unconformably overlain by Triassic to late-Cretaceous volcanic rocks (Figures 3 and 4). The regional structure and stratigraphy are a result of late-Precambrian to early-Palaeozoic rifting, subsequent widespread sedimentary aerial and shallow marine deposition through the Palaeozoic Era, followed by Mesozoic volcanism and late batholitic intrusions of the Laramide Orogeny. Mineral deposits associated with the Laramide Orogeny tend to align along regional NW structural trends.<br>• Cretaceous-age intermediate and felsic volcanic and intrusive rocks cover much of the Hermosa project area and host low-grade disseminated silver mineralisation, epithermal veins and silicified breccia zones that have been the source of historic silver and lead production.<br>• Mineralisation styles in the immediate vicinity of the Hermosa project include the carbonate replacement deposit (CRD) style zinc-lead-silver base metal sulphides of the Taylor Deposit and deeper skarn-style copper-zinc-lead-silver base metal sulphides of the Peake prospect and an overlying manganese-silver oxide manto deposit of the Clark Deposit.<br>• The Taylor Deposit comprises the overlying Taylor Sulphide, and Taylor Deeps domains that are separated by a thrust fault. Approximately 600–750m lateral and south to the Taylor Deeps domain, the Peake copper-skarn sulphide mineralisation is identified in older lithological stratigraphic units along the interpreted continuation of the thrust fault (Figures 5 and 6).<br>• The Taylor Sulphide Deposit extends to a depth of around 1,000m and is hosted within approximately a 450m thickness of Palaeozoic carbonates that dip 30°NW, identified as the Concha, Scherrer and Epitaph Formations.<br>• Taylor Sulphide mineralisation is dominantly constrained within a tilted and thrusted carbonate stratigraphy and to a lesser degree the overlying volcanic stratigraphy. The mineralising system is yet to be fully drill tested in multiple directions. At Taylor, the sulphide mineralisation is constrained up-dip where it merges into the overlying oxide manto mineralisation of the Clark Deposit, representing a single contiguous mineralising system.<br>• The north-bounding edge of the thrusted carbonate rock is marked by a thrust fault where it ramps up over the Jurassic/Triassic 'Older Volcanics' and 'Hardshell Volcanics'. This interpreted pre-mineralising structure that created the sequence of carbonates also appears to be a key mineralising conduit. The thrust creates a repetition of the carbonate formations below the Taylor Sulphide domain, which host the Taylor Deeps mineralisation.<br>• The Taylor Deeps mineralisation dips 10°N to 30°N, is approximately 100m thick, and primarily localised near the upper contact of the Concha Formation and the unconformably overlying 'Older Volcanics'. Some of the higher-grade mineralisation is also accumulated along a westerly plunging lineation intersection where the Concha Formation contacts the Lower Thrust. Mineralisation has not been closed off down-dip or along strike.<br>• Lateral to the Taylor Deeps mineralisation, skarn sulphide mineralisation is identified in older lithological stratigraphic units along the interpreted continuation of the thrust fault. This creates an interpreted continuous structural and lithological controlled system from the deeper skarn Cu domain into Taylor Deeps, Taylor Sulphide, and associated volcanic hosted mineralisation and the Clark oxide Deposit. |

| Criteria | Commentary |
|---|---|
| *Drill hole Information* | • A drill hole plan (Figure 4) provides a summary of drilling collar locations that support the exploration results and surface geology. Figure 5 provides a drill hole plan relative to the Taylor FY21 and Clark FY20 Mineral Resource domains, and the Peake copper-skarn prospect. Figure 6 shows a cross section relative to key inputs in Figure 5 alongside the Taylor thrust and simplified geology.<br>• Table 1 summarises all the drill holes that support Exploration Targets.<br>• Table 2 summarises all significant intersections.<br>• All drill hole information, including tabulations of drill hole positions and depths is stored within project data files on a secure company server.<br>• Hole depths vary between 550m and 2,000m. |
| *Data aggregation methods* | • Mineralisation domains were created within bounding litho-structural zones using both manually interpreted volumes and Radial Based Function (RBF) indicator interpolation of the cumulative in-situ value of metal content. The metal content descriptor, "Metval", is calculated by summing the multiplication of economic analyte grades for Zn, Pb, Ag and Cu, price and recovery. Metval cut-off ranges for mineralisation domains range from US$5-7.5 for the different litho-structural domains. Material above the Metval cut-off was modelled utilising the indicator numerical model function in Leapfrog Geo™ to create volumes.<br>• Significant assay intercepts are reported as length-weighted averages exceeding either 2% ZnEq or 0.2% Cu.<br>• No top cuts are applied to intercept calculations.<br>• ZnEq (%) is zinc equivalent which accounts for combined value of zinc, lead and silver. Metals are converted to ZnEq via unit value calculations using long term consensus metal price assumptions and relative metallurgical recovery assumptions. For the Exploration Target, overall metallurgical recoveries differ for geological domains and vary from 87% to 94% for zinc, 94% to 95% for lead, and 87% to 92% for silver. Exploration Target tonnage and grade is reported above an NSR that accounts for payability of metals in concentrate products, which depending on other factors, may decrease the total payable recovered metal. Average payable metallurgical recovery assumptions are zinc (Zn) 90%, lead (Pb) 91%, and silver (Ag) 81% and metals pricing assumptions are South32's prices for the December 2021 quarter. The formula used for calculation of zinc equivalent is ZnEq = Zn (%) + 0.718 * Pb (%) + 0.0204 * Ag (g/t). |
| *Relationship between mineralisation widths and intercept lengths* | • Near vertical drilling (75–90$^0$) amounts to the majority of holes used in the creation of the geology model. Where they intersect the low to moderately dipping (30°) stratigraphy the intersection length can be up to 15% longer than true-width.<br>• Since August 2018, drilling has been intentionally angled, where appropriate, between 60° and 75° to maximise the angle at which mineralisation is intersected.<br>• The mineralisation is modelled in 3D to appropriately account for sectional bias or apparent thickness issues which may result from 2D interpretation. |
| *Diagrams* | • Relevant maps and sections are included with this market announcement. |
| *Balanced reporting* | • Exploration results are reported considering drill holes completed outside the disclosed Mineral Resource estimate as at 30 June 2021. All drill hole intersections are considered in this assessment for balanced reporting. A list of drill holes is included as an annexure to this announcement. |
| *Other substantive exploration data* | • Aside from drilling, the geological model is compiled from local and regional mapping, geochemistry sampling and analysis, and geophysical surveys.<br>• Magneto-telluric (MT) and induced polarisation surveys (IP) were conducted with adherence to industry standard practices by Quantec Geosciences Inc. In most areas, the MT stations were collected along N–S lines with a spacing of 200m. Spacing between lines is 400m. Some areas were collected at 400m spacing within individual lines. IP has also been collected, both as 2D lines and as 2.5D swaths, collected with a variable spacing of data receivers. IP surveying is ongoing over the project.<br>• Quality control of geophysical data includes using a third-party geophysical consultant to verify data quality and provide secondary inversions for comparison to Quantec interpretations. |
| *Further work* | • The following work is planned to be conducted:<br>o The deeper Peake Copper-skarn prospect will be assessed in detail. |

| Criteria | Commentary |
|---|---|
| | ○ Additional drilling of the Peake Copper-skarn prospect is planned to occur in CY22, guided by the outcomes of a detailed assessment in the area adjacent to Taylor Deeps where very little drilling is completed so far.<br>○ Additional ongoing drilling will assess Taylor and Taylor Deeps extensional opportunities.<br>○ Exploratory drilling underneath and downdip of the historic mine workings at the Flux prospect is planned to occur in CY22, pending permit approvals.<br>○ Additional geophysics over the project is ongoing. |

**Figure 1: Regional location plan**

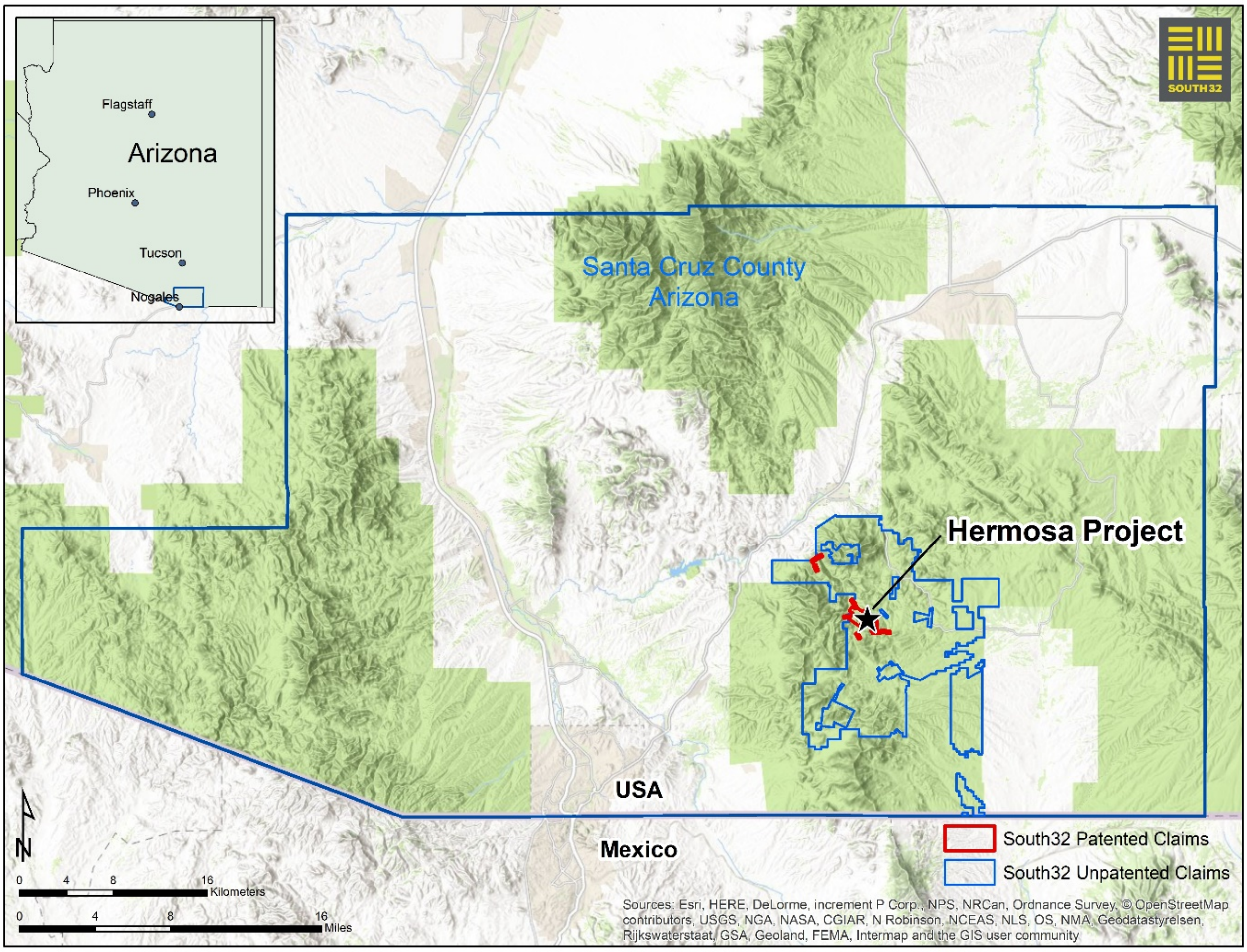


**Figure 2: Hermosa project tenement map**

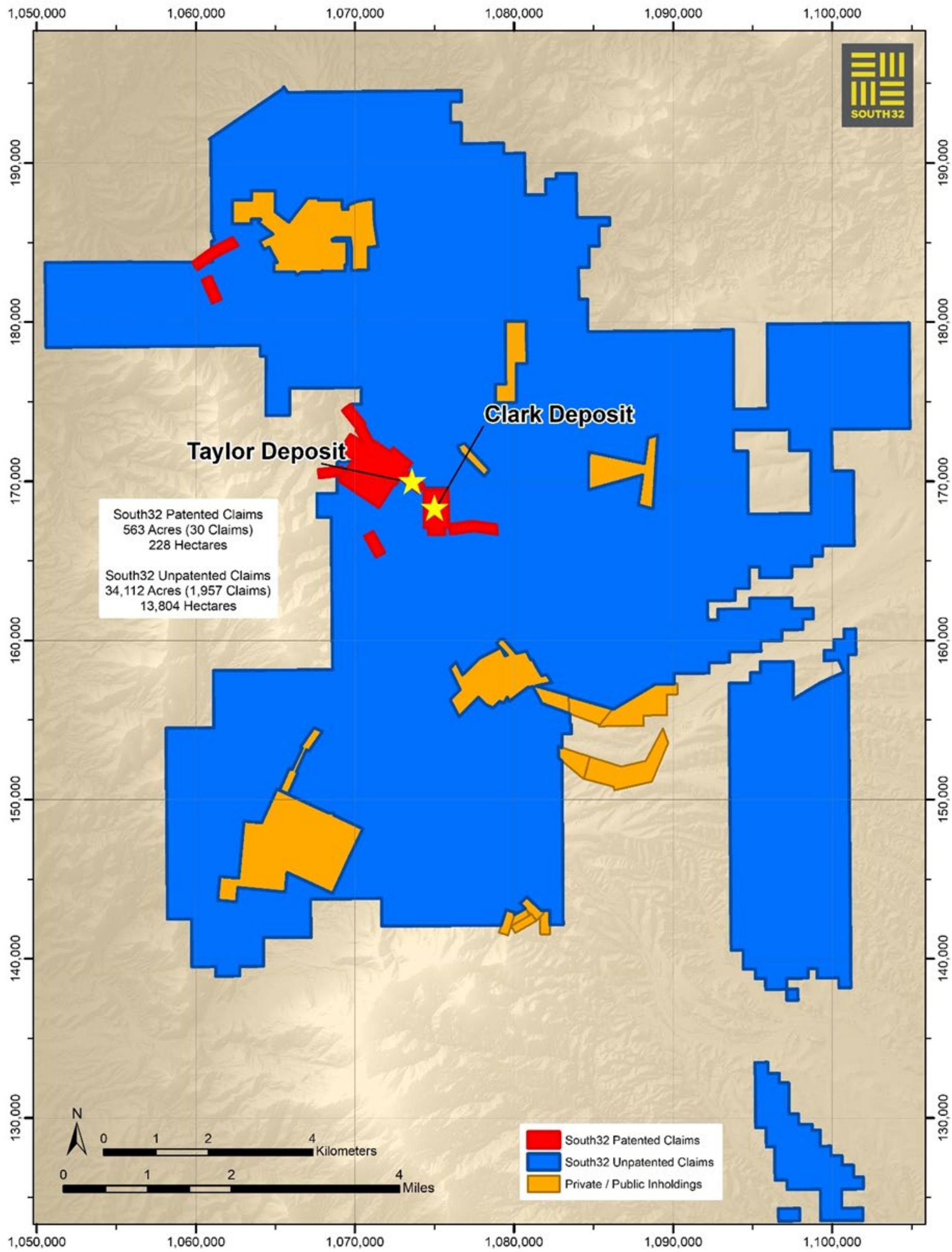
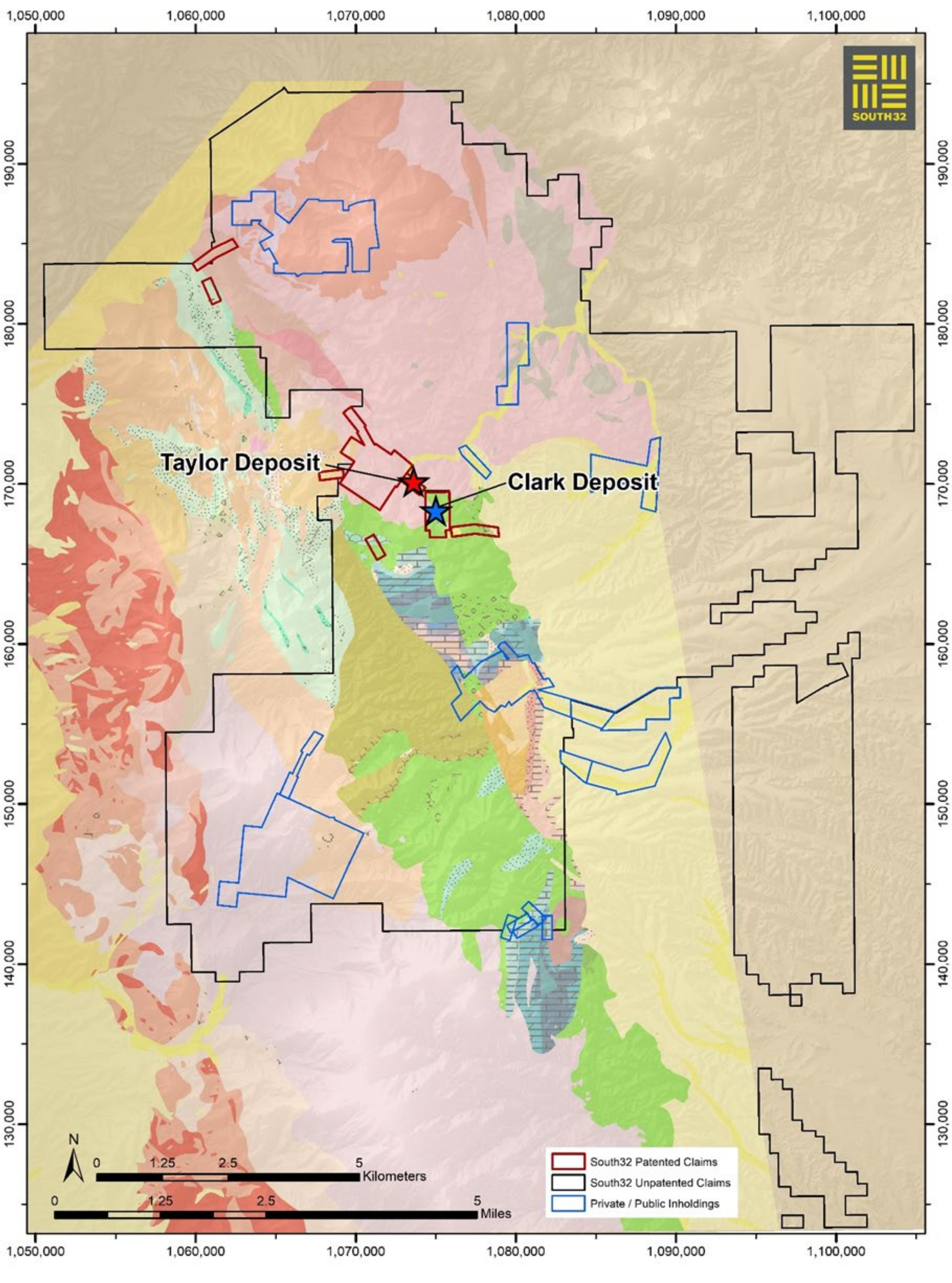


**Figure 3: Hermosa project regional geology**



**Map units**

**Symbol, Unit name**

Qal—Younger alluvium and talus
QTal—Older alluvium
QTg—Gravel and conglomerate
Tl—Limestone
Tt—Biotite rhyolite tuff
si—Silicification
Tv—Volcaniclastic rocks of middle Alum Gulch
Tib—Intrusive breccia of middle Alum Gulch
Tqp—Quartz feldspar porphyry of middle Alum Gulch
Tqpx—Xenolithic quartz feldspar porphyry of middle Alum Gulch
Tqmp—Quartz monzonite porphyry, in granodiorite of the Patagonia Mountains
Tqmpb—Breccia, in quartz monzonite porphyry (unit Tqmp) of granodiorite of the Patagonia Mountains
Tg—Granodiorite, in granodiorite of the Patagonia Mountains
Tgb—Breccia, in granodiorite (unit Tg) of granodiorite of the Patagonia Mountains
Tlp—Latite porphyry, in granodiorite of the Patagonia Mountains
Tbq—Biotite quartz monzonite, in granodiorite of the Patagonia Mountains
Tbqb—Breccia, in biotite quartz monzonite (unit Tbq) of granodiorite of the Patagonia Mountains
Tbg—Biotite granodiorite, in granodiorite of the Patagonia Mountains
Tibx—Intrusion breccia, in granodiorite of the Patagonia Mountains
Tsy—Syenodiorite or mangerite, in granodiorite of the Patagonia Mountains
Tag—Biotite augite quartz diorite, in granodiorite of the Patagonia Mountains
Tmp—Quartz monzonite porphyry of Red Mountain
TKr—Rhyolite of Red Mountain
TKggt—Gringo Gulch Volcanics
Ka—Trachyandesite
r—Rhyolite or latite, in trachyandesite (unit Ka)
Km—Pyroxene monzonite
Kl—Biotite quartz latite(?)
Kv—Silicic volcanics
la—Biotite latite(?), in silicic volcanics (unit Kv)
Kpg—Porphyritic biotite granodiorite
Kb—Bisbee Formation
Kbc—Conglomerate, in Bisbee Formation (unit Kb)
Jtg—Granite of Three R Canyon, in granite of Cumero Canyon
Jtgb—Breccia, in granite of Three R Canyon (unit Jtg) of granite of Cumero Canyon
Jcm—Porphyritic granite, in granite of Cumero Canyon
Jcs—Equigranular alkali syenite, in granite of Cumero Canyon
Jcsb—Breccia, in equigranular alkalik syenite (unit Jcs) of granite of Cumero Canyon
Jcg—Equigranular granite, in granite of Cumero Canyon
Jcgb—Breccia, in equigranular granite (unit Jcg) of granite of Cumero Canyon
Jhm—Hornblende monzonite of European Canyon
JTRv—Volcanic rocks, in silicic volcanic rocks
ha—Hornblende andesite dike and (or) plug, in volcanic rocks (unit JTRv)
b—Volcanic breccia, in volcanic rocks (unit JTRv)
s—Sedimentary rocks, in volcanic rocks (unit JTRv)
cg—Limestone conglomerate, in volcanic rocks (unit JTRv)
qz—Quartzite, in volcanic rocks (unit JTRv)
ls—Exotic blocks of upper Paleozoic limestone, in volcanic rocks (unit JTRv)
w—Rhyolitic welded(?) tuff, in volcanic rocks (unit JTRv)
lp—Latite(?) porphyry, in volcanic rocks (JTRv)
JTRvs—Volcanic and sedimentary rocks, in silicic volcanic rocks
TRm—Mount Wrightson Formation
q—Quartzite, in Mount Wrightson Formation (unit TRm)
a—Biotite(?)-albite andesite lava(?), in Mount Wrightson Formation (unit TRm)
t—Coarse volcaniclastic beds, in Mount Wrightson Formation (unit TRm)
TRms—Sedimentary rocks, in the Mount Wrightson Formation (unit TRm)
Pcn—Concha Limestone
Ps—Scherrer Formation
Pe—Epitaph Dolomite
Pc—Colina Limestone
PPe—Earp Formation
Ph—Horquilla Limestone
Me—Escabrosa Limestone
Dm—Martin Limestone
Ca—Abrigo Limestone
Cb—Bolsa Quartzite
pCq—Biotite or biotite-hornblende quartz monzonite
pCh—Hornblende-rich metamorphic and igneous rocks
pCm—Biotite quartz monzonite
pCd—Hornblende diorite

**Figure 4: Taylor Deposit local geology and Exploration Target collar locations**

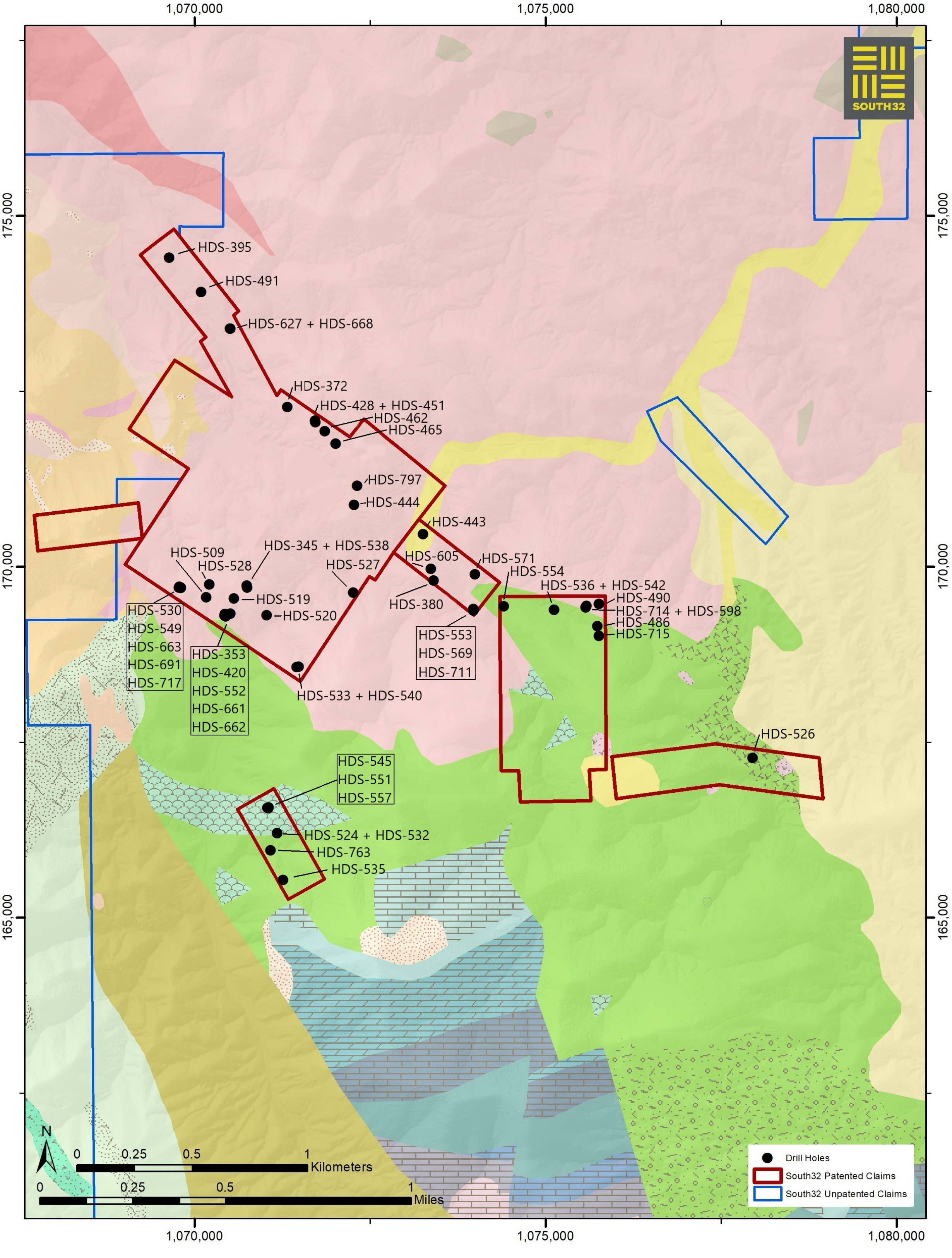


**Figure 5: Plan view of the Taylor and Clark Mineralisation Domains with exploration drill holes and the Peake Copper-Skarn Prospect**

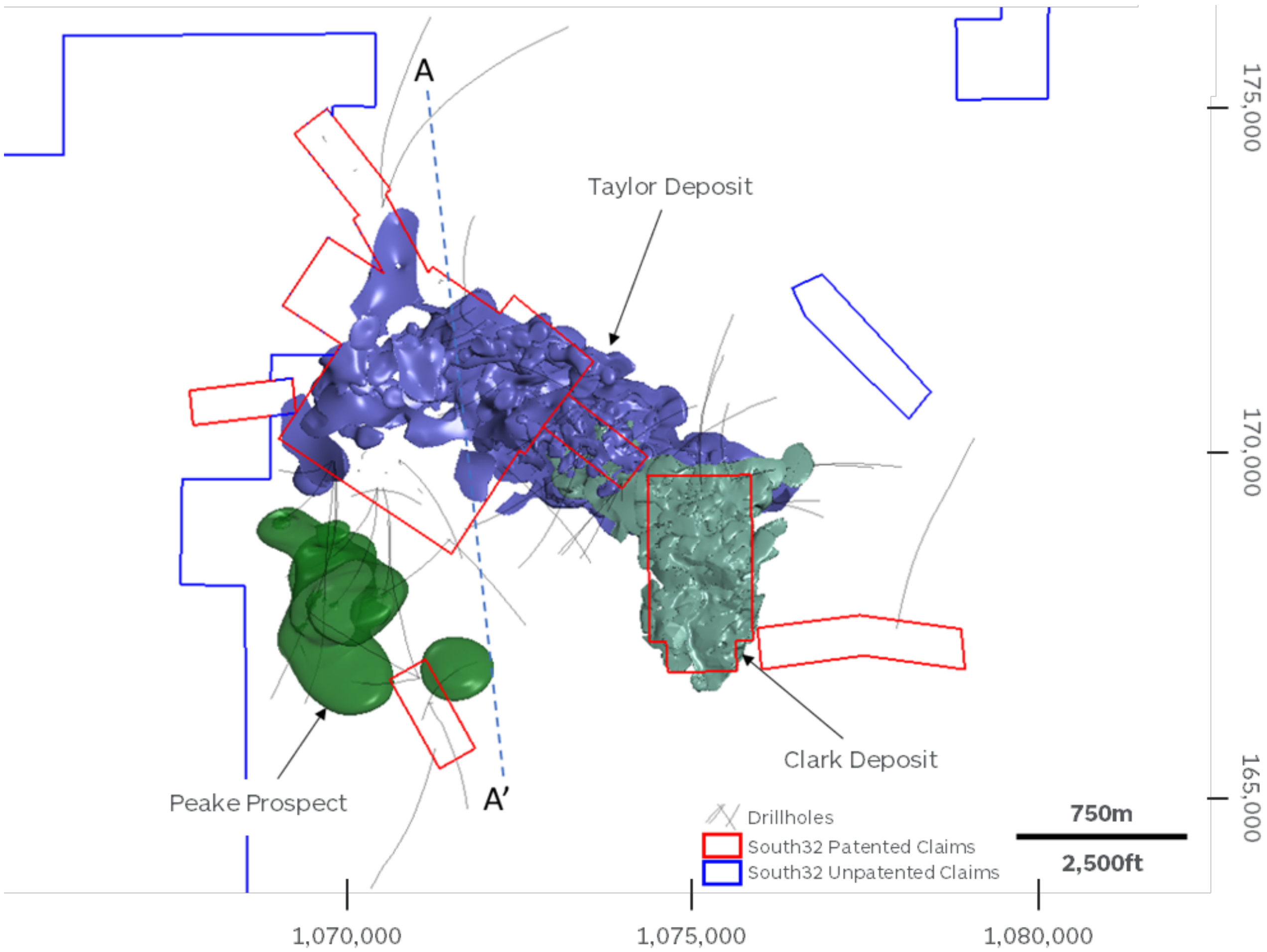


**Figure 6: Cross-section through the Taylor and Clark mineralisation domains showing exploration drill holes, simplified geology, Taylor Thrust and the Peake Copper-Skarn Prospect – looking east**

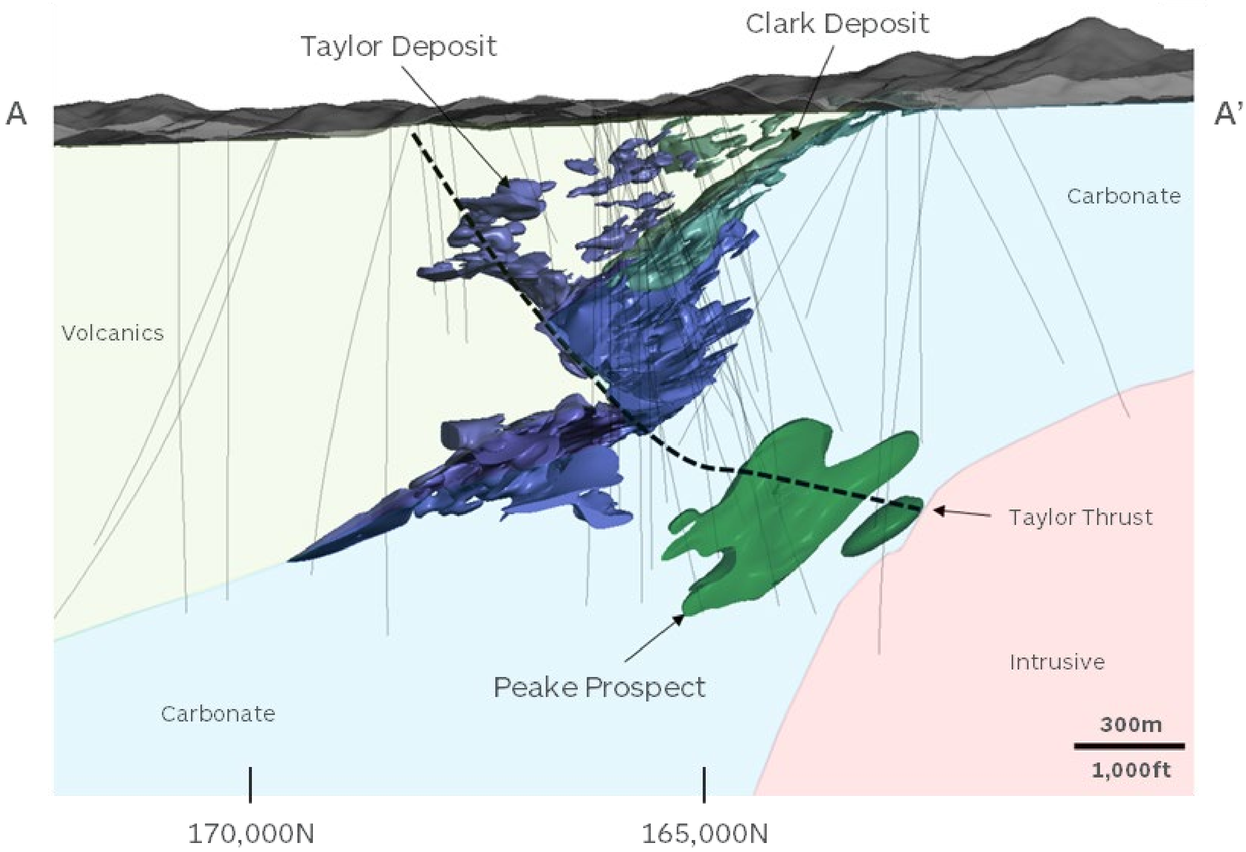


**Table 1: Hole ID, collar location, dip, azimuth and drill depth**

| Hole ID | East (UTM) | North (UTM) | Elevation (m) | Dip | Azimuth | TD Depth (m) |
|---|---|---|---|---|---|---|
| **HDS-345** | 525881 | 3480733 | 1603.2 | -90 | 0 | 1257.9 |
| **HDS-353** | 525781 | 3480612 | 1592.8 | -90 | 0 | 1701.5 |
| **HDS-372** | 526061 | 3481515 | 1564.6 | -90 | 0 | 1780.9 |
| **HDS-380** | 526689 | 3480757 | 1580.8 | -60 | 230 | 1321.9 |
| **HDS-395** | 525553 | 3482168 | 1502.4 | -90 | 0 | 1642.0 |
| **HDS-420** | 525785 | 3480607 | 1592.8 | -82 | 85 | 1372.8 |
| **HDS-428** | 526180 | 3481454 | 1578.1 | -75 | 355 | 1633.6 |
| **HDS-443** | 526645 | 3480958 | 1525.9 | -45 | 230 | 492.9 |
| **HDS-444** | 526347 | 3481088 | 1566.2 | -65 | 230 | 825.1 |
| **HDS-451** | 526182 | 3481448 | 1579.4 | -75 | 230 | 656.7 |
| **HDS-462** | 526223 | 3481409 | 1574.6 | -75 | 230 | 792.8 |
| **HDS-465** | 526268 | 3481353 | 1569.8 | -75 | 230 | 827.2 |
| **HDS-486** | 527398 | 3480552 | 1602.0 | -75 | 85 | 1142.1 |
| **HDS-490** | 527406 | 3480648 | 1593.8 | -60 | 70 | 1126.8 |
| **HDS-491** | 525690 | 3482016 | 1501.9 | -90 | 0 | 1595.0 |
| **HDS-509** | 525701 | 3480691 | 1602.1 | -90 | 0 | 1424.8 |
| **HDS-519** | 525822 | 3480685 | 1602.0 | -90 | 0 | 1422.2 |
| **HDS-520** | 525963 | 3480611 | 1573.1 | -90 | 0 | 1562.7 |
| **HDS-524** | 526002 | 3479665 | 1658.8 | -90 | 0 | 1220.0 |
| **HDS-526** | 528068 | 3479975 | 1571.1 | -65 | 15 | 1617.6 |
| **HDS-527** | 526339 | 3480706 | 1542.5 | -63 | 125 | 1288.4 |
| **HDS-528** | 525716 | 3480747 | 1610.3 | -90 | 0 | 1724.3 |
| **HDS-530** | 525583 | 3480735 | 1604.3 | -82 | 230 | 1446.9 |
| **HDS-532** | 526001 | 3479666 | 1659.1 | -60 | 150 | 1075.9 |
| **HDS-533** | 526092 | 3480386 | 1627.3 | -65 | 120 | 1257.6 |
| **HDS-535** | 526026 | 3479462 | 1678.1 | -60 | 190 | 1419.8 |
| **HDS-536** | 527211 | 3480625 | 1567.4 | -60 | 0 | 1206.1 |
| **HDS-538** | 525878 | 3480741 | 1603.3 | -70 | 130 | 1526.1 |
| **HDS-540** | 526101 | 3480387 | 1627.3 | -70 | 220 | 1528.9 |
| **HDS-542** | 527211 | 3480624 | 1567.1 | -70 | 0 | 1574.0 |
| **HDS-545** | 525960 | 3479775 | 1665.7 | -60 | 335 | 1427.1 |
| **HDS-549** | 525585 | 3480738 | 1604.4 | -78 | 200 | 1813.0 |
| **HDS-551** | 525963 | 3479774 | 1665.5 | -75 | 270 | 1542.6 |
| **HDS-552** | 525806 | 3480620 | 1592.9 | -70 | 165 | 1851.4 |
| **HDS-553** | 526860 | 3480624 | 1560.5 | -75 | 220 | 1524.0 |
| **HDS-554** | 526992 | 3480642 | 1550.9 | -65 | 35 | 1314.9 |
| **HDS-557** | 525963 | 3479776 | 1665.5 | -60 | 300 | 1199.1 |
| **HDS-569** | 526861 | 3480630 | 1560.3 | -62 | 205 | 900.1 |
| **HDS-571** | 526868 | 3480782 | 1543.4 | -66 | 45 | 961.0 |
| **HDS-598** | 527348 | 3480633 | 1606.7 | -75 | 333 | 1287.9 |
| **HDS-605** | 526678 | 3480806 | 1575.7 | -66 | 185 | 1468.4 |
| **HDS-627** | 525814 | 3481856 | 1502.2 | -60 | 20 | 1891.9 |
| **HDS-661** | 525782 | 3480619 | 1593.6 | -72 | 179 | 1981.2 |
| **HDS-662** | 525782 | 3480619 | 1593.6 | -76 | 190 | 1985.2 |
| **HDS-663** | 525592 | 3480733 | 1603.6 | -70 | 175 | 1980.6 |
| **HDS-668** | 525817 | 3481856 | 1502.4 | -60 | 20 | 1905.0 |
| **HDS-691** | 525592 | 3480734 | 1603.9 | -68 | 180 | 2079.0 |

| Hole ID | East (UTM) | North (UTM) | Elevation (m) | Dip | Azimuth | TD Depth (m) |
|---|---|---|---|---|---|---|
| **HDS-711** | 526863 | 3480628 | 1560.2 | -55 | 218 | 776.3 |
| **HDS-714** | 527351 | 3480641 | 1606.2 | -52 | 73 | 1184.8 |
| **HDS-715** | 527404 | 3480509 | 1607.7 | -65 | 75 | 817.2 |
| **HDS-717** | 525592 | 3480735 | 1603.9 | -70 | 175 | 1782.5 |
| **HDS-763** | 525971 | 3479591 | 1629.9 | -78 | 15 | 1943.4 |
| **HDS-797** | 526361 | 3481170 | 1560.0 | -55 | 108 | 551.1 |

**Table 2: Significant intersections**

| Hole ID | From (m) | To (m) | Cut off | Width (m) | Zinc (%) | Lead (%) | Silver (ppm) | Copper (%) |
|---|---|---|---|---|---|---|---|---|
| **HDS-345** | No significant intersection | | | | | | | |
| **HDS-353** | 966.2 | 976.0 | 2% ZnEq | 9.8 | 12.2 | 8.2 | 77 | 0.69 |
| | Including | | | | | | | |
| | 966.2 | 971.4 | 2% ZnEq | 5.2 | 22.0 | 14.8 | 130 | 1.21 |
| **HDS-372** | 312.4 | 318.5 | 2% ZnEq | 6.1 | 1.9 | 0.7 | 31 | 0.03 |
| | 458.1 | 463.6 | 2% ZnEq | 5.5 | 4.8 | 2.1 | 90 | 0.04 |
| **HDS-380** | 878.1 | 880.4 | 2% ZnEq | 2.3 | 2.6 | 1.8 | 362 | 0.33 |
| | 898.7 | 906.3 | 2% ZnEq | 7.6 | 1.0 | 1.9 | 142 | 0.23 |
| **HDS-395** | 448.7 | 454.3 | 2% ZnEq | 5.6 | 3.3 | 3.7 | 55 | 0.08 |
| **HDS-420** | 452.5 | 465.3 | 2% ZnEq | 12.8 | 2.5 | 1.1 | 73 | 0.11 |
| **HDS-428** | 266.4 | 269.3 | 2% ZnEq | 2.9 | 3.6 | 1.2 | 108 | 0.01 |
| | 1507.7 | 1516.5 | 2% ZnEq | 8.8 | 1.5 | 1.8 | 77 | 0.19 |
| **HDS-443** | No significant intersection | | | | | | | |
| **HDS-444** | 691.0 | 716.6 | 2% ZnEq | 25.6 | 1.4 | 0.7 | 15 | 0.04 |
| | Including | | | | | | | |
| | 709.3 | 716.6 | 2% ZnEq | 7.3 | 3.1 | 1.2 | 22 | 0.04 |
| | 790.0 | 793.1 | 2% ZnEq | 3.1 | 2.5 | 1.2 | 273 | 0.00 |
| | 803.1 | 809.5 | 2% ZnEq | 6.4 | 1.5 | 2.1 | 69 | 0.18 |
| **HDS-451** | 351.1 | 363.3 | 2% ZnEq | 12.2 | 1.4 | 0.5 | 13 | 0.00 |
| | Including | | | | | | | |
| | 357.8 | 363.3 | 2% ZnEq | 5.5 | 1.9 | 0.8 | 17 | 0.01 |
| **HDS-462** | 428.9 | 432.2 | 2% ZnEq | 3.4 | 0.9 | 1.3 | 48 | 0.06 |
| **HDS-465** | 322.6 | 335.6 | 2% ZnEq | 13.0 | 1.0 | 0.4 | 71 | 0.09 |
| **HDS-486** | 118.0 | 131.7 | 2% ZnEq | 13.7 | 0.1 | 0.9 | 64 | 0.04 |
| | 155.4 | 189.6 | 2% ZnEq | 34.1 | 0.1 | 0.6 | 86 | 0.09 |
| | Including | | | | | | | |
| | 169.8 | 189.6 | 2% ZnEq | 19.8 | 0.1 | 1.0 | 101 | 0.15 |
| | 249.8 | 290.9 | 2% ZnEq | 41.1 | 1.1 | 1.9 | 57 | 0.09 |
| **HDS-490** | 191.1 | 197.2 | 2% ZnEq | 6.1 | 0.1 | 0.4 | 77 | 0.08 |
| | 364.8 | 401.4 | 2% ZnEq | 36.6 | 0.1 | 1.1 | 69 | 0.04 |
| | Including | | | | | | | |
| | 379.5 | 399.9 | 2% ZnEq | 20.4 | 0.1 | 1.6 | 97 | 0.05 |
| | 442.6 | 450.2 | 2% ZnEq | 7.6 | 5.4 | 0.0 | 4 | 0.00 |
| **HDS-491** | 381.9 | 400.8 | 2% ZnEq | 18.9 | 13.1 | 8.3 | 137 | 0.39 |
| | Including | | | | | | | |
| | 387.1 | 399.1 | 2% ZnEq | 12.0 | 17.3 | 11.5 | 171 | 0.42 |
| **HDS-509** | 846.4 | 851.0 | 2% ZnEq | 4.6 | 1.4 | 0.7 | 21 | 0.10 |
| **HDS-519** | 389.2 | 393.8 | 2% ZnEq | 4.6 | 0.3 | 0.3 | 688 | 0.33 |
| | 731.5 | 736.1 | 2% ZnEq | 4.6 | 3.1 | 1.6 | 32 | 0.10 |

| Hole ID | From (m) | To (m) | Cut off | Width (m) | Zinc (%) | Lead (%) | Silver (ppm) | Copper (%) |
|---|---|---|---|---|---|---|---|---|
| HDS-520 | 684.9 | 689.3 | 2% ZnEq | 4.4 | 2.7 | 1.6 | 39 | 0.37 |
| | 694.9 | 704.4 | 2% ZnEq | 9.4 | 1.7 | 1.7 | 25 | 0.08 |
| | 1049.0 | 1053.7 | 2% ZnEq | 4.7 | 1.5 | 1.7 | 37 | 0.37 |
| HDS-524 | No significant intersection | | | | | | | |
| HDS-526 | 46.3 | 52.7 | 2% ZnEq | 6.4 | 0.0 | 0.1 | 100 | 0.01 |
| | 61.3 | 84.4 | 2% ZnEq | 23.2 | 0.0 | 0.3 | 113 | 0.03 |
| HDS-527 | 191.1 | 200.3 | 2% ZnEq | 9.1 | 1.2 | 0.9 | 23 | 0.00 |
| HDS-528 | No significant intersection | | | | | | | |
| HDS-530 | 840.3 | 846.4 | 0.2% Cu | 6.1 | 0.1 | 0.0 | 13 | 0.59 |
| | 904.3 | 910.4 | 0.2% Cu | 6.1 | 0.3 | 0.1 | 14 | 0.39 |
| | 1407.6 | 1419.1 | 2% ZnEq | 11.6 | 1.8 | 1.1 | 68 | 0.24 |
| HDS-532 | 76.5 | 83.8 | 2% ZnEq | 7.3 | 1.3 | 0.8 | 193 | 0.15 |
| HDS-533 | No significant intersection | | | | | | | |
| HDS-535 | No significant intersection | | | | | | | |
| HDS-536 | No significant intersection | | | | | | | |
| HDS-538 | 1445.4 | 1451.9 | 2% ZnEq | 6.6 | 0.1 | 1.2 | 74 | 0.03 |
| HDS-540 | 1279.2 | 1389.0 | 0.2% Cu | 109.7 | 0.1 | 0.3 | 15 | 0.62 |
| | Including | | | | | | | |
| | 1303.6 | 1309.7 | 0.2% Cu | 6.1 | 0.2 | 0.4 | 61 | 3.48 |
| | 1469.7 | 1488.0 | 0.2% Cu | 18.3 | 0.0 | 0.0 | 10 | 0.63 |
| HDS-542 | 128.6 | 133.2 | 2% ZnEq | 4.6 | 0.0 | 0.5 | 80 | 0.03 |
| | 800.3 | 809.9 | 2% ZnEq | 9.6 | 0.8 | 0.8 | 30 | 0.00 |
| HDS-545 | No significant intersection | | | | | | | |
| HDS-549 | 1169.5 | 1175.6 | 0.2% Cu | 6.1 | 1.5 | 1.6 | 312 | 1.92 |
| HDS-551 | 1100.6 | 1111.6 | 0.2% Cu | 11.0 | 0.0 | 0.2 | 10 | 0.39 |
| | 1254.9 | 1280.8 | 0.2% Cu | 25.9 | 0.0 | 0.0 | 10 | 0.54 |
| | 1294.5 | 1372.8 | 0.2% Cu | 78.3 | 0.0 | 0.1 | 10 | 0.51 |
| HDS-552 | 709.3 | 714.8 | 0.2% Cu | 5.5 | 11.2 | 5.5 | 64 | 0.12 |
| | 1265.8 | 1273.9 | 0.2% Cu | 8.1 | 0.2 | 0.5 | 27 | 0.39 |
| | 1308.2 | 1384.7 | 0.2% Cu | 76.5 | 0.2 | 0.4 | 25 | 1.52 |
| | Including | | | | | | | |
| | 1309.9 | 1328.6 | 0.2% Cu | 18.8 | 0.1 | 0.2 | 40 | 2.77 |
| | And | | | | | | | |
| | 1364.3 | 1384.7 | 0.2% Cu | 20.4 | 0.1 | 0.3 | 37 | 2.44 |
| | Including | | | | | | | |
| | 1375.3 | 1384.7 | 0.2% Cu | 9.5 | 0.1 | 0.3 | 62 | 4.45 |
| | 1478.9 | 1484.8 | 0.2% Cu | 5.9 | 1.0 | 1.5 | 57 | 0.41 |
| HDS-553 | 315.8 | 340.5 | 2% ZnEq | 24.7 | 3.4 | 3.3 | 266 | 0.32 |
| | Including | | | | | | | |
| | 315.8 | 325.2 | 2% ZnEq | 9.4 | 3.9 | 8.5 | 654 | 0.81 |
| | 332.8 | 340.5 | 2% ZnEq | 7.6 | 5.8 | 0.1 | 40 | 0.03 |
| HDS-554 | 181.7 | 197.8 | 2% ZnEq | 16.2 | 0.4 | 5.8 | 139 | 0.06 |
| | 1138.3 | 1140.9 | 2% ZnEq | 2.6 | 3.9 | 6.4 | 152 | 0.03 |
| HDS-557 | No significant intersection | | | | | | | |
| HDS-569 | 142.3 | 147.2 | 2% ZnEq | 4.9 | 3.6 | 2.4 | 61 | 0.03 |
| HDS-571 | 134.4 | 166.4 | 2% ZnEq | 32.0 | 0.7 | 0.8 | 94 | 0.12 |
| | 691.6 | 698.9 | 2% ZnEq | 7.3 | 4.7 | 3.4 | 56 | 0.14 |
| | 743.3 | 750.7 | 2% ZnEq | 7.5 | 7.6 | 18.5 | 296 | 0.11 |
| HDS-598 | No significant intersection | | | | | | | |

| Hole ID | From (m) | To (m) | Cut off | Width (m) | Zinc (%) | Lead (%) | Silver (ppm) | Copper (%) |
|---|---|---|---|---|---|---|---|---|
| HDS-605 | 447.1 | 452.9 | 2% ZnEq | 5.8 | 2.6 | 0.9 | 116 | 0.19 |
| | 512.2 | 531.6 | 2% ZnEq | 19.4 | 0.2 | 1.2 | 51 | 0.08 |
| | 842.5 | 845.8 | 2% ZnEq | 3.4 | 2.1 | 2.4 | 196 | 0.30 |
| HDS-627 | 349.9 | 354.5 | 2% ZnEq | 4.6 | 15.2 | 14.9 | 459 | 0.21 |
| HDS-661 | 1298.4 | 1305.2 | 2% ZnEq | 6.7 | 0.6 | 3.4 | 249 | 0.89 |
| | 1322.2 | 1374.6 | 0.2% Cu | 52.4 | 0.1 | 1.1 | 105 | 1.73 |
| | Including | | | | | | | |
| | 1322.2 | 1346.0 | 0.2% Cu | 23.8 | 0.1 | 0.8 | 81 | 3.32 |
| | And | | | | | | | |
| | 1322.2 | 1330.1 | 0.2% Cu | 7.9 | 0.1 | 0.4 | 81 | 7.89 |
| | 1386.8 | 1460.6 | 0.2% Cu | 73.8 | 0.5 | 0.7 | 67 | 1.06 |
| | Including | | | | | | | |
| | 1399.6 | 1410.3 | 0.2% Cu | 10.7 | 0.7 | 1.5 | 227 | 2.84 |
| | 1555.1 | 1573.1 | 0.2% Cu | 18.0 | 3.2 | 1.4 | 87 | 0.37 |
| HDS-662 | 1316.4 | 1329.2 | 0.2% Cu | 12.8 | 3.4 | 4.4 | 137 | 0.95 |
| | 1540.8 | 1546.7 | 2% ZnEq | 5.9 | 5.9 | 2.1 | 250 | 0.45 |
| HDS-663 | 1580.1 | 1591.8 | 0.2% Cu | 11.7 | 0.1 | 0.0 | 16 | 0.95 |
| | 1615.9 | 1651.1 | 0.2% Cu | 35.2 | 1.1 | 0.1 | 27 | 0.56 |
| HDS-668 | 201.2 | 211.8 | 2% ZnEq | 10.7 | 5.5 | 3.9 | 270 | 0.13 |
| | 221.0 | 233.2 | 2% ZnEq | 12.2 | 5.7 | 3.9 | 129 | 0.03 |
| | 699.5 | 713.2 | 2% ZnEq | 13.7 | 1.3 | 4.2 | 134 | 0.06 |
| HDS-691 | 1343.6 | 1353.6 | 2% ZnEq | 10.1 | 3.8 | 3.5 | 61 | 0.47 |
| | 1384.7 | 1395.4 | 0.2% Cu | 10.7 | 2.7 | 2.9 | 38 | 1.03 |
| | 1405.9 | 1415.2 | 0.2% Cu | 9.3 | 0.5 | 0.7 | 11 | 0.26 |
| | 1421.3 | 1452.1 | 0.2% Cu | 30.8 | 0.7 | 0.8 | 22 | 0.59 |
| | 1463.6 | 1509.7 | 0.2% Cu | 46.0 | 0.4 | 0.5 | 21 | 0.43 |
| | 1540.6 | 1549.3 | 0.2% Cu | 8.7 | 0.3 | 0.9 | 51 | 0.61 |
| | 1563.9 | 1581.3 | 0.2% Cu | 17.4 | 0.2 | 0.2 | 23 | 0.55 |
| | 1662.7 | 1677.9 | 0.2% Cu | 15.2 | 2.8 | 1.1 | 155 | 1.19 |
| | 1683.4 | 1692.6 | 2% ZnEq | 9.1 | 1.5 | 0.3 | 45 | 0.13 |
| | 1732.0 | 1735.2 | 2% ZnEq | 3.2 | 6.2 | 0.3 | 107 | 0.18 |
| | 1994.6 | 1997.4 | 2% ZnEq | 2.7 | 1.7 | 0.3 | 54 | 0.08 |
| HDS-711 | 150.6 | 153.9 | 2% ZnEq | 3.4 | 1.9 | 1.0 | 244 | 0.34 |
| HDS-714 | 372.5 | 377.0 | 2% ZnEq | 4.6 | 0.0 | 1.1 | 87 | 0.04 |
| | 410.6 | 415.1 | 2% ZnEq | 4.6 | 0.0 | 1.2 | 65 | 0.02 |
| | 627.9 | 632.5 | 2% ZnEq | 4.6 | 2.1 | 3.6 | 111 | 0.06 |
| | 682.8 | 688.8 | 2% ZnEq | 6.1 | 3.0 | 3.9 | 109 | 0.09 |
| HDS-715 | 119.5 | 127.4 | 2% ZnEq | 7.9 | 0.0 | 1.7 | 53 | 0.05 |
| | 167.3 | 196.0 | 2% ZnEq | 28.7 | 3.7 | 0.5 | 176 | 0.23 |
| | Including | | | | | | | |
| | 172.8 | 180.8 | 2% ZnEq | 8.0 | 7.1 | 1.2 | 218 | 0.71 |
| | 300.1 | 342.3 | 2% ZnEq | 42.2 | 2.1 | 1.8 | 94 | 0.09 |
| | Including | | | | | | | |
| | 333.3 | 342.3 | 2% ZnEq | 9.0 | 6.8 | 0.7 | 42 | 0.08 |
| | 563.9 | 575.3 | 2% ZnEq | 11.4 | 3.7 | 3.6 | 188 | 0.16 |
| | Including | | | | | | | |
| | 565.4 | 571.5 | 2% ZnEq | 6.1 | 4.5 | 5.4 | 290 | 0.19 |
| | 591.3 | 598.9 | 2% ZnEq | 7.6 | 4.7 | 2.1 | 92 | 0.14 |
| | 780.3 | 787.9 | 2% ZnEq | 7.6 | 0.2 | 0.1 | 96 | 0.01 |

| Hole ID | From (m) | To (m) | Cut off | Width (m) | Zinc (%) | Lead (%) | Silver (ppm) | Copper (%) |
|---|---|---|---|---|---|---|---|---|
| HDS-717 | 1065.3 | 1072.4 | 0.2% Cu | 7.2 | 3.5 | 2.7 | 22 | 0.21 |
| | 1306.1 | 1318.3 | 0.2% Cu | 12.2 | 1.8 | 1.8 | 63 | 0.82 |
| | 1444.1 | 1466.7 | 0.2% Cu | 22.6 | 1.7 | 1.7 | 46 | 1.38 |
| | Including | | | | | | | |
| | 1456.6 | 1466.7 | 0.2% Cu | 10.1 | 0.5 | 1.0 | 78 | 2.57 |
| | 1517.9 | 1522.2 | 2% ZnEq | 4.3 | 3.0 | 1.8 | 49 | 0.03 |
| | 1718.6 | 1727.0 | 0.2% Cu | 8.4 | 1.0 | 0.1 | 39 | 1.99 |
| | 1754.1 | 1763.3 | 2% ZnEq | 9.1 | 1.4 | 0.5 | 42 | 0.13 |
| HDS-763 | 1429.8 | 1439.6 | 2% ZnEq | 9.8 | 2.3 | 0.1 | 3 | 0.02 |
| HDS-797 | No significant intersection | | | | | | | |

**Annexure 2: Material Assumptions for the Production Target and Forecast Financial Information**

| Criteria | Commentary |
|---|---|
| *Mineral Resource estimate for conversion to Ore Reserves* | • The Production Target is based on 20% Measured, 62% Indicated, 14% Inferred Mineral Resources and 4% Exploration Target. The Mineral Resources were declared as part of South32's Annual declaration of resources and reserves in the Annual Report published on 3 September 2021 and is available to view on www.south32.net. The details of the Exploration Target are included in this announcement (Annexure 1). |
| *Study status* | • A pre-feasibility study has been completed for the Taylor Deposit in compliance with the AACE International Class 4 estimate standard.<br>• A technically achievable and economically viable mine plan has been determined by the study team. Material Modifying Factors have been considered and are included in this section of the report. |
| *Cut-off parameters* | • Taylor is a polymetallic deposit which uses an equivalent NSR value as a grade descriptor. NSR considers the remaining gross value of the in-situ revenue generating elements once processing recoveries, royalties, concentrate transport, refining costs and other deductions have been considered.<br>• The elements of economic interest used for cut-off determination include silver (Ag), lead (Pb) and zinc (Zn).<br>• The cut-off strategy employed at Taylor is to optimise the NPV of the operation.<br>• An NSR cut-off grade of US$90/tonne was used in the development of mineable stope shapes. |
| *Mining factors or assumptions* | • The mining method applied is longhole open stoping with paste backfill. This is the preferred mining method based on a combination of productivity, cost, resource recovery and risk of surface subsidence.<br>• Geotechnical recommendations based on deposit geology have been used to develop the stope shape dimensions.<br>• The mining dilution is applied based on rock dilution or fill dilution dependent on the location of the stope being mined. Dilution factors are applied on a stope by stope basis using incremental dilution widths applied to the stope geometry.<br>• The mining recovery factor is 95% and is applied to all ore tonnes.<br>• Inferred Mineral Resources are incorporated into the stope designs and contribute to the overall weighted grades and NSR of the stope. Inferred Mineral Resources contribute approximately 14% and the Exploration Target contributes 4% of the total planned tonnes. A risk assessment was completed considering Inferred Mineral Resources and the Exploration Target as waste to ensure that the Production Target and forecast financial information as stated can be achieved. Accordingly, the Company believes it has a reasonable basis for reporting a Production Target including those Inferred Mineral Resources and the Exploration Target.<br>• Primary access to the orebody will be through a main shaft and a ventilation shaft. Ore passes, haulage levels and ventilation raises will be established to move material internally within the mine and provide ventilation and cooling. Paste backfill will be produced in a surface backfill plant and distributed underground via a backfill reticulation system.<br>• The proposed mining method with modifying factors applied supports a single-stage ramp-up to the preferred development scenario of up to 4.3Mt per annum. |
| *Metallurgical factors or assumptions* | • The Taylor processing plant will consist of well-established processing techniques. Primary crushing will be conducted underground, and crushed ore will be hoisted to the surface. Grinding will be conducted by a single-stage AG mill to a size suitable for flotation. Sequential flotation will be followed by pressure filtration for concentrates and tailings.<br>• Metallurgical recovery is found to vary by geological domain and recovery ranges are applied based on geologic formation. Average process recoveries are: 90% for zinc in zinc concentrate; 91% for lead in lead concentrate and 81% for silver in lead concentrate.<br>• Lead is found to occur primarily as galena and zinc is found to occur primarily as sphalerite with small amounts of non-sulphide zinc occurring in the geological domains close to surface. Galena and sphalerite are coarse grained and easily liberated for effective recovery by sequential flotation. |

<table>
<tr><th>Criteria</th><th>Commentary</th></tr>
<tr><td></td><td><ul><li>Manganese occurs in relatively high concentrations in gangue and can occur as an inclusion of sphalerite especially in the higher geological domains. This can cause manganese in zinc concentrate to exceed penalty limits for most smelters. No other deleterious elements are expected to exceed penalty limits for lead or zinc concentrates.</li><li>Metallurgical test work has been conducted using samples covering the ore body vertically and horizontally. All metallurgical test work and the process design have been reviewed by independent consultants.</li></ul></td></tr>
<tr><td>Environmental factors or assumptions</td><td><ul><li>The project consists of patented claims surrounded by the Coronado National Forest and unpatented claims located within the surrounding Coronado National Forest and managed by the United Sates Forest Service.</li><li>A permitting schedule has been developed for obtaining critical state and federal approvals.</li><li>Waste rock generated from surface and underground excavations is delineated into potentially acid generating (PAG) or non-acid generating (NAG) rock. All PAG material will report to a lined facility as will most of the NAG material, except for a limited amount that will be used for construction material.</li><li>The tailings storage facilities have been designed in accordance with South32's Dam Management Standard and consistent with the International Council on Mining and Metals (ICMM) Tailings Governance Framework, in addition to the Australian National Committee on Large Dams (ANCOLD) guidelines.</li><li>Tailings from processing will be filtered and stored in purpose-built, lined, surface storage facilities or returned underground in the form of paste backfill. An existing tailings storage facility on patented claims will be used to store tailings from early operations.</li></ul></td></tr>
<tr><td>Infrastructure</td><td><ul><li>Current site activity is supported by and consists of office buildings, core processing facilities, an existing tailings storage facility as part of the voluntary remediation program, a water treatment plant, ponds, road networks and laydown yards.</li><li>Planned infrastructure will be installed to support future operations and will consist of:<ul><li>Dual shafts</li><li>Ventilation and refrigeration systems</li><li>Process comminution, flotation and concentrate loadout</li><li>Tailings filtration plant and tailings storage facilities</li><li>Paste backfill plant</li><li>Dewatering wells, another water treatment plant and pipelines</li><li>Surface shops, fuel bays, wash bays and office buildings</li><li>Powerlines and substations</li><li>Surface stockpile bins</li><li>Underground maintenance shops and ore/waste storage</li></ul></li><li>A site layout plan and construction schedule support the above listed infrastructure.</li></ul></td></tr>
<tr><td>Costs</td><td><ul><li>The capital cost estimate is supported by sufficient engineering scope and definition for preparation of a AACE International Class 4 estimate.</li><li>The operating cost estimate was developed in accordance with industry standards and South32 project requirements.<ul><li>Mining costs were calculated primarily from first principles and substantiated by detailed labour rate calculations, vendor-provided equipment operating costs and budgetary quotations for materials and consumables.</li><li>Processing costs account for plant consumables/reagents, labour, power and maintenance materials and tailings storage facility costs.</li><li>General and administrative costs are based on current operating structures and optimised based on industry benchmarks and fit-for-purpose sizing. Permitting and environmental estimates are based on current permitting timelines.</li></ul></li><li>Commodity price forecasts for silver, lead and zinc and foreign exchange are supplied by South32 Marketing. Price assumptions reflect South32's view on demand, supply, volume forecasts and competitor analysis. Price protocols will not be detailed as the information is commercially sensitive.</li><li>Transportation charges have been estimated using information on trucking costs, rail costs, export locations, transload capabilities and transit time associated with moving concentrate from site to port to market.</li></ul></td></tr>
</table>

| Criteria | Commentary |
|---|---|
| | • Treatment and Refining Charges used for the valuation are supplied by South32 Marketing and reflect South32's view on demand, supply, volume forecasts and competitor analysis.<br>• Applicable royalties and property fees have been applied using on the current US federal and state rates. |
| *Revenue factors* | • The life of operation plan derived from the pre-feasibility study provides the mining and processing physicals such as volume, tonnes and grades to support the valuation.<br>• Revenue is calculated by applying forecast metal prices and foreign exchange rates to the scheduled payable metal. Metal payabilities are based on contracted payability terms, typical for the lead and zinc concentrate markets. |
| *Market assessment* | • Internal price protocols reflect South32's view on demand, supply, and stock situations including customer analysis, competitor analysis and identification of major market windows and volume forecasts. |
| *Economic* | • Economic inputs are described in the cost, revenue and metallurgical factors commentary.<br>• Sensitivity analyses have been completed on metal prices, metallurgical recoveries, mine operating costs, growth capital costs and use of Inferred Mineral Resources and the Exploration Target to understand the value drivers and impact on the valuation.<br>• The pre-feasibility study evaluated alternate cases to assess the impact of longer than expected permitting timelines and associated capital spend profiles. |
| *Social* | • South32 maintains relationships with stakeholders in its host communities through structured and meaningful engagement activities including: community forums, industry involvement, employee participation, local procurement and local employment.<br>• A Community Management Plan has been developed in accordance with the South32 Community Standard and includes baseline studies, community surveys, risk assessments, stakeholder identification, engagement plans, cultural heritage, community investment plans, closure and rehabilitation. |
| *Other* | • Hermosa has developed a comprehensive risk register and risk management system to address foreseeable risks that could impact the project and future operations.<br>• No material naturally occurring risks have been identified and the project is not subject to any material legal agreements or marketing arrangements. |

# Attachment B

IN THE

# ARIZONA COURT OF APPEALS

**DIVISION ONE**

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SAN CARLOS APACHE TRIBE, *Appellant*,

*v.*

STATE OF ARIZONA; ARIZONA WATER QUALITY APPEALS BOARD; ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY, *Appellees*.

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RESOLUTION COPPER MINING, LLC,

*Intervenor/Appellee.*

No. 1 CA-CV 21-0295
FILED 11-15-2022

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Appeal from the Superior Court in Maricopa County
No. LC2019-000264-001
The Honorable Sigmund G. Popko, Judge *Pro Tempore*

**VACATED**

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COUNSEL

San Carlos Apache Tribe, San Carlos
By Alexander B. Ritchie, Justine R. Jimmie
*Counsel for Appellant*

Arizona Attorney General's Office, Phoenix
By Jeffrey Cantrell
*Counsel for Appellee, Arizona Department of Environmental Quality*

Perkins Coie LLP, Phoenix
By Christopher D. Thomas, Matthew Luis Rojas, Andrea J. Driggs, Karl J. Worsham
*Counsel for Intervenor/Appellee, Resolution Copper Mining, LLC*

## OPINION

Vice Chief Judge David B. Gass delivered the opinion of the court, in which Presiding Judge Paul J. McMurdie joined. Judge Angela K. Paton dissented.

**G A S S**, Vice Chief Judge:

**¶1** San Carlos Apache Tribe (the Tribe) argues Resolution Copper Mining LLC's (Resolution) copper-mining site is a new source under the Clean Water Act (CWA) because Resolution recently sank shaft 10. The CWA treats the new mine shaft as a "new source" because it is substantially independent of the non-contiguous original deposit at the mining site. In short, Resolution radically changed the nature of its existing mining site when it added the new mine shaft—a 7,000-foot-deep shaft designed to use a different mining technique to access a previously untouched, massive copper ore deposit that Resolution predicts will "supply more than 25% of America's demand for [copper] over the next 40 years."

**¶2** As a result, before the Arizona Department of Environmental Quality (ADEQ) issues a permit to allow Resolution to operate the new mine shaft, ADEQ must adopt Total Maximum Daily Loads (TMDLs) for Resolution's discharge of stormwater and non-stormwater—including treated mine water, industrial water, and seepage pumping—into Queen Creek near the town of Superior because Queen Creek is "impaired" for copper under the CWA.

## FACTUAL AND PROCEDURAL HISTORY

**¶3** The controversy arises because ADEQ renewed Resolution's Arizona Pollution Discharge Elimination System (AZPDES) Permit No. AZ0020389 (the permit). The permit ensures Resolution complies with CWA water quality standards for copper mining. The permit authorizes Resolution to discharge (1) stormwater and (2) non-stormwater, including treated mine water, industrial water, and seepage pumping.

**¶4** The permit also authorizes Resolution to discharge those waters into an unnamed tributary to Queen Creek near the town of Superior. Queen Creek is "impaired" for copper under § 303(d) of the CWA. *See* 33 U.S.C. § 1313(d). When discharging into an impaired waterway, mines may not exceed TMDLs. *See infra* ¶ 64–68. As such, Resolution and

ADEQ began drafting TMDLs for pollutants for the impaired waterway, but the TMDLs remain in draft form. *See* 40 C.F.R. § 130.7. The issue here is which comes first: the permit or the TMDL. We conclude it is the TMDL.

## I. Historical Mining At The Superior Site

**¶5** Resolution's mining site occupies a broad area of land in and near Superior, and Resolution uses it for underground copper mining activities. This area includes the Superior Operations Mine, located along Superior's northern boundary. Resolution's mining site also includes surface facilities located 0.22 miles north of Queen Creek in two non-contiguous areas identified as the West Plant Site (the WPS) and the East Plant Site (the EPS). The WPS is located immediately northwest of Superior. The EPS is located two miles east of Superior near the intersection of Highway 177 and U.S. Highway 60. The mining site included two large copper-ore deposits. The first was the now-exhausted ore body, originally owned by Magma, located in the WPS. The second is the recently discovered and untouched Resolution ore body located in the EPS.

**¶6** Resolution's mining site has a deep history. Resolution acquired the mining site from a long line of owners, stemming back to Magma, which built the first iteration of the mining site at the WPS in 1912. Magma constructed shafts Nos. 1 through 8 on the WPS as part of its original mining site. In the 1970s, Magma constructed shaft 9 on the EPS to facilitate better access to the Magma ore body. Before that, the Magma ore body was not accessible via the EPS. Magma also constructed shaft 9 to identify other ore bodies in the EPS. Magma connected the EPS to the WPS through a tunnel facility called the Never Sweat Tunnel. Magma used the Never Sweat Tunnel to transport copper ore from shaft 9 to processing facilities at the WPS.

## II. Modern Development of the Superior Site

**¶7** At one time, the owners extracted ore from the Magma ore body. For extended periods, the owners left the site all but destitute aside from doing the bare minimum to maintain the site, including groundwater pumping and exploration. In the early-to-mid 1990s, the owner at the time, Broken Hill Proprietary Company, Ltd. (BHP), discovered the untouched Resolution ore body in the EPS.

**¶8** Even after BHP discovered the Resolution ore body, BHP ceased actively mining ore at the Superior mining site in 1996 when it depleted the remaining mineable reserves out of the Magma ore body. Two years later, BHP ceased all other ore mining activities—except for applying to renew the permit—for a variety of reasons, including the costs of maintaining the mining site, falling copper prices, limited data on the Resolution ore body, and a lack of suitable infrastructure to exploit the Resolution ore body. Since discovering the Resolution ore body more than two decades ago, no mine owner has extracted ore.

**¶9** Starting in 2000, the Superior mining site ownership changed hands, and Resolution began exploring. In 2004, Resolution began planning new additions at its mining site, including shaft 10, a cooling tower, rock stockpiles, wash bays, and a Mine Water Treatment Plant (MWTP). In 2008, Resolution began constructing shaft 10—the most significant addition. Around this time, Resolution also resumed dewatering at the existing Magma facilities to help facilitate a study for its new construction plans. Dewatering uses water through a system of pumps, pipes, and conveyances to process and access ore and mine discharge drainage.

**¶10** By December 2014, Resolution spent approximately $500 million to complete shaft 10. Shaft 10 is 30 feet in diameter and extends 6,943 feet below ground surface (bgs). Resolution built shaft 10 about 300 feet away from shaft 9. Shaft 9, by contrast, only extends 4,882 feet bgs—more than 2,000 feet shy of shaft 10's depth. Resolution rehabilitated and extended the Never Sweat Tunnel as part of constructing shaft 10.

**¶11** Since Resolution constructed shaft 10, the only parts of the original mining site remaining operational are the Never Sweat Tunnel and shafts 8 and 9. Resolution uses shaft 8 to dewater the WPS. Resolution uses shaft 9 to support shaft 10, such as for ventilation and flowing mine drainage from shaft 9 to shaft 10. Resolution still actively uses the Never Sweat Tunnel to pump mine drainage from shaft 10 to the WPS, where the MWTP processes it. Resolution's focus with building the new facilities, like shaft 10, has been to target the yet untouched Resolution ore body.

**¶12** Resolution plans to access the Resolution ore body using panel caving. Panel caving is a variation of the high-volume technique known as block caving. Previously, the Superior site owners used adits and tunnels. With panel caving, Resolution will access the ore by caving in the ore zone and causing it to collapse—which will eventually cause ground subsidence. Resolution predicts the Resolution ore body will "supply more than 25% of America's demand for [copper] over the next 40 years."

## III. National Pollutant Discharge Elimination System (NPDES) And AZPDES Permitting Activities

**¶13** The Environmental Protection Agency (EPA) issued the original permit in 1975. The EPA issued the permit, including its renewals, until 2002, when the State of Arizona took primacy over the CWA and the NPDES permitting. Since then, ADEQ has issued permits to individuals, including Resolution for its copper-mining site.

**¶14** In 2015, Resolution applied to renew the permit. In 2017, ADEQ issued the renewed permit, which had an effective date of January 23, 2017, and an expiration date of January 22, 2022. The renewed permit allowed Resolution to operate its mining site, including shaft 10 and the other new facilities at the site, and treated them as existing sources.

## IV. Procedural Posture and Permitting Challenges

**¶15** Several months after the renewal, the Tribe challenged ADEQ's treatment of shaft 10 and several other new facilities before the Water Quality Appeals Board (the Board). The Tribe argued those facilities were new sources, not existing sources, under 40 C.F.R. §§ 122.2, 122.29. The Board referred the matter to the Office of Administrative Hearings (OAH) for an evidentiary hearing. In February 2018, OAH held the hearing before an OAH administrative law judge (ALJ). And on October 15, 2018, the ALJ issued findings of fact and conclusions of law, deciding ADEQ generally did not act arbitrarily and capriciously when it renewed the permit in 2017. The ALJ, however, took exception to ADEQ's failure to consider whether Resolution's new facilities, including shaft 10, were new sources under 40 C.F.R. §§ 122.2, 122.29(b). *See infra* ¶ 37. The ALJ, thus, recommended the Board remand the matter to ADEQ to conduct a new source analysis under 40 C.F.R. § 122.29(b). The ALJ did not decide whether Resolution's site was a new source.

**¶16** In November 2018, the Board remanded the matter to ADEQ to conduct a new source analysis. The Board's remand order also allowed ADEQ to ignore some of the ALJ's findings of fact and conclusions of law when ADEQ conducted the new source analysis.

**¶17** In 2019, ADEQ issued its new source analysis. ADEQ's new source analysis concluded Resolution's mining site was not subject to new source performance standards (NSPS) because the site was an existing source under 40 C.F.R. §§ 122.2, 122.29(b) and did not contain new sources under the CWA. *See infra* ¶ 37. ADEQ reasoned new source standards must apply to "the mine as a whole" and not to discrete facilities, such as shaft

10 because the regulations only provide independently applicable standards for copper mines and not for any of the new features.

**¶18** In March 2019, the Tribe challenged the Board's November 2018 order remanding the matter for ADEQ to conduct a new source analysis, arguing it was error for the Board to allow ADEQ to ignore certain portions of the ALJ's findings of fact and conclusions of law.

**¶19** In June 2019, the Board issued its final administrative decision, upholding ADEQ's issuance of the permit to Resolution. The Board also denied the Tribe's challenge to the Board's November 2018 order. In doing so, the Board adopted all the ALJ's findings of fact, including those it allowed ADEQ to ignore in its November 2018 order.

**¶20** The Tribe appealed the Board's 2019 decision to the superior court under A.R.S. § 12-905. The superior court upheld the Board's decision, including its findings of fact and conclusions of law. The Tribe timely appealed. This court has jurisdiction under article VI, section 9, of the Arizona Constitution, and A.R.S. §§ 12-913, 12-120.21.A.1, and 12-2101.A.1.

**ANALYSIS**

**V. The Validity Of The Permit Is Not Moot.**

**¶21** Because the permit at issue here expired on January 22, 2022, this appeal appears to lack a live controversy. *See Kondaur Cap. Corp. v. Pinal Cnty.*, 235 Ariz. 189, 192–93, ¶¶ 8–9 (App. 2014) (issues involving a corporation's ability to seek enforcement of a writ of restitution allowing it to evict occupants of its property became moot when the occupants already were evicted by other means). The parties did not raise mootness. We questioned the parties about mootness at oral argument, and, therefore, exercise our discretion to decide whether this matter has become moot. *See Big D Constr. Corp. v. Court of Appeals for State of Ariz., Div. One*, 163 Ariz. 560, 562–63 (1990).

**¶22** The issue here presents a live controversy despite the appearance to the contrary. ADEQ is authorized to administratively extend expired AZPDES permits if: (1) the owner of the mining site applies for a renewal of its permit 180 days before the permit expires and (2) ADEQ has not yet issued a new permit to the owner. *See* 40 C.F.R. § 122.6(d) ("States authorized to administer the NPDES program may continue either EPA or State-issued permits until the effective date of the new permits, if State law allows."); A.A.C. R18-9-B904.B.1 (AZPDES permittee must apply to renew its permit 180 days before the permit expiration date); A.A.C. R18-9-B904.C (continuation beyond the AZPDES permit date is permitted if: (1) the permittee has timely applied before the permit expires and the permitted activity is continuing; and (2) ADEQ "is unable, through no fault of the permittee, to issue an AZPDES permit on or before the expiration date of the existing permit"). Here, we take judicial notice of Resolution applying to renew the permit on July 23, 2021—180 days before the permit expired. Draft Fact Sheet: Arizona Pollutant Discharge Elimination System (AZPDES), Ariz. Dep't of Env't Quality 1, https://static.azdeq.gov/pn/azpdes_rcml_fs.pdf (last visited Oct. 3, 2022); *see Giragi v. Moore*, 48 Ariz. 33, 41–42 (1936); Ariz. R. Evid. 201(b). We also take judicial notice of ADEQ issuing draft forms of the renewed permit. Draft Permit: Authorization to Discharge Under the Arizona Pollutant Discharge Elimination System, Ariz. Dep't of Env't Quality, https://static.azdeq.gov/pn/azpdes_rcml_dp.pdf (last visited Oct. 3, 2022); *see Moore*, 48 Ariz. at 41–42; Ariz. R. Evid. 201(b). Resolution, thus, continues to operate its mining site under the permit at issue here.

## VI. The Tribe Untimely Appealed The Board's November 2018 Order.

**¶23** The Tribe argues the Board erred when it did not give a written justification for the November 2018 order. In that order, the Board allowed ADEQ to disregard portions of the ALJ's findings of fact and conclusions of law. The Tribe argues the order modified the ALJ decision, requiring written justification. The State correctly contends the Tribe's challenge is untimely because the Tribe did not file its challenge until over 100 days later.

**¶24** "[T]he decision of the Board [to reject or modify the ALJ's decision] is the final administrative decision." A.A.C. R2-17-124.A.2. Under A.R.S. § 12-904, a party must commence "an action to review a final administrative decision . . . by filing a notice of appeal within thirty-five days from the date" it receives a copy of that decision.

**¶25** Because the Tribe waited over 100 days to challenge the Board's November 2018 order and the Board's decision to modify or reject an ALJ's decision was a final agency decision, the Tribe untimely challenged the Board's November 2018 order.

**VII. Because The Parties Raise No Issues Of Fact On Appeal, We Need Not Address The 2021 Amendment To § 12-910.F Regarding This Court's Deference To Agencies' Determinations Of Questions Of Fact.**

**¶26** In 2021, during the pendency of this appeal, the Arizona Legislature modified § 12-910.F to include language providing, "In a proceeding brought by or against the regulated party, the court shall decide all questions of fact without deference to any previous determination that may have been made on the question by the agency." *See* 2021 Ariz. Laws, ch. 281, § 1 (S.B. 1063) (1st Reg. Sess.) (amending A.R.S. § 12-910.F). Before the amendment, Arizona courts held "a reviewing court may not substitute its judgment for that of the agency on factual questions or matters of agency expertise." *See WildEarth Guardians, Inc. v. Hickman*, 233 Ariz. 50, 53, ¶ 7 (App. 2013).

**¶27** Resolution argues we should not decide the constitutionality of the 2021 amendment because none of the parties dispute any of the facts below. We agree.

**¶28** The Tribe contends it raised issues of fact because it challenged the superior court's decision, "including the factual error that the Resolution [m]ine was the same mine as the more than 100-year-old Magma [m]ine." But, as we will discuss, this issue is a question of law, not fact. *See infra* ¶¶ 33–35. *Cf. State v. Romero*, 248 Ariz. 601, 604, ¶ 12 (App. 2020) (issue of whether the defendant knowingly engaged in criminal conduct is a question of fact because it "refers to factual knowledge"). The Tribe also contends whether the superior court's apparent assumption of the Tribe's motivations for disputing the permit improperly influenced its decision to uphold the permit is a question of fact. But the Tribe did not challenge any specific factual determinations below. Given the parties have not raised any factual issues on appeal, we need not resolve any questions of fact.

**¶29** Accordingly, we need not resolve issues relating to the constitutionality of the 2021 amendment to subsection F.

**VIII. Shaft 10 Is A New Source Under The CWA.**

**¶30** A "new source" under the CWA is "any building, structure, facility, or installation from which there is or may be a 'discharge of pollutants,' the construction of which commenced . . . [a]fter promulgation of standards of performance under section 306 of CWA which are applicable to such source." 40 C.F.R. § 122.2; *see also* 33 U.S.C. § 1316(a)(2) (same). A source is "a new source only if a new source performance standard is independently applicable to it." 40 C.F.R. § 122.29(b)(2). By contrast, the CWA grandfathers in an "existing source," which is a source permitted before the EPA promulgated performance standards independently applicable to the source. NPDES Permit Regulations, 49 Fed. Reg. 37,998, 38,042–43 (Sept. 26, 1984) (to be codified at 40 C.F.R. § 122.21(k)(4)). This distinction exists because new sources "have never operated under a previously issued permit and . . . are considered to be in a better position than existing sources to install and 'start up' their equipment and meet the [more stringent NSPS] permit limitations." *Id.* at 38,034.

**¶31** Resolution and the State argue all the sources in Resolution's mining site are existing sources under the CWA because a source must be subject to independently applicable standards to be a new source, and the only applicable standard applies to the "mine as a whole." Resolution and the State, therefore, conclude the mining site is not subject to NSPS because the mining site has existed since 1912, and as a result, any additional structure or facility must be an existing source.

**¶32** The Tribe contends "discrete pollutant-generating structures and facilities can themselves be new sources[,]" including the additions Resolution made since the EPA promulgated standards for copper mining in 1982. The Tribe further contends Resolution's additions effectively created a distinct mine from the original Magma mine, and the new mine should be subject to new source analysis.

**¶33** We first address our standard of review for ADEQ's determinations of issues related to the new source analysis. Second, we discuss whether the EPA promulgated any independently applicable standards for the types of sources Resolution constructed at its mining site after the EPA promulgated standards for copper—more specifically, we decide whether shaft 10 is a "mine" under 40 C.F.R. §§ 440.100, 440.132(a), (g). Third, we decide whether shaft 10 is subject to independently applicable NSPS. Fourth, we resolve whether shaft 10 is a new source under the 40 C.F.R. § 122.29(b)(1) criteria (further defining what is required for a source to be classified as a new source).

### A. We Review ADEQ's New Source Analysis *De Novo*.

**¶34** This court generally reviews *de novo* "the decisions reached by the administrative officer and the superior court" when reviewing questions of law involving an agency's "legal interpretation of a statute."

*Eaton v. Ariz. Health Care Cost Containment Sys.*, 206 Ariz. 430, 432, ¶ 7 (App. 2003). Principles of statutory construction apply to federal regulations. *See Env't Def. v. Duke Energy Corp.*, 549 U.S. 561, 573–74 (2007) (applying principles of statutory construction to regulations the EPA promulgated under the Clean Air Act); *Time Warner Ent. Co., L.P. v. Everest Midwest Licensee, L.L.C.*, 381 F.3d 1039, 1050 (10th Cir. 2004) (applying "general rules of statutory construction" to Federal Communication Commission's regulations). This court construes a regulation "and its subsections as a consistent and harmonious whole." *See State v. Green*, 248 Ariz. 133, 135, ¶ 8 (2020).

**¶35** This court starts by "giv[ing] words their plain meaning unless it is impossible to do so or absurd consequences will result." *Marsoner v. Pima Cnty.*, 166 Ariz. 486, 488 (1991); *see also Allstate Ins. Co. v. Universal Underwriters, Inc.*, 199 Ariz. 261, 264, ¶ 8 (App. 2000). When a case involves the intersection of multiple statutes or regulations, this court "construe[s] them together, seeking to give meaning to all provisions." *See State v. Francis*, 243 Ariz. 434, 435, ¶ 6 (2018) (cleaned up).

**¶36** This court gives a federal agency's interpretation of the federal law it administers the level of deference annunciated by the United States Supreme Court in *Chevron U.S.A. Inc. v. Nat. Res. Def. Council*, 467 U.S. 837 (1984). *See Eaton*, 206 Ariz. at 434, ¶ 16. By contrast, "[a] state agency's interpretation of a federal statutes is not entitled to the deference afforded a federal agency's interpretation of its own statutes under *Chevron*." *Orthopedic Hosp. v. Belshe*, 103 F.3d 1491, 1495 (9th Cir. 1997); *see also Arizona v. City of Tucson*, 761 F.3d 1005, 1014 (9th Cir. 2014). Instead, this court "review[s] *de novo* a state agency's interpretation of a federal [law]." *See Belshe*, 103 F.3d at 1495. Further, the Arizona Legislature amended A.R.S. § 12-910.F (providing the standards of review for final administrative decisions) in 2018 to abolish what is commonly known as the *Chevron* doctrine in Arizona. *See* 2018 Ariz. Laws, ch. 180, § 1 (2d Reg. Sess.) (H.B. 2238) (amending A.R.S. § 12-910.E) ("In a proceeding brought by or against the regulated party, the court shall decide all questions of law, including the interpretation of a constitutional or statutory provision or a rule adopted by an agency, without deference to any previous determination that may have been made on the question by the agency.").

### B. Because Shaft 10 Is A "Mine," It Is A Type Of Source Subject To CWA Copper Mining Regulations.

**¶37** The State contends "independently applicable standard" under 40 C.F.R. § 122.29(b)(2) means the EPA must have made standards independently applicable to the types of sources Resolution constructed at its site after 1982 to classify those sources as new sources. And the State urges this court to affirm ADEQ's decision to renew the permit because the only applicable standard under 40 C.F.R. § 440, Subpart J is for "the mine as a whole."

**¶38** Under 40 C.F.R. § 122.29(b)(2), "[a] source meeting the requirements of paragraphs (b)(1)(i), (ii), or (iii) of this section is a new source only if a new source performance standard is independently applicable to it. If there is no such independently applicable standard, the source is a new discharger." *See In re: Phelps Dodge Corp., Verde Valley Ranch Dev.*, 10 E.A.D. 460, 2002 WL 1315601, at *15 (EAB 2002) (discussing the need for an independently applicable standard to categorize a source as a new source under the CWA). NSPS only go into effect once the EPA promulgates performance standards independently applicable to the type of source the EPA is permitting. 40 C.F.R. § 122.2; *see* 33 U.S.C. § 1316(a)(2).

**¶39** The EPA promulgated the most recent performance standards for copper mines in 1982. Ore Mining and Dressing Point Source Category Effluent Limitation Guidelines and New Source Performance Standards, Final Rule, 47 Fed. Reg. 54,598 (Dec. 3, 1982). A source producing pollution from copper mining activities, thus, may only be a new source if it was constructed after 1982 and an independent standard applies to such a source. *See* 40 C.F.R. § 122.2; *see also* 33 U.S.C. § 1316(a)(2).

**¶40** The standards for copper mining apply to only a few types of sources, and here the only applicable standard is for "mines." *See* 40 C.F.R. § 440.100(a) ("provisions of this subpart are applicable to discharges from . . . [m]ines that produce copper" from "open-pit or underground operations"). The other types of sources subject to independently applicable standards under this section are "mills" and "mines and mills," which do not apply here because there are no copper mills at issue. *See* 40 C.F.R. § 440.100(a)(2)–(4). A plain reading of the controlling regulations requires this result, and we agree with the State to the extent it argues the only independently applicable standard is for "mines." *See Marsoner*, 166 Ariz. at 488. But that determination does not end our analysis.

**¶41** Because "mines" are the only type of source subject to independently applicable standards here, we must determine whether any sources Resolution constructed at its mining site after 1982 fall within the definition of a "mine." The EPA provides three terms guiding our interpretation of what a "mine" means. The first term, "active mining area," is "a place where work or other activity related to the extraction, removal, or recovery of metal ore is being conducted." 40 C.F.R. § 440.132(a). The second term, "mine," is:

> [A]n *active mining area*, including all land and property placed under, or above the surface of such land, used in or resulting from the work of extracting metal ore or minerals from their natural deposits by any means or method, including secondary recovery of metal ore from refuse or other storage piles, wastes, or rock dumps and mill tailings derived from the mining, cleaning, or concentration of metal ores.

40 C.F.R. § 440.132(g) (emphasis added). The third and most expansive of the three terms, "site," means "the land or water area where any 'facility or activity' is physically located or conducted, including adjacent land used in connection with the facility or activity." 40 C.F.R. § 122.2.

**¶42** These three terms are like nesting dolls in that an "active mining area" falls squarely within the definition of a "mine." Thus, if a source would qualify as an "active mining area," it would also qualify as a "mine." And because a "mine" and "active mining area" are each examples of "the land area where any 'facility or activity' is physically located or conducted," both an "active mining area" and "mine" neatly fit into the term "site." The term "site," however, cannot nest within the terms "mine" or "active mining area." *See infra* ¶ 44.

**¶43** The State argues new additions to Resolution's mining site, including shaft 10, cannot be considered new sources because the only applicable standards are for "mines," which can only mean the "mine as a whole." But the term "mine," as defined by 40 C.F.R. § 440.132(g) (defining "mines" in the ore mining context, including copper mining), does not mean the "mine as a whole." Instead, a "mine" is a discrete structure used for "extracting ore or minerals," such as shaft 10. *See* 40 C.F.R. § 440.132(g) (a mine "is an active mining area, *including all land and property* placed under, or above the surface of such land, *used in or resulting from the work of extracting metal ore or minerals* from their natural deposits by any means or method") (emphasis added); 40 C.F.R. § 440.132(a) (an active mining area "is a place where work or other activity related to the extraction, removal, or recovery of metal ore is being conducted"); *see Marsoner*, 166 Ariz. at 488.

**¶44** If the State was correct in arguing we must look to the mining site "as a whole," then it would render the new source rule under 40 C.F.R. § 122.29 null as applied to new facilities at mining sites. *See Chaparral Dev. v. RMED Int'l, Inc.*, 170 Ariz. 309, 313 (App. 1991) (this court harmonizes conflicting language of different parts of the statute to give effect to both); *Cleckner v. Ariz. Dep't of Health Servs.*, 246 Ariz. 40, 43, ¶ 9 (2019) (this court strives "to give meaning to each word, phrase, clause and sentence so that no part of that legislation will be void, inert or trivial"); *see also Patterson v. Maricopa Cnty. Sheriff's Off.*, 177 Ariz. 153, 157 (App. 1993) (applying statutory construction principles to read a portion of a rule in harmony with other parts of the rule to "give effect to the [framers'] intent behind" the rule). Indeed, the EPA wrote 40 C.F.R. § 122.29 to provide a framework to decide whether an addition to a mining site is a new source. *See infra* ¶¶ 48–60.

**¶45** Shaft 10 neatly falls within the description of a "mine," as opposed to a "site." As applied here, shaft 10 is an area of "land" (a 7,000-foot-deep hole) and "property" (a shaft is a man-made facility). *See* 40 C.F.R. § 440.132(g). Shaft 10 is located "under . . . the surface of such land," and Resolution has used the shaft to implement its plans to "extract[] metal ore or minerals from their natural deposits." *See* 40 C.F.R. § 440.132(g). And because Resolution is using shaft 10 to further its expansion of the site to extract copper from the new ore body, shaft 10 is "a place where work or other activity related to the extraction, removal, or recovery of metal ore is being [or will be] conducted." *See* 40 C.F.R. § 440.132(a). Shaft 10, thus, squarely falls within the plain meaning of the definitions of an "active mining area" and a "mine." As such, the EPA effectively provided an independently applicable standard for mining shafts—at least to the extent they qualify as "mines" or "active mining areas." *See Francis*, 243 Ariz. at 436, ¶¶ 9–10 (interpreting interrelated statutes together to discern their meaning); *cf. Verde Valley Ranch Dev.*, 10 E.A.D. 460, 2002 WL 1315601, at *16 ("Phelps Dodge's active maintenance of the tailings site (i.e., sprinkling with water to reduce dust blowing off the site surface) over the past years . . . cannot reasonably be categorized as active pursuit or processing of ore within the meaning of the copper mining NSPS."). Moreover, though the ALJ did not decide whether shaft 10 was a new source, the ALJ decided shaft 10 was a "mine" when the matter was before the OAH, in part, because Resolution was using it to further its mining activity, such as the production of mine drainage.

**¶46** Further, contrary to the State's argument, the EPA's regulatory framework does not require us to consider all "active mining areas" within Resolution's mining "site" when determining whether a source is a new or existing source. Here, the State has confused the term "mine" with the term "site" when arguing we must consider "the mine as a whole." *See* 40 C.F.R. §§ 122.2, 440.132(g). In contrast to the EPA's definition of a "mine," the EPA's definition of a "site" includes "adjacent land used in connection with the facility or activity." We cannot define a mining shaft as a "site" rather than a "mine" because of this additional requirement. Here, we have determined Resolution's shaft 10 is one "mine" of at least one or more "mines" or "active mining areas" operating within Resolution's mining "site." We, therefore, need not determine whether the mining site "as a whole" is a new source.

**¶47** Our interpretation of the EPA's regulations is consistent with the EPA's guidance on new sources, which we find persuasive. *See Christensen v. Harris Cnty.*, 529 U.S. 576, 587 (2000) (an administrative body's informal guidance on a regulation is not binding but may be persuasive "to the extent that those interpretations have the 'power to persuade'") (citations omitted). Indeed, the EPA provided several materials explaining parts of a discharger's site may be subject to NSPS while others are subject to existing source standards when the discharger constructs a new building, structure, or installation at a site. *See* Memorandum from Linda Boornazian, Director Water Permits Division, Office of Wastewater Management, and Mary Smith, Engineering & Analysis Division, Office of Science & Technology Office of Water, to Regional Water Division Directors, at 3 (Sept. 28, 2006) ("[I]f the new source is a new installation of process equipment at an existing facility, part of the facility may be subject to existing source standards and other parts of the facility subject to new source standards."); NPDES Permit Regulations, 49 Fed. Reg. 37,998, 38044 (Sept. 26, 1984) (to be codified at 40 C.F.R. § 122.29(b)) ("[I]f a facility replicates an existing facility, the fact that it shares or uses common land with another source does not prevent it from being considered a new source.").

**¶48** Resolution, nonetheless, argues its interpretation of the new source regulations, requiring this court to look to the "whole mine" when deciding whether shaft 10 is a new source, is consistent with EPA interpretations of a new source. Resolution cites past NPDES permits to support its proposition. Though EPA interpretations of regulations do not necessarily receive *Chevron* deference, "[c]ogent [federal] administrative interpretations . . . warrant respect." *Alaska Dep't of Env't Conservation v. U.S. E.P.A.*, 540 U.S. 461, 488 (2004). But Resolution's examples of past EPA permitting decisions are distinguishable from the permit here because none were for underground copper mines. Several of the cited EPA permits, for instance, were for coal mines, which are subject to "new source coal mine" standards. *See* 40 C.F.R. § 434.11(j)(1). Even so, those permits do not necessarily assist Resolution's proposition, and some even cut against it. Indeed, the regulatory definition of "new source coal mine" requires agencies to consider whether the regulated body created new shafts when deciding if a mine is a new source. *See* 40 C.F.R. § 434.11(j)(1) (a new source may also arise from a "major alteration" to an existing site, such as the "construction of a new shaft"). A new shaft, therefore, could be a "mine" and new source in the context of a coal mine as well.

### C. Because Shaft 10 Is A "Mine" And Shaft 10 Produces Mine Drainage, Shaft 10 Is Subject To "Independently Applicable Standards."

**¶49** For an agency to classify a source as a new source, the source must:

> (1) Be one of the types of sources the EPA has enumerated as being applicable to performance standards—here, the applicable regulation is 40 C.F.R. § 440.100 (listing the types of sources subject to copper mining standards)—and
>
> (2) Produce the type of wastewater discharge governed by the NSPS.

*See* 40 C.F.R. § 122.29(b)(2) (a source meeting the requirements of § 122.29(b)(1) "(i), (ii), or (iii) is a new source only if a [NSPS] is independently applicable to it"). Here, NSPS are independently applicable to shaft 10. First, as explained above, shaft 10 is a "mine" and, thus, is one of the types of sources specifically promulgated as applicable to the standards for copper. *See supra* ¶¶ 44–47. Second, shaft 10 is subject to NSPS under 40 C.F.R. § 440.104(a) because this standard applies to mine drainage from underground copper mining operations and shaft 10 produces mine drainage.

**¶50** The dissent believes we embark on our analysis out of order. As explained above, ignoring whether a new construction is a mine undercuts the effect of entire sections of federal regulations. We decline this path and instead give force to every word of the regulations by considering whether shaft 10 is a mine. In doing so, traditional canons of statutory interpretation guide our path. And ADEQ's own flow chart confirms our approach. *See Appendix A.*

**¶51** Accordingly, the EPA has provided an independently applicable NSPS standard for shaft 10. But that does not end our analysis.

### D. Shaft 10 Is A New Source Under The 40 C.F.R. § 122.29(b) Criteria.

**¶52** Next, to determine whether shaft 10 is a new source, we must decide if it meets one of the three new source criteria under 40 C.F.R. § 122.29(b). Because we decide only whether the third criteria applies, we decline to address the parties' arguments about the other two criteria.

**¶53** To be classified as a new source, a source must meet one of the following criteria: (1) "[i]t is constructed at a site at which no other source is located"; (2) "[i]t totally replaces the process or production equipment that causes the discharge of pollutants at an existing source"; or (3) "[i]ts processes are substantially independent of an existing source at the same site." 40 C.F.R. § 122.29(b)(1)(i)–(iii).

**¶54** The State argues shaft 10 is not "substantially independent" from other structures on the site but is fully integrated, and thus should not be considered a new source. Because Resolution only recently built shaft 10, heavily modified other nearby existing structures to facilitate the use of shaft 10, and operated or has plans to operate shaft 10 for copper mining so as not to replace but replicate existing source's copper mining activity, we disagree.

**¶55** In 1984, the EPA amended the third prong—regarding "whether the [source's] processes are substantially independent"—of the new source analysis test by requiring agencies to consider factors: (1) "the extent to which the new facility is integrated with the existing plant"; and (2) "the extent to which the new facility is engaged in the same general type of activity as the existing source." *See* NPDES Permit Regulations, 49 Fed. Reg. 37,998, 38,048 (Sept. 26, 1984) (to be codified at 40 C.F.R. § 122.29(b)(1)(iii)).

**¶56** The application of the 40 C.F.R. § 122.29(b)(1)(iii) criterion presents an issue of first impression to this court. The State, Resolution, and the Tribe provided no authority other than federal guidance from the EPA, and—aside from that guidance—we also found none.

**¶57** The State contends categorizing any new facilities in the mining site, such as shaft 10, would contradict the EPA's intent when it amended 40 C.F.R. § 122.29(b)(1)(iii) by adding two additional factors. To support this proposition, the State cites the EPA's discussion of the policy and application of the "substantially independent" factor in NPDES Permit Regulations, 49 Fed. Reg., 37,998, 38,048 (Sept. 26, 1984). But the EPA's guidance on the new rule establishes shaft 10 is a new source. Under the first of the two new factors, the EPA explains:

> [A] minor change[, such as a plant's installation of a new purification step in its process, like a new filter or distillation column,] would be integral to existing operations and would not require the facility to be reclassified as a new source. However, on the other extreme, if the only connection between the new and old facility is that they are supplied utilities such as steam, electricity, or cooling water from the same source or that their wastewater effluents are treated in the same treatment plant, then the facility will be a new source.

*Id.* Here, shaft 10 falls in the latter category as shaft 10 is not some insignificant process added to Resolution's mining site. Instead, shaft 10 is a brand new 7,000-foot-deep mining shaft. And though shaft 10 uses other facilities from other areas of the mining site to assist in ore production, such as Resolution's use of shaft 9 to pass mine drainage from shaft 9 to shaft 10, other pertinent facts show shaft 10 is a new source. Resolution modified several of these pre-existing structures, such as the Never Sweat Tunnel, to facilitate its $500 million investment in shaft 10. Further, Resolution also built shaft 10 over 300 feet away—laterally from shaft 9—to construct a new underground mining operation to extract copper from the new and as yet untouched ore body in the EPS.

**¶58** The EPA's guidance on the second factor—whether the source engages in the "same general type of activity as the existing source"—also cuts against the State's argument. Under the second factor, the EPA explains, "if the proposed facility is engaged in a sufficiently similar type of activity as the existing source, it will not be treated as a new source." *Id.* at 38,044. On first blush, Resolution's plans to use shaft 10 to mine copper appear to fall under the same type of activity at the mining site—specifically, copper mining. *See id.* ("For example, if a plant begins to produce a new product, e.g., nylon synthetic fiber, which is very similar to the product currently being produced by that plant, e.g., polyester synthetic fiber, using equipment that is essentially the same as the existing production equipment, this would likely be considered an existing source."). The EPA, however, goes on to explain, "Of course, to the extent the construction results in facilities engaged in the same type of activity because it essentially replicates, without replacing, the existing source, the new construction would result in a new source." *Id.* On this precise point, the State's argument collapses in on itself.

**¶59** Resolution built shaft 10, a completely new mining shaft, exceeding the depth of the nearest shaft (shaft 9) by over 2,000 feet bgs. And Resolution constructed shaft 10 approximately 300 feet away from shaft 9. Though Resolution repurposed shaft 9 to help facilitate mining in shaft 10 and no longer uses shaft 9 for mining ore, Resolution still has plans to expand shaft 9 by extending it to the same depth as shaft 10. And though Resolution has plans to stop using shaft 9 to extract copper ore, none of the parties have given us any reason to determine Resolution is using shaft 10 to replace shaft 9. Instead, Resolution built structures, such as shaft 10, to expand its mining site to begin mining the new, untouched ore body on the EPS—a feat BHP was unable to accomplish with the limited capabilities of older structures like shaft 9. Resolution also plans to use panel caving, a new and high-volume mining technique to access the untouched ore body, which Resolution's predecessors did not use when shaft 9 was producing ore. Resolution, thus, "replicated" the WPS when it constructed shaft 10 in the hopes of supplying over a quarter of our nation's copper needs. Indeed, the ALJ even referred to Resolution's site as being made up of "two non-contiguous areas," the EPS and the WPS, which the superior court adopted on appeal. Our determination is consistent with ADEQ's concession that "shaft 10 would be a new source" if it had been subject to independently applicable performance standards.

**¶60** Moreover, the State's use of other portions of the EPA's guidance is unconvincing and, in fact, supports a contrary result to the one it urges us to adopt. The State, for instance, cites to a portion of the EPA's guidance explaining the "substantial independence test was aimed at ascertaining whether an existing source which undertakes major construction that legitimately provides it with the opportunity to install the best and most efficient production processes and wastewater treatment technologies should be required to meet new source performance standards at that facility." *See* NPDES Permit Regulations, 49 Fed. Reg. 37,998, 38,043 (Sept. 26, 1984). Indeed, Resolution built shaft 10 well after 1982 and at a time when it had "the opportunity to install the best and most efficient production processes and wastewater treatment technologies." *See id.* And because Resolution "undert[ook] major construction" when it recently dug shaft 10, the facility, according to the EPA's own words, "should be required to meet new source performance standards." *See id.* And, as the ALJ aptly observed, the State's argument "that any new buildings, structures, facilities, or installations constructed at a copper mine that began operations before Subpart J was promulgated" is inconsistent with the regulatory framework and EPA guidance. A contrary result would mean Resolution could continuously sink shafts into its property and perpetually expand its mining site without being subject to NSPS so long as those structures were constructed on lands adjacent to its copper mining site.

**¶61** Accordingly, shaft 10—though not completely independent from other sources—is substantially separate to be classified as a new source under § 122.29(b)(1)(iii). Shaft 10, thus, is a new source and Resolution's mining site is subject to NSPS under 40 C.F.R. § 440.104(a).

## IX. To Comply With The CWA And For ADEQ To Permit Resolution's Site, Resolution And ADEQ Must Finalize The Ongoing TMDLs For Queen Creek, And Resolution Must Show The Site Will Comply With Applicable Water Quality Standards.

**¶62** The Tribe contends ADEQ may not issue the permit to Resolution because shaft 10 is a new source and Queen Creek is an impaired waterway. We disagree. Though permitting a new source for impaired waterways is more arduous, the CWA does not prohibit such an action. *See Friends of Pinto Creek v. U.S. E.P.A.*, 504 F.3d 1007, 1013 (9th Cir. 2007).

**¶63** Because shaft 10 is a "new source" within the meaning of 40 C.F.R. § 122.2, ADEQ may not renew the permit until: (1) ADEQ finalizes a TMDL plan for the receiving water segment; (2) Resolution demonstrates the existence of sufficient copper load allocations to allow for the proposed discharge; and (3) Resolution demonstrates the existence of water quality compliance schedules for the segment. *See* 40 C.F.R. § 122.4(i); *Pinto Creek*, 504 F.3d at 1012.

**¶64** The CWA preserves and restores the integrity of navigable waters by controlling both point and nonpoint pollution sources. 33 U.S.C. § 1251(a)(7). Point sources are discrete conveyances, including pipes, ditches, or other outfalls. 33 U.S.C. § 1362(14). "Nonpoint sources of pollution are non-discrete sources," such as agricultural runoff. *Pinto Creek*, 504 F.3d at 1011. Section 303 of the CWA requires states to identify waters not meeting applicable water quality standards. 33 U.S.C. § 1313(d)(1)(A). In Arizona, ADEQ prepares a list of those "impaired" waters and indicates the pollutant(s) causing impairment. A.R.S. § 49-232; *see also* 33 U.S.C. § 1313(d).

**¶65** CWA section 303 also requires states to determine the maximum amount of a given pollutant an impaired water can absorb but still meet water quality standards. 33 U.S.C. § 1313(d)(1)(C). Using this determination, ADEQ develops TMDLs for impaired waters. A.R.S. § 49-234.A. TMDLs are informational tools establishing attainment targets for pollutants, allocating discharge amounts, and aiding with attainment planning. *See* 40 C.F.R. §§ 130.2(e)–(i), 130.7(c); *see also Pronsolino v. Nastri*, 291 F.3d 1123, 1127–29 (9th Cir. 2002). TMDLs are comprised of a water's waste load allocation (WLA) and its load allocation (LA) plus a margin of safety. Overview of Total Maximum Daily Loads, Envt'l Prot. Agency, https://www.epa.gov/tmdl/overview-total-maximum-daily-loads-tmdls (last updated Aug. 31, 2022). WLAs represent the sum-total pollutant allocations for all point sources. In contrast, LAs are the sum total allocations for nonpoint and background pollution. *Id.*

**¶66** Special rules apply to permits authorizing a discharge into impaired waters. 40 C.F.R. § 122.4(i); *see also Pinto Creek*, 504 F.3d at 1011. Federal regulations broadly prohibit issuing a permit to a new source proposing to discharge into impaired waters. *See* 40 C.F.R. § 122.4(i); *Pinto Creek*, 504 F.3d at 1012. This ban, however, is not absolute. *Pinto Creek*, 504 F.3d at 1013. The relevant regulation reads in part:

> No permit may be issued:
>
> . . . .
>
> (i) To a new source or new discharger, if the discharge from its construction or operation will cause or contribute to the violation of water quality standards. The owner or operator of a new source or new discharger proposing to discharge into a water segment which does not meet applicable water quality standards . . . and for which the State or interstate agency has performed a pollutants load allocation for the pollutant to be discharged, must demonstrate, before the close of the public comment period, that:
>
> (1) There are sufficient remaining pollutant load allocations to allow for the discharge; and
>
> (2) The existing dischargers into that segment are subject to compliance schedules designed to bring the segment into compliance with applicable water quality standards.

40 C.F.R. § 122.4.

**¶67** This court reviews administrative regulations like statutes and interprets the regulations to further the intent of the enabling legislation. *Cooke v. Ariz. Dep't of Econ. Sec.*, 232 Ariz. 141, 144, ¶ 13 (App. 2013). The plain meaning of subsection (i)'s first sentence lays out a default rule: no permit may be issued to a new source causing or contributing to a violation of water quality standards. *Cf. State ex rel. Winkleman v. Ariz. Navigable Stream Adjudication Comm'n*, 224 Ariz. 230, 240, ¶ 24 (App. 2010) ("We look to the plain language . . . because it is the best evidence of the legislature's intent."). Under this rule, it would be nearly impossible for a new source to obtain a permit to discharge into impaired waters. But, when reading the regulation as a whole, the operator of a new source has two clearly defined steps it may take to show it will not "cause or contribute" to a violation of water quality standards. *Cf. Stambaugh v. Killian*, 242 Ariz. 508, 509, ¶ 7 (2017) (use context to interpret words and provisions).

**¶68** The EPA has interpreted 40 C.F.R. § 122.4(i)(1) and (2) to require a demonstration of sufficient loading capacity in a segment's WLAs to accommodate the new discharge in addition to the existence of compliance schedules. *In re: Carlota Copper Co.*, 11 E.A.D. 692, 765, 2004 WL 3214473, at *55 (EAB 2004). Stated more plainly, the party seeking the permit must show: (1) the segment's TMDL allocations can accommodate the proposed additional point source; and (2) existing point sources are subject to plans detailing the changes needed to bring the segment into compliance. *See Pinto Creek*, 504 F.3d at 1012–15. Once the operator of a new source establishes those two conditions, or if the director of the permitting department determines the department already has adequate information establishing those two conditions, the new source will not "cause or contribute" to continued water quality violations. 40 C.F.R. § 122.4(i).

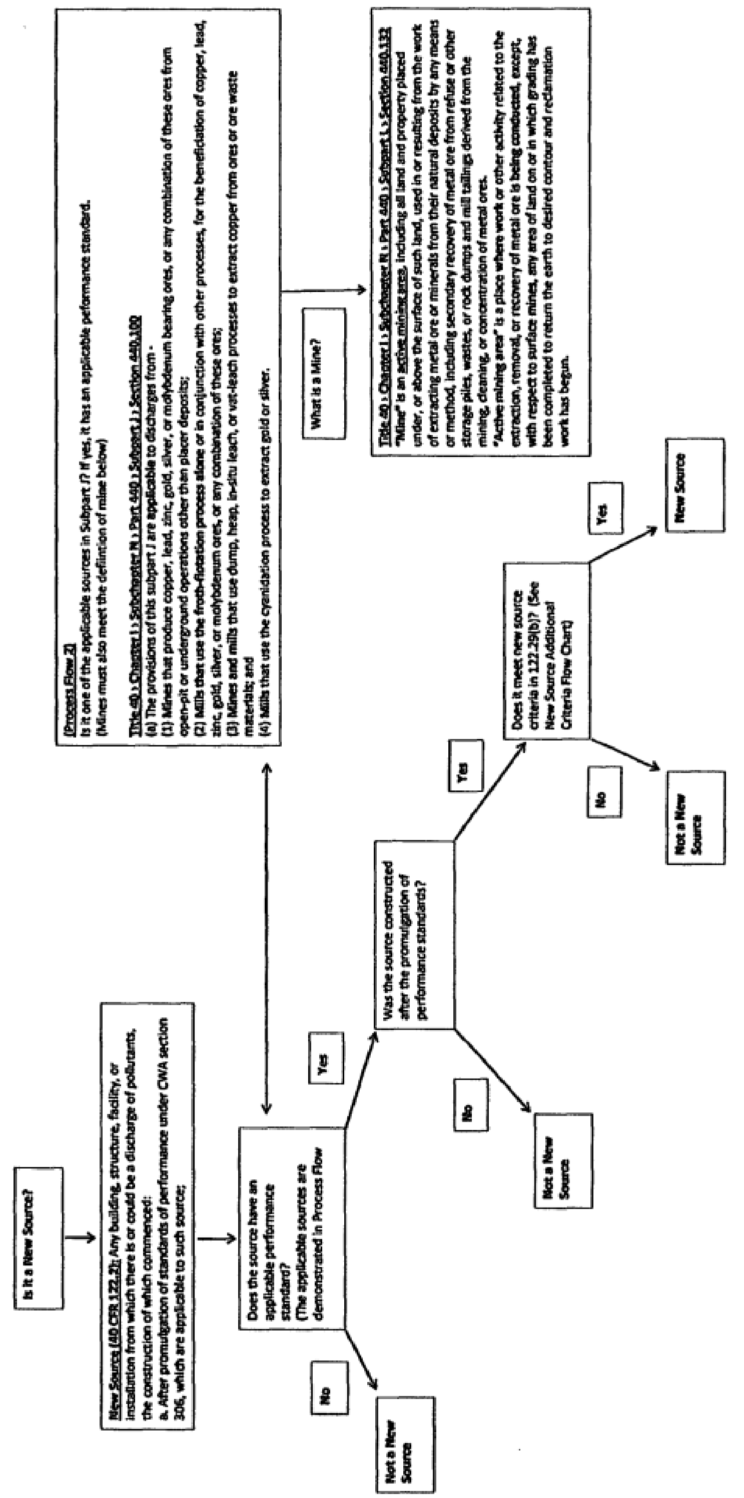
**¶69** Here, the CWA lists the tributary of Queen Creek—the proposed receiving water—as impaired for copper. Because of this impairment, ADEQ must finalize the TMDLs before issuing a permit for any new source. ADEQ, thus, erred in not finalizing the TMDLs before renewing the permit. *See* 40 C.F.R. § 122.4(i); *see also Pinto Creek*, 504 F.3d at 1012.

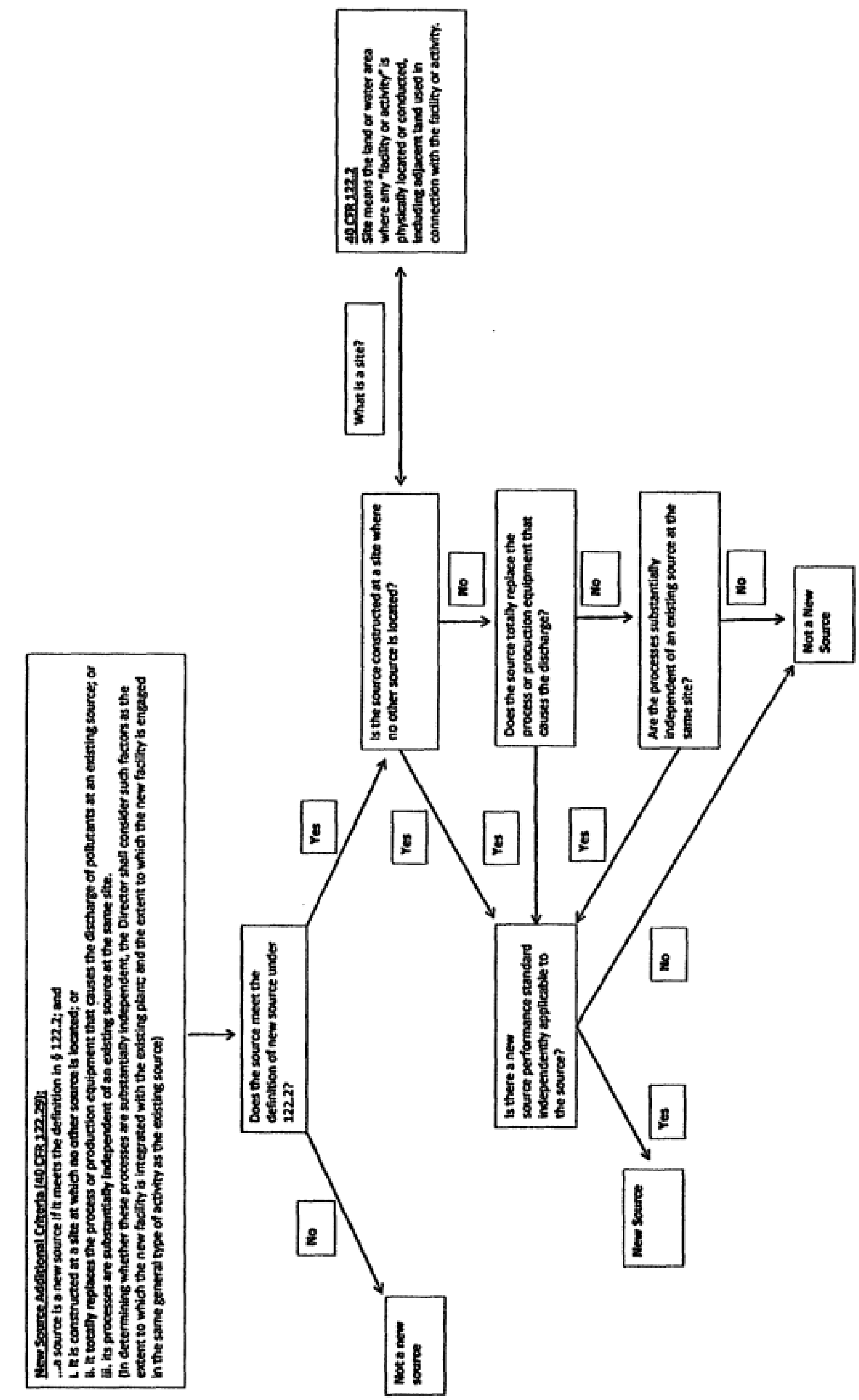
**¶70** The parties devote most of their briefings to whether shaft 10 is a new source. Resolution, however, preserves one argument pertinent to 40 C.F.R. § 122.4(i). Resolution contends a discharge by itself "would not cause or contribute to [the] impairment of Queen Creek." In support, Resolution points to Andy Koester, Manager of the AZPDES Permit Unit, who testified Resolution would not cause or contribute to a violation of water quality standards if their discharges do not exceed the limitations of the permit. Though this nascent argument does not directly address 40 C.F.R. § 122.4, it may suggest the federal regulation's prohibition against permitting new sources does not apply. And to the extent Koester's argument does, we disagree.

**¶71** This court gives meaning to every word and provision in a regulation, rendering none superfluous. *See Garcia v. Butler*, 251 Ariz. 191, 194, ¶ 12 (2021). Koester's testimony may be probative on whether the TMDL's load allocation can accommodate the proposed discharge—as required by 40. C.F.R. § 122.4(i)(1). Alternatively, the testimony may help demonstrate the existence of compliance schedules designed to bring the relevant segment of Queen Creek into compliance—as required by 40 C.F.R. § 122.4(i)(2). His testimony, however, does not allow us to ignore those requirements, essentially rendering them nugatory. Instead, Resolution must comply with all 40 C.F.R. § 122.4's requirements before ADEQ may issue an AZPDES permit. Further, during oral argument, Resolution said it is already subject to the most stringent standards for existing sources, so treating shaft 10 as a new source is merely a "labeling exercise." Indeed, Resolution may easily comply with applicable water quality standards. But the law still requires Resolution to show it can do so after ADEQ finalizes the TMDLs. Until then, ADEQ may not issue a renewal of the permit.

## CONCLUSION

**¶72** We vacate the superior court's orders and the decision of the Board upholding the validity of the permit. We remand this matter to ADEQ for further proceedings consistent with this decision.


Is it a New Source?
New Source (40 CFR 122.2): Any building, structure, facility, or installation from which there is or could be a discharge of pollutants, the construction of which commenced:
a. After promulgation of standards of performance under CWA section 306, which are applicable to such source;
Does the source have an applicable performance standard? (The applicable sources are demonstrated in Process Flow
No
Yes
Not a New Source
Was the source constructed after the promulgation of performance standards?
No
Yes
Not a New Source
Does it meet new source criteria in 122.29(b)? (See New Source Additional Criteria Flow Chart)
No
Yes
Not a New Source
New Source
(Process Flow 2)
Is it one of the applicable sources in Subpart J? If yes, it has an applicable peformance standard.
(Mines must also meet the defiintion of mine below)
Title 40 › Chapter I › Subchapter N › Part 440 › Subpart J › Section 440.100
(a) The provisions of this subpart J are applicable to discharges from -
(1) Mines that produce copper, lead, zinc, gold, silver, or molybdenum bearing ores, or any combination of these ores from open-pit or underground operations other than placer deposits;
(2) Mills that use the froth-flotation process alone or in conjunction with other processes, for the beneficiation of copper, lead, zinc, gold, silver, or molybdenum ores, or any combination of these ores;
(3) Mines and mills that use dump, heap, in-situ leach, or vat-leach processes to extract copper from ores or ore waste materials; and
(4) Mills that use the cyanidation process to extract gold or silver.
What is a Mine?
Title 40 › Chapter I › Subchapter N › Part 440 › Subpart L › Section 440.132
"Mine" is an active mining area, including all land and property placed under, or above the surface of such land, used in or resulting from the work of extracting metal ore or minerals from their natural deposits by any means or method, including secondary recovery of metal ore from refuse or other storage piles, wastes, or rock dumps and mill tailings derived from the mining, cleaning, or concentration of metal ores.
"Active mining area" is a place where work or other activity related to the extraction, removal, or recovery of metal ore is being conducted, except, with respect to surface mines, any area of land on or in which grading has been completed to return the earth to desired contour and reclamation work has begun.


New Source Additional Criteria (40 CFR 122.29):
...a source is a new source if it meets the definition in § 122.2; and
i. It is constructed at a site at which no other source is located; or
ii. It totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or
iii. its processes are substantially independent of an existing source at the same site.
(In determining whether these processes are substantially independent, the Director shall consider such factors as the extent to which the new facility is integrated with the existing plant; and the extent to which the new facility is engaged in the same general type of activity as the existing source)
Does the source meet the definition of new source under 122.2?
No
Yes
Not a new source
Is the source constructed at a site where no other source is located?
What is a site?
40 CFR 122.2
Site means the land or water area where any "facility or activity" is physically located or conducted, including adjacent land used in connection with the facility or activity.
Yes
No
Yes
Does the source totally replace the process or procuction equipment that causes the discharge?
Is there a new source performance standard independently applicable to the source?
Yes
No
New Source
Yes
No
Are the processes substantially independent of an existing source at the same site?
No
Not a New Source

**P A T O N,** J., dissenting:

**¶73** While I concur with my colleagues as to the issues of mootness and the scope of our review, I respectfully dissent on two grounds.

**¶74** First, in determining whether a construction is a new source, I would approach the CWA regulations in the order they are presented in the text of the regulation. Specifically, I do not agree that we are required to determine whether Shaft 10 is a "mine" in order to determine whether it is a new source. Second, under either approach, I do not find that Shaft 10 is substantially independent of an existing source, and would therefore affirm the superior court's ruling.

## I. Correct Order of Application

**¶75** The parties have centered their dispute on whether Shaft 10 is a "mine" as defined by the independently applicable NSPS. But we would not reach this question if we let the regulations speak for themselves. The parties' constructed framework, adopted by the majority, does not follow the order the regulatory text provides. I am unpersuaded by ADEQ's interpretation of the regulations as presented in the Appendix A flowchart, and we are not bound to apply it. A.R.S. § 12-910(F).

**¶76** The three-step framework I would apply comes from the text of the applicable regulations and statutes, along with commentary from the EPA's 2006 memorandum summarizing its requirements for determining whether a source is a new source. *See* Memorandum from Linda Boornazian, Director Water Permits Div., Off. of Wastewater Mgmt., and Mary Smith, Eng'g & Analysis Div., Off. of Sci. & Tech., to Regional Water Div. Dirs., New Source Dates for Direct and Indirect Dischargers, at *3 (Sept. 28, 2006), (available at https://www.epa.gov/systems/files/documents/2021-07/newsource_dates.pdf) ("2006 Memorandum"). An agency seeking to determine whether a construction is a new source under the CWA should ask the following:

1. Does the construction meet the definition of a new source in 40 C.F.R. § 122.2? *See also* 33 U.S.C. § 1316.

    a. Has there been a construction of a "building, structure, facility, or installation" that does or will "discharge pollutants?" 40 C.F.R. § 122.2; *see also* 2006 Memorandum at *4.

b. Has construction commenced? 40 C.F.R. § 122.2; *see also* 2006 Memorandum at *5.

c. Did construction commence subsequent to the promulgation (or proposal) of standards of performance applicable to the source? 40 C.F.R. 122.2; *see also* 2006 Memorandum at *6.

If the answer to any subpart is no, the construction is not a new source.

2. If the answer to all subparts of Step 1 is yes, does the construction meet any of the following definitions of a new source in 40 C.F.R. § 122.29(b)(1)?

    a. Is the construction at a site at which no other source is located? 40 C.F.R. § 122.29(b)(1)(i).

    b. Does the construction totally replace the process or production equipment that causes the discharge of pollutants at an existing source? 40 C.F.R. § 122.29(b)(1)(ii).

    c. Are its processes substantially independent of an existing source at the same site? 40 C.F.R. § 122.29(b)(1)(iii).

    If the answer to all subparts is no, the construction is not a new source.

3. If the answer to all subparts of Step 1 and any subpart of Step 2 is yes, is there an "independently applicable" new source performance standard? 40 C.F.R. § 122.29(b)(2).

    a. If yes, the source is a new source. *Id.*

    b. If no, "*the source is a new discharge*." *Id.* (Emphasis added).

Section 122.2 determines whether the construction falls within regulated activity that *may* meet the new source definition. Section 122.29(b)(1) outlines the criteria for determining whether a source is a new source. And Section 122.29(b)(2) resolves whether the activity is a new source or, instead, a new discharge. It is this formula that I apply below.

## II. Applying the Correct Test

**¶77** As to Step 1, I am largely in agreement with the majority. If there is no new construction, there cannot be a new source. I agree that

Shaft 10 is a new construction, and that copper mining is clearly regulated by standards of performance under section 306 of the Clean Water Act. *See* 40 C.F.R. § 440.100. The majority, however, reads the requirement for merely "applicable" standards of performance under Section 122.2 in defining a new source with the requirement under Section 122.29(b)(2) for an "independently applicable" standard of performance for an entirely different purpose. *Supra* ¶ 30.

**¶78** As a result, the majority's analysis concerning whether or not Shaft 10 is a "mine" takes Step 3 out of order. Indeed, the majority and the parties take it as given that if there is an independently applicable new source performance standard, the construction necessarily meets the definition of a new source. *See supra* ¶¶ 30-32, 37-48; *but see* 40 C.F.R. § 122.29(b). But the text of Section 122.29 does not say this. Instead, it provides:

> A source *meeting the requirements* of paragraphs (b)(1)(i), (ii), or (iii) of this section is a new source only if a[n] [NSPS] is independently applicable to it. If there is no such independently applicable standard, *the source is a new discharger*. *See* [40 C.F.R. § 122.2].

40 C.F.R. § 122.29(b)(2) (emphases added). Section (b)(2) applies on its own terms *after* an agency finds that the definition of a new source in 40 C.F.R. §§ 122.2 and 122.29(b)(1) are met. *Id.*

**¶79** Section (b)(2) provides that the reason we look for an "independently applicable [NSPS]" is to determine whether we are looking at a "new source" or "a new discharger." There is no third option, and the regulation presumes that the regulator has made a determination as to the 'new-ness' of the source by the time it reaches (b)(2). *Id.* In other words, once the regulator gets to Step 3, if the new construction is not a new source, it is a new discharger. But the purpose of (b)(2) is *only* to determine whether the new source is, in fact, a new discharger, subject to distinct regulations from a source. *See* 40 C.F.R. § 122.2 ("New discharger"). And in interpreting the regulations here, we do not reach (b)(2).

**¶80** Further, in reading together Section 122.2's requirement with 122.29(b)(2)'s requirement, the majority and parties disregard the use of the word "independently," which only appears in Step 3 and not Steps 1 or 2. At Step 1, we are not concerned with whether a construction is a "mine" or not; we look at whether the "industrial categor[y]" is covered under regulations promulgated under Section 306 of the CWA. *See* 67 Fed. Reg.

31,129, 31,135. In 2002, the EPA clarified the purpose of regulations promulgated under Section 306:

> Effluent limitation guidelines and new source performance standards ("effluent guidelines") promulgated under section 304 and 306 of the CWA establish limitations and standards for specified wastestreams from *industrial categories*, and those limitations and standards are incorporated into permits issued under section 402 of the Act.

*Id.* (Emphasis added).

**¶81** Consequently, in determining whether Step 1 is met, we need not determine whether Shaft 10 is in the form of a mine because, as a category, ore mining—and copper mining, specifically—is regulated. *See* 40 C.F.R. § 400.100. The construction in question is of a building, structure, facility, or installation that will discharge pollutants. The "construction commenced" because Shaft 10 was constructed and ancillary changes were made from 2014 onward. Finally, the "construction commenced" after the new source date for ore mining—December 3, 1982. *See* 2006 Memorandum, Appendix B ("Ore Mining and Dressing"). Thus, I answer Step 1 in the affirmative; Shaft 10 meets the definition of a "new source" as described in Section 122.2.

**¶82** ADEQ and the mine argue that because the mining site as a whole has existed since 1912, unless there is an independently applicable NSPS to a mining "shaft" rather than a mining "site" or "mine," there cannot be a new source from the construction of Shaft 10. I believe this point is neither correct nor necessary for our purposes. *See supra* ¶¶ 37-48; *see also* 49 Fed. Reg. 37,998, 38,043-44. But rather than use this rule for its intended purpose and then look to Step 2 to narrow an otherwise broad definition, the parties, and the majority in turn, begin their test by combining parts of 122.2 and 122.29(b)(2) and muddling the purpose of both. The appropriate focus, as Step 2 provides, is not on abstract definitions of "mine" but on an inquiry into whether the construction is "substantially independent of an existing source at the site." 40 C.F.R. § 122.29(b)(1)(iii).

**¶83** I believe that Step 1 is met and proceed to Step 2. Step 2 asks whether the construction meets a more narrow new source definition pursuant to Section 122.29(b)(1). I agree with the majority that (b)(1)(i) and (b)(1)(ii) do not apply here, *see supra* ¶¶ 52-56, and thus proceed to (b)(1)(iii).

**¶84** Section 122.29(b)(1)(iii), or Step 2(c) in my framework, provides that a construction meets the definition of a new source if "[i]ts processes are substantially independent of an existing source at the same site." ADEQ must consider a minimum of two factors in making this determination: (1) "the extent to which the new facility is integrated with the existing plant," and (2) "the extent to which the new facility is engaged in the same general type of activity as the existing source." *Id.* A construction is not a new source if it merely *could* operate substantially independently, unless, in fact, it actually does. 49 Fed. Reg. 37,998, 38,044 (rejecting a test based on whether a facility could operate substantially independently).

**¶85** I would find on de novo review that Shaft 10 is not substantially independent from the existing source. Shaft 10 is "new construction but less than total replacement at existing facilities," *i.e.*, not a new source. *Id.* at 38,043.

**¶86** As to factor (1), I would first consider Shaft 10's integration with the existing facilities. The primary means of integration the majority has considered are the Never Sweat Tunnel and Shaft 9, which dewater and ventilate Shaft 10. Dewatering and ventilation are not mere "supplied utilities," but are essential to *and components of* the mining process itself that are not analogous to the list of utilities the EPA states are insufficient for an integration finding. As a former miner and Arizona Mining Reform Coalition advocate testified before the ALJ, dewatering is "essential to underground operations" because without it the water content of the surrounding earth would flood drilled tunnels. The use of Shaft 9, the Never Sweat Tunnel, and Shaft 10 for interlocking systems of ventilation and drainage are not mere utilities (nor are they in any sense "supplied" in the sense that electricity or cooling water are) but are part of the mining process itself and essential physical features of the mine structure.

**¶87** I note that even if dewatering and ventilation are mere utilities, the EPA has stated that these connections by themselves are insufficient for a finding that a construction is a new source, not that they cannot be considered as part of such a finding. *See* 49 Fed. Reg. 37,998, 38,043-44. Even assuming these are utilities, they nonetheless support a finding of the substantial integration of Shafts 9 and 10.

**¶88** Shaft 8 also assists in draining groundwater from Shafts 9 and 10, pumping the water through the Never Sweat Tunnel. Further, the mine plans to add additional tunnels for conveying ore to the West Plant Site, including a tunnel for that purpose planned for construction at a depth similar to the Never Sweat Tunnel that would connect directly to Shaft 10. Shaft 9 is also likely to be used for extraction of water itself, as well as development rock. Physically, in addition to the Never Sweat Tunnel, various drill holes connect Shafts 9 and 10, conveying water from Shaft 9 to Shaft 10.

**¶89** Looking at the industrial system as a whole, it is apparent that—whether or not Shaft 10 *could* function independently—it does not. Shaft 10 is designed to be fully integrated into the mining process, physically attached to Shaft 9 by lateral tunnels and the Never Sweat Tunnel, as well as to the West Plant Site by a tunnel yet to be constructed. In other words, there is little independent about the construction, and I would find that it does not meet the first half of the (b)(1)(iii), or Step 2(c) test, the extent to which the new facility is integrated with the existing plant.

**¶90** The EPA provides clarifying scenarios for the second half of the test in (b)(1)(iii)—whether "the construction results in the facilities or processes that are engaged in the same general type of activity as the existing source." 49 Fed. Reg. 37,998, 38,044; 40 C.F.R. § 122.29(b)(1)(iii). In the first scenario, if a plant begins to produce a new product that is very similar to the product currently being produced, it "would likely be considered an existing source." 49 Fed. Reg. 37,998, 38,044. But if a plant producing a final product in an industrial process adds new equipment to produce raw materials for that product, it would likely be considered a new source. *Id.* A second analogy concerns whether the construction "replicates, without replacing" the existing source. *Id.* The regulations give the example of opening the second of two power plants at the same site and concludes the second is a new source. *Id.* But there is no similar replication here. The Magma deposits are exhausted. It is not possible to open a second "factory" when the first is largely shuttered. There is no evidence suggesting why a mere change in mining technique should be determinative as to whether or not the "same general type of activity" is occurring. 40 C.F.R. § 122.29(b)(1)(iii). The function of the source is still the same—copper mining. Consequently, I would find that in weighing the two factors that the EPA has expressly required ADEQ to consider, Shaft 10 is not substantially independent and, therefore, cannot be considered a new source.

**¶91** Thus, I would not reach Step 3 of the new source framework I outlined, which would require us to determine whether Shaft 10 is a new source or a new discharge. Such a consideration is unnecessary because Shaft 10, as a construction, is part of an existing source.

**¶92** The majority concludes differently for a few reasons, the first being that Shaft 10 is at least 300 feet away from Shaft 9. In this fact-specific inquiry, Shaft 9 is physically connected across those 300 feet with drill holes that drain water into Shaft 10 for pumping. In this context, 300 feet of separation means little when the physical architecture is nonetheless connected, and the site as a whole relies on interconnected mechanisms for ventilation and dewatering. Further, the Never Sweat Tunnel itself, connecting Shaft 9 and the West Plant Site, is roughly 10,000 feet in length. The scale of the mine's architecture dwarfs the distance between the two shafts. Shaft 10 is merely one component of a revised industrial process—the start of the copper mining process that is continued at various plant sites.

**¶93** Second, the majority suggests that Resolution has "'replicated' the [West Plant Site]" by constructing Shaft 10. *Supra* ¶ 59. In so doing, the majority suggests that the sheer volume of copper supply expected of Shaft 10 is relevant. This is at odds with EPA guidance which provides "if a facility increases capacity merely by adding additional equipment in one or two production steps to remove a 'bottleneck'" it is not a new source. 49 Fed. Reg. 37,998, 38,044. I also disagree with the majority that the cost of construction or future plans for Shaft 9 weigh in favor of finding Shaft 10 substantially independent. *See supra* ¶¶ 56-60. In my view, the former matters little and the latter demonstrates integration all the more. If the majority means to suggest that the cost somehow demonstrates that Resolution could have installed better equipment, I disagree. Facts such as where filtration equipment is installed in the dewatering or pumping process as installed in Shaft 10, or whether the technology has greatly changed since the last permit are not before us, and we therefore cannot make such a judgment even on de novo review.

**¶94** Nor do I make much, as the majority does, of the change in mining technique from adits and tunnels to panel caving. *Supra* ¶ 59. The regulations do not distinguish between existing and new sources by way of method, and I cannot find anything in the record that would allow us to make such a determination on de novo review.

**¶95** The EPA guidance states that "if a power company builds a new, but identical and completely separate power generation unit at the site of a similar existing unit, the new unit will be a new source." 49 Fed. Reg. 37,998, 38,044. Accordingly, the majority makes much of Resolution's goal of mining a new orebody. But as was testified to before the ALJ in this case, "[a] mine is constantly constructing . . . [t]hat's the nature of a mine." A mine is always "blasting, moving, or blasting more" and while ADEQ applied this fact to the wrong component of the analysis (*i.e.*, Step 1) it is relevant to my determination of Step 2: digging a new shaft to pursue more ore is not replication or duplication. *See* 49 Fed. Reg. 37,998, 38,044. Instead, it is the continuation of an industrial process as an existing source, or at most an expansion of capacity as permitted without the finding of a new source. *See id.*

**¶96** Again, to be fair to the majority, the EPA's list of analogies from 1984 is underinclusive. *See* 49 Fed. Reg. 37,998, 38,043-44. When dealing with complex industrial systems, looking for tidy analogies to only a smattering of categories such as "factory" or "power plant" is not always helpful. And if we and the parties are left asking ourselves (as we did at oral argument) "just how is a mine like a dentist's office," one might reasonably question the usefulness of analogies at all. Nonetheless, to the extent these analogies are persuasive, they point to Shaft 10 being a component of a larger existing industrial process, not an independent construction.

**¶97** Whatever a decision to mine another nearby ore body is, it is certainly not akin to opening a new power plant. The product of a mine is ore. It is necessary to move earth to get it and thus a mine will be continually constructing by adits and tunnels or otherwise. A mine by its nature will—as Resolution's senior manager of Environment Permitting and Approvals testified before the ALJ—"chas[e] the vein" as Magma did for decades, moving from west to east "in search of new orebodies." Shaft 10 is more of the same.

**¶98** The ore itself is a necessary input for this industrial process and is a substantially similar input as that which Magma sought prior to the construction of Shaft 10. Shaft 10 is not a full replacement of the facilities already present, as it relies heavily on Shaft 9, the Never Sweat Tunnel, and the panoply of facilities at the site to perform its function. Its mechanisms rely on, and in turn, support through Shaft 9, in dewatering and ventilation. Both processes are essential to ore mining and are not mere "utilities" ancillary to the process. *See* 49 Fed. Reg. 37,998, 38,043. It is in the nature of the mine as it existed before Shaft 10 to pursue ore and therefore Shaft 10 is not substantially independent.

**¶99** In short, I find that Shaft 10 is not a new source that would require ADEQ to issue TMDLs before permitting discharge from Shaft 10. Because we must affirm an agency's decision "if there is substantial evidence in support thereof, and the action taken by the agency is within the range of permissible agency dispositions authorized by the governing statute," I would affirm the ruling of the superior court notwithstanding the fact it, and ADEQ, performed the new source analysis incorrectly. *Holcomb v. Ariz. Dep't of Real Estate*, 247 Ariz. 439, 446, ¶ 26 (App. 2019).

**¶100** I respectfully dissent.