THE UNIVERSITY OF ARIZONA

NEW ACADEMIC UNIT – APPROVAL REQUEST

I. Campus and Location Offering – indicate by highlighting in yellow the campus(es) and location(s) where this academic unit will reside.

UA South Campus	UA Main	Phoenix Biomedical Campus
Sierra Vista	Tucson	Phoenix
Douglas	UA Downtown	
Mesa		Distance Campus
Pima CC East		Chandler
Pinal County		Paradise Valley
Santa Cruz		Yuma
UA Science and Tech Park		

II. Academic College—Provide the name of the academic college where this unit will be housed.

UArizona Minerals: School of Mining Engineering and Mineral Resources
College of Science and College of Engineering (equal partners)

III. Purpose and Activities of the Unit

Executive Summary:

The Challenge and Opportunity

- **Responsible and sustainable production and use of mineral resources underpins modern civilization and healthy communities.**
- **Demand for mineral resources and mining talent is on the rise.** Demand for both increased production and recycling are driven by global population growth, economic development, and shift to low carbon economy. Demand for copper could grow 200% by 2050 due to renewable energy alone[1].
- **Arizona is a critical, global player in mineral resources and mining with world-class ore deposits, operating mines and mining technology companies.** Arizona is the largest copper producer in the US, producing 68% of the nation's copper, and is the 6th largest copper producer in the world. Arizona ranks 2nd in the US for non-fuel mineral production overall[2].
- **There is a widening gap between the talent and innovation needed, and what universities provide.** Mining and minerals skills of the future are broader and more sophisticated, requiring curriculum refresh, interdisciplinary programming, and attracting a broader range of disciplines to apply their talent to mining and minerals.
- **While demand for talent is on the rise, the list of universities that provide mining and minerals talent is shrinking.** With the shift in commodities demand, many mining programs in 'coal country' have been hard hit and unable to survive (programs tend to be tied to what's mined nearby). UArizona is among the few operating from a position of strength.
- **UArizona is uniquely positioned to be a global leader in sustainable mining and use of mineral resources.** By virtue of expertise, breadth, location, and partners. UArizona could develop a global reputation as a leading provider of talent and innovation for 'Climate Smart Mining'[3].

- But a new model is needed to realize our potential. Siloes – disciplinary or organizational, are widely recognized as standing in the way of achieving the sea change needed. Multiple stakeholders and partners see the need and support the creation of a new transdisciplinary, collaborative approach to minerals education and innovation.
- The time is now. The importance of minerals is increasing, demand for a new kind of talent that few can provide is rising. UArizona + Arizona's mining and minerals ecosystem has what it takes.

Proposed Solution: a new interdisciplinary School

Local strength, global impact.

Breaking down siloes between existing programs and extending integration and interaction to other programs like business, social and environmental sciences, and rallying students and faculty around a real-world challenge rather than a single discipline, could not only improve the sustainability and competitiveness of each individual program, but also improve the quality of education, increase research output, bring visibility to an important topic and enhance the student experience.

At a faculty and researcher briefing & feedback session held in January 2021, 86% of responders agreed or strongly agreed that this is an important initiative for UArizona, and 83% of responders agreed or strongly agreed they would like to participate in this initiative.

Our Mission: *We transform the way students, professionals, and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources.*

Program areas:

- Partnerships and Networks. Connecting people – across campus and around the world. Increase collaboration across campus, with other universities, industry, NGOs, and communities; develop a global network of experts.
- Curricular Innovation & Global Access. Creating a dynamic, holistic, and integrated education experience for lifelong learning, from undergraduate to professional, in Arizona and globally accessible.
- Research and Innovation Hub. Stimulating collaborative, interdisciplinary research to become the go-to expert and solutions provider and preferred research partner for important issues like water and energy optimization; tailings management; social, environmental, and governance; and application of AI and analytics.
- Student Success. Helping students navigate mining and minerals education pathways, extracurricular activities, and connecting those to career options and opportunities.
- Community Outreach and Engagement. Increasing mineral resources literacy among K-12 teachers and students, and the public, to promote related studies and produce informed natural resources consumers.

Measuring Success:

- Students: enrollment, support, and completions
- Research: expenditures, proposals, papers
- Reputation: ranking, visibility (media)
- Partnerships: external organizations, faculty affiliation

- Funding: state, federal agencies, industry, philanthropy (diversified sources)

Key Financials:
Startup (year 0):

- Received: $3M philanthropy endowment, $1M philanthropy expendable capital
- Committed: $4M philanthropy expendable capital (signed gift agreements in place)
- Requested: $4M state (one-time) UArizona's FY2022 budget "New Economy Initiatives", and Senate Bill 1788.

At year 5:

- Income: $ 4,385,150; sources: Tuition revenues, research IDC, auxiliary services, philanthropy
- Expense: $ 4,136,171; categories: Faculty 42%, Staff, 24%, Student support 16%, Research investment 14%, Operations 4%
- The school design allows flexibility to experiment, and scale up or sunset programs based on performance, as well as funding.

A. Identify the basic goals and objectives of the new unit.

Demand for Mineral Resources and Mining talent is on the rise

Demand for mineral resources is increasing due to global population growth, the shift toward clean energy, increasing reliance on technology, and infrastructure development needs, as well as growing concern over securing domestic supply of the mineral resources we rely on every day.

A low-carbon future will be highly mineral intensive because clean energy technologies need more materials than fossil-fuel-based electricity generation technologies. Graphite and lithium demand are so high that current production would need to ramp up by as much as 500 percent by 2050 just to meet demand[4]. Copper is required for every major green energy technology, as well as storage and power transmission. Beyond energy, mineral resources are also required for other rapidly expanding technologies like medical devices, computing and communications networks, transportation, and manufacturing. Sand and gravel are needed to make the concrete ubiquitous in infrastructure.

With so many demands for mineral resources, optimizing supply has never been more important. This includes improving the safety and efficiency and reducing negative environmental and social impacts of primary production (mining), as well as finding new methods of recovering minerals from non-traditional sources (e.g., brines, waste), and overall innovation regarding how we manage resources, how we make and use products, and what we do with the materials afterwards (recycling and circular economy). It is important to note that while advancing the recycling and reuse of minerals can play an important role in meeting demand, mining will still be required to supply critical minerals needed so there is a need to meet remaining primary demand in the most effective, and environmentally and socially responsible manner.

Many of the necessary advances to safety, efficiency, and environmental mitigations are expected to come from technological innovations. Advances in use of geothermal and other green energy in operations, electric fleets, autonomous and continuous mining, use of analytics and artificial intelligence to optimize water and energy-intensive mineral processing, even deep-sea mining robots that can mine in ways less disruptive to delicate ecosystems are a few recent or in progress mining innovations. Additional potential exists for space mining, recovering minerals from waste, offsetting carbon emissions through geological carbon sequestration, as

well as recycling innovation like Apple's iPhone rare earths recycling robots or recovering cobalt and lithium from spent lithium batteries.

Mineral resources, mining and mining technology are also important to the economic development of the communities that hold the resources, whether in developing nations or right here in Arizona, bringing infrastructure like schools, hospitals, and water treatment facilities to the former (and even in rural US communities), and jobs to both. Ensuring maximum and equitable benefits to communities remains a complex challenge.

Arizona is a critical, global player in mineral resources and mining

Given growing concerns over security of supply of critical minerals, domestic mining activity is expected to increase. In fact, Arizona was recently ranked 2nd in the world for mining jurisdiction attractiveness[5], and companies from mineral resources-rich Australia are expanding investment in exploration here in Arizona[6]. Arizona is the largest copper producer in the US, producing 68% of the nation's copper, and is the 6th largest copper producer in the world. Arizona ranks 2nd in the US for non-fuel mineral production overall[7].

With so much at stake globally and here, in Arizona, it only makes sense that many of the advances required to ensure the workforce and innovation needed for a secure supply of responsibly sourced minerals would come from the University of Arizona.
While UArizona has long been a leader in mining and mineral resources workforce development and innovation, meeting the complex needs of the future requires a whole new level of preparation. Finding and extracting these minerals is growing more complex; the easy deposits have already been mined. Remaining deposits are deeper underground, lower grade ore, and are in difficult locations representing access or geopolitical difficulties, or simply the "not in my backyard" challenges that come with mining closer to communities. There are also growing environmental, social and governance concerns over issues like carbon emissions, wise land use, impact to biodiversity and ecosystem services, water and energy consumption, community health and safety, protection of cultural heritage sites near mine sites, and ethical sourcing. Manufacturers of everything from automobiles to cell phones face pressure from investors and consumers to ensure the materials they use are obtained in an ethical and sustainable way.

There is a widening gap between the talent and innovation needed, and what universities provide

Considering these gaps, it is no surprise that workforce is among the top three concerns expressed by global mining industry CEOs and other top industry leadership, according to interviews conducted as part of the discovery phase for the new school (see appendix). Industry interviews coupled with studies commissioned by industry bodies such as Minerals Council Australia and conducted by management consulting firms including Ernst and Young, and Deloitte, as well as articles and publications citing interviews with faculty from global minerals programs were consistent in their conclusions:

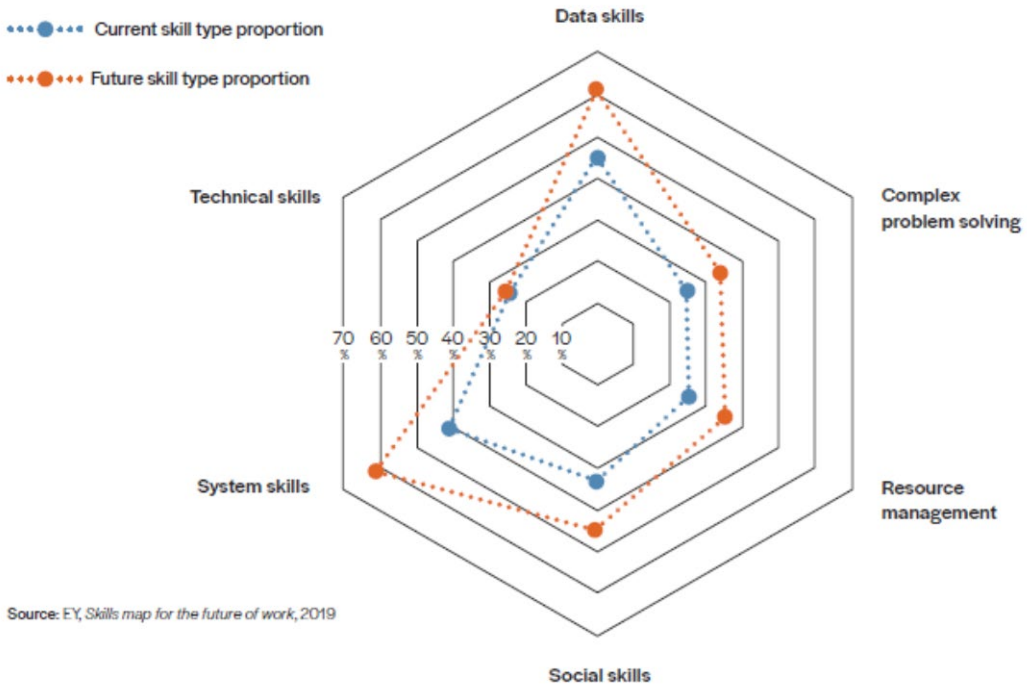


Fig. 1: Mining and Mineral Resources Skills of the Future are Broader and More Sophisticated

(1) Mining skills of the future are broader and more sophisticated, requiring more data, systems, social, complex problem solving, and resource management skills IN ADDITION TO traditional technical skills
(2) There is a perceived widening gap between industry and academia, with universities often seen as operating in isolation
(3) Mining curriculum is seen as outdated, and too narrow, failing to incorporate the latest technology, or emerging critical issues like environmental and social aspects
(4) Research is often seen as irrelevant, or takes too long (not practical to apply, or it is obsolete by the time it is finished)
(5) Minerals programs fail to attract the very best talent, and are currently facing critically low enrolments globally, with workforce shortages projected
(6) Finally, siloization and a lack of diversity in the workplace (in both disciplines and demographics) is not only hindering progress and innovation\ but is considered a threat. The industry is seeking diverse talent that can work and communicate across boundaries, with critical thinking skills and an appreciation for systems thinking to solve the complex problems of the future.

While interviews and studies largely covered industry (exploration, mine operators, supply-chain and consultancies) concerns, regulation and policymaking with respect to mineral resources are facing similar challenges and require the same investment in educational support. Likewise, ensuring sustainability of mineral resources relies not just on those who supply, regulate, and govern, but also the public. As such, it is equally important to engage with the public about limited natural resources and sustainability in a way that is relevant to their daily lives and that they can translate into personal decision making, so that they may become informed users of the resources they consume.

The list of universities that provide mining and minerals talent is shrinking

At the same time society's needs for mineral resources are increasing, and supply-side challenges are becoming more complex, the university programs that provide the talent and innovation needed to tackle these challenges and meet these needs are in decline. Mining Engineering programs in the US have halved since the 1980's and programs continue to close globally, with two of Australia's leading programs set to close this year. A 2018 study commissioned by Minerals Council Australia (MCA) warned of impending closures, "There is a genuine threat of program closure because of critically low enrolment levels in programs, which are also ... high cost to universities to run."[8] This is a global phenomenon. Enrollments typically fluctuate with the commodities cycle, and many programs struggle to survive downturns such as the current one – where enrollments in Australia, Canada and the US are down 50% or more from their respective peaks[9]. At the same time enrollment in Australian mining engineering programs was dropping, employment in the sector rose over 20%[10]. The same 2018 study by MCA predicted that by 2020, Australia would have only 25% of the mining engineers it needed meet existing project needs. The exception to declining mining engineering enrollment trends appears to be China University of Mining and Technology, which has more students enrolled in its mining engineering program than all US universities combined[11].

Small, but important programs like those that are related to mining and mineral resources are constantly at risk, and often lack the resources they need to modernize their programs or improve visibility and recruitment.

UArizona Mining and Minerals: Current State

Currently, UArizona offers the following mining and mineral resources specific degrees:

Mining Engineering BS
Mining, Geological, and Geophysical Engineering MSc, ME, PhD
Economic Geology MSc, PSM, PhD
Mining Law and Policy Concentration LLM, MLS

Currently, these programs operate largely independently of each other, with limited integration or interaction. This represents both a missed opportunity, and a risk. Currently, the courses and advising needed to attract students from important disciplines like hydrology, economics, data science and other engineering disciplines to mining and minerals related studies are not available.

Also, with such limited and targeted programs, most UArizona students do not get the opportunity to engage with the subject of mineral resources and mining and are therefore not well informed about the materials they use every day and how they are obtained, or related education and career opportunities.

According to a UArizona study conducted on UArizona students[12]:

- 72 percent agree mineral resources are important to their daily lives
- 74 percent are aware Arizona has active mines
- 66 percent are aware UArizona offers a Mining Engineering degree
- 67 percent say they know little to nothing about mining

A further study focused on UArizona freshmen engineering students[13] revealed that incoming students knew the least about mining engineering when compared to the 14 other majors they

could choose from. Correspondingly, they found it "very uninteresting." Overall, the study found a very strong correlation between knowledge of a subject and interest in the subject. After a 20-minute presentation on mining engineering, knowledge increased by 70 percent and interest tripled. Students will not choose to study something they know nothing about.

Similarly, students will not pursue a career in a field they do not know is a possibility for them. Back to the study on UArizona students as a whole, when asked if they were considering a career in the mining industry, about 95 percent said "no." When asked if they would consider a career in mining if one existed in their field of study, more than 60 percent said "yes." The mining and minerals industry employs a very, very wide range of disciplines but the myriad of possible education and career pathways are not well defined and lack visibility.

The problem of lack of awareness starts early. After a presentation on minerals, mining, education, and careers by the Lowell Institute for Mineral Resources' outreach staff, one local high school teacher remarked on a feedback form:

"Students are usually ignorant of what opportunities exist in the academia and, unless the academia reaches out to students, it is difficult for students to learn ahead of time what opportunities for their professional and academic growth exist. This presentation has certainly given motivation to some students to pursue with more determination higher education."

More robust high school and community college outreach has the potential to attract students who otherwise would not have considered higher education at all.

Considering the potential for broad student interest coupled with increasing demand for talent and declining supply, this is an area ripe for development.

UArizona has what it takes to be a world-leading mining and mineral resources university. But a new model is needed to realize our potential.

The University of Arizona has been a global leader in mining education since 1885, when mining was one of the university's two foundational programs along with agriculture. Today, the university has one of only 12 accredited mining engineering programs in the US and among the only economic geology and mining law programs.

UArizona also has leading programs in other critical disciplines required by mineral resources industries including environmental science, business, data science, social sciences, hydrology, public health, and policy, and a whole host of other engineering disciplines – meaning the UArizona is uniquely placed to cross-pollinate mining knowledge with other critical fields to provide the quality, depth and breadth of talent needed.

No other university in the US with an accredited mining engineering program has UArizona's proximity to world-class operating mines, ore deposits, and leaders in mining technology, and UArizona's industry partnerships are second to none.

Additionally, UArizona has created and sustained successful proof-of-concept interdisciplinary education programs including the Global Mining Law program, and interdisciplinary research centers such as Center for Environmentally Sustainable Mining, and other highly specialized,

solutions-oriented programs like the Geotechnical Center of Excellence.

Yet something is standing in our way. In a workshop with 10 faculty engaged in putting together this proposal, the current state of mining and mineral resources *education* at UArizona was described as siloed and unable to attract the quality or diversity of students needed. *Research* fared better, but still the group felt UArizona is not leveraging existing strengths to nearly its potential. Overall, the group felt a shared mission and goals, clear roadmap and dedicated leadership, and a more robust integrative framework and academic program support is needed to achieve the scope and scale of change required, and to sustain it.

Breaking down siloes between existing programs and extending integration and interaction to other programs like business, social and environmental sciences, rallying students and faculty around a real-world challenge rather than a single discipline, could not only improve the sustainability and competitiveness of each individual program, but also improve the quality of education, increase research output, bring visibility to an important topic and enhance the student experience.

Now is the time to connect and integrate UArizona's disparate mining and minerals programs into something truly world leading.

The School of Mining Engineering and Mineral Resources

Our Mission: *We transform the way students, professionals, and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources.*

Our Goals:

(1) **Elevate the status and quality of mineral resources related studies and research** to something the best students and faculty want to (are proud to) be a part of.

This will help us broaden the aperture of students, faculty and researchers who choose to become involved in the grand challenge of responsibly and sustainably supplying mineral resources. It will also help us attract higher caliber talent.

(2) Provide **transdisciplinary, integrated education and research** about sustainable mineral resource development and stewardship, covering the entire mining and mineral resources lifecycles.

Integrated, dynamic, and holistic. Unconstrained by traditional disciplines, the school will take an issue-centric approach to providing the mineral resources workforce and innovation of the future.

(3) Form **world-class strategic partnerships** to leverage the talent of global experts across industry, academia, NGOs, and governments.

We need to bring people together, providing the leadership and resources to build an international network of experts on mineral resources sustainability.

(4) Be a **thought leader** and a **change agent** on important issues to positively impact the way mining happens, improving economic, environmental, and social performance.

Be the go-to on issues pertaining to sustainability of mineral resources. As industry expressed it, "bring the new thinking" – but also create the talent capable of working across boundaries to influence and implement complex change.

B Describe the activities, projects, and programs that will be conducted by the new unit.

The new school is designed to provide an integrated, cohesive student experience and enhanced support for students, researchers and faculty pursuing mining and mineral resources related studies and research.

The school has five main **program areas**:

1. Partnerships and Networks
2. Curricular Innovation & Global Access
3. Research and Innovation Hub
4. Student Success
5. Community Outreach and Engagement

The school will also offer new **academic programs.** The intention of these new programs is to reach new audiences, create new interdisciplinary offerings, and improve accessibility.

The school will offer undergraduate, graduate, and professional development courses. Academic programs will not replace or duplicate existing degrees or programs, rather courses and curricula offered by the school will:

a) Complement current offerings through inter/transdisciplinary programs and modules that also incorporate in-demand soft skills and experiential learning
b) Address emerging needs of an inter/transdisciplinary nature that would be difficult or impossible for a single department to offer
c) Develop specific, industry or government agency requested professional development coursework that existing departments do not have the expertise, resources, or interest to develop.

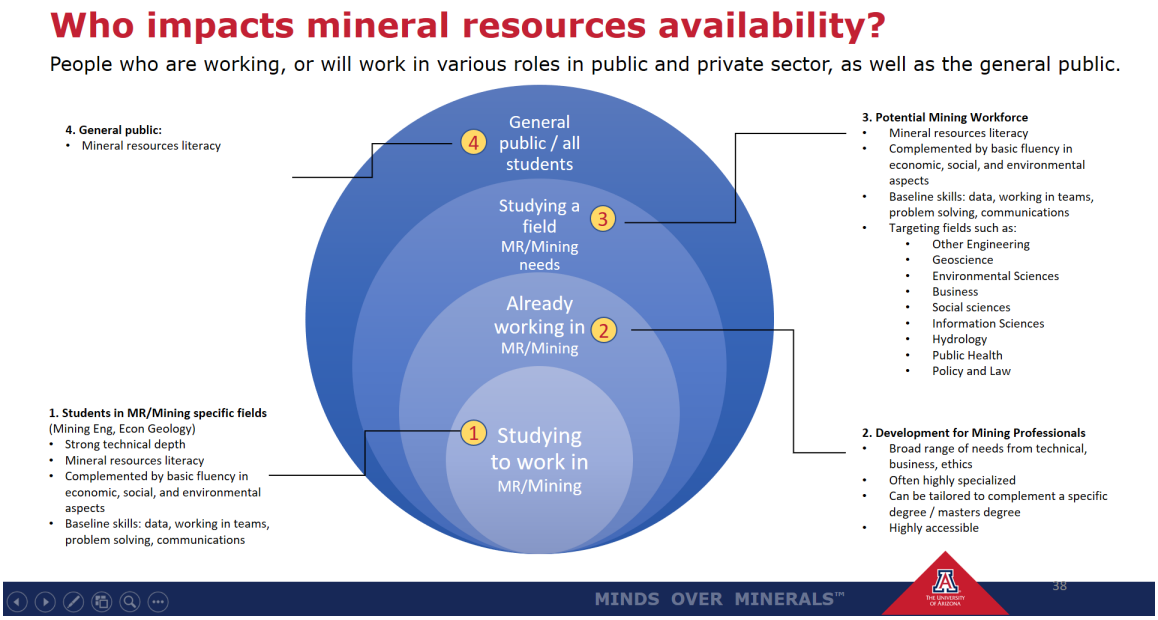
We anticipate that, within the first 5 years, the School would offer:

- At the undergraduate level: 1 new introductory course, 1 transdisciplinary minor including 5 new courses, 3 certificates
- At the graduate level: 1 new introductory course, 1 transdisciplinary minor including 3 new courses, 5 new certificates, and 1 GIDP
- 12 new professional development courses
- And 12-15 "modules" to be incorporated into existing courses at the undergraduate and graduate levels.

Above subject to market demand, and approval by required parties. We anticipate submitting our first academic program proposals in Fall 2021.

Additionally, the school will support curricular innovation in existing departments offering mineral resources related degrees or courses via support services for member, associate, and affiliated faculty.

Our target audiences for academic programs include all of the following:



A high-level description for program areas and academic programs follows.

(1) Partnerships and Networks	
Objective:	*Connecting people – across campus and around the world.* Increase collaboration across campus, with other universities, industry, NGOs and communities; develop a global network of experts
Activities:	Faculty and Researcher Connect: The School will serve to connect and communicate with faculty and researchers on a regular basis and as needed in order to: • Educate and engage a broader group of faculty on education and research opportunities around mining and mineral resources, both at UA and around the world • Provide a forum for exchanging information and ideas • Provide opportunities and a platform for showcasing and communicating success stories in education and research • Create a global network of experts The School will organize summits and events that bring people together (detail follows), help to monitor and curate internal and external events of interest, research opportunities, contests, and to communicate via department and proprietary listserv(s), website, newsletter, relevant

	association, society and industry media, and social media. The School will maintain an online, searchable faculty and researcher directory. Strategic Partnerships: The School will proactively work to identify, establish, build, and maintain targeted relationships with industry, academia, NGOs, governments, and communities to further the mission of the School, specifically to: • Secure internships, cooperative education, and research opportunities • Deliver timely and relevant solutions to complex stakeholder challenges • Identify needs, interests, and value propositions for development of specific programs, proposals, and agreements • Expand the School's reach, influence, and improve visibility • Secure financial support
(2) Curricular Innovation and Global Access	
Objective:	*Creating a dynamic, holistic, and integrated education experience for lifelong learning.* Prepare students and professionals with the breadth and depth of knowledge, skills and abilities needed in the future. Additionally, with the number of mining programs shrinking around the globe, this presents a unique opportunity for online and distance learning.
Activities:	The school will provide expertise and/or coordination support to member and affiliated faculty to complement existing degrees with interdisciplinary programs for knowledge and skills needed in the future, providing tools and resources needed to enable inter/ transdisciplinary education, best practices in instructional design and teaching, experiential learning. Specifically, • Monitor's student and stakeholder needs, update and improve existing courses and creating new offerings • Creates adaptive education pathways for students and professionals. Ensures new curriculum is successfully mapped to the student journey • Provides a new course development and course revision framework (methodology), expert resources (instructional designers, etc.), and financial compensation to ensure school-affiliated curriculum is developed and maintained to the highest standards • Works with member and affiliated faculty and identified subject matter experts both to develop modular content and to integrate the content into existing coursework (for example, integrating a case-based data science exercise into a reclamation course); engages world-wide subject matter experts.

	• Adapts or develops courses for specific international audiences and needs • Ensures development and maintenance framework integrates external stakeholder (industry, govt agency) input • Ensures maintenance framework successfully integrates latest research • Provides regular assessment and quality assurance
Academic Programs	
Introductory / General Education (undergraduate and graduate levels) (3 units)	Purpose: introduce a wide range of students to the topic of mineral resources, raise interest in pursuing studies in related fields (like majoring in mining engineering) and/or enrolling in the transdisciplinary minor. Improve natural resources literacy and create a generation of informed resource users. Could be part of a natural resources or sustainable development series to increase reach. The school will offer both an undergraduate, and graduate level course under its own prefix. Description: Entry level course that contextualizes mineral resources – what they are used for and questions of consumption, how they are acquired and challenges around traditional and new methods of production/acquisition, manufacturing, and recycling (future focused). (1) Mineral resources and their uses, consumption patterns and growing demand, current and future supply mix (production, recycling) (2) Where minerals happen and how we find them, responsible exploration considerations (3) Should we mine here?: assessing impacts to environment, social (health, culture and economic), resource economics, geopolitical and regulatory issues, and the economics of the feasibility study (4) How do we mine here?: difficulties due to nature of deposits, types of mines, processing, considerations in mine design, power and water, safety & workforce, digitization & workforce (5) What do we leave behind?: Reclamation, closure & repurposing, community sustainability (6) Manufacturing, recycling, and the circular economy: opportunities and challenges Optional companion course/activity: (undergraduate) Teaching GEOS 397a with education outreach project, offering UA students the opportunity to share what they know with K-12 students and the public This course content will be adapted for: • Individual modules for integration into other courses • General public, including K-12

Transdisciplinary Minor (undergraduate and graduate levels) (18 units)	**Purpose:** The minor is designed to attract a diverse range of students (diverse in terms of both demographics and disciplines) to broaden the aperture of who engages in mineral resources related studies. The minor will build on the introductory / general education course and provide students both holistic context and an opportunity to dive deeper into areas of interest (technical, social, environmental, economic) to complement their degree focus. The minor strives to bring diverse students together to learn to collaborate, problem solve, and communicate with people with different knowledge and perspectives. Ideally, experience with the minor will inspire students to study related topics at depth and explore career opportunities in natural resource development. The minor is envisioned to provide flexible options. **The school will offer both an undergraduate and graduate level minor.** The minor will consist of new and existing courses: at least 12 units across 3 different disciplines (largely existing courses in year 1). Some of the courses will be newly developed and owned by the School. Others will be existing courses offered by other departments. **For example,** an undergraduate economics student may choose to take: - Resources and Environmental Economics (AREC217) - Ecosystem Health and Justice (ENVS310) - Mine Examination and Valuation (MNE430) - The Economics and Social Connections to Natural Resources (RNR485) +3 unit experiential learning: (a) Internship or Cooperative education, or (b) Research project or research cooperative, or (c) community engagement or outreach (d) study or intern abroad +3 unit capstone: course (or) individual thesis-type project The capstone *course* will challenge students to work as a team to apply their knowledge, communications and presentation skills, analytics skills, and appreciation for diverse issues and talent on a project demonstrating an understanding of the technical, social, environmental, and economic aspects of the problem. The capstone *thesis project* will be an individual research project that demonstrates synthesis of multiple disciplines to solve a problem.
Certificates (Undergraduate, graduate, and professional) (9-15 units ea.)	Certificates will generally serve to provide breadth and context, or targeted topical specialization. Areas currently identified for development include: • Interdisciplinary Mineral Resources • Environment, Social, and Governance • Mining policy and law • Application of AI, Analytics and Automation in Mine Operations and/or Mineral Processing

	• Mine Safety and Health • Continuing education Mineral Resources for K-12 educators The school aims to offer 3-5 new certificate programs at each level over the first 5 years. This course content may be adapted for: • Standalone modules or for integration into other courses
Graduate Degrees	Likely not until year 3, options under consideration include: • Sustainable resources development GIDP • Mineral resources MBA
Professional Development	While not academic, this represents a lucrative opportunity to create industry-focused, targeted, and accessible programs that will also be attractive to students looking to gain a competitive advantage. Short courses, field courses and (as mentioned above) certificates are attractive options for employers. Being the educator of choice for the mining industry can lead to valuable partnerships and funding opportunities.
(3) Research and Innovation Hub	
Objectives:	***Stimulating collaborative research that could change our world*** Increase inter/transdisciplinary research, increase scope of awards, increase research with external partners
Activities:	The school will serve to break down barriers to inter/transdisciplinary research through: <u>Summits and Events</u> The School will strive to host **at least one large scale, world-class summit each year**. The summit will bring world-leading experts and diverse stakeholders together around themes and should provide opportunities for showcasing research, sparking ideas, prioritizing issues, and identifying education and research opportunities, student contest ideas, engaging students, networking and building relationships. The School will also organize and host **regular research seminars and/or conferences** and other smaller scale and sometimes targeted events with the purpose of building networks and relations, exchanging ideas across disciplines, sharing success stories and opportunities. Events will promote sharing across disciplines, and some will target students with the added objective of identifying student projects to showcase more broadly. <u>Projects and Contests for students</u> The school will organize and host **at least one large-scale contest bi-annually,** open to students globally. Contests will be sourced at the annual summit/event and emphasize interdisciplinary teams. Faculty mentors for

	UA students will be sourced from the school network. Judges will be sourced from global stakeholders. Contest winners will be invited to present at the annual summit/event. The school will help to curate research projects from strategic partners and establish an online forum for partners to submit project ideas for students. Faculty mentors for students will be sourced from the school network. Students will be eligible to apply for seed-funding through the school. Incubator / Seed-funding The incubator is where ideas enter the research and development pipeline. The incubator is meant to attract unconventional research and collaboration ideas, and encourage both students and faculty to engage in futuristic thinking. An internally competitive funding mechanism will allow faculty and students to put their ideas forward and compete for seed funding that will enable them to complete the exploratory work they need to do to compete for large contracts and grants, or proceed to the Strategic Initiative phase. • Applications will be reviewed by an internal committee, and external reviewers as needed (but generally recommended to engage others) • Proposals will be screened for alignment with school scope and then evaluated based on a predefined rubric (e.g. relevance, potential for future funding, partnership development, potential for interdisciplinary); protocols will be tiered according to award size • Awards will range from a few thousand dollars to $100,000 • Recipients will be required to present at school research seminars, annual summit, and a minimum of relevant conferences, as well as publish • Awardees will be eligible for mentorship from a member of the school's committee or affiliated faculty/researchers • A modified version of above will apply to students In addition to seed funding, the incubator will run regular (annual or semi-annual) workshops to help faculty/researchers learn how to create a successful mining or mineral resources proposal. Workshops will feature key guests from important funding agencies like NSF program coordinators/managers. Strategic Research Initiatives Provide faculty and researchers with the support necessary to develop interdisciplinary research ideas into areas of expertise where UA will be considered a go-to expert and solutions provider, and preferred research partner for important topics like water and energy optimization; tailings management; social, environmental, and governance; and application of AI

	and analytics. This approach builds on the Lowell Institute's experience establishing programs such as Geotechnical Center of Excellence. Specifically, to aid in the informed, continued development of the academic programs and to inform interested partners (universities, industry), we propose to pursue a mining and minerals **workforce intelligence initiative**, to better assess and monitor developing workforce trends and translate those into solutions. There is a significant intelligence gap in this space in the US. UArizona could become the national leader. There are two routes to a funded SRI: (1) An outside funder brings significant resources to the table • Projects must align with School scope and mission • Projects will be evaluated by committee to evaluate above and feasibility (2) A seed-funded project matures to a stage where it can demonstrate significant potential to: • Source its own funding through federal or state grants, industry projects/consortia/memberships/course revenues (becoming self-supporting in 3-5 years) • Develop a strategic partnership(s) or collaboration • Deliver an important product or solution • Applications will be reviewed by an internal committee, and external reviewers as needed (but generally recommended to engage others) • Proposals will be screened for alignment with school scope and then evaluated based on a predefined rubric based on above. Strategic Research Initiatives are expected to: • Develop courses and integrate research findings into existing coursework • Hire and mentor graduate students to help with research and teaching, and engage undergraduate students • Engage with other universities, industry, government, and the community • Present at school research seminars, annual summit, and a minimum of relevant conferences as well as publish • Source diversified funding to become financially self-supporting within 3-5 years • Report against KPIs semi-annually
(4) Student Success	
Objectives:	***Helping students navigate options and connecting them with opportunities and people that could change their lives.*** Attract more students, more diverse students, and better students. Help students achieve the mineral resources career placement of their choice by becoming the educator of choice.

Activities:	This program area will help to connect students to the 4 other program areas. The school will provide a new level of "connected advising" to help students: • Discover mineral resources related studies and opportunities • Navigate and customize education options and pathways • Connect education pathways with career options • Connect with internships, research projects, study abroad, scholarships, and people These services aim to support students who seek to maximize their college education opportunities, as well as provide that extra level of navigation assistance especially important to first generation and underrepresented students. A dedicated staff resource, as well as Core Member faculty will share responsibility for connected advising. Strategic partnerships can help connect students with industry and other professional mentors. Through our programs, future collaborative space and advisory network, we seek to create a cohesive yet diverse student community, connected by the common, challenging experience fostered by the school. Provision of scholarships and fellowships to attract the best students is included in the budget.
(5) Outreach and Engagement	
Objectives:	Increase mineral resources literacy among K-12 teachers and students, and the public
Activities:	Building off the Lowell Institute's existing minerals outreach education model and collaborating with other outreach on campus, the school will: • Partner to help develop, coordinate, and deliver engaging age & curriculum-appropriate outreach in classrooms, online and in other venues including civic organizations • Advance education through online K-12 education and creation of other materials with an Arizona focus but with national to global potential • Promote active (non-instructional) engagement through citizen science and similar means; potentially at all levels/groups • Work with and leverage other partners (e.g., foundations, museums, societies) to advance minerals understanding • Interact with and support educators (K-12, community colleges, other universities) to meet their needs; to influence curricula at state and national levels • Integrate education outreach with scholarship and fellowship opportunities to encourage students to engage in education outreach with K-12 teachers and students • Develop continuing education opportunities for K-12 teachers • Adapt general education curriculum for the public through a speaker series

C. Describe demonstrable partnerships and partnership support that arise from the creation of the unit.

Through support offered through the partnerships and networks framework, we expect to achieve closer partnerships with external partners, specifically:

- A Technical Advisory Committee comprised of members from industry, other universities, government agencies and NGOs will engage regularly to keep the school connected with stakeholders, providing guidance and expertise
- The school will actively identify high-value potential strategic partners and pursue relationships, financial and non-financial in nature; strategic partners may contribute expertise, research projects, internships, scholarships, and other financial support; strategic partners may be industry, government, other university, or NGOs
- Specifically, Strategic Research Initiatives like Environment, Social and Governance, or Analytics, AI and Automation have the potential to bring in industry sponsored memberships or contracts in the same manner as the existing Geotechnical Center of Excellence, and the Center for Environmentally Sustainable Mining. Pursuing program areas aligned with industry and other stakeholder interests will not only keep the school connected but funded.
- Having dedicated resources to develop partnership opportunities will allow us to monetize existing opportunities that we are currently unable to pursue, such as building out a comprehensive in-house professional training program for a major mining company (similar in scale to Caterpillar's Mining 360).

D. How does formal creation of this unit directly promote the fostering of collaborative and synergistic research and outreach beyond what is already happening on campus with existing entities?

Through the partnerships and networks framework, and the research and innovation hub, the school will serve to break down barriers to mineral resources related inter/transdisciplinary research by and to:

- Bring people together to ideate through seminars, summits, and events
- Communicate opportunities and success stories
- Competitive seed funding for students, faculty, and researchers
- Competitive funding and program management support for strategic research initiatives
- Incentives for collaboration with internal and external partners
- Contests and projects for students

Currently, the Lowell Institute runs minerals education outreach with K-12 students. By improving connective support through the school, education outreach could expand to integrate and promote other, related UArizona outreach in areas like College of Science earth sciences (GEOS and HAS), water (Water Resources Research Center), indigenous peoples and health in mining communities (Superfund/ENVS), Policy and Law (Natural Resources Users Law and Policy Center), Arizona Geological Survey, and The Gem and Mineral Museum.

E. Alignment of the proposed unit's purpose to the reporting unit and the University's strategic goals.

Pillar 1: The Wildcat Journey
Driving Student Success for a Rapidly Changing World

Through our student success framework, in conjunction with curricular innovation, the school is committed to providing students with accessible and adaptive education pathways, innovative and relevant curriculum, and arming students with the skills employers value most. The school will also help them navigate options and opportunities to connect with future success. The school also intends to contribute to the new general education curriculum and provide a new collaborative and innovative learning space.

Pillar 2: Grand Challenges
Tackling Critical Problems at the Edges of Human Endeavor
Through our research and innovation hub and curricular innovation frameworks the school will support the dual mandate to expand educational opportunities and address important societal challenges. The grand challenge is meeting the mineral resources needs of a growing population in an economically, socially, and environmentally sustainable way while lifting global living standards and transitioning to a low-carbon economy. This broadly includes aspects of space and the natural environment in a way that will fundamentally shape the future.

Pillar 3: The Arizona Advantage
Driving Social, Cultural, and Economic Impact
Mining is a significant economic driver in the state of Arizona, not only because of the natural resources but also the human capital represented in an exceptional cluster of companies with global reach. But it can be pursued in ways that do not align with social or cultural interests of the communities that hold the mineral resources. The school's draft mission statement: "We transform the way students, professionals and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources." The school will provide the means to incorporate social and cultural issues more holistically into mining and mineral resources related studies. Study abroad programs and community engagement projects can help students develop the social and cultural sensitivity they need to be a positive force in the workplace.

Pillar 4: Arizona Global
Redefining International and Setting the Standard for a Global University in the Digital Age
Through our curricular innovation and global access frameworks, the school will provide online courses to improve global access to mining and mineral resources education particularly in mining jurisdictions. Additionally, through the partnerships and networks framework the school will establish strategic partnerships with oversees universities, particularly in mining jurisdictions, for student and faculty exchange.

F. Documented support from affiliated faculty, department heads, and deans. At the college level, alignment of the proposed unit's goals and objectives to the college's recruitment plan and programmatic priorities.
Attached.

Clear statement of the evaluative criteria to be used in the comprehensive review. How will the proposed unit demonstrate success?

Pillar/Goal*	Metric
	Student enrollment

Curricular Innovation & Global Reach / Goal 1, Goal 2	Course offerings
Research & Innovation Hub/ Goal 1, Goal 4	Research expenditures
	Papers
	Proposals
Partnerships and Networks / Goal 3	Faculty (members and affiliates) & depts.
	Partners (Academia, Industry, Govt agency)
Student Success / Goal 4	Students supported
	Student completion
	Student placement
Outreach / Goal 1, Goal 4	Visibility
	Community Engagement

III. Resources

A. Faculty and Staff

1. Provide the name and employee ID of the unit head.

new Director – to be hired

2. List the name, rank, highest degree, primary department and estimate of the level of involvement of all current faculty and professional staff who will participate in the new unit. Also, indicate the position each person will hold in the new unit.

The school will use a faculty engagement model similar to GIDPs. In the early years, the school will look to utilize existing faculty to the greatest extent possible, with a limited number of potential strategic hires. Similar to GIDPs, the school will also engage faculty at different levels from across campus. Faculty membership levels are described below:

Category	Leadership	Instructional	Research
[Core] Members: *Joint appointments* with home department(s)	Director, Assoc. Directors (1.0-0.5 FTE)	Key instructors for school courses (0.2 FTE); Minor / GIDP / Program head (0.4 FTE); educational program directors (0.0-0.2 FTE)	Program/Center Directors; project leaders (0.2-1.0 FTE)
Members: actively engaged in school	Internal advisory board members,	Module instructors; capstone participants / leader (0-0.25 FTE);	PIs/co-PIs and others engaged in school / centers research with

Category	Leadership	Instructional	Research
mission ± recipients of school support	other standing committee members	certificate leaders (0-0.25 FTE)	school sponsorship (0.0-0.5)
Associate members: interested in school mission, participate intermittently	–	Instructors in non-school (but related) courses; guest lecturers	PIs/co-PIs etc. in school-related research
Affiliate members: interested in school mission	–	–	Willing to be listed
Professional affiliates: non-UA contributors to School activities	External advisory board members	DCCs and adjuncts involved in teaching / advising	External co-PIs, DCCs involved

Faculty recruitment is ongoing at this stage. **At a faculty and researcher briefing & feedback session held in January 2021, 83% of responders agreed or strongly agreed they would like to participate in this initiative.**

Faculty -- Leadership	**Position**	**FTE**
TBD	Assoc. Dir, Curricular Innovation	0.5
Mark Barton, PhD, Professor GEOS	Assoc. Dir, Lowell Institute	0.6
Faculty Members/Associates/Affiliates	**Name, rank, degree, department**	
Core Members	Mark Barton, PhD, Professor GEOS and Assoc. Director, Lowell Institute Moe Momayez, PhD, Professor, and Interim Head MGE* Brad Ross, PhD, Professor of Practice MGE* John Lacy, JD, Adjunct Professor, Law and Director, Global Mining Law Program* Eric Lutz, PhD, Assoc. Director Safety & Health, Lowell Institute TBH Mine Automation Professor, MGE (new hire in progress)	0-1.0
Members	Raina Maier, PhD, Professor, ENVS and Director, Superfund* Julie Nielsen, PhD, Assoc. Research Professor ENVS and Director, CESM* Jeff Burgess, PhD, Assoc. Dean, CoPH* Diane Austin, PhD, Director and Professor, School of Anthropology* Eric Seedorff, PhD, Assoc. Professor GEOS and Lowell Chair in Economic Geology*	0-0.5

	Phil Pearthree, PhD, Director AZGS* Ty Ferré, PhD, Distinguished Professor, HAS Pete Reiners, PhD, Professor GEOS and Assoc. Dean COS Carson Richardson, PhD, Sr Research Scientist AZGS Monica Ramirez, PhD, Asst. Professor ENVS Isabel Barton, PhD, Asst. Professor MGE Frank Mazdab, PhD, Researcher, GEOS Chad Williams, MSc Geotechnical Engineering, Asst. Director Geotechnical Center of Excellence Jenna White, MBA, Program Manager Environment, Social, and Governance, Lowell Institute TBC Professor, GEOS and Lundin Chair, Economic Geology (new hire in progress)	
Associate Member *(to be confirmed)*	Victor Garcia, PhD, Research Scientist AZGS *Alicja Babst-Kostecka, PhD, Asst. Professor ENVS* *Larry Head, PhD, Professor SIE*	var
Affiliates	Jaeheon Lee, PhD, Associate Professor MGE Gail Heath, MSc Geophysics, Sr Lecturer MGE John Kemeny, PhD, Professor MGE Kwangmin Kim, PhD, Assistant Professor MGE Victor Tenorio, PhD, Professor of Practice MGE Muhammad Waqas, PhD, Lecturer MGE Jinhong Zhang, PhD, Associate Professor MGE Mike Conway, PhD, Sr Research Scientist AZGS At least 50 more faculty with a track record in mining and minerals to be invited	var
Professional Affiliates	Various individuals from Freeport, Newmont, IDS, GroundProbe, BGC, Rio Tinto, and others.	var

**member of the Lowell Institute's existing advisory board*

Current staff who will participate in the new unit are presently with the Lowell Institute.

Professional Staff		
Jodi Banta	Program Manager	1.0
Mario Munoz	Recruitment & Advising Coordinator	1.0
Chris Earnest	Education Outreach Coordinator	1.0
DeeDee DuPlessis	Communications Specialist	1.0
Pat Waters	Accountant	1.0
Jenna White	Program Manager, Environment, Social, and Governance	0.6*

**target to increase to 1.0 in Y0/FY22.*

3. List the clerical and support staff positions that will be included in the new unit.

None

4. Project the number and type of new faculty and staff positions that will be needed by the unit during each of the next three years.

Faculty (FTE)	Yr1	Yr2	Yr3	Total
Director (nature of appointment TBD)	1.0	-	-	1.0
Members/ Affiliates*	5.0	+1.5	+0.4	6.9
Professional Staff (FTE)				
Program Coordinator	2.0	-	-	2.0
Instructional Designer	1.0	-	-	1.0

**Not necessarily new hires, just new participants in the School.*

B. Physical Facilities and Equipment

1. Provide the Unit address for the new department. Include the following:

Mailing address 1235 E James E Rogers Way
Building Name Mines and Metallurgy
Building # 12
Room 209
PO Box 210012
Zip Code 85721
Unit phone number (520) 621-2988

2. Identify the physical facilities that will be required for the new unit and indicate whether those facilities are currently available.
The Director and 2 staff hires can be accommodated within the Lowell Institute for Mineral Resources office in Mines Building Rm 209. Meanwhile, a feasibility study is underway to accommodate future growth.

3. List all additional equipment that will be needed during the next five years and the estimated cost.
Nothing beyond computer and telecom equipment is required.

C. Library Resources, Materials, and Supplies

1. Identify any additional library acquisitions that will be needed during the next three years and the estimated cost.
None

2. List any special materials or supplies, other than normal office supplies, that will be required by the new unit.
None

D. Other Information

1. Identify any implications of the proposed change for regional or programmatic accreditation.

None.

2. Provide any relevant information, not requested above, that will assist reviewers in evaluating this proposed addition.

The school will house the Lowell Institute for Mineral Resources, which currently resides within the College of Science. As such, relevant income, expense, staff and facilities associated with the Lowell Institute are part of the plan, but not all are included in the budget because they are handled separately.

E. Financing

1. Explain the university's plan for providing adequate financing for the unit.

Funding will come from 5 primary sources:
1. Tuition revenues
2. Research IDC
3. Auxiliary Services (continuing and professional development)
4. One-time funding from the state
5. Philanthropy, which will cover the difference between earned income and operating expense on an ongoing basis.

2. Identify potential sources for external funding for the unit.

State. One-time funds have been requested in FY22.
Philanthropy. Nearly $8M in one-time and multi-year gifts, including endowment funds, have been raised (received or committed) for the school and its programs from private individuals and corporations. Fundraising is on-going and laid out in (5) below.
Auxiliary services. Professional development courses and membership fees in Strategic Research Initiatives (like consortia) are anticipated to bring in hundreds of thousands of dollars each year. This is based on experience with existing Strategic Research Initiatives.

Advancing mining specifically will help secure continued and increased funding from industry and likely large national agencies. Expanding into circular economy and other supply chain issues like ethical sourcing will open up sources from private foundations, manufacturers and other national agencies, allowing for more diversified funding.

3. If state funds will be used, indicate whether new appropriations will be requested or existing appropriations will be reallocated. If reallocating existing appropriations, indicate where these will be drawn from.

UArizona's FY2022 budget request includes $4M for "New Economy Initiatives" allocated to the school.

Additionally, Senate Bill 1788 requests $4M one-time for development of the new school.

4. Complete the Budget Projection Form, projecting the operating budget for the proposed unit for the next three years.

Attached.

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5. Estimate the amount of external funds that may be received by the unit during each of the first three years.

Source	Y0/FY22	Y1/FY23	YR2/FY24	YR3/FY25
State	4,000,000			
Auxiliary Services	420,000	630,000	730,000	730,000
Philanthropy-Cash*	4,795,000	2,370,000	2,050,000	2,230,000
Philanthropy-Endowment**	3,000,000	2,000,000	2,000,000	2,000,000
Total	**12,215,000**	**5,000,000**	**4,880,000**	**4,960,000**

** Annual gifts + endowment income.*
***Additions to principal.*

6. Provide the unit account number (if previously assigned).
None.

IV. Additional Information --provide any other information not requested above that may be useful in evaluating this proposal.

See Appendix for organization chart, UArizona Design Team, high level job descriptions for new staff, Industry Advisory Committee, and list of Companies and Agencies consulted.

V. Required Signatures

Managing Unit Administrator: David Hahn, Craig M. Berge Dean, College of Engineering
(name and title)

Managing Administrator's Signature: _____ Date:_____

Managing Unit Administrator: Elliott Cheu, Interim Dean, College of Science
(name and title)

Managing Administrator's Signature: _____ Date:_____

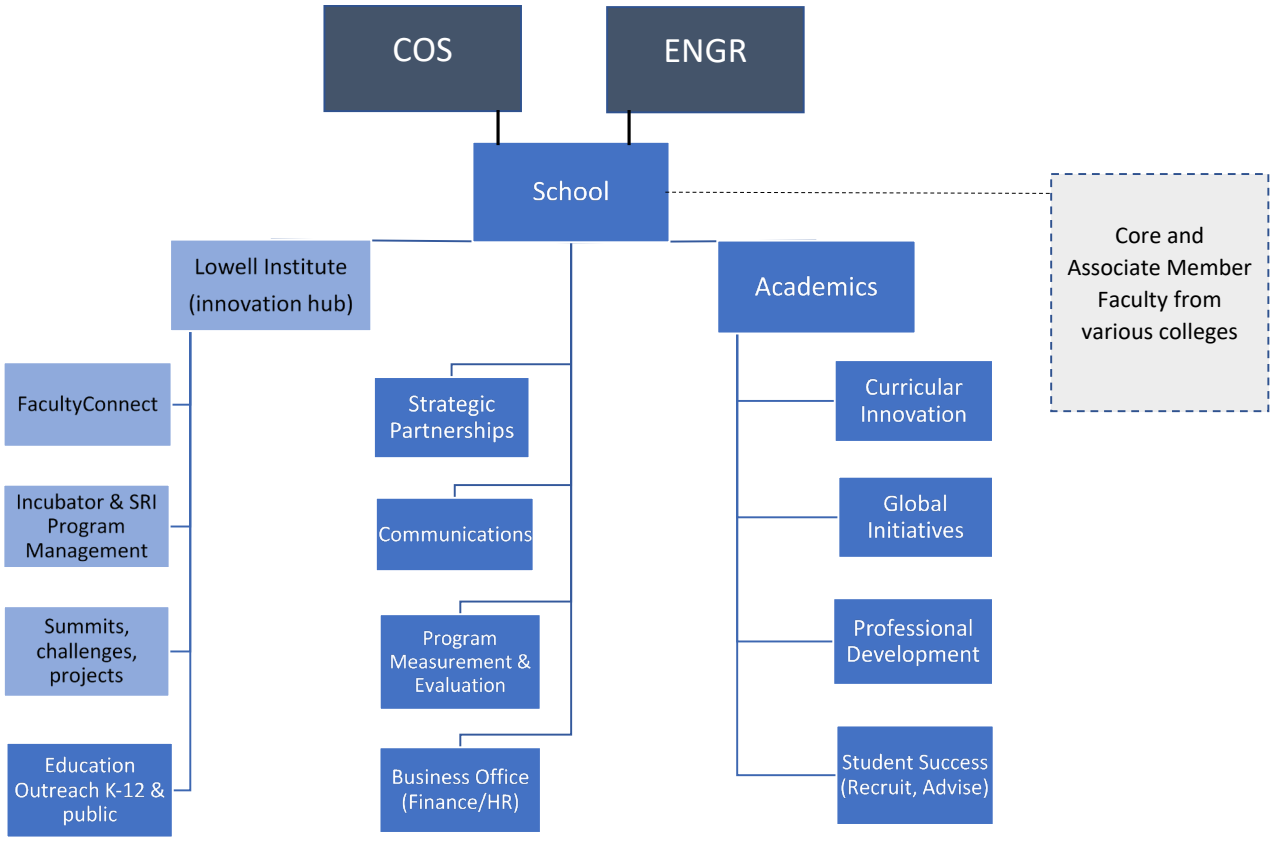
Dean's Signature: (above) Date:_____

All programs that will be offered through distance learning must include the following signature. The signature of approval does not indicate a commitment to invest in this program. Any potential investment agreement is a separate process.

Sarah Wieland, Assistant Vice Provost, Distance Education

Signature: _____ Date:_____

1. Proposed Organization Chart (Functional)



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2. High Level Position Descriptions for New Hires

Position & Time	Description
Director (1.0)	Acts as the face of the school-- actively builds internal and external networks of support and engagement, establishes world class connections, builds school reputation, secures diversified funding; responsible for building and overseeing academic, innovation and shared services -- assembles a team of superstars, responsible for financial management of the school; Establishes the School's place in UA ecosystem and connect School to other important programs/opportunities.
Associate Dir, Academics (0.5)	A Core faculty member, owner of at least one academic program with extra responsibility to champion faculty membership in the School. Recruits and engages faculty across campus by representing opportunities and supporting resources, leads faculty communications and engagement, strategy and development for academic programs.
Program Coordinator, Sr (1.0)	Coordinates with faculty, researchers, and external parties to plan and develop integrated programs, coordinates & plans administration and operations including policy development. Identifies potential funding opportunities and supports proposal development. Responsible for tracking and reporting program performance.
Program Coordinator (1.0)	Supports general meeting and event planning and coordination (including summits, seminars, contests and workshops), communications coordination, online forum support, handles general enquiries from public, faculty, researchers and students.
Instructional Designer (1.0)	Facilitates learning through instructional design, curriculum implementation, technology application, and teaching and learning assessment. Creates materials and programs to support and evaluate academic and program objectives, course design and delivery. Provides course design consultation to instructional staff and graduate students. Designs courses and workshops for face-to-face, online, and hybrid delivery. May also provide course support and assistance.

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3. UArizona Design Team & Process

Executive Committee:

David Hahn, Craig M. Berge Dean, College of Engineering
Elliott Cheu, Interim Dean, College of Science
Mary Poulton, Co-Director, Lowell Institute for Mineral Resources

Upon receipt of the lead gift, the design team's Working Group met at least 1 hour weekly from July 2020-March 2021 to construct the plan for the school, representing over 40 hours of meetings and workshops.

Working Group:

Mark Barton, Geosciences and Lowell Institute for Mineral Resources
Ty Ferré, Hydrology and Atmospheric Sciences
Larry Head, Systems and Industrial Engineering
Jaeheon Lee, Mining & Geological Engineering
Raina Maier (Alicja Babst-Kostecka), Environmental Science
Moe Momayez, Mining & Geological Engineering
Monica Ramirez-Andreotta, Environmental Science, Public Health – Community, Environment & Policy
Pete Reiners, Geosciences and Associate Dean Research, College of Science
Carson Richardson, Arizona Geological Survey
Brad Ross, Mining & Geological Engineering

Our Process:

	Where are we now?	**Where do we want to be?**	**How do we get there?**					**How do we tell everybody [else] about it?**	
Tasks	Strengths Weaknesses	Opportunities Threats	Programs Activities Research Partnerships	Org Structure Leadership Governance	Faculty Facilities Equipment	Financing	Goals & Success Metrics	Stakeholder Engagement	Communications/ Marketing
Questions	Internal assessment	External assessment	What will do to get where we want to go?	What shape will that take? Who will lead? Who will advise?	What resources are required to do what we want? What do those cost?	How will we pay for this? Tuition Research Philanthropy Other?	What are our key result areas? KPIs?	Who do we involve, how during the process	Who do we need to sell this School to? What do they need to see?
Process	SWOT analysis Workshop		Subcommittees Workshop	Meetings	Subcommittees	Subcommittee	Meetings	Subcommittee	Subcommittee
Inputs	• Pitchbook • Interviews • Topical briefs • List of UA Minerals faculty and orgs • High level competitor scan • SWOT worksheet		• SWOT analysis • Prioritized strategies and activity ideas • Pitchbook • Interviews • Topical briefs • List of UA Minerals faculty and orgs • High level competitor scan • High level market sizing	• Models to replicate (or not) •	• The School plan (programs, activities, research) • Bids?	• Expenses • Refined market sizing • Enrollment projections • Research contracts and grants projections • Fundraising projections	• Enrollment projections • Research contracts and grants projections • Other .. (depends on KRAs)	• List of all stakeholders who can influence success or failure	• The School scope of activities etc • Org/ldrship/gov • Resource requirements • Financing • Goals & metrics
Outputs	• SWOT analysis • Prioritized strategies and activity ideas • List of information requirements		• (the School! What does it do? How does it work?) • Specific competitor scan • Recommendations for strategic partnerships	• Org Chart • Job Description (Director profile)	• Hiring plan • Equipment and space requirements • One-time and recurring expenses	• Teaching revenues • Research revenues • Other revenues • Philanthropy targets • Sustainable business model	• KRAs, KPIs, and targets	• Stakeholder engagement plan •	• Plan for submission for internal approval • Pitch for fundraising

4. Industry Advisory Committee

The industry advisory board met 1 hour weekly from July 2019-October 2019 to construct the business case to establish the need for the school and to secure a lead donor.

Sudhanshu Singh, General Manager Caterpillar Resource Industries; Lowell Institute Board of Directors
Steve Trussell, Executive Director Arizona Mining Association and Arizona Rock Products Association; Lowell Institute Board of Directors
Jack Lundin, CEO Bluestone Resources; Lowell Institute Board of Directors & Mining Engineering Alumnus
Greg Boyce, Former CEO Peabody Energy, Lowell Institute Board of Directors & Mining Engineering Alumnus
Mark Baker, Principal CheckMark Consulting; Lowell Institute Board of Directors, Mining Engineering Industry Leadership Board
Xavier Ochoa, VP Operations Quintana Minerals; Engineering Industry Leadership Board & Mining Engineering Alumnus

Faculty participants: Mary Poulton, Professor Emerita Mining Engineering & Co-Director Lowell Institute; Mark Barton, Professor Geosciences & Co-Director Lowell Institute; John Kemeny, Department Head Mining Engineering

Additionally, representatives of the following companies and agencies were interviewed between July and October 2019 for their input.

- Anglo-American
- ASARCO
- Bronco Creek Exploration
- Caterpillar
- Denison Mines
- EMX Royalty
- Filo Mining
- Freeport-McMoRan
- Hazen Research Labs
- Hudbay Minerals
- Josemaria Resources
- Lucara Diamond
- Lundin Gold
- Lundin Mining
- Metallurgium Inc
- Modular Mining
- Newmont-Goldcorp
- NGEx Minerals
- Resolution Copper
- Salt River Materials Group
- US Geological Survey

[1] Hund, K., La Porta, D., Fabregas, T.P., Laing, T., and Drexhage, J., 2020, Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition, The World Bank Group, Climate-Smart Mining Facility (http://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf)

[2] Arizona Geological Survey, Arizona Geology e-Magazine, 2020, USGS Mineral Commodities Summary 20020: Arizona's piece of the pie (https://blog.azgs.arizona.edu/blog/2020-02/usgs-mineral-commodities-summary-2020-arizonas-piece-pie)

[3] The World Bank Group, Climate-Smart Mining, 2019, Climate-Smart Mining: Minerals for Climate Action (https://www.worldbank.org/en/news/infographic/2019/02/26/climate-smart-mining)

[4] Hund, K., La Porta, D., Fabregas, T.P., Laing, T., and Drexhage, J., 2020, Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition, The World Bank Group, Climate-Smart Mining Facility (http://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf)

[5] Yunis, J., and Aliakbari, E., 2020, Fraser Institute Annual Survey of Mining Companies 2020, Fraser Institute (https:/www.fraserinstitute.org/sites/default/files/annual-survey-of-mining-companies-2020.pdf)

[6] https://www.mining-technology.com/news/pershing-to-acquire-three-new-properties-in-us/ , https://www.mining-technology.com/features/hands-across-the-pacific-australian-miners-look-to-north-america/

[7] Mining Technology, News, 2021, Pershing to acquire three new properties in US, (https://www.mining-technology.com/news/pershing-to-acquire-three-new-properties-in-us/)

[8] Evans, N., 2018, Mining-focused university enrolments and 17-year low, PerthNow (https:www.perthnow.com.au/business/mining/miners-warn-of-skill-shortage-ng-b88750262z)

[9] Roy, J., Wilson, C., Erdiaw-Kwasie, A., and Stuppard, C., 2019, Engineering & Engineering Technology by the Numbers, 2019. American Society for Engineering Education. (https://ira.asee.org/wp-content/uploads/2020/09/E-ET-bythe-Numbers-2019.pdf).

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[10] Casey, J.P., 2021, In numbers: how mining came to be Australia's most profitable sector, Mining Technology, Analysis (https://www.mining-technology.com/features/in-numbers-how-mining-came-to-be-australias-most-profitable-sector/)
[11] Kecojevic, V., 2021, Student and Faculty Numbers in Mining Engineering Programs, Society of Mining Professors and Society for Mining, Metallurgy, and Exploration.

[12] UArizona mining perception study surveys were conducted face-to-face using tablet computers November-December 2019. Sample size =344, confidence level of 95 percent, and margin of error of +/- 5.25 percent.

[13] UArizona freshmen engineering student surveys were conducted online (a) September 14-October 26, 2020. Sample size = 363, confidence level of 95 percent, and margin of error of +/-2.7 percent. (b) November 30-December 6, 2020. Sample size = 367, confidence level of 95 percent and margin of error of +/-2.7 percent.

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BUDGET PROJECTION FORM

Name of Proposed Program or Unit: UArizona Minerals School of Mining Engineering and Mineral Resources

Budget Contact Person: Mark D. Barton, Lowell Institute

		Projected				
	Year 0 2021 - 2022	**1st Year** 2022 - 2023	**2nd Year** 2023 - 2024	**3rd Year** 2024 - 2025	**4th Year** 2025 - 2026	**5th Year** 2026 - 2027
METRICS						
Net increase in UG enrolled in school courses (head count)	0	115	240	365	395	395
Net increase in college SCH UG	0	345	870	1710	1965	2085
Net increase in Grad enrolled in school courses (head count)	0	75	125	205	225	235
Net increase in college SCH Grad	15	285	675	930	1260	1500
New Sponsored Activity (MTDC) – School + other units	$ 300,000	$ 800,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000
New Sponsored Activity (MTDC) – School only	$ 300,000	$ 600,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000
Number of Faculty FTE (teaching)	3.48	3.48	4.20	4.63	4.90	5.15
Number of Faculty FTE (research)	1.00	1.50	2.25	2.25	2.25	2.25
FUNDING SOURCES						
Continuing Sources						
UG RCM Revenue (net of cost allocation)	$ -	$ 55,450	$ 89,550	$ 199,200	$ 229,800	$ 237,450
Grad RCM Revenue (net of cost allocation)	$ -	$ 121,900	$ 205,800	$ 256,800	$ 277,200	$ 302,700
F and A Revenues (net of cost allocations) – total to UA	$ 75,000	$ 200,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000
F and A Revenues (net of cost allocations) – net to School	$ 37,500	$ 75,000	$ 112,500	$ 112,500	$ 112,500	$ 112,500
UA Online Revenues	$ -	$ 41,700	$ 289,350	$ 417,000	$ 576,750	$ 652,500
Distance Learning Revenues						
Memberships	$ 300,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000
Professional Education Revenue (non-credit)	$ 120,000	$ 180,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000
Other Items (Endowment income: existing + projected)	$ 280,000	$ 280,000	$ 360,000	$ 440,000	$ 520,000	$ 600,000
Total Continuing	**$ 737,500**	**$ 1,204,050**	**$ 1,747,200**	**$ 2,115,500**	**$ 2,406,250**	**$ 2,595,150**
One-time Sources						
School fund balances						
Institutional Strategic Investment	$ 4,000,000	$ -	$ -	$ -	$ -	$ -
Gift Funding	$ 4,515,000	$ 2,090,000	$ 1,690,000	$ 1,790,000	$ 1,790,000	$ 1,790,000
Other Items (attach description)	$ -	$ -	$ -	$ -	$ -	$ -
Total One-time	**$ 8,515,000**	**$ 2,090,000**	**$ 1,690,000**	**$ 1,790,000**	**$ 1,790,000**	**$ 1,790,000**
TOTAL SOURCES	**$ 9,252,500**	**$ 3,294,050**	**$ 3,437,200**	**$ 3,905,500**	**$ 4,196,250**	**$ 4,385,150**
EXPENDITURE ITEMS						
Continuing Expenditures						
Faculty	$ 828,000	$ 1,083,000	$ 1,200,000	$ 1,281,000	$ 1,314,000	$ 1,344,000
Other Personnel	$ 655,310	$ 736,883	$ 754,386	$ 754,386	$ 754,386	$ 754,386
Employee Related Expense	$ 459,826	$ 564,164	$ 605,860	$ 630,970	$ 641,200	$ 650,500
Graduate Fellowships	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
Graduate Teaching Assistantships	$ -	$ 128,321	$ 217,756	$ 326,634	$ 357,742	$ 373,296
Other Student Aid (undergraduates)	$ 18,360	$ 53,360	$ 65,600	$ 65,600	$ 65,600	$ 65,600
Operations (materials, supplies, phones, etc.)	$ 255,088	$ 148,450	$ 156,900	$ 131,900	$ 131,900	$ 131,900
Additional Space Cost	$ 12,595	$ 25,190	$ 25,190	$ 25,190	$ 25,190	$ 25,190
Research and innovation investments	$ 350,800	$ 553,700	$ 578,700	$ 578,700	$ 578,700	$ 578,700
Other Items (attach description)	$ -	$ -	$ -	$ -	$ -	$ -
Total Continuing	**$ 2,779,979**	**$ 3,493,067**	**$ 3,804,391**	**$ 3,994,379**	**$ 4,068,717**	**$ 4,123,571**
One-time Expenditures						
Construction or Renovation	$ 400,000	$ -	$ -	$ -	$ -	$ -
Start-up Equipment (mainly faculty)	$ 990,000	$ 990,000	$ 240,000	$ -	$ -	$ -
Replace Equipment	$ 11,300	$ 11,300	$ 12,600	$ 12,600	$ 12,600	$ 12,600
Library Resources	$ -	$ -	$ -	$ -	$ -	$ -
Other Items (attach description)	$ -	$ -	$ -	$ -	$ -	$ -
Total One-time	**$ 1,401,300**	**$ 1,001,300**	**$ 252,600**	**$ 12,600**	**$ 12,600**	**$ 12,600**
TOTAL EXPENDITURES	**$ 4,181,279**	**$ 4,494,367**	**$ 4,056,991**	**$ 4,006,979**	**$ 4,081,317**	**$ 4,136,171**
Net Projected Fiscal Effect	**$ 5,071,221**	**$ (1,200,317)**	**$ (619,791)**	**$ (101,479)**	**$ 114,933**	**$ 248,979**
Year end balance (carry forward)	**$ 5,071,221**	**$ 3,870,905**	**$ 3,251,114**	**$ 3,149,635**	**$ 3,264,568**	**$ 3,513,547**

Consolidated Income and Expense Yr0 + Yr1-5

CONSOLIDATED EXPENSES

	FTE Yr 5	Year 0 (FY22)	Year 1 (FY23)	Year 2 (FY24)	Year 3 (FY25)	Year 4 (FY26)	Year 5 (FY27)
FACULTY & STAFF							
Faculty	10.25	$ 1,084,680	$ 1,418,730	$ 1,572,000	$ 1,678,110	$ 1,721,340	$ 1,760,640
Program management	4.00	$ 349,661	$ 456,521	$ 456,521	$ 456,521	$ 456,521	$ 456,521
Business office	2.50	$ 226,007	$ 226,007	$ 226,007	$ 226,007	$ 226,007	$ 226,007
Instructional support	2.00	$ 129,930	$ 129,930	$ 152,859	$ 152,859	$ 152,859	$ 152,859
Outreach	2.00	$ 152,859	$ 152,859	$ 152,859	$ 152,859	$ 152,859	$ 152,859
Subtotal faculty & staff	20.75	$ 1,943,136	$ 2,384,046	$ 2,560,245	$ 2,666,355	$ 2,709,585	$ 2,748,885
STUDENTS							
Undergraduate	5.00	$ 18,360	$ 53,360	$ 65,600	$ 65,600	$ 65,600	$ 65,600
Graduate	35.00	$ 200,000	$ 328,321	$ 417,756	$ 526,634	$ 557,742	$ 573,296
Subtotal students	40.00	$ 218,360	$ 381,681	$ 483,356	$ 592,234	$ 623,342	$ 638,896
RESEARCH INVESTMENT							
Start up		$ 990,000	$ 990,000	$ 240,000	$ -	$ -	$ -
Continuing		$ 350,800	$ 553,700	$ 578,700	$ 578,700	$ 578,700	$ 578,700
Subtotal research		$ 1,340,800	$ 1,543,700	$ 818,700	$ 578,700	$ 578,700	$ 578,700
OPERATIONS							
Space		$ 12,595	$ 25,190	$ 25,190	$ 25,190	$ 25,190	$ 25,190
All other		$ 666,388	$ 159,750	$ 169,500	$ 144,500	$ 144,500	$ 144,500
Subtotal operations		$ 678,983	$ 184,940	$ 194,690	$ 169,690	$ 169,690	$ 169,690
TOTAL		$ 4,181,279	$ 4,494,367	$ 4,056,991	$ 4,006,979	$ 4,081,317	$ 4,136,171

CONSOLIDATED GROSS INCOME

		Year 0 (FY22)	Year 1 (FY23)	Year 2 (FY24)	Year 3 (FY25)	Year 4 (FY26)	Year 5 (FY27)
Teaching							
Tuition		$ 120,000	$ 399,050	$ 584,700	$ 873,000	$ 1,083,750	$ 1,192,650
Professional Development		$ 120,000	$ 180,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000
Teaching subtotal		$ 240,000	$ 579,050	$ 824,700	$ 1,113,000	$ 1,323,750	$ 1,432,650
Research	*rates*						
MTDC total		$ 675,000	$ 1,450,000	$ 2,075,000	$ 2,075,000	$ 2,075,000	$ 2,075,000
IDC total	25%	$ 75,000	$ 200,000	$ 325,000	$ 325,000	$ 325,000	$ 325,000
IDC fraction to all units	50%	$ 337,500	$ 550,000	$ 612,500	$ 612,500	$ 612,500	$ 612,500
IDC to school		$ 37,500	$ 75,000	$ 112,500	$ 112,500	$ 112,500	$ 112,500
Memberships		$ 300,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000
Research all funds		$ 750,000	$ 1,650,000	$ 2,400,000	$ 2,400,000	$ 2,400,000	$ 2,400,000
IDC+memberships to school		$ 337,500	$ 525,000	$ 562,500	$ 562,500	$ 562,500	$ 562,500
Philanthropy							
Endowment		$ 280,000	$ 280,000	$ 360,000	$ 440,000	$ 520,000	$ 600,000
Gifts		$ 4,515,000	$ 2,090,000	$ 1,690,000	$ 1,790,000	$ 1,790,000	$ 1,790,000
Philanthropy subtotal		$ 4,795,000	$ 2,370,000	$ 2,050,000	$ 2,230,000	$ 2,310,000	$ 2,390,000
Other sources							
UA		$ -	$ -	$ -	$ -	$ -	$ -
State		$ 4,000,000	$ -	$ -	$ -	$ -	$ -
Other total		$ 4,000,000	$ -	$ -	$ -	$ -	$ -
TOTAL		$ 9,372,500	$ 3,474,050	$ 3,437,200	$ 3,905,500	$ 4,196,250	$ 4,385,150
NET INCOME		**$ 5,191,221**	**$ (1,020,317)**	**$ (619,791)**	**$ (101,479)**	**$ 114,933**	**$ 248,979**

Teaching Yr 1-5

Year	1 FY23	2 FY24	3 FY25	4 FY26	5 FY27

Enrollments, Credits, Centers

Undergraduate

	1 FY23 Number of units	Credits per unit	Resid.	Online	SCH	2 FY24 Number of units	Credits per unit	Resid.	Online	SCH	3 FY25 Number of units	Credits per unit	Resid.	Online	SCH	4 FY26 Number of units	Credits per unit	Resid.	Online	SCH	5 FY27 Number of units	Credits per unit	Resid.	Online	SCH
Overview/Intro	1	3	25	20	135	1	3	50	40	270	1	3	100	50	450	1	3	100	50	450	1	3	100	50	450
Minor	2	3	30	0	180	3	3	30	25	495	4	3	60	25	1020	5	3	60	25	1275	5	3	60	25	1275
Modules*	3	1	30		0	6	1	60		0	9	1	90		0	12	1	120		0	12	1	120		0
Certificate	1	3	10	0	30	1	3	15	20	105	2	3	15	25	240	2	3	15	25	240	3	3	15	25	360
red = not school owned					345					870					1710					1965					2085
					0.339130435																				

Graduate

	Number of units	Credits per unit	Resid.	Online	SCH	Number of units	Credits per unit	Resid.	Online	SCH	Number of units	Credits per unit	Resid.	Online	SCH	Number of units	Credits per unit	Resid.	Online	SCH	Number of units	Credits per unit	Resid.	Online	SCH
Overview/Intro	1	3	30	15	135	1	3	30	15	135	1	3	60	30	270	1	3	60	30	270	1	3	60	30	270
Minor	2	3	10	0	30	3	3	20	10	90	3	3	40	20	180	3	3	40	20	180	3	3	40	20	180
Modules*	3	1	n/a		0	3	1	n/a		0	3	1	n/a		0	3	1	n/a		0	3	1	n/a		0
Certificates	2	3	20	0	120	3	3	30	20	450	3	3	30	20	450	4	3	30	30	720	5	3	30	30	900
GIDP	0	3	0	0	0	0	6	0	0	0	1	6	5	0	30	1	6	10	5	90	1	6	20	5	150
red = not school owned					150					540					660					990					1230

Professional Development

	Number of units	Credits per unit	Resid.	Online/ other	SCH	Number of units	Credits per unit	Resid.	Online/ other	SCH	Number of units	Credits per unit	Resid.	Online/ other	SCH	Number of units	Credits per unit	Resid.	Online/ other	SCH	Number of units	Credits per unit	Resid.	Online/ other	SCH
Centers/SRIs	2	n/a	n/a	n/a	n/a	3	n/a	n/a	n/a	n/a	3	n/a	n/a	n/a	n/a	3	n/a	n/a	n/a	n/a	3	n/a	n/a	n/a	n/a
PD Courses	9	n/a	n/a	360	n/a	12	n/a	n/a	480	n/a	12	n/a	n/a	480	n/a	12	n/a	n/a	480	n/a	12	n/a	n/a	480	n/a
red = not school owned																									

Comments	Var X	Var Y	Var Z	
Gen ed mineral resources & soc	50			X = # UA students enrolled (not incl. those in minor); Y = non-degree, non-certifcate (~online) enrolled
Capstone (2nd yr)	30	15	3	X = # resid./class; Y = # online/class; Z credits/class; final # school-owned courses
* to other classes (non-school)	3	12	10	X = # modules added per year, Y = max (final) number of modules; Z = students enrolled per module
school-owned course per certfi	1	3	1	X = #school owned courses per certificate, certificates added per year
Overview class	30	30	1	X = # UA students enrolled; Y = non-degree, non-certifcate (~online) enrolled; Z = # school owned course
enrollment grows over first few	20	20	3	X = # UA students enrolled; Y = non-degree, non-certifcate (~online) enrolled; Z = # school owned course
* to other classes (non-school)	3	12	10	X = # modules added per year, Y = max (final) number of modules; Z = students enrolled per module
#certs = #centers	1	3		X = #center owned courses per certificate; Y = credits per unit
start in y3	10	5	6	X = # UA students enrolled; Y = #online; Z= # school owned credits
	1	0.5		X = initial #, Y = added/yr
	40	3	3	X = enrollment /course; Y = courses/center; Z = additional courses

Revenues (teaching)

Undergraduate

	1 FY23 Total credits	Resid.	Online	SCH	Income	2 FY24 Total credits	Resid.	Online	SCH	Income	3 FY25 Total credits	Resid.	Online	SCH	Income	4 FY26 Total credits	Resid.	Online	SCH	Income	5 FY27 Total credits	Resid.	Online	SCH	Income
Overview/Intro	3	25	20	135	$ 22,950	3	50	40	270	$ 45,900	3	100	50	450	$ 76,500	3	100	50	450	$ 76,500	3	100	50	450	$ 76,500
Minor	6	30	0	180	$ 30,600	9	30	25	495	$ 84,150	12	60	25	1020	$173,400	15	60	25	1275	$216,750	15	60	25	1275	$216,750
Modules*	3	30		0	$ -	6	60		0	$ -	9	90		0	$ -	12	120		0	$ -	12	120		0	$ -
Certificate	3	10	0	30	$ 12,100	3	15	20	105	$ 28,350	6	15	25	240	$ 51,300	6	15	25	240	$ 51,300	9	15	25	360	$ 71,700
SUBTOTAL		95	20	345	$ 65,650		155	85	870	$158,400		265	100	1710	$301,200		295	100	1965	$344,550		295	100	2085	$364,950
		online revenue			$ 10,200		online revenue			$ 68,850		online revenue			$102,000		online revenue			$114,750		online revenue			$127,500
red = not school owned																									

Graduate

	Total credits	Resid.	Online	SCH	Income	Total credits	Resid.	Online	SCH	Income	Total credits	Resid.	Online	SCH	Income	Total credits	Resid.	Online	SCH	Income	Total credits	Resid.	Online	SCH	Income
Overview/Intro	3	30	15	135	$ 46,800	3	30	15	135	$ 46,800	3	60	30	270	$ 93,600	3	60	30	270	$ 93,600	3	60	30	270	$ 93,600
Minor	6	10	0	30	$ 10,200	9	20	10	90	$ 93,600	9	40	20	180	$187,200	9	40	20	180	$187,200	9	40	20	180	$187,200
Modules*	3	n/a		0		3	n/a		0		3	n/a		0		3	n/a		0		3	n/a		0	
Certificates	6	20	0	120	$ 96,400	9	30	20	450	$285,900	9	30	20	450	$285,900	12	30	30	720	$427,200	15	30	30	900	$505,500
GIDP	0	0	0	0	$ -	0	0	0	0	$ -	6	5	0	30	$ 5,100	6	10	5	90	$ 31,200	6	20	5	150	$ 41,400
SUBTOTAL		60	15	285	$ 153,400		80	45	675	$426,300		135	70	930	$571,800		140	85	1260	$739,200		150	85	1500	$827,700
		online revenue			$ 31,500		online revenue			$220,500		online revenue			$315,000		online revenue			$462,000		online revenue			$525,000
red = not school owned																									

Professional Development

	Total students			Income	Total students			Income	Total students			Income	Total students			Income	Total students			Income
Centers	2	n/a	n/a		3	n/a	n/a		3	n/a	n/a		3	n/a	n/a		3	n/a	n/a	
Courses	9	n/a	n/a	360	$ 180,000	12	n/a	n/a	480	$240,000	12	n/a	n/a	480	$240,000	12	n/a	n/a	480	$240,000	12	n/a	n/a	480	$240,000
SUBTOTAL					$ 180,000					$240,000					$240,000					$240,000					$240,000

enrollments and SCH from above				
	$ -	$ 170	$ 170	X = $/student, Y = $/SCH; Z = $/SCH(online)
	$ -	$ 170	$ 170	X = $/student, Y = $/SCH
no income realized on modules	$ -	$ -		X = $/SCH
	$ 700	$ 170	$ 170	Z = $/SCH
enrollments and SCH from above				
		$ 170	$ 700	X = $/student, Y = $/SCH; Z = $/online
		$ 170	$ 700	X = $/student, Y = $/SCH; Z = $/online
no income realized on modules	$ -			X = revenue per SCH
3 certificates per center	$ 3,800	$ 170	$ 700	X = $/student, Y = $/SCH; Z = $/online
not sure how to model this -- he	$ -	$ 170	$ 700	X = $/student, Y = $/SCH; Z = $/online
enrollments from above				
number of centers from above				
based on Inputs/GCE	$ 500			X = revenue per enrollee

TOTAL TEACHING REVENUES				**$ 399,050**				**$ 824,700**				**$ 1,113,000**				**$ 1,323,750**				**$ 1,432,650**

Instructors (faculty, teaching assistents, other)

Undergraduate

	1 FY23 Total credits	Faculty FTE	0.5 TA	Total students	Cost	2 FY24 Total credits	Faculty FTE	0.5 TA	Total students	Cost	3 FY25 Total credits	Faculty FTE	0.5 TA	Total students	Cost	4 FY26 Total credits	Faculty FTE	0.5 TA	Total students	Cost	5 FY27 Total credits	Faculty FTE	0.5 TA	Total students	Cost
Overview/Intro	3	0.15	1	45	$ 32,000	3	0.15	2	90	$ 46,000	3	0.15	3	150	$ 60,000	3	0.15	3	150	$ 60,000	3	0.15	3	150	$ 60,000
Minor	6	0.80	1	30	$ 110,000	9	0.95	3	55	$156,000	12	1.10	6	85	$216,000	15	1.25	7	85	$248,000	15	1.25	7	85	$248,000
Modules*	3	0.15	0	30	$ 18,000	3	0.15	0	60	$ 18,000	6	0.30	0	90	$ 36,000	6	0.30	0	120	$ 36,000	6	0.30	0	120	$ 36,000
Certificate	3	0.13	1	10	$ 29,000	3	0.13	1	35	$ 29,000	6	0.25	2	40	$ 58,000	6	0.25	2	40	$ 58,000	9	0.38	2	40	$ 73,000
SUBTOTAL		1.23	3		$ 189,000		1.38	6		$249,000		1.80	11		$370,000		1.95	12		$402,000		2.08	12		$417,000
red = not school owned; no revenue to school																									

Graduate

	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost
Overview	3	0.15	1	45	$ 32,000	3	0.15	1		$ 32,000	3	0.15	2		$ 46,000	3	0.15	2		$ 46,000	3	0.15	2		$ 46,000
Minor	6	0.30	1	10	$ 50,000	9	0.45	1		$ 54,000	9	0.45	1		$ 68,000	9	0.45	1		$ 68,000	9	0.45	1		$ 68,000
Modules*	3	0.15	0	n/a	$ 18,000	3	0.15	0		$ 18,000	3	0.15	0		$ 18,000	3	0.15	0		$ 18,000	3	0.15	0		$ 18,000
Certificates	6	0.25	1	20	$ 44,000	9	0.38	3		$ 87,000	9	0.38	3		$ 87,000	12	0.50	4		$116,000	15	0.63	5		$145,000
GIDP	0	0.5	0	0	$ 60,000	0	0.5	0		$ 60,000	6	0.5	1		$ 74,000	6	0.5	1		$ 74,000	6	0.5	1		$ 74,000
SUBTOTAL		1.35	3.00		$ 204,000		1.63	5.00		$251,000		1.63	7.00		$293,000		1.75	8.00		$322,000		1.88	9.00		$351,000
red = not school owned; no revenue to school																									

Professional Development

	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost	Total credits	Faculty FTE	0.5 TA	Total students	Cost
Centers						0	n/a	n/a			0	n/a	n/a			0	n/a	n/a			0	n/a	n/a		
Courses	9	0.9	2.25	360	$ 139,860	12	1.2	3	480	$186,480	12	1.2	3	480	$186,480	12	1.2	3	480	$186,480	12	1.2	3	480	$186,480
SUBTOTAL		0.9	2.25		$ 139,860		1.2	3		$186,480		1.2	3		$186,480		1.2	3		$186,480		1.2	3		$186,480
Total # instructors		**3.48**	**8.25**				**4.20**	**14.00**				**4.63**	**21.00**				**4.90**	**23.00**				**5.15**	**24.00**		
ERE		129,270	12,821		$ 142,091		156,240	21,756		$177,996		172,050	32,634		$204,684		182,280	35,742		$218,022		191,580	37,296		$228,876
TOTAL INSTRUCTORS				**$ 674,951**				**$ 864,476**				**$ 1,054,164**				**$ 1,128,502**								**$ 1,183,356**	

Faculty FTE annual	TA 0.5/ semester	0.5 TA / 100SCH		
$ 120,000	$14,000	0.50		X = faculty FTE;
$ 120,000	$14,000	0.50		
$ 120,000	$14,000	0.50		
$ 120,000	$14,000	0.50		
$ 120,000	$14,000	0.50	0.05/fac FTE to teach; 0.25/200	
$ 120,000	$14,000	0.50	0.05/fac FTE to teach; 0.25/200	
$ 120,000	$14,000	0.50	0.05/unit to create (1 time)	
$ 120,000	$14,000	0.50	0.125FTE per certificate to run (	
$ 120,000	$14,000	0.50	0.5 FTE to run GIDP/minor; clas	
$ 120,000	$14,000	0.50	0.1 fac FTE and 0.25 TA per cour	

	faculty	grad
salary	$ 120,000	$14,000
ERE	31%	11%

NET DIRECT INSTRUCTION				**$ (275,901)**				**$ (39,776)**				**$ 58,836**				**$ 195,248**				**$ 249,294**
TA salaries				$ 128,321				$217,756				$326,634				$357,742				$373,296
Faculty salaries				$ 546,270				$660,240				$727,050				$770,280				$809,580

from above (revenue - instructors)

Research Yr 1-5

	Year 0 (FY22)	Year 1 (FY23)	Year 2 (FY24)	Year 3 (FY25)	Year 4 (FY26)	Year 5 (FY27)	Comments	Amounts	Variables
Expenses									
Strategic research initiatives (aka centers/programs)	2	3	3	3	3	3			
Faculty program leadersip	1.5	2.25	2.25	2.25	2.25	2.25		0.75	faculty per initiative
Faculty salaries	$ 180,000	$ 270,000	$ 270,000	$ 270,000	$ 270,000	$ 270,000		$ 120,000	faculty salary
Faculty ERE	$ 55,800	$ 83,700	$ 83,700	$ 83,700	$ 83,700	$ 83,700		31%	ERE rate
Total faculty cost	$ 235,800	$ 353,700	$ 353,700	$ 353,700	$ 353,700	$ 353,700			
Additional center investment	$ 50,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000		$ 25,000	per center
Total center cost	$ 285,800	$ 428,700	$ 428,700	$ 428,700	$ 428,700	$ 428,700			
Matching / seed funds	$ 50,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000		$ 100,000	annual match (50% Yr 0)
Other opportunity (collaborations, workshops etc)	$ 15,000	$ 25,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000			
Total Research	**$ 350,800**	**$ 553,700**	**$ 578,700**	**$ 578,700**	**$ 578,700**	**$ 578,700**			
Income									
Strategic research initiatives (aka centers/programs)	2	3	3	3	3	3	number of initiatives		
Memberships (e.g., dedicated gifts)	$ 300,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000		$ 150,000	Membership per program
MTDC	$ 300,000	$ 600,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000		$ 300,000	MTDC per program
IDC total	$ 75,000	$ 150,000	$ 225,000	$ 225,000	$ 225,000	$ 225,000		25%	IDC rate
IDC to school	$ 37,500	$ 75,000	$ 112,500	$ 112,500	$ 112,500	$ 112,500		50%	% of total IDC returned to school
Total strategic research	$ 675,000	$ 1,200,000	$ 1,575,000	$ 1,575,000	$ 1,575,000	$ 1,575,000			
Total strategic research to school	$ 637,500	$ 1,125,000	$ 1,462,500	$ 1,462,500	$ 1,462,500	$ 1,462,500			
Matching / seed funds							funding for projects inother units, no direct return to school		
MTDC	$ -	$ 200,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000		4.0	rate of return (multiplier)
IDC total	$ -	$ 50,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000		25%	IDC rate
IDC to other units	$ -	$ 25,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000		50%	% total IDC returned to other units
Total from matching / seed	$ -	$ 250,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000			
Total from matching / seed to other units	$ -	$ 225,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000			
Total Research Income	**$ 675,000**	**$ 1,450,000**	**$ 2,075,000**	**$ 2,075,000**	**$ 2,075,000**	**$ 2,075,000**			
Total Research IDC	**$ 75,000**	**$ 200,000**	**$ 325,000**	**$ 325,000**	**$ 325,000**	**$ 325,000**			
Total Research Income (to school & other units)	**$ 637,500**	**$ 1,350,000**	**$ 1,912,500**	**$ 1,912,500**	**$ 1,912,500**	**$ 1,912,500**			
Total Research IDC + memberships (to school & other units)	**$ 337,500**	**$ 550,000**	**$ 612,500**	**$ 612,500**	**$ 612,500**	**$ 612,500**			
Net									
Totals with 100% IDC									
Net Total Income	**$ 324,200**	**$ 896,300**	**$ 1,496,300**	**$ 1,496,300**	**$ 1,496,300**	**$ 1,496,300**			
Net Total with only IDC+memberships (no MTDC)	**$ 24,200**	**$ 96,300**	**$ 196,300**	**$ 196,300**	**$ 196,300**	**$ 196,300**			
Net Total to School with only IDC+memberships	**$ 24,200**	**$ 46,300**	**$ 96,300**	**$ 96,300**	**$ 96,300**	**$ 96,300**			
Net to initiatives only (centers) with only IDC+memberships	**$ 24,200**	**$ 46,300**	**$ 96,300**	**$ 96,300**	**$ 96,300**	**$ 246,300**	other IDC goes to home units		
Totals *with only returned IDC*									
Net Total Income	**$ 286,700**	**$ 796,300**	**$ 1,333,800**	**$ 1,333,800**	**$ 1,333,800**	**$ 1,333,800**			
Net Total with only IDC+memberships (no MTDC)	**$ (13,300)**	**$ (3,700)**	**$ 33,800**	**$ 33,800**	**$ 33,800**	**$ 33,800**			
Net Total to School with only IDC+memberships	**$ (13,300)**	**$ (28,700)**	**$ (16,200)**	**$ (16,200)**	**$ (16,200)**	**$ (16,200)**			
Net to initiatives only (centers) with only IDC+memberships	**$ 51,700**	**$ 96,300**	**$ 133,800**	**$ 133,800**	**$ 133,800**	**$ 133,800**	other IDC goes to home units		

Income

	Year 0 (FY22)	Year 1 (FY23)	Year 2 (FY24)	Year 3 (FY25)	Year 4 (FY26)	Year 5 (FY27)		
Earned -- TBD								
Tuition (total undergrad + grad; includes online)	0	219,050	584,700	873,000	1,083,750	1,192,650		from Teaching Yr1-5
Professional course revenues	120,000	180,000	240,000	240,000	240,000	240,000		from Teaching Yr1-5
Memberships	300,000	450,000	450,000	450,000	450,000	450,000		from Research Yr1-5
IDC total (all new)	75,000	200,000	325,000	325,000	325,000	325,000		from Research Yr1-5
IDC total (new school programs only)	75,000	150,000	225,000	225,000	225,000	225,000		from Research Yr1-5
IDC return (return to school for new programs only	37,500	75,000	112,500	112,500	112,500	112,500	50%	from Research Yr1-5
Total Earned	457,500	924,050	1,387,200	1,675,500	1,886,250	1,995,150		
Other								
UA	0	0	0	0	0	0		
State	4,000,000	0	0	0	0	0		Requested
Philanthropy (committed, requested, or planned)								
Endowment income								
Existing endowment	280,000	280,000	280,000	280,000	280,000	280,000		
New endowment	0	0	80,000	160,000	240,000	320,000		
Subtotal: Endowment income	280,000	280,000	360,000	440,000	520,000	600,000		
Gifts								
Committed/Rcvd	4,015,000	490,000	490,000	90,000	90,000	90,000		
Requested	500,000	500,000	0	0	0	0		
Projected	0	1,100,000	1,200,000	1,700,000	1,700,000	1,700,000		
Subtotal: Gifts	4,515,000	2,090,000	1,690,000	1,790,000	1,790,000	1,790,000		
Total Philanthropy	4,795,000	2,370,000	2,050,000	2,230,000	2,310,000	2,390,000		
Total Other	8,795,000	2,370,000	2,050,000	2,230,000	2,310,000	2,390,000		
Total Income	**9,252,500**	**3,294,050**	**3,437,200**	**3,905,500**	**4,196,250**	**4,385,150**		

New Endowment (principal)	***0***	2,000,000	4,000,000	6,000,000	8,000,000	10,000,000	**2,000,000**	principal added/year
	initial value (subtracted from Yr0 philanthropy)						4%	rate of return

THE UNIVERSITY OF ARIZONA

College of Science
Office of the Dean

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(520) 621-4091

March 28, 2021

To Whom It May Concern,

I am writing in support of the proposed school, UArizona Minerals. This collaborative effort between the College of Science and the College of Engineering will create a transformative entity that will support students, professionals and the broader community in education and research as it relates to mineral resources. A number of departments in the College of Science will contribute to this new School such as Geosciences, Hydrology and Atmospheric Sciences, the Arizona Geological Survey and the Lowell Institute for Mineral Resources. This unique collaboration at the University of Arizona has the potential to lead the world in preparing the next generation of leaders dedicated to the acquisition and utilization of mineral resources. We are both proud and excited to be founding members of this new institution, and expect that the collaboration will grow to include a significant number of units throughout the University of Arizona. Already excitement is building around this new School, with many leaders in industry stepping up to support this effort. This is an ideal time to jumpstart this effort, and the proposed new School has the expertise deliver upon its mission.

I fully support the creation of this new School of UArizona Minerals, and expect that it will become the premier institution devoted to mineral resources.

Best regards,

Elliott Cheu, Ph.D.
Interim Dean, College of Science
Distinguished Professor of Physics

THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING
Mining & Geological Engineering

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http://mge.arizona.edu
http://minerals.arizona.edu

Thursday March 18, 2021

To whom it may concern,

On behalf of the faculty and staff in the Department of Mining and Geological Engineering, I am writing to express my enthusiastic support for the establishment of the School of Mining Engineering and Mineral Resources. I have been involved in the discussions and planning meetings ever since President Robbins proposed the idea of a 'School of Mines' for the first time to Greg Boyce, Chairman of the Board of the Lowell Institute for Mineral Resources.

All parties involved agree that the School would bring together faculty, departments, colleges, and units on campus and would act as a catalyst to address technical, environmental, and societal challenges related to the supply of critical minerals and the threats to their supply chains. All the faculty and students on campus who study topics associated with the life cycle of a mine, from exploration to mining law, social license, sustainable development, mine construction, mine production, environment, reclamation, safety and health, and beyond (for example space mining) will benefit from the creation of the School, as it will enhance the national and international reputation of the University of Arizona and the Department of Mining and Geological Engineering.

All parties involved explicitly agree that the School will not duplicate existing degree programs, courses, centers, or initiatives. Any new endeavor undertaken by the School will support academic and research units by elevating their profile in terms of higher student enrollment, fostering new collaborations, and increasing the likelihood of attracting additional funding, including seed, training, and large-scale grants.

This is an opportunity to formalize the relationships between an outstanding group of faculty on campus, stakeholders in the global community and a multinational industry working at the forefront of a critical and exciting field. The School is positioned to help support the department of Mining Engineering at UArizona to enhance and broaden our offerings and provide opportunities for research for our faculty and students, and we welcome the new projects on the horizon. As such, this effort has my unreserved support.

With best regards,

Moe Momayez, PhD
Associate Professor and Interim Department Head
David and Edith Lowell Chair in Mining and Geological Engineering

THE UNIVERSITY OF ARIZONA

VICE PRESIDENT FOR THE DIVISION OF AGRICULTURE, LIFE AND VETERINARY SCIENCES, AND COOPERATIVE EXTENSION

CHARLES-SANDER DEAN OF THE COLLEGE OF AGRICULTURE AND LIFE SCIENCES

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sburgess@cals.arizona.edu
Tel: 520-621-7621

March 11, 2021

Dear David and Elliot,

I support you establishing a *School of Mining Engineering and Mineral Resources* and its mission, primarily because, as the deans of the two home colleges, I believe that you should be able to do what is best for your colleges and the UA as a whole, and that you are best placed to know this—pending provost, president and ABOR approval, of course.

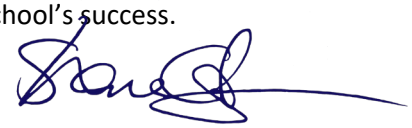
The School's discipline areas are outside my academic discipline expertise, so I have no standing to comment on these, but its mission to "transform the way students, professionals and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources" makes sense to me as ALVSCE VP and the CALS Dean. Equally so does your assertion that this new School is "a unique and exciting opportunity for the UA to lead in this area of growing global significance".

As CALS dean, the School does seem to me to complement the CALS' disciplines because of its centrality to the future of Earth's critical zone, global geopolitics and natural resource and sustainable economies. I think the probability of having the nation's "top comprehensive program" around mining engineering and mineral resources, and related disciplines" is not only consistent with the UA Strategic plan but will directly achieve aspects of it. The proposed plan certainly complements UA's, and CALS', global strength in another often-mined natural chemical, water.

The School also seems to me to complement the CALS' faculty who educate and research, and the CES' faculty who extend, in the aspects of mining before and after the extractive phase. The CES may in particular be a good potential partner with the School, analogous to the partnership it has with the Rogers College of Law in the Natural Resource Users Law and Policy Center (and its legal clinic).

As I understand the School to not be a shared academic unit, but rather a shared entity more akin to an Institute or a Center, then my opinion is that it's founding document should include a *sunset clause*. Of course, given that I understand it will have an endowment, this may not be relevant; in which case I think a statement why it doesn't need a sunset clause would be good.

Best wishes on the School's success.



COLLEGE OF ENGINEERING
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THE UNIVERSITY OF ARIZONA
College of Engineering

March 29, 2021

To Whom It May Concern:

On behalf of the College of Engineering, I want to express my strongest support for the proposed School of Mining Engineering and Mineral Resources which will be jointly administered by the College of Science and the College of Engineering. I note that the College of Engineering has its roots in the former College of Mining, one of UA's founding colleges. This speaks to the history that mining and geological engineering has played in this college for over 100 years. The proposed School is key to looking forward to the future of mining and mineral resources in the context of our education and research missions. We seek to transform the way students, professionals and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources, in keeping with our proposed mission statement.

Our goal with the proposed School is to position the University of Arizona to be the global leader around mining engineering and mineral resources, linking core disciplines and establishing strong collaborations with related disciplines across the UA campus. The support of our external stakeholders is strong, noting that I have met extensively with industry leaders, many of whom are willing to support the new school financially and are looking to UA for leadership. Along with College of Engineering leadership, I look forward to participating in this important initiative and are supportive of helping UA become a global leader in this area.

Sincerely,

David W. Hahn
Craig M. Berge Dean, College of Engineering
Professor and Eminent Scholar, Aerospace and Mechanical Engineering

THE UNIVERSITY OF ARIZONA
Mel & Enid Zuckerman
College of Public Health

OFFICE OF THE DEAN

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www.publichealth.arizona.edu

March 11, 2021

To Whom It May Concern:

On behalf of the University of Arizona Mel and Enid Zuckerman College of Public Health, I am pleased to offer this letter in support of the newly proposed *School of Mining Engineering and Mineral Resources*, and its mission to "transform the way students, professionals and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources." I agree this is a unique and exciting opportunity for the University of Arizona to lead in an area of growing global significance, notably a chance to have the nation's top comprehensive program around mining engineering and mineral resources, including all related disciplines.

The Mel and Enid Zuckerman College of Public Health has historically contributed to the goal of advancing the health and safety of miners and the introduction of risk management and critical controls in mining. I see current and future opportunities to contribute to related teaching and research in such areas as environment and occupational health and how this contribution can benefit this College, the new School, the UA community overall, and society.

We look forward to participating in this important initiative and are supportive of helping UA become a global leader in this area.

Sincerely,

Iman Hakim, MD, PhD, MPH
Dean and Professor
Mel and Enid Zuckerman Endowed Chair in Public Health

THE UNIVERSITY OF ARIZONA
College of Social & Behavioral Sciences

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www.sbs.arizona.edu

March 12, 2021

To Whom It May Concern:

On behalf of the College of Social and Behavioral Sciences, I am pleased to offer this letter in support of the newly proposed School of Mining Engineering and Mineral Resources, and in particular to its commitment to socially responsible mining and the proposed School's singular mission to "transform the way students, professionals and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources." This is an exciting opportunity for the University of Arizona to lead in an area of growing global significance and, notably, a chance to build the nation's top comprehensive program around sustainable mining engineering and mineral resources, including all related disciplines.

SBS has significant faculty resources to contribute to this goal. Among our faculty are experts on: engaging multi-sector stakeholders in conflict resolution and problem solving through the process of collaborative governance (School of Government and Public Policy); helping communities assess disaster preparedness, evaluate system vulnerability, and speed post-event resilience (School of Anthropology, School of Sociology); working with Indigenous peoples to assess land-based cultural resources (e.g., sites of archaeological and spiritual significance) (Department of American Indian Studies; School of Anthropology); conducting social cost-benefit analysis and social program evaluation for governmental and non-governmental agencies (School of Government and Public Policy, Southwest Institute for Research on Women); and integrating, mapping, and analyzing multi-sourced geocoded social and environmental data (School of Geography, Development and Environment). I see opportunities to contribute to teaching and research in these and emerging areas (e.g., data science in the School of Information).

We look forward to participating in this important initiative and are supportive of helping UA become a global leader in this area.

Sincerely,

John Paul Jones III
Don Bennett Moon Dean

THE UNIVERSITY OF ARIZONA
James E. Rogers College of Law

DEAN'S OFFICE
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1201 E Speedway Blvd
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March 18, 2021

David W. Hahn, Dean, Craig M. Berge College of Engineering
dwhan@arizona.edu

Elliott Cheu, Interim Dean, College of Science
echeu@arizona.edu

Dear David and Elliott,

On behalf of the James E. Rogers College of Law, I am pleased to offer this letter in support of the newly proposed School of Mining Engineering and Mineral Resources. The College of Law has in recent years developed the world's leading online masters program for lawyers and non-lawyers in global mining law and policy. Global Mining Law | University of Arizona Law. The Global Mining Law Center now includes more than 15 courses. I attach a two page list of the current courses. We have also put on a highly successful annual mining law and policy summit for the last several years.

Our global mining law program was created with substantial private support from both alumni, such as Chuck Jeannes and Desmond Kearns, and others excited by our vision, such as Stanley Dempsey and private companies such as Royal Gold and the Rocky Mountain Mineral Law Foundation. Our current goal is to expand these offerings to upper division undergraduates at both the BA in Law program and through cross-listing with other colleges at the University.

Our program has relied on the strength of our faculty and programs in environment law, water law, the top program in the world in indigenous peoples law and policy, and international trade and business law. We have also relied on deep connections across the University of Arizona, drawing us naturally to the idea of a new focal point in the proposed

School of Mining Engineering and Mineral Resources. We see the proposed School as a way to build on university-wide strengths, a distinctive history, the relevance of place, and to address an area that is (again) central to global commerce, industry, and society in the Fourth Industrial Revolution.

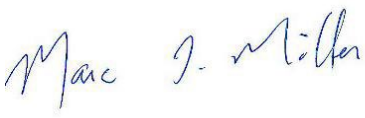
Let me offer a little relevant history. The Department of Mining and Geological Engineering was established at the College of Mines by Dr. Willard Lacy in the mid-1960s. One of Dr. Lacy's stated goals was to educate lawyers in the intricacies of geology and mining and established some joint programs between the Colleges of Mines and Law. After Dr. Lacy's retirement, his successor, Dr. Tom O'Neal, in 1976, asked Dr. Lacy's son John, then a mining lawyer, to put together a course in mining law.

John Lacy taught a mining law course in the department and the law school ever since. In 2015, I asked John to put together a series of courses related to mining industry to form the basis of graduate degrees in law, a Master of Legal Studies for mining professionals as well as to provide additional opportunities for our law students. As part of this program, John reached out to Mary Poulton to take advantage of and expand some of the short courses previously offered by the Lowell Institute for Mineral Resources (LIMR.) To this end, we have been able to use the talents of Steve Ralbovsky, Dave Hammond, Doug Silver, Tim Snider, Luke Danielson and Chris Hopkins to prepare and teach courses within the mining law offerings. The LIMR has also been the co-sponsor of all of the Mining Law Summits and Mary has been given a courtesy appointment at the College of Law.

We embrace the stated mission of the new proposed School to "transform the way students, professionals and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources."

We look forward to participating in this important initiative and are supportive of helping UA become a global leader in this area.

Sincerely,



Marc L. Miller
Dean and Ralph W. Bilby Professor of Law

Dr. Barbara Carrapa
Professor and Department Head
Department of Geosciences
Gould-Simpson Building
Tucson, AZ 87521-0077

THE UNIVERSITY OF ARIZONA
TUCSON ARIZONA

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Tucson, March 18, 2021

Dear Dr. Cheu and Dr. Hahn,

Following my conversation with Dr. Mark Barton, the department of Geosciences is supportive of the initiatives described in the proposal for the development of a new School of Mining and Mineral Resources, with the understanding that such initiatives will take advantage of existing synergies, strengthen collaborations among units and enhance research and teaching capabilities within units and across colleges at the University of Arizona. The new School has the unique potential to establish strong and global leadership in the field of mineral resources because of the excellence of units across campus with expertise in this transdisciplinary field and because of its location.

Sincerely,

Barbara Carrapa

Barbara Carrapa
(Professor and Head of Geosciences)

THE UNIVERSITY OF ARIZONA
Eller College of Management

OFFICE OF THE DEAN

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eller.arizona.edu

March 17, 2021

To Whom It May Concern:

On behalf of the Eller College of Management, I am pleased to offer this letter in support of the newly proposed School of Mining Engineering and Mineral Resources, and its mission to "transform the way students, professionals and communities work across boundaries to meet the complex challenges of economically, socially, and environmentally sustainable mineral resources." I agree this is a unique and exciting opportunity for the University of Arizona to lead in an area of growing global significance, notably a chance to have the nation's top comprehensive program around mining engineering and mineral resources, including all related disciplines.

The Eller College has historically contributed to the goal of advancing responsible and economically viable mining and use of mineral resources by partnering with the mining industry to provide graduate business education opportunities to employees of local mining organizations, and having our students and faculty work on company-sponsored business related projects to solve real problems. I see current and future opportunities to contribute to related teaching and research in such areas as agile business and economic models for the mining industry, logistics and optimization, smart automation, data analytics and artificial intelligence and how these contributions can benefit this college, the new School, the UA community overall, and society.

We look forward to participating in this important initiative and are supportive of helping UA become a global leader in this area.

Sincerely,

Paulo B. Goes

Paulo B. Goes
Dean and Halle Chair in Leadership
Eller College of Management
University of Arizona

THE UNIVERSITY OF ARIZONA
School of Anthropology

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anthropology.arizona.edu

April 10, 2021

To Whom It May Concern:

On behalf of the School of Anthropology (SoA), I am pleased to offer this letter in support for the proposed School of Mining Engineering and Mineral Resources (SMEMR). As long-time collaborators with colleagues in Mining Engineering and Geosciences, as well as the Lowell Institute for Mineral Resources, SoA faculty are committed to continuing to contribute to efforts through the SMEMR to fulfill its mission to "transform theway students, professionals and communities work across boundaries to meet the complex challenges ofeconomically, socially, and environmentally sustainable mineral resources." We are pleased to support University of Arizona's commitment to leadership in this critical area and to building a successful comprehensive and truly multidisciplinary program around sustainable mining engineering and mineral resources.

The SoA has expertise in many areas relevant to the new SMEMR. We commit to ongoing collaboration in areas such as cultural resources, impact assessment and mitigation planning, collaborative community research, international development, mineralogy and metallurgy, and materials and conservation science. We also look forward to opening up new avenues of collaboration.

Sincerely yours,

Diane E. Austin
Professor and Director
School of Anthropology