### The Case for Designation Project Narrative

Project Summary: We are inarguably living in the Polymer Age with advances in lightweight composites, rubber goods, membranes, and plastic medical devices to help us resolve important challenges in energy, transportation, water, and health sciences. The Greater Akron region (OH) has played an influential role in the development and commercialization of synthetic rubber and the education of plastics and rubber over the last 125 years with thousands of alumni contributing to the growth of the polymer industries around the world. The Greater Akron region has a long and rich tradition associated with polymers (rubber and plastics) and currently has the largest concentration of plastics and rubber manufacturing plants, machines, and materials in North America.[1]   However, the current production and use of fossil-derived polymers in society is not sustainable. Most dire is the consequence of persistent Green House Gas emissions, plastic pollution, scrap tires, inadequate disposal systems, lack of recycling pathways and capabilities, and chemical composition that makes plastic and rubber products difficult to degrade. Working in collaboration with academics and industry partners, the Akron region is well-positioned to take on the challenge of creating more sustainable plastic and rubber technology. The proposed Sustainable Polymers Tech Hub will accelerate critical use-inspired commercialization of sustainable polymers through regional partnerships in research and development, an inclusive workforce, and an entrepreneurial ecosystem for a sustainable society. We will focus on all stages of polymer manufacturing including renewable feedstock and the use of recycled materials; developing processes that are energy efficient and have reduced CO_2 emission; and chemistries that are recyclable, biodegradable, non-toxic, and can be reprocessed multiple times. The Sustainable Polymers Tech Hub will build the environment and foundation for a collaborative effort to solve critical challenges we are facing with a growing population, climate change, clean water, and the need to reduce our dependence on fossil fuels.

Tech Hub Region: The service region of the Tech Hub will be the Akron Metropolitan Statistical Area (MSA). Akron MSA, with a population of 702,219, consists of Summit and Portage counties and is anchored by the city of Akron, the fifth largest in Ohio, and an anchor city in the Northeast Ohio region. Akron MSA comprises a geographically diverse population of underserved urban areas (23.5% of Akron residents live in poverty) as well as small and rural communities (Portage County population 161,791).

Akron MSA
Northeast Ohio
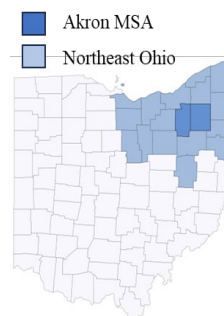
Selected Core Technologies: Used in almost all economic sectors, polymers enable essential technologies and create solutions to the greatest local and global challenges. However, historical efforts in sustainable innovations are disconnected, making it unlikely that global industry will meet its aggressive carbon reduction goals. Through collaboration, alignment, and investment, the proposed Tech Hub will excel in technology commercialization in Key Technology Focus Areas (#9) Advanced Energy and (#10) Advanced Materials Science, including but not limited to bio-based and recyclable plastics, liquid crystal displays and sensors, next-generation batteries, sustainable sources for manufacturing and improved recyclability of rubber and plastic, and designing advanced materials for mobility and transportation.

Membership of the Consortium:

- Economic Development: Greater Akron Chamber (Lead); Northeast Ohio Four County Regional Planning and Development Organization (NEFCO)
- Institutions of Higher Education: The University of Akron; Kent State University; Case Western Reserve University (NSF ENGINES Type 1 recipient)

- <u>Government</u>: City of Akron, Summit County, Portage County
- <u>Industry</u>: Goodyear Tire & Rubber Co, Bridgestone Americas, ContiTech, Synthomer, Avient Corp, Smithers Group, Parker Hannifin, Avery Dennison.
- <u>Workforce</u>: ConxusNEO
- <u>Other</u>: Bounce, BRITE, NASA Glenn Research Center

The consortium has already identified a Regional Innovation Officer to ensure clear and effective governance and leadership of the Sustainable Polymers Tech Hub. Brian Anderson, VP of the Polymer Industry Cluster (PIC), currently provides the governance and drives the communications of the PIC and will do the same for the Tech Hub.

(1) Technology-based potential of the region for global competitiveness.

The Greater Akron region is strong across the entire polymer and materials value chain – from extraction to distribution. Polymer and materials companies benefit from access to markets, innovation, education, a skilled workforce, and a low-cost-of-living region that's focused on the future of sustainable, smart materials. The Sustainable Polymers Tech Hub is designed to address cross-sector challenges with its regional partnerships, R&D, and inclusive innovation ecosystem.

Table 1. Greater Akron Existing Assets, Resources, & Capabilities	
Network Polymer Industry Advisory Council AmericaMakes MAGNET	• Fosters relationships between industries, regional universities, and other partners including in economic development; 45 member organizations (35 industries) conducting interviews, strategic planning, identifying R&D and workforce needs, and mapping local assets • Manufacturing USA Institute nation's leading public-private partnership for additive manufacturing technology and education; $28M+ program to develop digital additive manufacturing supply chain for U.S. Army. • Drives Northeast Ohio to be a global leader in smart manufacturing
Academic University of Akron (UA) Case Western Reserve University (CWRU) Kent State University (KSU)	• UA is ranked #1 in the world in polymer science and plastics engineering; 3rd most startups formed among Ohio institutions; UA College of Engineering & Polymer Science received over $40.6M in external awards and ~ $33M in research expenditures for FY20-22 • CWRU- R1 designation.; home to NSF Science & Technology Center: Center for Layered Polymeric Systems (CLiPS) including world-renowned research on packaging; received $40M for CLiPS; • KSU- R1 designation; home of the Advanced Materials & Liquid Crystal institute (AMLCI); top institution for liquid crystal innovations in the world; leading higher-ed network funded by Intel; Since 2021, KSU has received over $4M in polymer-related grant funding
Corporate Avery Dennison Bridgestone Continental ContiTech	• Avery Dennison- designing labels that facilitate the recyclability of plastics; developing alternate materials to replace polyvinyl chloride • Bridgestone (#1 tire company in the world) – excellence in materials technology - extensive investment to develop new, natural source of rubber from guayule in U.S., innovative recycling technologies to extract materials for reuse; home to Advanced Tire Production Center • Continental ContiTech (#4 tire company in the world) - manufacturer of industrial rubber goods; leader in use of dandelion sourced natural rubber; center for development of hydrogen technologies; advance sustainable materials testing lab.

Goodyear Smithers **National Labs**	• Goodyear (#3 tire company in the world) - world class tire and tire materials testing facility; Innovation Center with advance modeling and data analytics and experimental tire building capabilities • Smithers- accredited materials testing facility offers a range of chemical and physical testing, and technical services; supports the development of rubber and plastic-based materials & end products. • Sandia National Laboratories and UA - approved Master Research Agreement that enables collaborations in advanced materials research. • NASA Glenn Research Center – materials research focus to deliver advanced technologies and flight systems and improve efficiency in aircraft; leading research to address technical challenges facing the air transport industry.
Venture Capital and Entrepreneurship Bounce Innovation Hub (Bounce) UA Research Foundation (UARF) BRITE Energy Innovators (BRITE)	• Bounce- technology incubator and accelerator programs provide early-stage tech startups with resources to start and scale; GROW programs support women and minority-led startups and small businesses, recognizing diversity and inclusivity in entrepreneurship; received $3.5M from Ohio Third Frontier to provide services to high-growth startups • UARF provides entrepreneurship education, and support for technology commercialization and creation of new entrepreneurial ventures • BRITE - only energy technology entrepreneur program in Ohio; served more than 600 companies that have created nearly 2,100 jobs and attracted $250 million in investment.
Equity Assets Akron Urban League	• Programs and services emphasize education, job training, economic development, anti-violence, health & wellness, mentoring; employment of minority workers in the community; reducing health and racial disparities
Government Summit County City of Akron	• Summit County received $125,000 from the EDA in 2021 for a broadband study; committed an additional $70M of local money for fiber and data investments throughout the County • The City of Akron received $2M EDA Economic Adjustment Assistance in May 2022 for the Bounce Innovation Hub Renovation and Expansion;
Workforce & Economic Development NEFCO ConxusNEO Team NEO	• NEFCO's Economic Recovery and Resiliency Plan (ER&R) and Comprehensive Economic Development Strategy (CEDS)[2] align with the priorities of the Tech Hub by addressing polymers as a target industry sector. • ConxusNEO- working to build a talent pipeline that supplies employers with access to talent; companies & residents share in economic prosperity; a sub-recipient of a $930,000 EDA Good Jobs Challenge award to support the training of 370 underserved individuals; place 150 into entry-level manufacturing roles, and upskill 220 additional. • TeamNEO- regional economic development agency

Nature and magnitude of the consortium's selected core technology

Table 2. Polymers and Material Science NEO Region						
Total GRP	$10B		Average Wage	$55,000	Jobs	41,000
Polymer Companies	1,200+		Recent Investments	$9.8B	New Payroll Created	$1.1B+

The Sustainable Polymers Tech Hub is going to leverage key regional innovations in designing recyclable thermosets (rubber, carbon fiber composites); the use of CO_2 in the production of plastics to reduce our footprint of CO_2 and dependence on fossil fuels; designing additives that will make our most commonly used plastic recyclable; the use of bioinspired materials to improve performance and reduce toxicity; develop new packaging materials that are recyclable; and improving the performance and safety of batteries for next-generation EV applications. Advances in these areas will be game-changing for this region.

(2) Role of the private sector. The bedrock of this Sustainable Polymers Tech Hub is the Polymer Industry Cluster (PIC). The PIC, operating on behalf of the region's academic, industry, and support organizations in the polymer industry, has created cross-sector collaboration in R&D, Workforce Development, Infrastructure Projects, Start-up Support, and Business-to-Business collaboration. Under the guidance of the Polymer Industry Advisory Council, a coalition of 45 partners, the PIC is positioned to win catalytic investment from state and federal agencies, to drive industry growth and transform the economy. This cluster engages core polymer industry companies to facilitate a collaborative vision, identify common challenges, and develop shared solutions. Ten of the companies that lead the PIAC are billion-dollar national and global corporations, including Goodyear, Bridgestone & Continental ContiTech. Together these companies represent tremendous private investment, employment opportunities, and the commercialization of technologies that catalyze sustainable production of rubber & plastic goods.

(3) Regional coordination & partnerships: Akron MSA has been committed to a step-by-step, year-over-year strategic plan to reinvigorate the decades-old prominence in the rubber and polymer space to focus on future challenges. Collaborations with TeamNEO, JobsOhio, & MAGNET are working to elevate Northeast Ohio's polymer industry into a truly dynamic enterprise that is better positioned for strong, sustainable growth. Several cross-sector working groups have been established to collaborate on key areas of development, including R&D, workforce, development, infrastructure projects & startup support. In 2017, a collaborative plan called Elevate Greater Akron (EGA) was developed. EGA is informed by extensive market research, interviews with business and community leaders, and insights from emerging practices in peer cities, and has expanded to include the region's most impactful economic development, education, government, & support organizations. BRMD Consulting was then recruited to create a strategic framework for addressing challenges in Greater Akron's polymer cluster, summarize the key assets, and identify gaps in the region. The Polymer Industry Cluster initiative launched in 2021 to conduct a deeper examination of the region's polymer industry and develop a framework to leverage its full potential.

(4) Equity & diversity. The Sustainable Polymers Tech Hub will leverage and expand existing DEI initiatives to ensure that it is fostering a business environment that is inclusive and provides equitable opportunities for all businesses, entrepreneurs, and workers. GAC partners with the Greater Cleveland Partnership, a national leader in engaging employers to enhance DEI strategies by conducting speaking engagements and providing one-on-one advisory services to employers on workforce DEI strategies. The expansion of equitable community partnerships enabling the on-ramping of underrepresented groups will increase workforce development initiatives in the most under-resourced neighborhoods. As part of the Strategy Development funding, GAC will assist regional companies with the completion of an Equity & Inclusion Organization Assessment, which commits them to a multi-dimensional action plan to improve racial equity within their organizations. Expansion efforts will focus on:
- Increasing access to work experience, internship, & employment for Black talent

- Providing tools, resources, and customized training for companies
- Informed, aligned, and supported strategies for achieving DEI goals
- Akron Urban League's Minority Business Assistance Center (MBAC), Minority Contractor Capital Assistance Program (MCCAP), and STEAM Academy
- Bounce GROW programs support women and minority-led startups and small businesses

(5) Composition and capacity of the regional workforce. The polymer industry is Ohio's largest industry cluster with more than 140,000 employees in more than 2,800 companies.[3] Northeast Ohio employs 40% of the polymer industry workforce in Ohio with polymer companies in Greater Akron employing almost five times as many plastics workers (42,000+)[4] as the average U.S. region. The unemployment rate for Akron MSA's Black population is 12.2% compared to 5.1% of the overall population. Women, Latinx and African Americans are underrepresented in the top 20 STEM occupations in Akron MSA and significantly underrepresented in Engineering occupations (Women 10.7%; Latinx 0%; Black 3.7%). The PIC plans include strategies for increasing the accessibility and equitable outcomes: building the pipeline of diverse talent to fill high-paying innovation jobs through middle & high school STEM programming, engaging in targeted outreach to underserved populations for in-demand jobs with low barriers to entry

(6) Innovative "lab to market" approaches. The Greater Akron region prioritizes technology creation and production through knowledge sharing, talent attraction, and technology transfer within the local ecosystem. The proposed Tech Hub aims to strengthen knowledge of polymer sustainability. The vision is to build a collaborative network to accelerate sustainable polymer commercialization. The Tech Hub can remove obstacles by investing in pilot scale-up facilities that are accessible to small and large-scale companies; leveraging regional polymer expertise, and translating ideas into promising technologies. The "Ohio I.P. Promise" initiative ensures a unified process for commercialization among higher education institutions. Universities provide information on their technology transfer that guides entrepreneurs through the commercialization process.[5] Bounce provides support and resources to startups and small businesses, helping them commercialize their proprietary technologies. In 2022, Bounce generated $58M in revenues, raised $11M in investments, assisted with 34 patents, and supported the creation of 140 new jobs.[6]

7) Impact on economic and national security of the entire United States. The Sustainable Polymers Tech Hub envisions a polymer industry based on: 1) fossil-free resources, 2) human and environmentally safe chemicals, 3) cost-competitive processes, 4) advanced material solutions for societal challenges, and 5) efficient waste reduction/resource recovery. The Tech Hub's R&D activities will focus on areas for reducing carbon footprint, improving sustainability, and minimizing dependency on fossil fuels. The Tech Hub aligns with numerous national priorities: President Biden's Justice40 Initiative and 2021 Executive Order on America's Supply Chains; House Bill S.2226 National Defense Authorization Act for Fiscal Year 2024 (requests funding that includes R&D aspects for increasing the domestic supply of natural rubber); NSF Engineering elimination of end-of-life-plastic waste; & US DOE's Plastics Innovation Challenge.

Geographic Constraints. The Akron MSA is covered by the EDA Chicago Regional Office. The Sustainable Polymers Tech Hub benefits small and rural communities and underserved communities in and near metropolitan areas. The region comprises a geographically diverse population of underserved urban areas (23.5% of residents of Akron live in poverty) as well as small and rural communities (Portage County population 161,791). Summit County includes 11 villages and 9 townships. Portage County includes 6 villages and 20 communities.