Judith Barish, coalition coordinator
**CHIPS Communities United**
℅ Good Jobs First
1380 Monroe St NW, PMB 405
Washington DC 20010
info@chipscommunitiesunited.org

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**NIST-CPO/EA-002: Response to Draft Environmental Assessment for TSMC Arizona**

Thank you for the opportunity to comment on the May 29, 2024 Draft Environmental Assessment (EA) for providing federal financial assistance under the CHIPS Incentives program to TSMC Arizona (NIST-CPO/EA-002) for the purchase and installation of semiconductor manufacturing equipment in up to three new semiconductor fabs. CHIPS Communities United (CCU) is a national coalition of unions, environmental organizations, and community groups committed to the safe, equitable, and sustainable implementation of the CHIPS and Science Act. This letter is also signed by the Sierra Club, Stand.earth, Tonatierra, the International Campaign for Responsible Technology, Safe Jobs Healthy Families, Clean Air for All Now, and the Center for Public Environmental Oversight.

The draft EA does not convincingly support the finding that the proposed action will have no significant environmental impacts, because the EA does not provide sufficient evidence and analysis of the short-term, long-term, and cumulative environmental impacts of the project and its effects on public health and safety. Indeed, the EA overlooks many inevitable direct and indirect environmental and public health consequences of the proposed action. Accordingly, we respectfully request the preparation of an Environmental Impact Statement (EIS) with robust opportunities for community engagement.

We are not opposed to the TSMC project, and we are not asking for unnecessary delay. But we believe it's important that environmental review of this project be thorough, in order to:

- Support TSMC in identifying mitigation measures.
- Guide the Chips Program Office (CPO) in its agreements with TSMC. Best Management Practices (BMPs) should be required, not recommended.

- Inform the Phoenix community and other neighbors as they provide input on permit applications and the related expenditures of public resources.
- Set a precedent for thorough reviews of other major CHIPS-subsidized projects.

**Ultimately, we conclude that by conducting an inadequate environmental assessment and making a finding of "no significant impact," rather than completing a full environmental impact statement, the CHIPS Program Office is attempting to *short-circuit* the National Environmental Policy Act. Had the EA appropriately analyzed the environmental effects of the TSMC project, it would have concluded that it could not make the "no significant impact" finding, and it would have concluded that a full EIS is required.**

**INTRODUCTION AND OVERVIEW**

Our argument follows three themes: an opportunity for environmental leadership, the public right to know, and the legal requirements of NEPA review.

1. **The draft EA misses a critical opportunity for environmental leadership.**

CCU's call for a full EIS follows the leadership of the Biden-Harris administration. The CHIPS and Science act offers a once-in-a-generation opportunity not just to reshore the semiconductor manufacturing industry but also to improve product stewardship throughout the semiconductor supply chain, strengthen chemicals management, and promote sustainable production in the global supply chain. The industry has a toxic legacy of poisoning groundwater and workers: as we bring chip-making back to the United States, this is our chance to get it right by ensuring state-of-the-art standards for safe use, storage, transport, and management of the hazardous chemicals used in chip-making. This is an opportunity to use industrial policy to shape markets while protecting workers and communities.

Adopting best-in-class processes and the safest possible management of hazardous chemicals in semiconductor manufacturing has the potential to position the US as a global leader in the sector and to set a high bar that can improve productivity and build resilience in the semiconductor supply chain. As the CHIPS Program Office (CPO) negotiates contractual language with TSMC and other CHIPS Act recipients, the federal government has an opportunity to support sustainable production and lay out a framework for future investments and public and private sector collaboration. It is a chance to advance innovation in the field of sustainable chemistry solutions to address the challenges of toxicity, climate change, and environmental justice. The US government is positioned to improve occupational and community health and safety in the semiconductor ecosystem, with improved detection and measurement technologies, remediation strategies, and alternatives to toxicants in the manufacturing process.

But this vision depends upon a clear and robust understanding of the risks and hazards of semiconductor manufacturing. As the first NEPA review launched by CPO, the draft EA of TSMC should lay the foundations for the Commerce Department's commitment to a revived US chip-making industry that is safe and sustainable. But the draft EA's finding of no significant impact lacks the substantive evidence and detail that signal leadership in this critical moment.

2. **The draft EA violates the public's right to know.**

The public deserves to know about the likely environmental impacts of the TSMC project before the plant is completed so we can ensure adequate steps are taken to protect worker and public health and safety, minimize the project's impact on climate, and address other environmental impacts. The EA does not provide adequate information about the impacts, the hazards, or the processes for mitigating and remediating them.

The NEPA Scoping meeting for Micron Technology's planned facility, held by the Army Corps of Engineers in Clay, NY on March 19, 2024, drew over two hundred members of the public, suggesting strong public interest in environmental review of new chip fabs.

The absence in the draft EA of specific information and the use of secret, industry-sponsored standards are sadly all too familiar. They fit a decades-long pattern of opacity on the part of the semiconductor industry. The semiconductor industry's current lobbying for an exemption from NEPA is also part of that tradition of lack of accountability.

We call for an EIS process with strong transparency and accountability.

3. **The Draft EA violates the National Environmental Policy Act.**

For many reasons, the draft fails to comply with the National Environmental Policy Act (NEPA). We urge CPO to reconsider the finding of no significant impact and instead to undertake a robust environmental impact statement. We base our analysis on legal precedent and the most recently adopted regulatory language governing the TSMC EA. Statutes, regulations, and court rulings are clear about the purpose of NEPA and the responsibilities of the lead agency. We conclude that a full EIS is required based on six arguments.

a. **The draft EA has insufficient evidence and analysis:** The draft EA provides insufficient details on the planned environmental management for the site and thus about the consequences of the proposed action. But an environmental assessment must be detailed. The lead agency is required to take a "hard look" at the environmental effects of a proposed action. The EA must provide "sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact."[1] We will argue throughout this comment that the EA fails to provide sufficient evidence and analysis to justify a finding of no significant impact, including because it entirely fails to analyze the full scope of impacts.

b. **The draft EA inadequately considers cumulative effects:** The draft EA fails to document anticipated cumulative impacts. By defining the affected area as the area of the TSMC plant plus a one-mile perimeter, the EA prevents meaningful analysis of the effect of TSMC and other industrial facilities on air quality, GHG emissions, water use, housing, and land use. This narrow definition is *prima facie* inappropriate, since the impacts of a large factory obviously extend more than a mile beyond its walls, but it is even more inadequate given that the CHIPS Program Office has just released another draft EA for another large semiconductor fab expansion, Intel's Ocotillo campus, in the same county.

[1] 40 CFR 1501.5(c)(1)

Per NEPA regulations, EAs must consider all foreseeable direct and indirect impacts as well as cumulative impacts, also referred to as cumulative effects. This has long been understood as part of the obligation of NEPA review.[2] The current regulations underscore this obligation. Regarding "[w]hether the action is related to other actions with individually insignificant but cumulatively significant impacts": The term "effects," which is what must be considered in determining significance, is defined as reasonably foreseeable direct, indirect, and cumulative effects,[3], and "[c]umulative effects can result from individually minor but collectively significant actions taking place over a period of time."[4] Neither the TSMC project nor the Intel project can be considered individually minor, making the obligation to consider their cumulative impact all the more clear.

c. **The draft EA improperly excludes connected actions:** The draft EA improperly segments the TSMC project, ignoring the construction and operation of the plant, and only focusing on the purchase and installation of some unspecified subset of the facility's semiconductor manufacturing equipment (SME). But regulations explicitly prohibit this sort of division of a project for NEPA review and call on agencies to consider actions that are connected. The EA must consider connected actions, "which means that they are closely related and therefore should be discussed in the same impact statement. Actions are connected if they:

> (i) Automatically trigger other actions that may require environmental impact statements;
>
> (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously; or
>
> (iii) Are interdependent parts of a larger action and depend on the larger action for their justification."[5]

In the case of the TSMC plant, using the SME depends on the existence of the factory, and the factory cannot run without the purchase of the equipment. The SME is thus inextricably connected to the construction and operation of the fabs, because the use of the machines cannot proceed without "other actions … taken previously" – the construction of the three fabs.

Ample empirical evidence, furthermore, refutes the idea that the construction and operation of the fabs would take place absent the expectation of CHIPS Act subsidy. Government insiders have said privately that TSMC's interest in building a fab in the US was the catalyst for the CHIPS and Science Act, whose roots were planted during the Obama administration, since TSMC was hesitant to build a facility in this country, where costs were higher than in Taiwan, without public support. When the company broke ground in Phoenix in June 2021 on a planned $12 billion fab, it did so with the hope of receiving federal funding, as the bill that became the CHIPS and Science Act was advancing in the US Senate.[6] TSMC decided to build a second fab, raising its proposed investment to $40 billion, in

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[2] Please see *Ctr. for Biological Diversity v. Salazar*, 695 F.3d 893, 916-17 (9th Cir. 2012); *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989).

[3] 40 CFR 1508.1(g)

[4] 40 CFR 1508.1(g)(3)

[5] 40 CFR 1501.9(e)(1)

[6] https://www.reuters.com/technology/tsmc-says-construction-has-started-arizona-chip-factory-2021-06-01/

response to the signing of the CHIPS and Science Act in August 2022.[7] The company announced plans to build a third fab, raising the total investment again, this time to $65 billion, in response to the Preliminary Memorandum of Terms (PMT) announcement in April 2024.[8]

US officials have made repeated public statements that federal funding was the *sine qua non* for TSMC's Arizona facility. Brian Deese, director of the National Economic Council, explained:

> The passage of the CHIPS and Science Act was absolutely critical in providing the long term certainty for companies like TSMC to expand their footprint and expand their commitment to the United States.[9]

TSMC executives have similarly underlined the role federal funding played in the company's decision to build fabs in Phoenix. TSMC Chairman Dr. Mark Liu said:

> The proposed funding from the CHIPS and Science Act would provide TSMC the opportunity to make this unprecedented investment and to offer our foundry service of the most advanced manufacturing technologies in the United States.[10]

Academic observers have echoed the conclusion. For example, commenting on TSMC's Phoenix facility, Prof. Juri Ezzaini, a professor of political science and economics at the University of Zurich, wrote that "[t]his would not have been able without the CHIPS and Science Act."[11] In short, the fabs would not have been built or operations begun absent the likelihood of federal funding. Thus, an EA that does not consider the impact of the entire TSMC project – all three fabs, their construction, and their operation – has failed to meet the requirements of the law.

d. **The draft EA fails to meet the burden of proof required by NEPA:** CPO has a duty to take a hard look at all potential environmental impacts of the proposed action and to prepare an EIS if substantial questions are raised regarding whether the project may cause significant environmental effects.[12] If the CPO finds the project will not have a significant impact on the environment and public health, it must provide "'a convincing statement of reasons to explain why a project's impacts are insignificant.'"[13] The burden of proof lies with the agency to justify a conclusion that there will be no significant impact, not with the public to prove there will be. CPO and TSMC must provide "sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact."[14] Indeed, if the degree of effects is uncertain or controversial, then the agency has not met the "sufficient evidence" requirement in 40

[7] https://www.cnbc.com/2022/12/06/tsmc-to-up-arizona-investment-to-40-billion-with-second-semiconductor-chip-plant.html
[8] https://arstechnica.com/tech-policy/2024/04/tsmc-will-build-third-arizona-fab-after-winning-6-6b-in-chips-funding/
[9] https://www.cnbc.com/2022/12/06/tsmc-to-up-arizona-investment-to-40-billion-with-second-semiconductor-chip-plant.html
[10] https://www.nist.gov/news-events/news/2024/04/biden-harris-administration-announces-preliminary-terms-tsmc-expanded
[11] https://www.linkedin.com/posts/juri-ezzaini-9a0402127_tsmc-expands-us-investment-to-65bn-after-activity-7183150742050877442-IpGD/
[12] See, e.g., *Ctr. for Cmty. Action & Env't Just. v. Fed. Aviation Admin*., 61 F.4th 633, 639 (9th Cir. 2023).
[13] Id., quoting *Bark v. United States Forest Serv*., 958 F.3d 865, 869 (9th Cir. 2020).
[14] 40 C.F.R. 1501.5(c)(1)

CFR 1501.5(c)(1). If there are "substantial questions whether a project may have a significant effect" – as is the case here – an EIS must be prepared.[15]

e. **The draft EA assumes the use of Best Management Practices that are not required:** If it is the case that TSMC can avoid all significant harm to the environment and public health by following best management practices (BMPs), this will only meet the standard of no significant impact if those BMPs are included, in detail, as mandatory actions in the contractual language the CHIPS Program Office (CPO) is negotiating with the company. It is not enough to say that TSMC has agreed to obey relevant laws and regulations.

f. **The draft EA relies on standards that are not available for public inspection:** Finally, the EA violates federal regulations by basing its conclusion of no significant impact on standards that are not publicly accessible or reasonably available, namely SEMI's S2 standard, which the EA describes as "one of the primary guidelines for Environment, Health and Safety for designing and manufacturing SME" (p. 65). But this standard is not available for inspection since it is proprietary, copyrighted, and can only be inspected by purchasing it, a clear violation of NEPA regulations, which state:

> Agencies may not incorporate material by reference unless it is reasonably available for inspection by potentially interested persons within the time allowed for comment. Agencies shall not incorporate by reference material based on proprietary data that is not available for review and comment.[16]

CCU's initial request to inspect SEMI S2 was rejected. We were subsequently told that we could inspect it, but not within the time frame of the public comment period, which violates the requirement that material be "available for inspection … within the time allowed for comment." Even if CCU staff and members were able to look at S2, the EA would still be based on "proprietary data that is not available for review and comment." Finally, even if the use of secretive, proprietary standards were permissible under NEPA, it violates basic principles of good government. These standards were not established through a transparent, multi-stakeholder process, with opportunities for public review and participation, or led by democratically accountable actors. It flies in the face of regulatory ethics to allow a regulated entity to write the regulations that will be applied to it and calls to mind the adage of foxes guarding the hen-house.

In the appendix to the recently released PEA on modernization of semiconductor facilities, CPO refers to congressional statute and an OMB circular to argue that it is permissible to rely on secret, private-sector standards. The language of the congressional statute in no way authorizes the agency to rely for NEPA review on standards that are privately owned and inaccessible. Rather, it authorizes NIST to "facilitate standards-related information sharing and cooperation … and to coordinate the use by Federal agency of private sector standards," "to cooperate with other departments and agencies of the Federal Government, with industry, … in establishing standard practices, codes, specifications, and voluntary consensus standards;" and "to coordinate technical

[15] C*tr. for Cmty. Action & Env't Just*., 61 F.4th at 639

[16] 40 CFR 1501.12

standards activities and conformity assessment activities of Federal, State, and local governments with private sector technical standards activities and conformity assessment activities."[17] None of these activities – facilitating sharing, cooperating to establish standards, and coordinating conformity activities – describe the use of private, copyrighted, inaccessible standards as the basis for environmental findings.

As for the OMB circular cited in the PEA (A-119), it encourages agencies to use voluntary consensus standards as the basis for regulations, but also underlines that agencies are still bound by the Freedom of Information Act's requirement that "standards incorporated into regulation by reference be made reasonably available to the "class of persons affected."'[18] What does "reasonably available" mean? A-119 clarifies four factors to consider.

- "(i) whether the standards developer is willing to make read-only access to the standard available for free on its website during the comment period to facilitate more effective access, because access may be necessary during rulemaking to make public participation in the rulemaking process effective."[19] In the case of SEMI S2, no such access has been made available for free.

- "(ii) the cost to regulated and other interested parties to access a copy of the material…" In the case of SEMI S2, the cost is $355, which is a significant burden on individuals, environmental justice communities, small non-profits, neighborhood groups, and other community organizations.

- "(iii) the extent particular access is needed to achieve agency policy or to subject the effectiveness of agency programs to public scrutiny." In the case of SEMI S2, it is described in the draft EA as "one of the primary guidelines for Environment, Health and Safety for designing and manufacturing SME. The S2 standard addresses environmental, health, and safety practices and incorporates several other standards, addressing: equipment installation, gas effluent handling, exhaust ventilation, ergonomics, risk assessment, equipment decontamination, fire risk mitigation, electrical design." The draft EA implicitly argues that the use of S2 has made the industry safer than in the 1980s and 1990s when semiconductor manufacturing left more Superfund sites in Santa Clara county than in any other county in the nation.

- "(iv) whether the standards developer can provide a summary that explains the content of the standard in a way that meets agency needs and is understandable to a member of the public who lacks relevant technical expertise." We have been presented with no such summary.

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[17] 15 U.S.C. § 272, Statutory Notes, Utilization of Consensus Technical Standards by Federal Agencies (added by Section 12 of the National Technology Transfer and Advancement Act of 1995, Pub. L. 104-113, § 12(d), Mar. 7, 1996, 110 Stat. 775), https://uscode.house.gov/view.xhtml?req=(title:15%20section:272%20edition:prelim) Sections (b) (3), (10), and (13)

[18] U.S. Office of Management and Budget, Revised Circular No. A-119 (Jan. 27, 2016), https://www.nist.gov/system/files/revised_circular_a-119_as_of_01-22-2016.pdf., p 6

[19] ibid., p. 21

- "When considering incorporation by reference, agencies should include in the preamble of an NPRM, final rule, or guidance document an explanation of the incorporated materials, and how the agency's incorporation by reference of the standard would further the agency's regulatory objective." CPO has not provided an explanation of the incorporated materials.[20]

Additionally, A-119 cites as guiding documents several principles that would mitigate against using inaccessible standards:

- "Executive Order 12866 ("Regulatory Planning and Review") states that regulations must be consistent with law…" In this case, the law is NEPA, which prohibits the use of secret documents as the basis for environmental review.
- "Executive Order 13563 ("Improving Regulation and Regulatory Review") emphasizes that the U.S. regulatory system "must protect public health, welfare, safety, and [the] environment while promoting economic growth, innovation, competitiveness, and job creation," and stresses the importance of public participation…" Public participation relies on access to the information that the CPO uses for its finding of no significance.[21]

Furthermore, even if it is legitimate for CPO to rely on these standards, the agency is not authorized to rely on them without making them available to the public for review. NEPA does not permit CPO to rely on standards to justify its environmental findings if those standards are not publicly available. CPO cannot rely on secret standards to justify their finding because that violates NEPA regulations.

Ultimately, NEPA is the relevant authority here, not the OMB. NEPA is a binding statute governing the requirement to assess the environmental impacts of federal agency actions. The OMB circular is non-binding guidance.

For all these reasons, we urge CPO to reject the finding of no significant impact and instead to undertake a robust environmental impact statement.

**POTENTIAL ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED PROJECT**

In the following pages, we explore some of the individual issued raised in the draft EA. In each case, the draft EA provides insufficient detail and analysis to make a finding of no significant impact.

**1. AIR QUALITY**

**a. The proposed project may be a threat to air quality because of Hazardous Air Pollutants.**

When it comes to air Hazardous Air Pollutants (HAPs), the draft EA provides insufficient detail to make a finding of no significant impact. The semiconductor industry has a long history of using extremely hazardous materials and sometimes exposing workers and the public. By way of example, in April 2021, a phosphine leak at Apple Computer's fab in Santa Clara, California, caused the evacuation of 50 employees.

[20] *Loc. cit.*
[21] *Op. cit.,* p. 2

In July 2023 the Oregon Department of Environmental Quality penalized Intel Corporation for violating its Air Contaminant Discharge Permit for the release of acid gases.[22]

There is also a long history of the public and governmental agencies taking action and enacting rules to prevent airborne exposures to workers and nearby communities. But the EA fails to provide the necessary information to determine whether TSMC (and its suppliers) have taken the appropriate steps to prevent toxic gas releases.

Other than reviewing existing permits and EPA limits, the EA's only reassurance around Hazardous Air Pollutants (HAPs) is the following: "Air emission control technologies will be applied to manufacturing processes to reduce criteria pollutants and hazardous air pollutants (HAPs) in accordance with applicable air permits." (p 12) But this level of vagueness and generality is grossly inadequate, given all that is omitted:

- The EA does not specify the chemicals that will be used. For example, in ion implantation, "the most common gaseous sources are boron trifluoride (BF3), arsine (AsH3), and phosphine (PH3). Less common gas sources include germanium tetrafluoride (GeF4), and silicon tetrafluoride (SiF4)."[23] But the EA mentions arsine and phosphine only once, in connection with an existing permit. It doesn't mention any of the other gases. This is particularly important because the chemicals in use are always evolving, so it is critical for a company to be transparent about the chemicals it employs and its safety plans. The EPA has warned that it lacks up-to-date information about the health impacts of some of the minerals used in semiconductor manufacturing.[24] A full EIS should require TSMC to publish a list of all extremely hazardous substances used and stored, along with their anticipated monthly and annual storage quantities. It should also identify which hazardous substances require substance-specific risk management plans.
- The EA does not state if TSMC AZ will use the same hazardous gases used by TSMC's much smaller facility in Camas, Washington, also known as WaferTech, reported in the facility's 2022 Toxics Release Inventory (TRI):
    - 2,2-Dichloro-1,1,1-trifluoroethane (HCFC-123)
    - Ammonia
    - Catechol
    - Fluorine
    - Hydrogen fluoride
    - N-Methyl-2-pyrrolidone
    - Nitrate compounds (water dissociable; reportable only when in aqueous solution)
    - Nitric acid
    - Ozone
    - Phosphoric acid

[22] https://www.oregonlive.com/silicon-forest/2023/07/oregon-seeks-to-penalize-intel-31000-over-failed-pollution-controls.html
[23] https://www.bazmsolutions.com/Blog/Ion-Implantation.html
[24] https://core.verisk.com/Insights/Emerging-Issues/Articles/2023/September/Week-3/Semiconductors-and-PFAS-Risk

Will those be used in Arizona? Will they exceed the TRI reporting threshold? Will they exceed the storage threshold for requiring gas-specific risk management plans?

- The EA doesn't describe the prevention measures that will be applied, including the equipment used to prevent the exposure or release of gases or abatement strategies. This is an area of concern. Due to the toxic nature of arsenic-containing compounds, for example, abatement options are limited. Arsine is not water soluble, making water scrubbers ineffective without the addition of permanganate, hypobromite, or hypochlorite solutions, which are other dangerous chemicals. Even with chemical injection, the effluent water will become contaminated with arsenic, which is a very closely regulated water pollutant. A full EIS should identify the mechanisms for preventing release and for abatement and demonstrate redundant protections for workers and the community.

- The EA doesn't analyze how semiconductor manufacturing equipment (SME) will use and contain toxic gases and chemicals. Given that CPO aspires to define the proposed project exclusively in terms of the SME, this is a particularly significant omission. What chemicals are used by ASML's photolithography machine, for example? What safeguards or mitigation practices are built into the machinery, and what safety methods will be applied in the event of unplanned emissions?

- The EA doesn't identify the safety standards that will be used to determine adequate levels of protection from toxic gas exposure, either with regard to workers or to neighbors. Instead, the document repeats (eight times) some variant of the following phrase: "TSMC's current practice is to apply the most protective chemical exposure levels based on published standards on a chemical-by-chemical basis to protect worker safety." (p. 67) But what is the most protective exposure level? Cal-OSHA standards, which are far more protective than US-OSHA standards? Standards developed by the ACGIH? A proprietary standard developed by the industry itself that cannot be inspected by the public? Since hazardous air pollutants pose serious risks to workers as well as the general population, we further address these issues in the section on Human Health and Safety.

- The EA's language on the transportation of hazardous materials and wastes (p. 73), including highly toxic gases, provides insufficient evidence and analysis about how workers, the public, and the environment will be protected from toxic leaks. Storage and delivery are known to create significant challenges for environmental health and safety, due to both the chemical hazard of the molecule and the kinetic energy stored in a vessel in the form of compression. Thus the lethality of a toxic release is magnified exponentially by the force of high pressure storage.[25] There is little public confidence in our country's system for transporting hazardous materials. The release of vinyl chloride from a train derailment in East Palestine, Ohio is one example of a significant environmental impact from a transportation release, while the recent death of a worker at the TSMC plant from toxic substances in his truck is another ominous example. The EIS should provide details identifying the hazardous materials to be transported to and from the TSMC plant, how they will be transported, what steps will be taken to prevent releases, and what will be done to respond to any releases.

[25] https://sst.semiconductor-digest.com/2018/05/next-generation-dopant-gas-delivery-system-for-ion-implant-applications/

- The EA doesn't describe the control systems that will be used to minimize risk of exposure. Consider Santa Clara County's Toxic Gas Ordinance (TGO), developed in the 1990s and now a model ordinance that has been adopted in a number of municipalities. The TGO differentiates between highly toxic, toxic, and moderately toxic gases, and regulates bulk containment systems appropriate to each category.[26] The draft EA never describes which set of toxic gas rules and control measures TSMC intends to implement or how the workers and public can be assured they would be protected in the event of a release. A full EIS should include these elements.

- The EA doesn't estimate safe distances for sensitive uses of toxic gases. A full EIS should use dispersion models to estimate safe distances for sensitive uses such as homes, schools, hospitals, and daycare centers, for each extremely hazardous gas. City and facility planners need such information to safely plan for the intense development anticipated around the TSMC factory. The public at large should be aware of the risks of catastrophic releases, not to oppose the project, but to ensure sufficient resources and regulations are brought to bear to protect the communities. For example, a report prepared by the Santa Clara County Fire Chief's Association around the hazards posed by four of the toxic gases most commonly used by the semiconductor industry concluded that "virtually the entire Santa Clara Valley is the 'immediate community' which in the event of a major release could be exposed to toxic gas concentrations in excess of the safe Level of concern."[27] Yet there is no indication in the draft EA that screening models have been conducted to assess potential harm to nearby communities.

**b. The proposed project may be a threat to air quality because of fluorinated gases.**

The draft EA provides insufficient detail to conclude that the use and release of fluorinated gases will not constitute a significant environmental impact.

The CHIPS Program Office has identified the use and release of fluorinated gases as the principal source of greenhouse gases (GHGs) from semiconductor production:

> Most of the GHG emissions from semiconductor fabrication facilities are fluorinated gases such as PFCs and $SF_6$.… Under normal operating conditions, EPA estimates that 10 to 80 percent of these gases pass through the manufacturing process unreacted and are released into the atmosphere.[28]

A new industry paper summarizes the challenge:

> So, what is the concern? The fluorinated greenhouse gases used in plasma processes are the most potent greenhouse gases measured. They absorb infrared (IR) at wavelengths that

[26] https://sesha.org/abstract/toxic-gas-ordinance-data-book-updated-and-expanded-for-2014/

[27] "Modeling toxic gas releases using a simple screening model" by Dr. Kenneth MacKay, Professor of Meteorology at San Jose State University, et al , February 1, 1987. Published in "Transportation of Hazardous Materials"; Hearings Before the Subcommittee on Surface Transportation, Committee on Public Works and Transportation, May 19,25 1988.

[28] "Draft Programmatic Environmental Assessment for Modernization and Internal Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program," CHIPS Program Office, December, 2023, https://www.nist.gov/system/files/documents/2023/12/26/CHIPS%20Modernization%20Draft%20PEA.pdf, p. 1

> CO2 does not, and they are potent - 1 kg of SF6 has the global warming impact of >25,000 kg of CO2. They also have the longest atmospheric lifetime of any of the greenhouse gases, up to 50,000 years. F-GHGs are anthropogenic and their concentrations in the atmosphere are increasing. Once released to the atmosphere, they will remain for longer than human civilization has existed.[29]

Despite the apparent seriousness of fluorinated gas emissions from wafer fabrication, the draft TSMC EA provides no quantitative information on the use and release of these potent greenhouse gases. Instead, it states, without clear detail, what the F-GHG treatment train will look like:

> Similar to other TSMC facilities, SME planned for TSMC AZ will incorporate air emission control devices for safety purposes. These control devices also abate F-GHGs using electrical heating, fuel combustion, plasma, and catalytic devices that have destruction and removal efficiencies for F-GHGs (e.g., CH4 and C2F6) that, in the aggregate, would reduce F-GHGs by at least 90 percent. (p. 32)

What is the climate impact of the remaining 10%?

Furthermore, not only does this promise lack specificity, but it fails to document the greenhouse gas and toxic releases from abatement systems. Beu and Gresham note:

> Abatement devices can break PFCs into smaller chemical byproducts but may have high COO and create criteria air pollutants such as SOx, NOx, CO and hazardous and toxic air pollutants such as F2, COF2, and HF, that require additional abatement.[30]

The EA never explores or analyzes the likelihood that fluorinated gases might break down into criteria air pollutants and thus violate federal law.

In addition to the climate impact and the contribution to criteria air pollution and HAPs, fluorinated gases are also likely to break down into PTFA, a powerful PFAS chemical, in the surrounding environment. Recent research has found:

> But the inconvenient truth is that F-gases are creating widespread, persistent, and growing global PFAS pollution. When these gases are released into the air, they degrade to trifluoroacetic acid (TFA), a highly persistent and mobile PFAS. TFA concentrations are now rapidly increasing in rainwater, groundwater and ocean water, and were also detected in vegetation. Since TFA is also widely found in indoor and outdoor dust, as well as in bottled water, it comes as no surprise that TFA is now commonly found in human blood and urine. No other substance has been found in so many environmental media, in these high concentrations and with such a fast increase. TFA is highly persistent and under environmental conditions, there are no known degradation processes, meaning TFA's lifetime is practically indefinite.[31]

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[29] Laurie S. Beu and Melissa A. Gresham, "An Overview of Semiconductor Industry Efforts to Reduce PFAS Use and Emissions in Plasma Processes," 2024, Proceedings of the International Society for Optics and Photonics, https://www.spiedigitallibrary.org/conference-proceedings-of-spie/12958/3013226/An-overview-of-semiconductor-industry-efforts-to-reduce-PFAS-use/10.1117/12.3013226.short, p. 2

[30] Beu and Gresham, p. 3

[31] https://meta.eeb.org/2024/05/29/f-gases-an-unprecedented-case-of-chemical-pollution/

To the best of our knowledge, there is no plan to regulate or even independently monitor the abatement of F-GHG's at the TSMC plant. Maricopa County's latest air permit, focused on the operation of a Rotor Concentrator Thermal Oxidizer, makes no mention of fluorinated gases.[32] Thus, there appears to be no plan to independently verify the effectiveness of the proposed abatement systems in either destroying fluorinated gases or preventing the release of products of incomplete combustion. U.S. EPA notes:

> Thermal oxidizers have historically not been designed with destruction of PFAS as the primary focus, so most currently installed thermal and catalytic oxidizers may not be optimized for PFAS destruction. However, some thermal oxidizers are being used for halogenated wastes, including PFAS precursors. Thermal oxidizers are being employed to destroy PFAS-containing and gaseous streams, but the data are insufficient to allow conclusions on the overall efficiency of thermal oxidizers in PFAS destruction.[33]

Indeed, whether PFAS compounds can be destroyed by thermal processes remains in doubt. This is because both the mixtures of PFAS and related compounds that enter a treatment process and the materials that emerge from the treatment process cannot be fully characterized by existing methods. Of the thousands of PFAS chemicals, only a few can be detected by current methods. Moreover, the processes of transformation are complex and remain beyond current scientific understanding. At this point, the only established way to prevent further distribution of PFAS compounds is to provide for secure sequestration pending resolution of these technical and scientific issues. The draft EA provides no reassurance on this score.

In conclusion, the draft EA provides insufficient detail to conclude that the use and release of fluorinated gases will not constitute a significant environmental impact.

- The NEPA review of this project should identify which fluorinated gases and other fluorinated materials will be used in this project, and it should describe the risk to public health and the environment, both from those gases and also from the byproducts of abatement systems. It should also describe how emissions of fluorinated greenhouse gases will be monitored and regulated.
- The NEPA review of this project should quantify and total the use and release of each greenhouse gas used in production and estimate the cumulative GHGs to be released by the proposed project.
- The draft EA acknowledges the uncertainty generally associated with the TSMC project's impact on air quality, but it fails to identify the uncertainty inherent in the planned partial destruction of fluorinated greenhouse gases. That uncertainty alone is reason enough to conduct a more thorough review.
- The project's vague promise to abate GHG emissions and to rely on Renewable Energy Certificates (RECs) to compensate for the remainder flies in the face of growing public concern about climate change. (See more below in the section on Climate Change.)

[32] "Air Quality Permit to Operate and/or Construct, Issued to TSMC Arizona Corporation," Maricopa County Air Quality Department, Permit No. P0011418, June 17, 2024.
[33] "Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances—Version 2 (2024), U.S. Environmental Protection Agency, April 8, 2024, p. 52

### c. The proposed project may be a threat to air quality because of criteria pollutants.

The draft EA for TSMC Arizona does not provide sufficient evidence and analysis to make a finding of no significant impact with regard to the emission of criteria air pollutants.

The drafters conclude there will be no significant impacts because TSMC will "evaluate and adopt appropriate emission control technologies and potential emission offsets to maintain compliance with the National Ambient Air Quality Standards (NAAQS) and the Arizona State Implementation Plan." (Table ES-1) However, the draft EA provides only a general description of the emission control technologies. It describes a modeling exercise that "showed that emissions under the Proposed Project would not cause an exceedance of NAAQS standards," but it presents no modeling data for independent review.

It states, "Potential direct air effects from the operation of tools will be managed through MCAQD air permits." (p. 25) The draft EA refers to the "construction and synthetic minor operating permit number P0009668 (the Permit) issued by MCAQD on March 30, 2023." That should be updated to reference the June 17, 2024 Air Quality Permit to Operate and/or Construct.[34] It should note any changes between the former and current permit. The air permits are not listed in the EA Reference section, and they appear not to be web accessible. The draft EA should also summarize public involvement in the development of that permit. The draft EA reports, "All nonattainment NSR programs require an opportunity for public involvement in the permitting process." (p. 24)

Given the complexity of the air permitting process, it is not sufficient to find there will be no significant impacts on the air simply because a permit has been issued. The burden of proof is on the agency to illustrate how emission control technologies will achieve regulatory requirements. In particular, the draft EA states:

> In February 2024, EPA lowered the level of the annual NAAQS for PM2.5 from 12.0 to 9.0 micrograms per cubic meter (µg/m3), prompting revisions to the NAAQS. Current PM2.5 emission levels modeled for Phases 1, 2, and 3 of the Proposed Project demonstrate conformance with the current standard of 12.0 µg/m3; however, additional control technologies may be required to meet the proposed revised standard. Conformance with the PM2.5 levels will be maintained through MCAQD permits for the equipment. (p. 26)

Finding that additional control technologies "may be required" is a far cry from finding no significant impact.

The EA discusses thermal oxidizer controls for VOC and wet scrubbers "to reduce inorganic HAP emissions" but there is no mention of how they will contain and control impacts from particulate matter (PM) emissions inside or outside the manufacturing facility. Dust collection and control equipment to protect ambient air such as electrostatic precipitators or cyclone dust collection systems are not mentioned or considered.

The draft EA also states, "Potential air effects from the construction of the Facility are not included in the Proposed Project, because the SME and tool purchases and installation are independent from construction of the fab buildings." (p. 25) This segmentation of air impacts violates both the spirit and the letter of NEPA.

[34] #P0011418

The historic pollution associated with construction, including the manufacture of concrete, should be taken into account when evaluating new emissions associated with SME operations.

The draft EA's language on cumulative effects amounts to little more than wishful thinking, rather than a finding of no significant impact:

> Future industrial development within the ROI [Region of Influence], including any potential future expansion of the TSMC AZ Facility, may be limited to those projects that can meet tightening air permitting requirements. This limitation should ensure significant cumulative effects from industrial and commercial sources on air quality fall below significant levels. (p. 84)

We raise these issues not to prevent the operation of the wafer fabrication facilities, but to encourage TSMC to utilize the technologies that it describes in its corporate sustainability report.[35] That report describes treatment methods that target the specific manufacturing steps and gases used in production. In fact, it would be useful to include them in the NEPA documentation and compare that approach with those described or required in the Maricopa County permit.

Finally, the current air permit requires that TSMC prepare an Operations and Maintenance Plan that will include requirements for air monitoring. Please include in the NEPA documentation a description how the public may obtain that plan as well as the sampling results.

**d. The proposed project may be a threat to air quality because of cumulative impacts.**

As mentioned in our introduction, NEPA obligates federal agencies to consider the cumulative effects of different projects. In the case of TSMC, Maricopa County, Arizona is the only location (so far) where the CHIPS Program Office is proposing two major investments. TSMC AZ is already located in a non-attainment area for criteria air pollutants ozone, PM10, and (based on the 2024 rule) PM2.5.

Yet nowhere does the EA mention let alone explore the cumulative effects of TSMC with Intel's expansion.

Air pollution can have impacts far beyond the borders of a factory (and beyond a one-mile perimeter). The burden of proof is on the agency to demonstrate that there is no relevant cumulative impact on air quality of the TSMC plant, the Intel facility in Chandler, Lucid Motors in Casa Grande, the Meta Data Center in Mesa, the LG Plant in Queen Creek, and the Kohler facility in Casa Grande, to name just a few of the new large manufacturing projects underway in the Phoenix metropolitan area.

**2. CLIMATE CHANGE, RESILIENCY, AND SUSTAINABILITY**

The draft EA provides insufficient details to make a finding of no significant environmental impact with regard to greenhouse gas (GHG) emissions. Indeed, there are reasons to expect the TSMC AZ facility will have significant impacts on Scope 1, 2, and 3 emissions.

To assess the impact of a project, maximum possible emissions should be evaluated. The Institute of Environmental Management & Assessment (IEMA), the world's largest professional body for environmental practitioners, has identified "climate change as one of the defining environmental policy drivers of the

[35] "TSMC 2022 Sustainability Report," pp. 126-133, https://esg.tsmc.com/en-US/file/public/e-all_2022.pdf

future and that action to address GHG emissions is essential." It has determined that there are three overarching principles particularly relevant to considering the aspect of "significance":

> The GHG emissions from all projects will contribute to climate change; the largest interrelated cumulative environmental effect.
>
> The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive – e.g. Population, Fauna, Soil, etc.
>
> GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.[36]

In short, the Institute concludes that, "in the absence of any significance criteria or a defined threshold, it might be considered that all GHG emissions are significant, and an EIA should ensure the project addresses their occurrence by taking mitigating action."

**a. The proposed project may significantly increase Scope 1 greenhouse gas emissions.**

Semiconductor manufacturers use a variety of gases with high Greenhouse Warming Potential (GWP) to create intricate circuitry patterns on silicon wafers and to rapidly clean chemical vapor deposition tool chambers. Semiconductor manufacturing processes use high GWP fluorinated compounds including perfluorocarbons (e.g., CF4, C2F6, C3F8 and c-C4F8), hydrofluorocarbons (CHF3, CH3F and CH2F2), nitrogen trifluoride (NF3), and sulfur hexafluoride (SF6). These manufacturing processes also use fluorinated heat transfer fluids and nitrous oxide (N2O).

To understand TSMC AZ's potential emissions, we consider TSMC's facility in Camas, Washington, very near Portland, Oregon. According to TSMC, TSMC Washington (also known as WaferTech LLC) was the first dedicated semiconductor contract manufacturer in the United States. The WaferTech facility is smaller than the proposed TSMC AZ facility, but it has reported GHG emissions through the EPA Greenhouse Gas Reporting Program (GHGRP) since at least 2012, and those reports provide insight into what can be expected from the proposed facility.

Total reported 2022 GHG emissions from the WaferTech facility was 14,278 Metric Tons. According to the draft EA for TSMC, "the current estimations for annual Scope 1 GHG emissions for the Facility overall is approximately 1.6 million MT." (p. 31) With an assessed 90% emissions control, this would mean ongoing GHG emissions of at least 160,000 metric tons/year, which is >11 times higher than the WaferTech facility reported GHG emissions.

160,000 metric tons per year is a low estimate, since the draft EA only estimates GHG emissions from the purchase and installation of SME, not from other Scope 1 sources. But it is a vast amount of GHG, equivalent to the annual electrical use of 32,000 homes or the gas consumed by 38,000 cars.

[36] Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance, Institute of Environmental Management & Assessment (IEMA), https://www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance

GHG emissions from TSMC AZ will likely be significant, therefore, and must be considered for meaningful planned impact reduction in a comprehensive EIS.

**b. The proposed project may significantly increase Scope 2 greenhouse gas emissions.**

The draft EA anticipates that the three fabs will require a significant electricity load of **8.54 GW per day, or 3.1 Terawatt hours per year, enough to power over 300,000 Arizona households.**[37] According to the draft EA's appendix, this electricity use will release approximately 492,000 MT of GHG annually. However, the EA provides no analysis on the significant impact that the project will have on the grid, or what plans Arizona Public Service Company (APS) has in place to meet it.

This electricity use will drive expansion of fossil fuel burning. In the load forecast for its 2023 Integrated Resource Plan, APS projects that electricity demand from large electricity customers will jump from 3% in 2023 to 34% in 2038, driven primarily by data centers and industrial customers like TSMC's semiconductor fabs, including just the first two of TSMC's proposed phases. APS's integrated resource plan for the next fifteen years points to this growing industrial demand in part to justify a delay in a coal plant retirement and replacement with gas fired generation. The utility forecasts a 1.8 GW load growth by large industrial customers in the next five years; the impact of this growth on peak demand will require new investments in fossil gas generation capacity, which will have significant negative long term impacts on Arizona's climate emissions and clean energy transition.[38]

Expansion of gas power plants in response to increased demand from TSMC will result in significant and long term emissions growth, delay system-wide grid decarbonization, and lock in fossil fuel demand well past the cut-off recommended by repeated IPCC reports.

An Environmental Impact Assessment must consider the impact of TSMC's electricity demand on an hourly-matched (24/7) basis in order to account for the significant long term impacts on grid decarbonization. Because solar power cannot be generated at night, the existing electricity grid has a higher emissions intensity during hours of darkness. Semiconductor fabs require round-the-clock electricity supply, meaning that under the current proposal TSMC's increased demand will need to be met by increased fossil fuel-based power generation in order to keep the supply available at night, driving dangerous further demand for new fossil gas infrastructure.

The draft EA provides insufficient detail to show how TSMC's energy plan will negate or mitigate climate impacts of electricity generation and increased grid load, having established that the project will be primarily reliant on grid electricity.

**c. The proposed project may significantly increase Scope 3 greenhouse gas emissions.**

The draft EA provides insufficient information on the GHG emissions and air pollutants from the construction process, making it impossible to adequately assess the risks the TSMC AZ project poses to the climate.

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[37] EIA 2023 data

[38] https://www.aps.com/-/media/APS/APSCOM-PDFs/About/Our-Company/Doing-business-with-us/Resource-Planning-and-Management/APS_Public_Stakeholder_Meeting_Recap_04-07-2023.ashx?la=en&hash=707B427B35EC1A6491B7ADE8B61202E3

By solely assessing the climate impact of running the sites and excluding the impact of GHG emissions and air pollutants from the complete value chain of the construction process, the draft EA inappropriately segments impacts. The emissions associated with construction of the large semiconductor fabs proposed will be extremely significant, as concrete and steel manufacturing remain among the highest emitting industries in the world, contributing about 17% of anthropogenic climate-warming emissions.

Due to segmentation, entirely absent in the EA is information on the megafabs' steel and cement needs, as well as information on how TSMC will go about procuring these materials. TSMC's demand for these products will increase greenhouse gas emissions and toxic releases harmful to steel and cement communities. These concerns can be mitigated, however, if TSMC has a preference for steel and cement produced by facilities using both clean production practices and sound reporting tools.

In "Coming Clean on Industrial Emissions," a report commissioned by Sierra Club and carried out by Synapse Energy Economics, there is a wide range of emissions and toxic pollutants released by domestic producers of steel and cement. For example, integrated mills producing steel products have Scope 1 emissions intensities ranging from 0.26 to 2.19 metric tons of carbon dioxide equivalent per ton of steel produced. There is far more clustering in the cement sector, but the gap between the best and worst performing facilities is equally stark: the best performing cement facility on a Scope 1 basis emits 0.18 metric tons of CO2 per ton of cement produced, while the greatest laggard emits 1.41 metric tons of CO2 per ton of cement produced.[39]

The domestic iron and steel industry releases 39 chemicals on land, 51 into water, and 77 into the air. The domestic cement industry releases 26 on land, 17 into water, and 139 into the air.[40] Within three miles of integrated steel mills in the US, communities are exposed, on average, to about 10 micrograms of PM2.5 per cubic meter of air. While the health impacts within three miles of cement facilities may be less pronounced on a PM2.5 basis (on average, communities within three miles of cement production face about 8 micrograms per cubic meter air), the range is stark and troubling, with PM2.5 levels three times higher in the cement community with the greatest exposure than the cement community with the least exposure.

The absolute volume of cement and steel products necessary to complete the project on a 1,129 acre site must be massive. But little information has been relayed or considered in the draft environmental assessment, due to segmentation and limited review of the true cumulative impacts of the project beyond immediate fencelines. A robust EIS is necessary to understand the climate and public health impacts of construction materials at TSMC AZ.

Whatever steel and cement facilities TSMC chooses, there will be impacts. But a preference for less emitting building materials and using producers' environmental product declarations to inform purchasing decisions could mitigate environmental and public health burdens, while signaling to industry that there is a massive market for clean steel and cement products.

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[39] Coming Clean on Industrial Emissions Database. https://docs.google.com/spreadsheets/d/1oVevRe4KdmO6iK83R_-jE-JpAnoZEOAE/edit?gid=1490092082#gid=1490092082

[40] *Ibid.,* p. 32

With the cement and steel industries among those making use of EPA's low carbon labeling program, and DOE investments in clean steel and cement demonstrations—in addition to other industrial sectors—catalyzing upwards of $20 billion in additional manufacturing investments, transparency on the scale of TSMC's cement and steel needs are at a premium to complement federal, state, and local Buy Clean procurement initiatives and supply-side investments. This information could signal to materials manufacturers that there is a robust market for retrofits and state-of-the-art greenfield developments that emit less and release fewer toxics.[41]

Micron's New York fabs, which are meant to span 108 acres, are projected to use four times more steel than the Golden Gate Bridge and six times more concrete than was used to build the Pentagon.[42] To mitigate the environmental consequences of this resource use, Micron has committed to use low-carbon steel and cement in construction.[43]

There is ample opportunity for TSMC to adopt a similar path, secure its steel and cement needs, or join a purchasing platform that pairs less emissions-intensive producers with sustainability-minded offtakers.[44] By inducing steel and cement producers to invest in retrofits, technologies, repowerings, and mixes that lower their emissions and pollution profiles, TSMC and other chipmakers can join the demand-pull force of Buy Clean purchasing programs to lower the absolute impacts of the industry. Without information on its steel and cement needs and sourcing plans, however, environmental and public health burdens in steel and cement manufacturing communities are sure to increase.

As it stands, the draft EA provides insufficient evidence and analysis to determine that there is no significant impact on the climate from the construction materials involved in the building process.

**d. The proposed project inaccurately claims Renewable Energy Certificates will offset climate effects.**

The draft EA provides insufficient detail to conclude that the very significant climate implications from TSMC's proposed action or inaction plan will be adequately mitigated by the actions indicated.

The draft EA maintains that "BMPs mitigate potential effects by avoiding, minimizing, or reducing or eliminating effects."(p. 13) In the context of addressing the significant climate impacts of this project related to its electricity consumption, TSMC asserts that as a BMP it will prioritize the purchase of Renewable Energy Certificates (RECs), along with the installation of a local solar array.

> [T]hrough the purchase of RECs, the TSMC AZ Facility would offset 2.06 million MT of Scope 2 GHGs. RECs would also be purchased in an amount equivalent to offset its Scope 1 (direct) GHGs. As another BMP, TSMC will install solar panels over its parking area

[41] https://www.epa.gov/greenerproducts/label-program-low-embodied-carbon-construction-materials; https://www.energy.gov/articles/biden-harris-administration-announces-6-billion-transform-americas-industrial-sector

[42] Glenn Coin, "Micron's Concrete Dilemma: Building the Vast Complex in Clay Conflicts with Green Promises," Syracuse.com, June 13, 2024, https://www.syracuse.com/business/2024/06/microns-concrete-dilemma-building-the-vast-complex-in-clay-conflicts-with-green-promises.html

[43] https://esd.ny.gov/micron-green-chips-sustainability-requirements

[44] https://rmi.org/press-release/major-corporations-come-together-to-advance-the-first-commercial-batch-of-sustainable-steel-in-the-us/

> producing an estimated 14.5 megawatts (MW) of renewable energy (covering ~4,000 parking spaces).

However, this interpretation of a BMP is contrary to the common usage of BMPs in other contexts, and as a practice is inappropriate to apply here. The EPA's Guidance Manual for BMPs states "Best management practices are **inherently pollution prevention practices.**"[45] It has been widely and firmly established that the purchase of RECs does not prevent or reduce pollution, and as such cannot be considered a BMP.

Agencies including the US Department of Energy have explicitly said that RECs are not effective in reducing GHG emissions (pollution) or deploying additional renewable energy. Per the DoE:

> Given the impacts of adding load to the grid… purchasing an EAC from any low-GHG generator is not in and of itself sufficient to justify a claim of low lifecycle GHG emissions due to the presence of induced effects.[46]

Numerous academic studies have shown that the relatively small revenue generated from the sale of unbundled RECs at their current low per unit price has done little to expand renewable energy capacity.[47] Recent studies indicate that the purchase of unbundled RECs rarely results in the addition of renewable energy to the grid, and in fact are significantly undermining the credibility of voluntary corporate targets under the Science Based Target initiative.[48]

**As an action to effectively reduce or eliminate GHG emissions from electricity generation, the purchase of RECs is inappropriate and insufficient, and cannot be considered a BMP.**

Further, neither the draft assessment nor TSMC's Sustainability Report provide detail to demonstrate whether TSMC's REC procurement practices would meet criteria for higher impact sourcing, or simply lowest cost. Currently, TSMC's renewable electricity purchasing in the US is 100% derived from unbundled REC purchases, implying that under a business-as-usual scenario as set out according to the company's Sustainability Report, the project will result in significant induced grid emissions. According to the DoE,

> EACs [Energy Attribute Certificates] do not directly quantify emissions from specified sources or from induced generation when adding load to the grid. However, when EACs from low-GHG generators have attributes that meet three criteria (incremental generation,

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[45] https://www3.epa.gov/npdes/pubs/owm0274.pdf

[46] Department of Energy, Assessing Lifecycle Greenhouse Gas Emissions Associated with Electricity Use for the Section 45V Clean Hydrogen Production Tax Credit. p.8 https://www.energy.gov/sites/default/files/2023-12/Assessing_Lifecycle_Greenhouse_Gas_Emissions_Associated_with_Electricity_Use_for_the_Section_45V_Clean_Hydrogen_Production_Tax_Credit.pdf

[47] Holt, E., Sumner J. and Bird, L. "The Role of Renewable Energy Certificates in Developing 30 ENDNOTES New Renewable Energy Projects" National Renewable Energy Laboratory January 2011. https://www.nrel.gov/docs/fy11osti/51904.pdf; Brander, M, Gillenwater, M & Ascui, F 2018, "Creative accounting: A critical perspective on the market based method for reporting purchased electricity (scope 2) emissions", Energy Policy, vol. 112, pp. 29-33. https://doi.org/10.1016/j.enpol.2017.09.051

[48] Bjorn, Lloyd, Bander, Matthew. "Renewable energy certificates threaten the integrity of corporate science-based targets" Nature Climate Change, volume 12, pages 539–546 (2022) https://www.nature.com/articles/s41558-022-01379-5

geographic matching, and temporal matching ...) they can serve as a reasonable proxy for calculating induced grid emissions.

To accurately represent its impacts, the environmental review should clearly specify what criteria will be used to source RECs/EACs.

**e. The climate impacts of the proposed project may have broader environmental justice impacts.**

By failing to acknowledge the climate impacts of grid expansion of fossil gas power plants as a result of increased energy demand from the projects, the EA also fails to assess the environmental justice impacts of this expansion. The demand growth on existing and additional power plants (as assessed by APS) will result in significant increases in local air pollution, impacting communities in a far wider area than the existing scope of the EA. The American Lung Association reports that emissions from gas-powered plants can harm health hundreds of miles downwind, and have impacts which include:

- Direct impacts. Emissions directly released include sulfur dioxide, nitrogen dioxide, and carbon monoxide, as well as hazardous pollutants that can cause cancer and other health problems. Even biomass plants can produce very harmful emissions.
- Particle Pollution. Particle pollution forms directly, seen as ash and soot, or indirectly, as sulfur dioxide and nitrogen dioxide emissions convert into particles once they reach the outside air. These particles are so tiny they can blow hundreds of miles from the source.
- Ozone Pollution. Emissions of nitrogen dioxide react in the air with other gases to form ozone pollution, the nation's most widespread air pollutant. Ozone can also spread across thousands of miles.

In addition, the scope of the EA should not be limited to the impacts from TSMC's planned expansion, but also developed in the context of additional major expansions from Intel, which will have a significant impact on local grid systems. To meet "growing industrial demand", including Intel's Ocotillo expansion, the Salt River Project is planning to add 12 new gas turbines to its Coolidge Generating Station, as well as extending the operation of the Four Corners coal power station in the Navajo Nation until 2031, all of which will have significant community health impacts and in spite of local opposition.[49]

In conclusion, then, the major CO2 impact of this project calls for a full Environmental Impact Assessment to ensure that the scale of the harm is adequately addressed and appropriate mitigation measures are included.

**3. WATER RESOURCES**

**a. Water Supply**

The draft EA provides insufficient evidence and analysis to make a finding of no significant impact with regard to water supply.

This is troubling given the location of TSMC AZ. The facility is located in the Sonoran desert, where the average annual total rainfall is 7.22 in (183 mm). Desert heat led to 645 deaths last year in Maricopa

[49] https://www.sanjuancitizens.org/four-corners-power-plant-navajo-mine

County, the most ever documented in Arizona. The soaring number of heat mortalities — a 1,000 percent increase over 10 years — comes as temperatures reach new highs amid exploding eviction rates in the Phoenix area, leading to a collision of homelessness and record-setting heat waves. In fact, last August, Phoenix broke 110 degrees for a month straight.[50]

The entire state has technically been in a drought since 1994, and Maricopa County is in a state of extreme long-term drought.[51] Significant groundwater depletion has occurred, and last year, the state of Arizona declared it would halt new residential developments in Phoenix that relied on groundwater.[52]

In this context, it is vital to scrutinize the effects of the TSMC project, which will use between 11.4 and 17.3 MGD of water, according to the Draft EA, equivalent to the standard water consumption of 99,000 to 150,000 Phoenix residents.[53]

The EA concludes that "effects on local and regional water supply would be moderate," but provides insufficient evidence and analysis to support this claim. EA seems simply to allow the City of Phoenix to shoulder any impacts on water supply: "A new or revised Development Agreement with the City's Water Services Department would take into account regional water demands to ensure adequate water supply would be provided to support the Proposed Action and ensure this increased use would not affect the City's Assured Water Supply."

Environmental review must provide evidence and analysis of how this allocation may affect other potential water uses in a region with chronic water shortages. What will be the effect on Phoenix's water supply from TSMC's water use of an additional 17 MGD, or over 6 billion gallons a year? Will there be sufficient water to support the development of workforce housing near the TSMC complex? How will the city maintain an adequate water supply? What will be the consequences for residents, farmers, and other firms? The EA is silent. A robust EIS is required to answer these questions.

The draft EA proposes that recycling will solve this problem. On page 37, it states:

> Potential adverse effects from the Facility's demand for water in wafer production would be managed by optimizing reuse of process water.... The IRWP would be constructed and operational by 2028 and would recycle at least 90 percent of the Facility's wastewater for reuse.

On the same page, it says, "The IRWP, to be completed by June 2028, would recycle water from all three phases and would allow TSMC AZ to reach 'Near Zero Liquid Discharge' and achieve a water recycling rate of 95 percent or greater."

These are admirable intentions, but the draft EA provides no explanation or details of the technologies that will be used to achieve these objectives. The draft EA for Intel's Ocotillo campus, by way of comparison, only claims that 37 to 46% of its water will be sourced through its own recycling programs. Given that the

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[50] "What will become of American Civilization?" Atlantic Magazine, June 10, 2024, https://www.theatlantic.com/magazine/archive/2024/07/phoenix-climate-drought-republican-politics/678494/?gift=5blxLHhUXsWeAPkU6YlBqpSOKt40n0mOpDZsEy6widk

[51] https://www.azwater.gov/drought/drought-status?field_archive_date_target_id=1186

[52] https://www.azcentral.com/story/news/local/arizona-environment/2023/06/01/new-arizona-groundwater-model-shows-shortfall-state-will-halt-growth/70279189007/

[53] https://www.theguardian.com/us-news/2021/apr/05/arizona-water-one-percenters

Intel facility is already in operation, its numbers are more likely grounded in fact, as opposed to wishful thinking, and may reflect a more clear-eyed estimate of what is possible.

TSMC's experience in Taiwan gives further reason to doubt. In that country, also, TSMC claims to recycle 90% of its water, but its excessive use of water has led to water shortages and limits on irrigated agriculture.[54] Even as the company has publicly announced aggressive water recycling measures, TSMC's water use has increased. The company's own sustainability report shows the amount of water used per wafer increased 30% between 2018 and 2022.[55]

What will be the consequences (and backup plan) if the treatment system does not achieve either 90% or 95%? What will be the secondary effects of the planned treatment system? How much energy will be used? How much GHG will be emitted? What will be the impacts when the reused water is ultimately discharged? Will contaminants still be present in discharged wastewaters to the City of Phoenix, and if so, which? The EA does mention that tetramethylammonium hydroxide, ammonia, sulfuric acid, and fluoride will be used as part of the Water Resource Center.

Promising treatment and recycling is a good thing, but promises alone are not sufficient to meet NEPA's threshold of evidence.

The issue of water use further underlines the failure of the draft EA to undertake meaningful analysis of cumulative effects. Drawing on municipal water supply, the proposed project will obviously affect water supplies far beyond the one-mile perimeter the draft EA uses to consider cumulative impacts. The water supply of the TSMC facility will have consequences for the entire metropolitan region; it is critical to consider the effect of TSMC's water use on top of that of Intel and other large new developments.

**b. Wastewater**

The draft EA provides insufficient evidence and analysis to conclude that the project's impact on the municipal wastewater system will have no significant impact. The EA says the discharges will have no significant impact on the city's wastewater treatment plant. Does that include the brine from the water recycling systems? What will be done with the additional brine that the treatment system may be required to dispose of?

We are particularly concerned with the use and release of perfluoroalkyl and polyfluoroalkyl substances (PFAS). The draft EA provides insufficient evidence and analysis to conclude that the use and release of PFAS will not constitute a significant environmental impact.

PFAS are persistent, toxic, bioaccumulative, and ubiquitous. Well-studied PFAS have been linked to cancer, immunotoxicity, reproductive and developmental harm, and other serious health effects at extremely low exposure levels.[56]

The same strong carbon-fluorine bond that makes PFAS valuable industrial chemicals makes them highly persistent, which, along with their mobility, "indicates the potential for long-lasting environmental and

[54] https://www.washingtonpost.com/world/2023/10/09/taiwan-tsmc-chip-manufacturer-fab/
[55] https://esg.tsmc.com/download/file/2022_sustainabilityReport/english/e-all.pdf
[56] See, for example, "Toxicological Profile for Perfluoroalkyls," Agency for Toxic Substances and Disease Registry, May, 2021, https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf . This Profile analyzes twelve PFAS compounds.

human exposure to a chemical that is difficult to control and reverse."[57] Thus, any release of PFAS from semiconductor production is unacceptable.

The draft EA reflects the semiconductor industry's position that PFAS—many compounds at many steps of wafer fabrication—are essential to manufacture of products that are essential to our economy, national security, and way of life. Yet CPO concluded, in its initial draft Programmatic Environmental Assessment, "Wastewater discharge from semiconductor manufacturing facilities presents the greatest risk for PFAS."[58]

The draft EA explains:

> As a BMP [best management practice], TSMC AZ would segregate known process PFAS-containing chemicals from other waste streams, such that this waste would be directed to a closed bulk storage system. This waste is then managed at an off-site permitted treatment and disposal facility. Under this process, these streams would not enter the Facility's wastewater treatment systems or downstream wastewater delivered to the POTW.

EPA has adopted guidance for use of pretreatment to exclude industrial waste streams containing PFAS from wastewater distributed to POTWs through use of permit conditions. Such provisions should be specified in the environmental review. An additional option to assess would be the recovery and re-use of PFAS compounds, which are persistent.

Segregating PFAS wastes from other wastewater, as proposed by TSMC, is an appropriate first step. However, the promise to ship waste off site for disposal does not adequately demonstrate that those wastes will have no environmental impact. The environmental review should answer many more questions:

***At the TSMC Site:***

- Where in the production process will PFAS wastes be separated from other production wastes?
- Which PFAS compounds are likely to be included in that waste stream?
- What other substances are likely to be mixed with the PFAS wastes?
- How much wastewater will be directed to the bulk storage system?
- Will the PFAS-contaminated wastewater be filtered or concentrated before shipping off site?

***Off site:*** Shipping off site is not a "get out of jail free" card when it comes to environmental impacts. In fact, the National Environmental Policy Act requires the consideration of indirect and cumulative effects of the project under review. (See above.)

- How will the PFAS waste be transported to the permitted facility?
- Where is that facility located?

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[57] Ian T. Cousins et al., "Why is High Persistence Alone a Major Cause of Concern?" *Environmental Science: Process & Impacts,* Issue No. 5,2019), https://doi.org/10.1039/C8EM00515J.)

[58] "Draft Programmatic Environmental Assessment (PEA) for Modernization and Internal Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program," U.S. Department of Commerce CHIPS Program Office, December, 2023, p. B-7

- Will the treatment and disposal facility be located in an environmental justice community?
- If some type of thermal treatment, such as incineration, is used to treat the PFAS waste, how will emissions from the facility be monitored to ensure that PFAS or other products of incomplete combustion are not released into the environment? What will the nature and quantities of such emissions be?
- Will emission controls on the treatment system transfer contamination to other media, requiring treatment and/or disposal?
- How much energy will be required to treat or dispose of the PFAS wastewater?
- How much greenhouse gas will be released in the treatment or disposal system?
- If thermal treatment is not used, how will PFAS releases into the environment be controlled in the long run?

U.S. EPA has found, with regard to PFAS:

> … uncertainties remain about the effectiveness of thermal treatment. EPA encourages additional testing with EPA-approved or EPA-evaluated methods by waste managers of thermal treatment operations, including for products of incomplete combustion and the presence of PFAS in all associated waste streams, to evaluate whether thermal treatment technologies are minimizing potential environmental releases.[59]

A 2021 Cornell University study showed that non-targeted PFAS in chipmaking wastewater exceeded the concentration of targeted, or specifically analyzed PFAS. This research was sponsored by the semiconductor industry. This study found that PFBS was the targeted PFAS found in greatest concentration in chipmaking wastewater. The combustion of short-chain PFBS can form perfluorooctane, a long-chain compound.[60]

The implications of this are that monitoring and assessment methods must include not only those that have been adopted by US EPA or perhaps others to identify specific PFAS compounds but also methods that can identify the remaining burden of unidentified PFAS compounds. The CHIPS program should engage NIST in a project to identify the "unidentified" fraction of PFAS and develop standards to support methods to allow these to be routinely monitored. Current capacity for monitoring and identification is woefully behind the use of PFAS compounds.

In summary, TSMC's proposal to ship PFAS wastewater off site for treatment or disposal requires additional review because it may indeed have a significant environmental impact.

1. By adding to the widespread, continuing release of PFAS into the environment, the proposed project may threaten public health and safety.

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[59] "Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances—Version 2 (2024), U.S. Environmental Protection Agency, April 8, 2024, p. ES-2

[60] Paige Jacob, Kristas Barzen-Hanson, and Damian Helbling, "Target and Nontarget Analysis of Per- and Polyfluoralkyl Substances in Wastewater from Electronics Fabrication Facilities," *Environmental Science & Technology,* February 16, 2021, p. 2353. https://pubs.acs.org/doi/10.1021/acs.est.0c06690.

2. Off-site impacts, including potential releases in environmental justice communities, constitute cumulative impacts that should be addressed in the environmental review. In particular, the greenhouse gas emissions from thermal treatment should be considered part of the TSMC project's climate footprint.

3. As EPA and many others have observed, evidence demonstrating the conversion of PFAS into harmless substances through thermal treatment is highly uncertain.

4. Thermal treatment, opposed for decades by many environmental advocates, remains controversial.[61]

## 4. HUMAN HEALTH AND SAFETY

The draft EA provides insufficient analysis and evidence to conclude that there will be no significant impact to human health and safety in the arena of chemical safety.

### a. Chemical safety standards applied to the proposed project may fail to protect human health and safety.

The draft EA acknowledges that OSHA Permissible Exposure Limits (PELs) for workplace chemicals are inadequate and cites a number of other standards for safe handling of toxics, including EPA TSCA, ACGIH, and NIOSH. But rather than commit TSMC AZ to maintaining workplace safety through any of those, the draft EA discusses the project's proposed adherence to two standards.

One is a vague reference to a compilation of unnamed standards: "TSMC's current practice (BMP) is to apply the most protective chemical exposure levels based on published standards on a chemical-by-chemical basis to protect worker safety." But the draft EA doesn't say which standards. In some locations it refers to "industry" standards. Which industry standards? For which chemicals? What about the many chemicals with no known standards and no known hazard testing?

This vagueness is inadequate as part of a NEPA review. It is essential to anticipate the potential impact of chemical exposures in the workplace in order to design appropriate engineering controls, such as local exhaust ventilation. As part of a full EIS, TCMC AZ must assess how workers might be exposed at each step of the process and install engineering controls to reduce assessed impacts. The environmental review must specify which standards the company will meet to keep workers safe.

The second standard named in the draft EA is SEMI Standard S2, Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment. As we discussed in our introduction, reliance on a secret standard that the public cannot inspect conflicts with NEPA regulations, which state: "Agencies may not incorporate material by reference unless it is reasonably available for inspection by potentially interested persons within the time allowed for comment. Agencies shall not incorporate by reference material based on proprietary data that is not available for review and comment."

[61] Sonya Lunder and Denise Trabbic-Pointer, "Ten Bad Things We Do With PFAS Waste," Sierra Club, June 27, 2022, https://www.sierraclub.org/articles/2022/06/ten-bad-things-we-do-pfas-waste

We are aware, from a publication of the Semiconductor PFAS Consortium, that S2 standards are derived from OSHA standards; standards 23.5.1, 23.5.2, and 25.3.3, for example, define safe chemical exposures as 1% or 25% of OSHA OELs.

- SEMI S2, 23.5.1 states that there should be no chemical emissions to the workplace environment during normal equipment operation. Measurements that show the air concentration to be less than 1% of the occupational exposure limit (OEL) in the worst-case PBZ demonstrate conformance to this requirement.
- SEMI S2, 23.5.2 states that chemical emissions during maintenance activities should be minimized. Measurements that show a concentration in the anticipated worst-case PBZ during maintenance activities as less than 25% of the OEL demonstrate conformance to this requirement.
- SEMI S2, 25.5.3 states that chemical emissions during equipment failure should be minimized. Measurements that show a concentration in the anticipated worst-case PBZ during a realistic worst-case system failure as less than 25% of the OEL demonstrate conformance to this requirement.[62]

But 25% of OSHA's exposure limits, or even 1%, is still a dangerous and unprotective level, because many of OSHA's Permissible Exposure Limits are several orders of magnitude too lax to protect human health.

Furthermore, given that new chemical compounds are developed regularly in the industry, it is likely that SEMI S2 and other industry standards are incomplete. The draft EA doesn't identify which substances to be used at the TSMC plant are not listed in SEMI S2 or any of the industry standards. The NEPA documentation should explain how those are to be regulated.

CCU appreciates the June 5, 2024 letter from Under-Secretary Laurie E. Locascio to Rep. Zoe Lofgren, in which she states:

> The evaluation of worker health and safety is an integral part of all CHIPS National Environmental Policy Act (NEPA) reviews and informs the Department's decision-making on final funding awards. Based on our conversations with subject matter experts, and in part, as a result of your expressed concerns, the CHIPS Program shares your concern that the OSHA standards alone may not be enough to ensure adequate worker protections. As OSHA itself has noted the value of additional standards such as the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), National Institute for Occupational Health (NIOSH) Recommended Exposure Limit (RELs), and/or Cal/OSHA Permissible Exposure Levels (PELs). Thus, **CHIPS is evaluating how it can potentially use CHIPS NEPA decision documents to require that recipients of federal funding review all chemical occupational exposure levels (e.g., OSHA, ACGIH, and NIOSH) and apply the lowest limit (most protective) for each chemical used in its operations**. [emphasis added]

[62] "Background on Semiconductor Manufacturing and PFAS," Semiconductor PFAS Consortium May 17, 2023. https://www.semiconductors.org/pfas/

We therefore are hopeful that a full EIS will include not just optimistic words about reviewing exposure levels and meeting the strictest requirements, but documentation of which exposure levels are being applied to which chemicals and a confirmation that meeting those standards is a requirement for CHIPS Act funding, included in the binding grant agreement that the Department of Commerce signs with TSMC.

**b. Risk management plans may not protect human health and safety.**

On pages 64-5, the draft EA states:

> Additionally, pursuant to CAA § 112(r), and EPA regulations at 40 C.F.R. Part 68, facilities that use more than threshold quantities of hazardous air pollutants (HAPs) are required to develop and implement a risk management program and submit a risk management plan (RMP) to EPA. The RMP must identify the potential effects of a chemical accident, steps the facility is taking to prevent an accident, and emergency response procedures. These plans provide valuable information to local fire, police, and emergency response personnel.

But U.S. EPA's thresholds for developing RMPs are an order of magnitude less protective than California's.[63] So already it is clear that TSMC AZ is *not* planning to use the most protective standards.

The draft EA also fails to disclose which Extremely Hazardous Substances TSMC plans to use and what the EPA and California thresholds are for requiring the development of Risk Management Plans.

Once again, there is insufficient detail in the draft EA to make a finding of no significant impact.

**c. The proposed project may pose dangers to workers.**

Exposure to chemical vapors at work has seriously damaged worker health in the semiconductor industry, even when all exposures fall within permissible exposure limits (PELs) or occupational exposure limits (OELs). That's why today OSHA acknowledges that its own PELs do not provide adequate protection for exposed workers.[64]

While the semiconductor industry has long kept its chemical information secret, what we do know is cause for concern. Among the 460 most commonly used chemicals in electronics manufacturing, 147 are known carcinogens, 115 are reproductive toxins, 116 are mutagens, 123 are developmental toxins, and 105 are endocrine disruptors. Most of the thousands of chemicals in use in the industry have never been evaluated for their health effects.[65]

The industry has a history of introducing new chemicals and other production materials without adequately evaluating their toxicity. Nor are workers or residents exposed to only one chemical at a time; victims of exposures typically experience a toxic cocktail of multiple chemicals, which makes assessing and controlling the danger even more challenging.

The impact of semiconductor chemicals on workers has long been known. In a study funded by the Semiconductor Industry Association 30 years ago: researchers from UC Berkeley and UC Davis found

[63] See https://calepa.ca.gov/california-accidental-release-prevention/california-accidental-release-prevention-program-resources/

[64] https://www.osha.gov/annotated-pels

[65] https://pharos.habitablefuture.org/

significantly more miscarriages in women working in fabrication compared to office workers, even though fab workers were exposed to chemicals that were a tiny fraction of their PELs.[66] Worker exposure to neurotoxins can also lead to birth defects, including the birth of a child whose brain fails to develop.[67]

In order to demonstrate a finding of no significant impact, TSMC AZ must be required to

- List all chemicals it expects to use that have known hazardous properties including reproductive toxins, carcinogens, neurotoxins, and endocrine disruptors, and report the volumes to be used annually.
- Disclose plans for monitoring exposures (using appropriate levels of detection e.g. ppb) and how results will be reported to workers and the public.
- Describe how TSMC plans to establish and implement a medical monitoring program for all workers and how results will be reported.
- Identify what PPE and engineering controls are planned for the facility and what levels of exposures for each of the hazardous chemicals they are committed to achieve.

## 5. HAZARDOUS MATERIALS AND WASTES

### a. The draft EA provides Insufficient information on disposal of hazardous substances.

The draft EA provides insufficient evidence and analysis to conclude that the use and release of chemicals *in addition to* hazardous air pollutants and perfluoroalkyl and polyfluoroalkyl substances (PFAS), described above, will not constitute a significant environmental impact. There should be a full listing of hazardous substances to be used in or released from production at the site.

For example, CPO's own draft "Programmatic EA for Modernization and Internal Expansion of Existing Semiconductor Fabrication Facilities" notes, "traditional solvents [used in semiconductor production] contain N-methyl-pyrrolidinone (NMP), which is known to cause harm to reproductive systems. Therefore, some manufacturers have begun to replace traditional solvents with NMP-free varieties."

Yet there is no indication in the draft TSMC EA whether the company plans to use NMP at the site, even though the company's most recent Toxics Release Inventory to U.S. EPA for its smaller, Camas, Washington plant reports releases totaling more than 63,000 pounds per year, and it projects continuing use. Over three quarters of those releases were burned for "energy recovery" off site, a practice with its own environmental impacts that should be documented as part of the draft EA.[68]

### b. The draft EA provides insufficient evidence and analysis about RCRA compliance.

The draft EA says that TSMC does not need to obtain a RCRA permit for the treatment, storage, and disposal of hazardous wastes, but it contains insufficient evidence and analysis of how regulators and the

[66] Schenker et al. 1992. Epidemiologic Study of Reproductive and Other Health Effects among Workers Employed in the Manufacture of Semiconductors, Final Report to the Semiconductor Industry Association, December, 1992
[67] See e.g. "The Impenetrable World of Mark Flores" by Jim Morris of the Center for Public Integrity July 1, 2015
[68] U.S. EPA Toxics Release Inventory for 2022, https://enviro.epa.gov/envirofacts/tri/form-r/dcn-list/98607WFRTC5509N/2022

public will be assured that no waste is stored longer than 90 days (which would trigger the need for a RCRA permit). The NEPA review should explain how compliance with RCRA will be ensured.

In fact, since there is no RCRA permit application, NEPA documentation may be the most useful description of hazardous waste management that the public receives. But all the draft EA says is that TSMC will comply with the law. Of course they should.

To adequately inform the public, therefore, the proposed EIS should describe the hazardous waste categories to be generated at the site, the quantities, and how, when, and where the wastes are to be transferred.

## 6. SOCIOECONOMICS

The draft EA estimates that the project will generate over 4,000 direct and indirect operational new jobs, but it does not provide sufficient detail to conclude that increased employment will not constitute a significant negative socioeconomic impact. It is typical for high-tech industries to bring in a significant number of well paid professionals into their areas. That influx drives up the cost of housing, making it difficult for lower paid workers to live near their employers.

The NEPA review should evaluate the current and planned housing developments to determine to what degree TSMC employees, at all levels, will be able to afford living near the plant. Furthermore, it should evaluate whether uncertainty over the long-term availability of public water will affect planning for residential development in the areas near the TSMC plant.