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Chemical Risks Should Be Considered before Approving the Northpark TSMC Project

By Lenny Siegel, Executive Director
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I have been asked by nearby residents to review the proposed Northpark Planned Unit Development (PUD) rezoning in north Phoenix with respect to the use and potential release of hazardous substances by Taiwan Semiconductor Manufacturing Company (TSMC), the anticipated major occupant of the Northpark "Innovation Corridor," and its suppliers. I have not reviewed other impacts of the proposal, such as increased traffic and a reduction in open space.

As a long-time resident of Silicon Valley, I have witnessed the growth and departure of semiconductor wafer fabrication plants. As a community activist, environmental professional, and local elected official, I have overseen the ongoing efforts to clean up chipmaking pollution. See https://www.cpeo.org/chips.html.

I am currently a member of the steering committee of Chips Communities United (CCU), which nationally advocates for the responsible expansion of the domestic semiconductor industry. Last year I contributed to CCU's submitted comments on the draft Environmental Assessment for TSMC's development north of Highway 303. See https://www.cpeo.org/pubs/CCUcommentsonTSMCArizonaEA.pdf. However, the Federal government and the company did not respond to ours and other comments because Congress subsequently exempted semiconductor manufacturers from the National Environmental Policy Act (NEPA), at the request of semiconductor manufacturers..

A Chemical Industry

Since the earliest days of chip manufacture, many people have believed semiconductor production to be a clean light industry, because the products were fabricated in "clean rooms," they didn't drip oil, and the plants were called campuses. In reality, **chipmaking is a chemical**

industry, using a vast mix of carcinogens, reproductive hazards, greenhouse gases, and lethal gases, all of which the producers consider essential to production.

TSMC North of 303

Most of the semiconductor wafer fabrication facilities, known as fabs, have departed Silicon Valley, leaving behind dozens of groundwater contamination plumes, nearly thirty of which qualified for the Federal "Superfund" National Priorities List. Phoenix has its share, including the seven-mile-long trichloroethylene (TCE) plume emanating from the Motorola 52nd Street fab, exposing residents and other occupants of buildings above the plume. See https://cpeo.org/brownfields/reports/N-Z/PhoenixVI.pdf.

In response, in Silicon Valley we developed local regulations to prevent additional hazards to public health and the environment. That appears to be a major reason why fabs have moved elsewhere, even though companies continue to concentrate design and software development in Silicon Valley.

Today, chipmakers continue to use toxic solvents such as N-Methyl-2-pyrrolidone (NMP), hundreds of PFAS "forever chemicals" (perfluoro- and polyfluoroalkyl substances), and potent persistent greenhouse gases known as fluorinated gases. Their wastewater discharges contain significant concentrations of unregulated, largely unmonitored PFAS, which enter wastewater treatment plants either to contaminate surface waterways or form toxic biosolids, much of which are deposited on farm and ranch lands, contaminating agricultural products.

Toxic Gases

Most pertinent, however, for land use planning, are the risks inherent in the use and potential emission of toxic gases, particularly at factories abutting or near homes and associated services. The Northpark Innovation Corridor is between one and two miles from existing homes, and the proposed Planned Unit Development could place residences immediately adjacent to

TSMC and its suppliers. This means that toxic releases from the plant or gas storage facilities could easily impact residents and other local property occupants.

For convenience, I divide the universe of toxic gases used in semiconductor production into two categories, those that require continuous scrubbing and those only released by accident.

Intel's 2022 release of acid gases in Hillsboro, Oregon is an example of the former. In issuing a much-too-small civil penalty to Intel, the Oregon Department of Environmental Quality (DEQ) wrote:

> DEQ issued this penalty because the alleged violations posed a risk of harm to human health and the environment. Failing to operate an acid gas scrubber at the required minimum pH set point resulted in operating the scrubber with no caustic injection to treat the acid gases, thereby reducing the scrubber removal efficiency and increasing hydrogen fluoride, total fluorides and hydrogen chloride (and possibly fluorine, chlorine, and hydrogen bromide) emissions, in this case, for at least 63 days. **Even short-term exposure to these chemicals, in high enough concentrations, can cause severe health effect including respiratory damage and irritation and lung edema, skin burns, and eye irritation.** (emphasis added)[1]

The category of accidental releases includes lethal chemicals considered essential by chip companies, such as arsine and phosphine. Back in the 1980s, when Silicon Valley was developing our precedent-setting Toxic Gas Ordinance, Joseph LaDou, head of the University of California San Francisco Division of Occupational and Environmental Medicine, warned:

> that the accidental release of the contents of a 20-pound cylinder of 100% phosphine gas would have to disperse over 276 city blocks ten feet deep before being diluted to the permissible exposure level of 0.3 parts per million (ppm)…. **A concentration of 2000 ppm is lethal within a few minutes.** (emphasis added)[2]

Though releases of extremely hazardous gases are not routinely reported to the public, sometimes the information leaks out. For example, in April, 2021 phosphine entered the ventilation system of a small Apple Computer fab in Santa Clara, California triggering the evacuation of 50 employees. A larger leak, though not as likely, would have been catastrophic.[3]

Comparison to other Maricopa County Chip Plants

Phoenix city planners have downplayed risks due to the proximity of homes and schools to the proposed TSMC factory, describing the surrounding neighborhoods at Intel's two facilities in Chandler. They conveniently ignore the hazardous substances released from Motorola's former 52nd Street Plant, its former 56th Street Plant, and Indian Bend Wash. And even Intel has

[1] "Notice of Civil Penalty Assessment and Order, Case No. AQ/ACDP-NWR-2023-039," Oregon Department of Environmental Quality, July 11, 2023

[2] "Bhopal in Silicon Valley," *Silicon Valley Toxics News*, Fall, 1986

[3] "Hazardous Materials Spill Report," Cal OES 21-2288, April 30, 2021

had its problems. In 2013 65 people received health evaluations following a toxic nitrogen trifluoride leak at its Ocotillo facility.[4]

I suspect that the neighbors of existing fabs are unaware of the large quantities of toxic substances used, stored, and released at those facilities. In the absence of a public reporting system, I wonder how many more hazardous incidents have taken place at Intel and other chip plants.

Recommendation

Consideration of the Northpark Planned Unit Development should include a transparent assessment of the risk to the public, both in the existing neighborhood and in the proposed development, posed by the presence and potential release of hazardous substances, with a focus on toxic gases. That assessment should propose buffer zones to protect the public from such releases. It should also evaluate whether existing regulations are sufficient to protect the public and whether public agencies have the resources and training to apply the regulations *and* respond in potential emergencies. There should be an opportunity for public comment on that assessment.

The semiconductor industry lobbied hard to exempt its projects from environmental review under NEPA, so the companies and the Federal government never answered the questions raised by environmental and public interest groups such as Chips Communities United for both TSMC North and Intel Ocotillo. Therefore, the review of the Northpark PUD should ensure that the potentially impacted public is aware of the chemicals to be used in the new TSMC facility, the risks, and steps taken to protect public health and the environment.

[4] "Intel Corporation Exhaust Leak Investigation Report," June 29, 2013