

Gelman Sciences 1,4-Dioxane Plume, Washtenaw County, Michigan

By Lenny Siegel
August, 2020

The three-mile-long 1,4-dioxane plume at the Gelman Sciences site in Scio Township, Washtenaw County, Michigan is unusual in that 1,4-dioxane is by far the principal contaminant of concern. Because 1,4-dioxane has been used as a stabilizer in chlorinated solvents such as 1,1,1, trichloroethane, it is generally found as a co-contaminant at sites dominated by chlorinated solvent releases. At Gelman, however, it was used directly in the manufacture of medical filters, from 1966 to 1986, and the company released it through multiple pathways into groundwater that served as local drinking water supplies.

There is a long history of community engagement at the Gelman site. While state regulators have provided a great deal of information and met with the community many times over the years, community activists have not had full access to data or the decision-making process, and there is widespread dissatisfaction with the limited cleanup that is underway.

Since 1,4-dioxane was discovered at the Gelman site in 1984, the company has had three different owners, local governments have had numerous personnel turnovers, and the state regulatory agency has had multiple names and organizational structures. Today it is known as the Department of Environment, Great Lakes, and Energy (EGLE). For persistent compounds such as 1,4-dioxane, maintaining oversight and institutional knowledge through such changes is always a major challenge. For the Gelman site, citizens provide much of that continuity. The local community has always played a role in detecting dioxane and monitoring its fate and transport.



Photo by Roger Rayle

The Gelman Site in 2008

Early History

Public stakeholders first raised environmental issues at Gelman as early as 1967, when neighbors complained about odors and illegal waste disposal.¹ In 1986, in response to Gelman's proposal to dispose of hazardous wastes in a deep injection well, residents of local communities formed Tocsin, gathering over 1,000 signatures to oppose the well permit. In response, the Michigan Department of Natural Resources (DNR) formed the short-lived Citizen Information Committee.²

Meanwhile, in 1984, about four years after a former employee notified DNR that Gelman was releasing 1,4-dioxane into the University of Michigan's (UM) Third Sister Lake, graduate student Dan Bicknell documented the presence of dioxane in the lake and traced it back to Gelman. The company questioned the results, and the DNR's lab found "No detect" because it didn't have the capability to test for the compound. Bicknell and a local resident circulated a petition that caused the Washtenaw County Health Department to sample local wells, and it found contamination.³

In 1988, a group of UM graduate students produced a comprehensive review of the Gelman site to date and concluded, "It was the work of citizens like Dan Bicknell and those who signed the petition that helped to force the State and Gelman to recognize that there was a contamination problem and to start addressing it."⁴ State regulators did indeed become more responsive, but early Gelman site history illustrates both the importance and difficulty of earning the public's trust.

Community Concerns

Citizens and their local governments have several concerns about the environmental response at Gelman. First and foremost, local stakeholders opposed the Prohibition Zone (PZ) concept, adopted by the Michigan Department of Environmental Quality (DEQ) in 2004-2005, as a long-term remedy. Water supply wells are forbidden in a 3.3-square-mile primarily residential area between the Gelman site and the Huron River. The PZ permitted Gelman to avoid cleaning up dioxane in the underlying aquifers as long as it was below 2800 ppb, at the time Michigan's groundwater/surface water interface standard—the dioxane concentration limit for groundwater discharged to surface water that was not a drinking water source downstream. Since then dioxane standards have been tightened but not yet applied to the site even as the dioxane has spread outside the prohibition zone.

Few people objected the prohibition of water supply wells within the PZ. Gelman or its insurance company paid for hook-ups to public water for all properties previously served by private wells in the Prohibition Zone, but it does not assist in the payment of water bills or additional property taxes for the township residents whose properties were annexed into the city of Ann Arbor to provide water and sewer service.

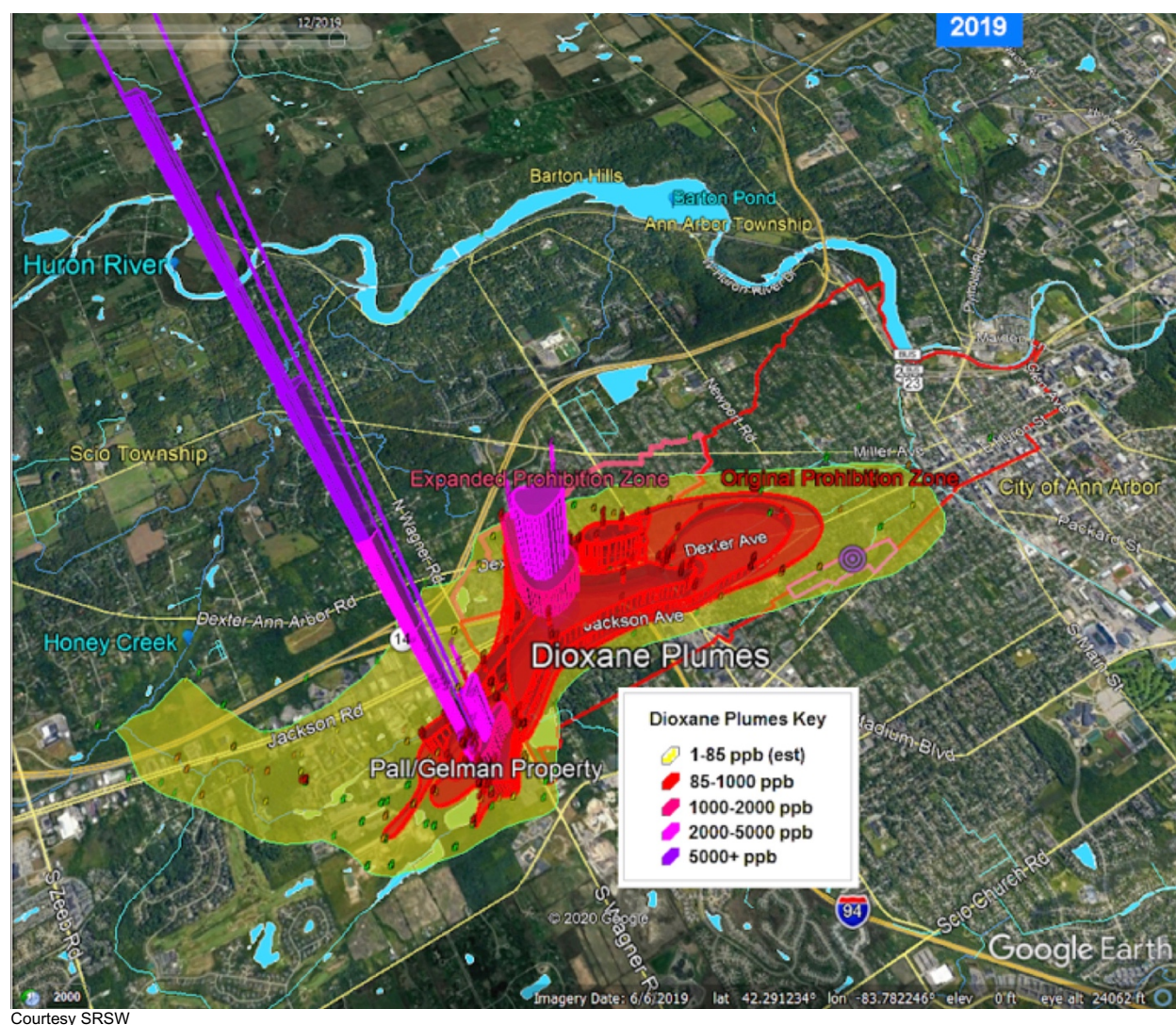
¹ Phillis Engelbert et al, "A Case Study of Environmental Contamination: Gelman Science, Inc.," University of Michigan masters project, 1988, p. 156. <https://app.box.com/s/012oigz74r>

² *ibid.* pp. 164-166.

³ *ibid.* pp. 35-39, 160-161.

⁴ *ibid.* pp. 160-161.

Stakeholders criticized the absence of a plan to remediate both the source area and the areas with the highest concentrations of 1,4-dioxane within the zone. In 2004 DEQ selected a remedy based on extraction and treatment at the leading edge of the dioxane plume. The PZ was expanded in 2011 after Gelman failed to arrest the spread of the northernmost plume as required in the Consent Judgment. While containment zones are not unusual during aquifer remediation at sites across the U.S., the Gelman Prohibition Zone is permanent, unusually large, and in a residential area. Community members are concerned that the \$30M allocated by the company to finish the cleanup under the old cleanup standards is not enough to do a protective cleanup under the new standards. Furthermore, given recent experience throughout Michigan, people are worried that similar-acting PFAS compounds might be comingled with the 1,4-dioxane.



Courtesy SRSW

The Gelman 1,4-Dioxane Plume as of December 31, 2019

While many stakeholders oppose permanent aquifer degradation in principle, local communities and their water purveyors also have practical reasons for concern. The 1,4-dioxane plume is migrating toward Barton Pond, where Ann Arbor gets about 85% of its water. Some very low levels of dioxane already arrive there from Gelman's permitted discharges of partially treated dioxane into Honey Creek, which empties into the Huron River upstream from Barton Pond. Since

parts of the creek lose to groundwater at times, some dioxane may get into homeowner wells along the way.

Stakeholders are also concerned that investigation thus far has not identified all potential pathways, recalling that a larger, underlying aquifer was found to be contaminated after being ignored for 14 years. Before the extent of this deeper contamination was determined, it caused one of the city's supply wells to be shut down. Furthermore, because shallow aquifers approach the surface as elevations decline, many homes in the plume's path have experienced wet basements that may contain dioxane. Yet no one has conducted ongoing dioxane sampling in near-surface groundwater to assess the risks

In addition, the exposure standards still written into the consent judgment are unprotective and out of date. In 2016-17, Michigan tightened its 1,4-dioxane drinking water standard to 7.2 parts per billion (ppb), but the Gelman site standard is still an unusually high 85 ppb. Gelman's plume maps still don't show a 7.2 ppb isopleth, which would delineate the full extent of the plume. The company appears to have developed such contours for internal use, because it inadvertently included one 7.2 ppb segment on the public version of a plume map.⁵

In 2018 EGLE tightened its statewide groundwater-surface water interface standard, the regulatory limit for 1,4-dioxane in groundwater entering drinking water sources that may be used for drinking water downstream, to 3.5 ppb, but under the consent judgment the local goal is still 34 ppb. Scio Residents for Safe Water (SRSW) wrote, "With a more protective Consent Judgment, much more dioxane would have to be removed in the well Prohibition Zone before the dioxane reaches surface water."⁶

Active public stakeholders are also unhappy with the treatment method approved in 2005. Gelman originally used ultraviolet oxidation to break down 1,4-dioxane in the extracted water before discharge to a tributary of Honey Creek, but it saved about half of its treatment costs by switching to ozone oxidation.⁷ Public stakeholders are concerned that ozone oxidation hasn't been able to treat dioxane to non-detect, as UV oxidation did, and that ozone oxidation creates a new carcinogen, bromate (from ozone acting on naturally occurring bromide in the groundwater) that is discharged into the tributary as well.⁸

Finally, public oversight at the Gelman site, situated near the University Michigan, has since 1985 benefited from the skills and expertise of community members. With the introduction of Google Earth in 2005, SRSW began using it as a platform to illustrate the reality of the dioxane contamination. Since then, these annual SRSW Google Earth mashups have provided a useful

⁵ DEQ Extends Emergency Rules to Establish Safer Dioxane Standards, Scio Residents for Safe Water, April 27, 2017. <https://sites.google.com/site/srsworg/Home/news/04-27-2017-michigan-deq-issues-emergency-rules-to-establish-safer-dioxane-standards>

⁶ "DEQ Tightens Groundwater-Surface Water Interface Standards for Dioxane," Scio Residents for Safe Water, May 2, 2018. <https://sites.google.com/site/srsworg/Home/news/05-02-2018---deq-tightens-groundwater-surface-water-interface-standards-for-dioxane>

⁷ "DEQ's Proposed Remedial Alternative Gelman Sciences, Inc Unit E Aquifer Groundwater Contamination," Michigan Department of Environmental Quality, July, 2004.

⁸ "Pall Permit Meeting/Hearing – comments," Scio Residents for Safe Water, September 13, 2005. <https://sites.google.com/site/srsworg/Home/archives/09-13-2005-pall-permit-meeting-hearing---comments>

interactive model of the site with 2D, 3D and 4D depictions of the dioxane over the years. The SRSW web site shows plume maps, flow lines, well locations and log details, cross-section maps and diagrams, and imagery of water bodies, watersheds, recharge areas, and jurisdiction boundaries. The Google Earth mashups are used at monthly meetings of the multi-stakeholder Coalition for Action on Remediation of Dioxane (CARD) partnership to show site details, and anyone with Google Earth installed on their computer can download and use the SRSW mashups. In 2020, SRSW began using the free interactive visualization platform Tableau Public to display available sampling and well log data to show the movement of the dioxane laterally and vertically over the years.⁹

Yet stakeholders report that EGLE has not been able to require Gelman to provide a complete database of all well log and sampling data shown on Gelman maps and cross-section diagrams, and what Gelman shares is often difficult to utilize. No maps provide complete contour lines/isopleths using the state's new concentration standards. Activists say that data is incomplete, inconsistent, and often has to be entered manually into map images. Stakeholders believe that the Gelman site needs a well-organized, complete, easy-to-use, long-term archive of all information about the Gelman site, accessible to all stakeholders, that can survive until the end of the cleanup, decades in the future. If Gelman and the state treated the community as a true partner, they would make an extra effort to share data in a usable form and create such an archive.



Photo by Roger Rayle

April 2016 Public Meeting

⁹ See "Pall/Gelman Site in Google Earth," Scio Residents for Safe Water.
<https://sites.google.com/site/srsworg/Home/images/pgsi-site-in-google-earth>

Ongoing Oversight

Today the leading environmental advocacy organization overseeing the Gelman response is SRSW, formed as a 501(c)(3) non-profit in 1995 out of a series of less formal citizen groups “to protect and preserve the groundwater in Scio Township.”¹⁰ In 2006, the Coalition for Action on Remediation of Dioxane (CARD) was formed, with Washtenaw County and SRSW support, to succeed the Intergovernmental Partnership Committee, which met only occasionally to respond to new crises as they arose. Through CARD, citizens and local government representatives meet monthly with EGLE staff to review site progress and provide feedback.

While CARD receives regular reports from state agencies, participating organizations have felt shut out from key site decisions. Negotiations between the state and the Gelman site owner are confidential, because site activities are governed by a court-overseen consent judgment. For this reason, in 2016 the City of Ann Arbor, Washtenaw County, Scio Township, and the Huron River Watershed Council won court approval to participate in consent judgment negotiations. While this expanded the negotiations, they still remain confidential. Several virtual status hearings in judge’s chambers in July and August, 2020 were supposed to result in making a settlement proposal public, but as we “go to press” no information has been released.

Also in 2016, dissatisfied with progress at the site, Ann Arbor Charter Township, Scio Township, and the Sierra Club of Huron Valley petitioned U.S. EPA to add the Gelman site to the “Superfund” National Priorities List. The site easily scored above the 28.5 Hazard Ranking System score required for listing, but EPA is unlikely to list the site unless the state agrees. Meanwhile, EPA has assigned a project manager to the site, requires quarterly reports from the state, and it reserves the right to take enforcement actions.

The proponents of listing believe that additional EPA involvement will bring more resources and enforcement clout to the oversight effort. EPA actions would halt the dioxane plume migration and restore the impacted aquifer to dioxane drinking water criterion. It should also enable the awarding of a technical assistance grant to a local non-profit organization

Michigan uses remedy selection criteria similar to the nine criteria of the National Contingency Plan, the basis of EPA decision-making at NPL sites. But from the community’s point of view, “community acceptance” was largely ignored when the remedy—Prohibition Zone with ozone oxidation treatment at boundary extraction wells—was selected in 2005.

In summary, decisions at the Gelman Site are not transparent because they are negotiated in private. Data, particularly data to delineate the 1,4-dioxane plume and measure its migration, have not been adequately shared. And despite forums and fact sheets, the community is dissatisfied with the results of the environmental response process, and as a result, the process itself.

¹⁰ Scio Residents for Safe Water. <https://sites.google.com/site/srsworg/Home>