Testimony of Lori Swanson
Former Minnesota Attorney General

Before the Committee on Oversight and Reform
Subcommittee on Environment
United States House of Representatives

September 10, 2019

Chairman Rouda, Ranking Member Comer, and members of the Committee, thank you for this opportunity to appear today to discuss per- and polyfluoroalkyl substances, or PFAS. I understand this Committee has been conducting hearings into PFAS for some time and is familiar with the chemical and the problems it has caused.

In 2010 I was serving as Attorney General of the State of Minnesota and filed a lawsuit against 3M Company for damaging my state's natural resources through its manufacture and disposal of PFAS. Our lawsuit alleged that 3M contaminated the aquifers that supplied drinking water to over 100,000 Minnesota residents through its manufacture and disposal of these chemicals. The lawsuit was settled in February 2018—on the morning our trial was to begin. The settlement required 3M to pay $850 million to the State of Minnesota to bring long-term clean drinking water to our residents and up to another $40 million for short-term drinking water solutions. I have been told it is the third largest natural resource damages settlement in the nation's history.

The lawsuit lasted over seven years and involved the production of 27 million pages of documents, about 200 witness depositions, testimony of world-renowned expert scientists, and over 1,500 court filings. Public records and public trial exhibits in the lawsuit show that 3M knew but concealed information about the dangers of these chemicals for decades—some of which the public is just now discovering[i].

PFAS is a man-made chemical that was created from the Manhattan Project, the top-secret project to develop the nuclear bomb during World War II. The Manhattan Project scientists needed a way to separate uranium for the bomb. They used fluorine gas for this purpose—a gas so powerful it can burn water and steel. The scientists soon discovered that fluorine gas bonds with carbon molecules to make fluorochemicals.

Minnesota is Ground Zero for the PFAS problem that now confronts the entire country. After World War II, 3M bought the patent to develop perfluorochemicals. 3M started to manufacture PFAS in Minnesota in the 1950s and ship the chemicals and related products around the country. It used them to make Scotchgard, a widely-used stain repellant. It also sold them to DuPont, which used PFAS to make Teflon, the non-stick product for cookware and manufacturing processes. 3M also used and sold PFAS for firefighting foam.

Now PFAS is in everyone's blood. Polar bears have it. The Inuit have it. Eaglets have it.

The properties that made PFAS such a blockbuster commercial success—the ability to repel oil and water and stains and to withstand fire and temperatures of 1,700 degrees—also make it hazardous to people and the environment. The chemicals are non-biodegradable in the environment, and they bio-accumulate in the human body.

Unfortunately, 3M knew about the risks of the chemicals to the drinking water, the environment, and human health for decades, but concealed its knowledge, subverted the science, and kept pushing the chemicals out the door.

In 2000, when it stopped making some forms of PFAS, 3M was making almost one-half a billion dollars per year from the products, according to testimony in our lawsuit.

And what did 3M know about PFAS prior to the year 2000?

I refer you to Exhibit A of this testimony. It shows that in 1997 3M gave DuPont a Material Safety Data Sheet with a label that said:

"CANCER: WARNING: Contains a chemical which can cause cancer" (citing "1983 and 1993 studies jointly conducted by 3M and Dupont)."

But 3M removed the label that same year and for decades sold PFAS products without warning the public of its dangers.

We know from our lawsuit that 3M told employees not to write things down about PFAS and to mark documents about PFAS as "attorney-client privileged" regardless of whether attorneys were involved.

We know that in 1998 a committee of 3M scientists recommended the company notify the EPA that its chemicals were widely found in human blood. But a 3M executive overruled them.

In 1999, a 3M scientist, Dr. Richard Purdy, blew the whistle on 3M. In March 1999 he resigned from 3M and sent his resignation letter to the EPA. Among other things, he said that 3M ecotoxicologists urged the company for two decades to perform an ecological risk assessment of PFAS but 3M dragged its feet; that 3M misleadingly downplayed to regulators the transfer of the chemicals through the food chain; and that 3M scientists were told not to write down their thoughts because of how it would look in a lawsuit. See Exhibit B.

An issue in our lawsuit was what did 3M know and when did it know it? Unfortunately, 3M knew early on there were significant problems with these chemicals.

We know that throughout the 1950s, 3M's own animal studies found that PFAS are "toxic."

By the 1960s, 3M knew the chemicals do not degrade in the environment.

In 1970, a company that purchased 3M's firefighting foam had to abandon a test of the product because it killed all the fish. See Exhibit C.

In 1975 two independent scientists—Dr. Warren Guy and Dr. Donald Taves—found PFAS in human blood in blood banks around the country. They called 3M to say they thought its chemicals may be to blame. But 3M "plead ignorance" and misled the scientists, claiming that Scotchgard did not contain the chemicals found in blood, and refused to identify the chemicals in its products to the scientists. See Exhibit D. In doing so, the company thwarted the broader scientific community's understanding of the health impacts of these chemicals for a generation.

We know that 3M soon replicated these studies and confirmed that PFAS was in human blood. See Exhibit E.

In 1979 3M's lawyers advised the company to conceal that the chemical in the blood was PFOS. See Exhibit F.

We know that 3M concealed from the United States Environmental Agency for more than 20 years that PFAS was in human blood. Its actions delayed scientific knowledge for decades while the company reaped huge profits from the sale of its PFAS products.

We know that by 1976 3M knew the chemicals were in the blood of workers who handled them at levels higher than the general population.

We know that by 1978, it knew the chemicals killed monkeys.

We know that 1981 it knew the chemicals caused abnormalities in pregnant rats.

We know that in 1988, a company that purchased PFAS firefighting foam complained to 3M that it had falsely claimed the product was biodegradable. See Exhibit G.

We know that a few months later, a 3M employee wrote: "I don't think it is in 3M's long-term interest to perpetrate the myth that these fluorochemical surfactants are biodegradable. It is probable that this misconception will eventually be discovered, and when that happens, 3M will likely be embarrassed, and we and our customers may be fined and forced to immediately withdraw

products from the market." He added that if 3M wants to continue to sell these products, "3M has to accurately describe the environmental properties of these chemicals." See Exhibit H.

3M continued to sell the products.

We learned from testimony in our lawsuit that by 1993, 3M knew that there was some evidence that lactating goats transferred PFAS to their kids in milk and it was likely that human mothers would similarly transfer PFAS to their babies. We found no evidence that 3M published this study or followed-up with an analysis of human milk.

We know that not until 23 years later did the EPA issue a health advisory cautioning pregnant women and breast-fed infants to avoid these chemicals out of concern that, just like with goats, a mother can transfer the chemicals to her fetus or baby through the placenta or breastmilk.

We know that in 2000, under pressure from the EPA, 3M announced a phase-out of the production of some PFAS. 3M publicly suggested that it had recently learned PFAS was widely present in human blood. But 3M knew these chemicals were in human blood at least twenty-five years earlier, when the two scientists notified 3M they found the chemicals in blood banks.

We know that in 2006, the EPA fined 3M $1.5 million for withholding studies about the toxicity of these chemicals, in some cases for decades, that the company should have reported under the Toxic Substances Control Act (TSCA). TSCA requires a company to immediately notify the EPA of information that shows that a product presents a substantial risk of injury to human health or the environment.

Unfortunately, that didn't end the saga. 3M then began a campaign to create "defensive barriers to litigation." 3M worked to "command the science" about the human health and ecological risks posed by these chemicals. It selectively funded outside research in exchange for the right to review and edit scientific papers about PFAS before they were published. It developed

a relationship with a professor and editor of academic journals who reviewed about one-half the studies of these chemicals by other scientists before they were published. We believe that 3M paid him at least $2 million, based on documents uncovered in our lawsuit. He told 3M he made sure in his timesheets "there was no paper trail to 3M." The professor shared manuscripts of other scientists with 3M before they were published and advised 3M to "keep 'bad' papers out of the literature otherwise in litigation situations they can be a large obstacle to refute." See Exhibit I.

I have attached to my testimony as Exhibit K a brief the State of Minnesota filed in court in 2017 asking for leave to seek punitive damages in our lawsuit. The brief provides a chronology of what we discovered about what 3M knew about the science and when it knew it, as well as its decades-long efforts to suppress scientific understanding of the impact of these chemicals on human health and the environment.

Almost 25 years ago, 3M expressed this goal: "continue to maintain regulatory approval to sell PFCs as long and as broadly as we can." Unfortunately, it succeeded for more than 50 years. And now states and local governments around the nation are now grappling with the consequences.

There are many ways for Congress to be part of the solution, such as the following:

First, lawsuits like the one I filed against 3M are complex and take years to complete. Congress should designate PFAS as "hazardous substances" under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") to help support clean-up of contaminated sites, including military sites contaminated from the use of firefighting foam in training exercises.

Second, Congress should require the listing of PFAS on the federal Toxic Release Inventory so that communities learn about releases of these chemicals

Third, federal agencies should be required to help communities conduct sampling and analysis to determine the scope and extent of PFAS contamination.

Fourth, a great deal of PFAS contamination occurred from the use of firefighting foam in training exercises at airports and military installations. Congress should ban the use of PFAS in firefighting foam at airports and military installations as quickly as possible and prohibit its use in training exercises.

Thank you for the opportunity to testify.

[i] The documents attached or referred to in this testimony are from public court records in *State of Minnesota vs. 3M Company*, Hennepin County District Court File No. 27-CV-10-28862, including the attached Memorandum of Law in Support of Plaintiff State of Minnesota's Motion to Amend Complaint to Seek Punitive Damages, and the State of Minnesota's Trial Exhibits currently posted on the Minnesota Attorney General's website at https://www.ag.state.mn.us/Office/Cases/3M/StatesExhibits.asp.

3M General Offices

3M Center
St. Paul, MN 55144-1000
612 733 1110

1714

MATERIAL SAFETY
DATA SHEET

3M

8. HEALTH HAZARD DATA (continued)

extended time.

No toxicity data for the solution. Ammonium perfluoroalkyl carboxylate is slightly toxic when absorbed through the skin; it is non-irritating to the skin.

INHALATION:
May be absorbed by inhalation and persist in the body for an extended time.

No toxicity data for the solution. Ammonium perfluoroalkyl carboxylate may cause respiratory system irritation from inhalation; can be considered moderately toxic by inhalation on a single exposure; a median lethal concentration for a 4-hour exposure in the albino rat is 980 milligrams per cubic meter. Repeated inhalation exposure produced liver changes and elevated blood organofluoride levels in rats.

IF SWALLOWED:
Ingestion is not a likely route of exposure to this product.

No toxicity data for the solution Ammonium perfluoroalkyl carboxylate is considered moderately toxic from a single oral exposure; acute oral LD50 (rat) is 540 mg. per kg. of body weight.

CANCER:
WARNING: Contains a chemical which can cause cancer. (3825-26-1) (1983 and 1993 studies conducted jointly by 3M and DuPont).

MUTAGENICITY:
Ammonium perfluoroalkyl carboxylate was not mutagenic in invitro mutagenicity assays. Did not cause cell transformation in a mammalian cell transformation assay.

REPRODUCTIVE/DEVELOPMENTAL TOXINS:
Ammonium perfluoroalkyl carboxylate was not teratogenic in rabbits by oral administration and was not teratogenic to rats by gavage and inhalation exposures.

SECTION CHANGE DATES

HEALTH HAZD. DATA SECTION CHANGED SINCE AUGUST 23, 1996 ISSUE

Abbreviations: N/D - Not Determined N/A - Not Applicable

EID599984

STATE_07543964

28 March 1999

To: 3M

I resign my position as Environmental Specialist effective 6 April 1999. My resignation is prompted by my profound disappointment in 3M's handling of the environmental risks associated with the manufacture and use of perfluorinated sulfonates (PFOS)(CAS# 29081-56-9) and its precursors, such as ethyl FOSE alcohol (CAS #1691-99-2) and methyl FOSE alcohol (CAS #24448-09-7).

Perfluorooctansefulfonate is the most insidious pollutant since PCB. It is probably more damaging than PCB because it does not degrade, whereas PCB does; it is more toxic to wildlife; and its sink in the environment appears to be biota and not soil and sediment, as is the case with PCB.

I have worked within the system to learn more about this chemical and to make the company aware of the dangers associated with its continued use. But I have continually met roadblocks, delays, and indecision. For weeks on end I have received assurances that my samples would be analyzed soon--never to see results. There are always excuses and little is accomplished. I can illustrate with several examples.

- For more than twenty years 3M's ecotoxicologists have urged the company to allow testing to perform an ecological risk assessment on PFOS and similar chemicals. Since I have been assigned to the problem a year ago, the company has continued its hesitancy.
- Over a period of seven months I made frequent requests that ecological risk consultants be hired to help me plan toxicity testing, environmental sampling, chemical fate studies, and ecological risk procedure. I still have not received authorization even to bring people in to interview.
- I requested, very frequently, over a nine-month period, a sample of chemical to send out for fate property and ecotoxicity testing. Finally I was provided with one that apparently the division had had all along.
- I put together a pioneer risk assessment on PFOS that indicated a greater than 100% probability of harm to sea mammals, based on preliminary data on the concentration of PFOS in menhaden fish meal. The 8e committee told me that they would like to reconsider the assessment after we had a validated value for fishmeal. That analysis was given high priority by the committee. After three months the analysis is still not done--not because there were technical problems, but because management did not actually give the analysis high priority.
- 3M submitted a TSCA 8e last May. There is tremendous concern within EPA, the country, and the world about persistent bioaccumulative chemicals such as PFOS. Just before that submission we found PFOS in the blood of eaglets--eaglets still young enough that their only food consisted of fish caught in remote lakes by their parents. This finding indicates a widespread environmental contamination and food chain transfer and probable bioaccumulation and bio-magnification. This is a very significant finding that the 8e reporting rule was created to collect. 3M chose to

report simply that PFOS had been found in the blood of animals, which is true but omits the most significant information.

- One of our customers, Griffin, has data on some of our chemicals. They developed this data for pesticide registration purposes. I started regularly asking for permission to visit Griffin and view the data last May. Their data can help us plan our studies of similar chemicals. It can also indicate if there is an unforeseen risk to certain biota or via certain exposure pathways. It was ten months before I was allowed to visit Griffin, at which time I did not get to see the data. I have to return another time to see it.
- 3M waited too long to tell customers about the widespread dispersal of PFOS in people and the environment. We knew before May of 1998, yet 3M did not start telling customers until January of 1999. I felt guilty about this and told customers I personally knew earlier. Still, it was not as early as it should have been. I kept waiting for 3M to do its duty, as I was continually assured that it would. Some of the customers have done risk assessments on the PFOS precursor they use. They assume there is not a background in the environment and in wildlife. Since there is a background, their risk assessments are inaccurate. Thus they can make inappropriate business decisions and not realize that their use of PFOS precursors contributes to an aggregate risk.
- 3M continues to make and sell these chemicals, though the company knows of an ecological risk assessment I did that indicates there is a better than 100% probability that perfluorooctansulfonate is biomagnifying in the food chain and harming sea mammals. This chemical is more stable than many rocks. And the chemicals the company is considering for replacement are just as stable and biologically available. The risk assessment I performed was simple, and not worst case. If worst case is used, the probability of harm exceeds 100,000%.

- 3M told those of us working on the fluorochemical project not to write down our thoughts or have email discussions on issues because of how our speculations could be viewed in a legal discovery process. This has stymied intellectual development on the issue, and stifled discussion on the serious ethical implications of decisions.

I have worked to the best of my ability within the system to see that the right actions are taken on behalf of the environment. At almost every step, I have been assured that action will be taken—yet I see slow or no results. I am told the company is concerned, but their actions speak to different concerns than mine. I can no longer participate in the process that 3M has established for the management of PFOS and precursors. For me it is unethical to be concerned with markets, legal defensibility and image over environmental safety.

Sincerely,

Rich Purdy

CHEMICAL CONCENTRATES Corporation
A SUBSIDIARY OF BAKER INDUSTRIES, INC.
FORT WASHINGTON, PA. 19034 PHONE (215) MI 6-9400

15 June 1970

The Editor
Fire Journal
National Fire Protection Association
60 Batterymarch Street
Boston, Massachusetts 02110

Sir:

At the recent NFPA Meeting in Toronto information about the toxicity of "Light Water" was asked of me frequently. We had made a limited study on the effects of "Light Water" on marine life in preparation for substantial and controlled field tests. These effects were highly derogatory to marine life and the entire test program had to be abandoned to avoid severe local stream pollution. I am asked by concerned people to report our data on the "Light Water" studied and do herewith comply.

The only commercially available product was FC-194 and this was checked over a range which allowed for 48-fold to 16,000-fold dilution. These results are reported. Other "Light Water" formulations not commercially available were also checked and the results were similar.

A series of five ten-gallon tanks were used and these were stocked and restocked with a recommended group of hardy fish. Tank temperatures were maintained at 72°F ± 2°F, uniform aeration maintained by Tiger pumps and filter.

Each tank, fitted with stainless lids, housed a) 3 goldfish (average length 2-1/4 inches, average weight 1-1/2 grams), b) 2 Blackmoors (average length 2-1/2 inches, average weight 3 grams) and c) 2 Calicos (average length 2 inches, average weight 1-1/2 grams). There were fed standard fish food at a rate of 0.025 grams per tank per day. The tanks contained nine gallons of tapwater and foam concentrate as shown in the following summary chart.

EXHIBIT C tabbies

Exhibit 1083
State of Minnesota v. 3M Co., Court File No. 27-CV-10-28862
3M_MN02267863

L CONCENTRATES CORPORATION

The Editor
Fire Journal

16 June 1970
Page 2

Foam Liquid Type	Conc.:%	Fluorochemical :ppm	Surface Tension :dynes/cm	Survival Time
FC-194	2.0	1,250	14.8	3-10 min.
"	0.2	125	16.3	5-60 min.
"	0.02	12.5	36.7	4-8 hrs.
"	0.006	4	39.7	2-7 days
"	0.002	1	52.5	Over 7 days
Blank	-	-	67.5	Over 10 weeks

1/20 FC

We regard the 4 parts per million as the threshold concentration with lower concentrations probably safe. However, at all listed concentrations (including the 1 part per million) erratic motion, loss of stability and other visibly odd effects were present.

There appeared to be two principal possible causes of death for all the fish. The erratic motion, rapid rotation and general inability to remain upright led to the apparent drowning of the fish. The same characteristic, by which fluorochemical greatly lowers the interfacial tension allowing for film-formation, also permits the intrusion of water as the oil film on which protection of the fish's stabilizing mechanism depends is destroyed by the fluorochemical. The fish appears to drown as a result. There also appears to be an attack on his nervous system as evidenced by high speed swimming and crashing headlong into the sides and bottom of the tank.

Faithfully yours,

CHEMICAL CONCENTRATES CORPORATION

S. I. Kalkstein
President

SIK/k

3M_MN02267864

1083.0002

Interoffice Correspondence 3M COMPANY

August 20, 1975

Subject: Fluorocarbons in Human Blood Plasma

CONFIDENTIAL

TO: L. C. KROGH - COMMERICAL CHEMICAL DIVISION - 223-6SE
J. D. LAZERTE - COMMERCIAL CHEMICAL DIVISION - 236-1
R. A. NEWMARK - CENTRAL RESEARCH - 201-2W
J. A. PENDERGRASS - MEDICAL DEPARTMENT - 220-2E

FROM: G. H. CRAWFORD - PHOTOGRAPHIC PRODUCTS - 209-1S

Record of a Telephone Conversation - August 14, 1975

Person calling - Dr. William Guy
College of Medicine
University of Florida
Gainesville, Florida

Dr. Guy called again, following up on the subject (vide my earlier memo) to see if we had any further ideas as to possible sources of the fluorocarbon carboxylic acids found in human blood samples from Texas and New York. I got John Pendergrass on the line and Guy brought in a Dr. Tays (who apparently was involved in the original observation).

The original sampling involved plasma specimens from Albany, New York, Rochester, New York (low natural fluoride in the water) Hillsborough, Texas, Andrews, Texas, and Corpus Christi, Texas (high natural fluoride). There was no measurable difference by region (10^{-6} molar F^-). F^{19} NMR studies run by Prof. Wallace Brey (Dept. of Chem., U. of F.) indicate that the fluorine is organic and the suspected species is fluorocarbon carboxylic acid with a C_6 or C_7 fluoroalkyl group. Dr. Brey suspects a branched end on the chain, e.g. perfluoro t-butyl.

The discussion involved Dr. Guy's speculative questions as to where such a "universal" presence of such compounds in human blood could come from. (The compounds are not present in laboratory animals.) These included:

1. Biosynthesis from inorganic F^-.

2. Biosynthesis from aerosol freons (but they don't find chlorine).

3. Teflon cookware.

4. "Scotchgarded" fabrics.

Somewhere he got the information that 3M's fluorocarbon carboxylic acids are used as surfactants and wanted to know if they were present in "Scotchgard" or other items in general use by the public. We plead ignorance but advised him that "Scotchgard" was a polymeric material not a F.C. acid.

Apparently an earlier ('59-'60) study turned up similar quantities of F^- in human plasma (not necessarily FC derived); this would presumably antedate the increased use of either "Scotchgard" or "Teflon" cookware.

They have done experiments involving water boiled in Teflon cookware with negative results.

We suggested obtaining plasma specimens from uncivilized areas, e.g. New Guinea where they don't use too much "Teflon" cookware or "Scotchgard".

Of all the unlikely explanations above, the least unlikely is residual FC 143 (or whatever) we sell to DuPont to polymerize TFE in Teflon cookware. This is still pretty far-fetched. This was not (I hasten to say) suggested to Dr. Guy.

We adopted a position of scientific curiosity and desire to assist in any way possible and suggested that our own analytical people might be able to clarify Dr. Brey's NMR findings (I know Wallace Brey from way back. He is highly respected, conservative and not given to frivolous speculations).

After we hung up I called CRL Analytical, talked to John McBrady and Richard Newmark. It turns out that Newmark is acquainted with Brey and has, in fact, published in a NMR journal edited by Brey.

My recommendation (with J.P.'s concurrence) is to get Richard in touch with Brey, obtain spectra for his own interpretation perhaps samples to run on our equipment, etc. In other words, keep scientists talking to scientists in the spirit of cooperative scientific inquiry.

On the positive side - if it is confirmed to our satisfaction that everybody is going around with fluorocarbon surfactants in their bloodstreams with no apparent ill-effects, are there some medical possibilities that would bear looking into? We

know that fluorocarbons are good oxygen carriers (but this is straight FC-75, not dissolved FC 143). Can fluorocarbon surfactants improve the hemodynamics, wetting and capillary permeation of blood in cases of atherosclerosis, kidney blockage, senility and the like? Can hemolysis, platelet destruction and other blood damage during hemodialysis and cardiovascular surgical procedures be reduced by fluorocarbon surfactants? This is speculation (but not completely wild). I would like to suggest that we consider some animal experiments to see just how much of these materials can, in fact, be tolerated in the bloodstream - both from a defensive point of view and for the above (to me) intriguing reasons. What do you think, John?

GHC/lr

File

Interoffice Correspondence 3M COMPANY

Subject: Telephone Call from Dr. Warren S. Guy, University of Florida, Gainesville, Florida re Fluorochemicals in Human Blood

cc: T. J. Brice -CRL-201-2S
G. H. Crawford -Photo Prods.-209-1S
A. D. Levi -Gen.Counsel-220-12E
J. E. Long -Toxicology-220-2E
J. A. Pendergrass-Medical-220-2E

AUG 2 6 1975

August 22, 1975

TO: L. C. Krogh - Comml.Chem.-223-6SE

FROM: J. D. LaZerte - Comml.Chem.-236-1

Dr. Guy, who is located at the University of Florida, was calling from the University of Rochester, New York, where he and the other author of the paper entitled "Characteristics and Concentrations of Organic Fluorocompounds Found in Human Tissues" were finalizing their preparations. After reviewing the background experimental information, Dr. Guy indicated that they were attempting to "run down" the source of organic fluorine so they could make a more specific report when they give their paper at the National ACS Meeting in Chicago this coming Tuesday. In the search for information he had called Gene Stump of Peninsular Chemresearch. Gene had suggested that he contact me.

I indicated to Dr. Guy that he was asking me to speculate in an area where one should definitely not speculate. He asked me if it would be possible for the residues that they had found in 98 of 100 people sampled could have come from SCOTCHGARD. I told him that SCOTCHGARD contained no materials that were likely to produce the perfluorocarboxylic acid derivatives they claim to have found. He asked me if we manufacture perfluorooctanoic acid. I indicated that we did. He asked for chemical identification of our overall product line. I advised him our products were proprietary but referred him to Volume V of Simons for chemical background. He said he had already read this and it was not specific enough.

I closed the conversation by again reiterating that this was no time for speculation. I asked him to be on firm technical ground before making statements as to possible sources of organic fluorine.

Ron Mitsch and possibly a member from our Analytical Section of Central Research will be present at the time the paper is given.

JDL:ha

J. A. Ubel, M.D.

3M "CONFIDENTIAL"

CHRONOLOGY - FLUOROCHEMICALS IN BLOOD

AUG 26 1977

August 22, 1975 - Initiating event. J.D. LaZerte receives phone call from W.S. Guy. W.S. Guy, D.R. Taves, and W.S. Brey Jr. are to present a paper at the Chicago A.C. & S. meeting entitled "Characteristics and Concentration of Organic Fluorocompounds Found in Human Tissues". W.S. Guy was attempting to locate the source of the organic fluorocompound and thought that SCOTCHGARD might be the source. J.D. LaZerte advises Guy not to speculate.

August 25, 1975 - At the request of Commercial Chemicals Division Control Research sends B.W. Nippolt to the Chicago ACS Meeting to hear the paper by Guy, Taves and Brey. A copy of the ^{19}F NMR spectrum of the fluorochemical isolated from human blood is shown.

September 17, 1975 - At a joint CRL-CCD meeting B.W. Nippolt presents data from the Chicago ASC paper of Guy, Taves and Brey. A copy of the ^{19}F spectrum of the fluorochemical isolated from human blood is shown.

September 21, 1975 - Commercial Chemicals Division Laboratory begins submitting ten samples of perfluorocarboxylic and perfluorosulfonic acid derivatives to Central Research Analytical for ^{19}F NMR analysis in an attempt to identify the material found by Guy and Taves in human blood.

September 22, 1975 - Taves calls J.D. LaZerte to see if 3M will further analyze sample of fluorochemical isolated from human blood and is given a qualified "yes". Further requests that we open contents of FDA (FC-807) petition to him and is given an unqualified no. Taves indicates "strong and continuing" interest in finding source of fluorochemical.

October 7, 1975 - Central Research Analytical submits research proposal to determine quantity and character of organic fluorine in human blood with an estimated project duration of 5 months and estimated cost of $12,000.

October 21, 1975 - Research proposal accepted by Commercial Chemicals Division.

November 6, 1975 - Of the ten samples submitted on September 21, 1975, Central Research reports that the ^{19}F NMR analysis shows that the spectrum of $C_8F_{17}SO_3H^*$ or its salts matches that presented by Guy and Taves.

$^*C_8F_{17}SO_3H$ - LD_{50} (Oral)	Less than 630 mg/Kg -- Toxic
$C_8F_{17}SO_3K$ - LD_{50} (Oral)	About 1250 mg/Kg - Moderately Toxi

EXHIBIT tabbies' E

Exhibit 1144 State of Minnesota v. 3M Co., Court File No. 27-CV-10-28862

December 16, 1975 - J.D. LaZerte, H.E. Freier and J.E. Long visit Guy and Taves at University of Rochester. Agreement is reached that 3M will attempt to isolate and identify fluorochemicals in blood.

February 17, 1976 - Central Research Analytical completes development of accurate analytical method for determining ppb quantities of organic fluorine in human blood. Method is tested on sample of pooled serum from American Red Cross.

April 14, 1976 - Central Reserach Analytical completes analysis of four blood samples from Commercial Chemical Division personnel. Laboratory personnel exposed to fluorochemicals have up to 100 times "normal" amounts of organically bound fluorine in their blood.

May 4, 1976 - Taves calls D.F. Hagen of CRL and requests help in developing a chromotographic method for analyzing perfluoro-octanoic acid. He requests that we analyze some of his perfluoroocanoic acid.

May 13, 1976 - H.E. Freier calls Taves. Agrees to analyze their sample by gas chromotography.

June 29, 1976 - Central Research Analytical completes analysis of nine blood samples including three from Chemolite. Chemolite personnel exposed to fluorochemicals have up to 1000 times "normal" amounts of organically bound fluorine in their blood. Results from previously exposed laboratory personnel indicate that organically based fluorine remains in the blood for an indefinite period.

July 19, 1976 - 3M Medical Department initiates program to study blood chemistry of persons exposed to fluorochemicals.

August 23, 1976 - Central Research Analytical completes analysis of nine blood samples indluding eight from Cordova. Cordova personnel exposed to fluorochemicals have up to 50 times "normal" amounts of organically bound fluorine in their blood.

August 26, 1976 - Central Research Analytical isolates and characterizes fluorochemical from blood of Chemolite supervisor. The fluorochemical is identified as $C_7F_{15}CO_2H$ or one of its salts by G.C. and ^{19}F NMR.

September 9, 1976 - Central Research Analytical completes analysis of the blood of mice which were fed FC-807 at 1000 and 3000 ppm for 30 days. The mice which were fed FC-807 had roughly 4000 times as much organically bound fluorine in their blood as "nonexposed" mice.

September 17, 1976 - Central Research Analytical characterizes the fluorochemical metabolite from the mouse feeding studies as $C_8F_{17}SO_3H$ or one of its salts. Characterization by ^{19}F NMR.

September 20, 1976 - H.E. Freier calls Taves to keep him informed of our interest. Gave Taves results of CRL analysis of the $C_7F_{15}CO_2H$ which Taves sent. Taves is also told:

1. We are using a modified Wickbold method for fluorine analysis.
2. We have analyzed pooled Red Cross plasma and found organic fluorine levels comparable to those in the literature.
3. We have not yet begun to isolate fluorochemicals in pooled Red Cross plasma.

October 8, 1976 - Central Research Analytical completes analysis of thirteen blood samples including seven from Decatur. Decatur personnel exposed to fluorochemicals have up to 300 times "normal" levels of organically bound fluorine in their blood. Other samples show:

1. Rats exposed to FC-70 do not have FC-70 in their blood.
2. Individuals exposed to fluorochemicals over twenty years ago and not exposed since, have "normal" organically bound fluorine levels.

October 18, 1976 - Central Research Analytical isolates and characterizes fluorochemical from blood of Decatur cell operator. The fluorochemical is identified as $C_8F_{17}SO_3H$ or one of its salts by ^{19}F NMR.

October 20, 1976 - H. E. Freier calls Taves to report results on analysis of $C_7F_{15}CO_2H$ sample supplied by Taves.

October 28, 1976 - Dr. Leon Singer requests sample of $C_7F_{15}CO_2H$ from 3M. Singer believes he can improve on Tave's method of analysis.

November 8, 1976 - 3M sends 25 g $C_7F_{15}CO_2H$ to Dr. Leon Singer

November 17, 1976 - Central Research Analytical completes analysis of six blood samples from Chemolite personnel exposed to fluorochemicals and again finds up to 1000 times "normal" levels of organic fluorine. Further analysis of one individual's blood showed both $C_7F_{15}CO_2H$ and $C_8F_{17}SO_3H$ to be present.

Blood samples are sent to General Activation Analysis to see if Neutron Activation Analysis can be used for determining organically bound fluorine.

December 1, 1976 - Industrial Hygiene begins medical examination of Chemolite personnel including those exposed to fluorochemicals. Examination includes blood, urine and enzyme analysis as well as a partial physical examination.

January, 1977 - J. E. Long arranges to supply Central Research Analytical with blood and liver samples from rats exposed to FC-43 vapors.

January 14, 1977 - Central Research Analytical is unable to detect FC-43 in the blood of rats exposed to FC-43, but finds that organically bound fluorine is present in the blood of exposed rats at seven times the level of a control.

January 15, 1977 - Industrial Hygiene completes medical examinations of Chemolite personnel. Those exposed to fluorochemicals show no medical abnormalities which can be attributed to fluorochemical exposure.

January 20, 1977 - Attempted analysis for organically bound fluorine in blood by General Activation Analysis using photon activation is unsuccessful.

January 27, 1977 - Central Research Analytical completes method for determining organically bound fluorine in whole blood. Blood samples from American Red Cross donors have "normal" plasma levels of organic fluoride.

February 3, 1977 - Central Research Analytical completes wrok on livers of rats exposed to FC-43. Gas chromotography shows FC-43 to be present at approximately 2ppm. Total organic fluorine level is 8.7 ppm in exposed rats as compared to 7.8 ppm in the control.

January 4, 1977 - Central Research Analytical completes work on blood and livers of rats fed 3000 and 10,000 ppm FC-807 for 30 days. Rats fed at 3000 ppm show an organic fluorine level of 75 ppm in blood while those fed at 10,000 ppm show a level of 125 ppm. (Control = 0.03 ppm.)

Analysis of the livers of the rats fed at the 10,000 ppm level show an organic fluorine level of 500 ppm (Control = 1 ppm).

February 14, 1977 - Central Research Analytical begins a concentrated effort to characterize $C_8F_{15}SO_3H$ derivatives in the 10 ppb range using the Gas Chromotography.

April 12, 1977 - J. D. LaZerte reviews status of organic fluorochemicals in blood with J. V. Erwin and P. H. Schertler of Personal Care Products. Decision made to determine amount of organically bound fluorine in blood of individuals who use Skaid Brand Repellents.

May 5, 1977 - Central Research Analytical completes analysis of blood from 3 employees at High Point, North Carolina. Organically bound fluorine level is on the high side of "normal".

June 9, 1977 - Central Research Analytical completes analysis of blood from three employees who use Skaid Brand Repellents. All blood samples contain organically bound fluorine at higher than "normal" levels. One sample is ten times "normal".

June 15, 1977 - J. D. LaZerte reviews status of organic fluorochemicals in blood with J. A. Muhlenpoh and R.W.H. Chang of Home Health Care Products. Muhlenpoh and Chang review plans for use of fluorochemicals in plague and carrier prevention.

July 6, 1977 - J. E. Long submits tentative schedule for chronic toxicity/carcinogenity study on FC-807 metabolite, FC-143 and Ethyl FOSE Alcohol.

July 29, 1977 - July issue of "Fluoride" contains special report on AAAS Fluoride Symposium held on February 25, 1977. Guy and Taves again report finding $C_7F_{15}CO_2H$ in pooled plasma and attribute its presence to industrial products such as SCOTCHGARD and ZEPEL.

August 3, 1977 - Toxicology proposes four studies to be carried out with SCOTCHGARD and FLUORAD type products. Purpose of studies is to determine if these materials can enter the blood in significant quantities.

1975 Using a preconcentration method and NMR, Guy and Taves report presence of organic fluorine compounds in blood bank blood from around the country (average concentration about 0.03 ppm OF, which corresponds to about 45 ppb PFOS). Work was first reported at a conference (ACS?) and subsequently published in Biochemistry Involving Carbon-Fluorine Bonds, "Organic Fluorocompounds in Human Plasma: Prevalence and Characterization" in 1977. Guy and Taves hypothesis that POAA is the OF compound. This is never satisfactorly verified (e.g. by MS or by NMR).

1975 - probably in September; According to Richard Newmark, Dallas Zimmerman (3Mer) obtained copy of the NMR spectra at the meeting and spoke with CAL about the possibility of a 3M-produced contaminant.

1976 - by October, CAL has the ability to measure PFOS in sera using NMR (report #AR7230)

According to Richard Newmark, CAL team lead by Don Hagan and Jon Belisle (Richard Newmank - NMR) confirm that Guy and Taves' spectra reflects the presence of PFOS - not POAA - as the major OF compound.

According to Richard Newmark, Newmark generates 6 reports to this affect. **Can we locate any of these reports?**

According to Richard Newmark, Newmark analyzes samples he receives from Hagan that he believes are blood bank samples but does not know for sure. **Can we locate the notebook that references the identity of the sample in order to match it with microfisched spectra?**

1977 Unspecified fluorochemical (called "B") is identified in sera samples from High Point, NC. No conclusions are made about the specific compound, but data is attached. Analysis was by GC.

1977 Elevated R-F values are found in 3 3M employees who use Ensure and Skaid skin care products. Report suggest that there's not enough samples for specific compound id, yet GC data is attached indicating presence of "B".

1979 Guy and Taves author a paper speculating that POAA is the main OF in human blood.

According to Richard Newmark, Guy and Taves send this paper to CAL for review.

According to Richard Newmark, 3M lawyers urge CAL not to release the true identity (PFOS) of the OF compound.

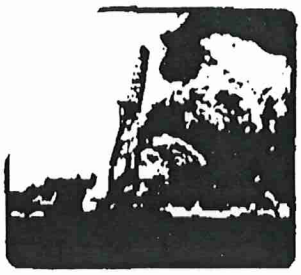
Belise, Hagan, and Bunnelle publish internal reports measuring POAA and PFOS in worker blood using GC/ECD. (report # A73629)

Belilse and Hagan publish a paper suggesting the accuracy of Guy and Taves' conclusions about the identity of the OF found in blood. They propose a new analytic method (derivitization followed by GC/ECD analysis) for the analysis of POAA extracted from tissues and fluids. Recoveries of POAA are determined by spiking human sera free of POAA. **Doesn't the ability of these researchers to verify blank (with respect to POAA) sera prior to spiking indicate that Guy and Taves conclusion was inaccurate?** Analytical Biochemistry; "A Method for the Determination of Perfluorooctanoic Acid in Blood and Other Biological Samples".

Need copies of any papers Guy and Taves published from 1975 on.

Concentration of branched isomer in metabolised material confirmed (5/77, report #C46956) and (5/6/77, report #A64037)

L/W Correspondence file Reimer



BOOTS & COOTS
FIRE & PROTECTIVE EQUIPMENT, INC.

1437 Leimert Blvd., Suite B
Oakland, California 94602-1860
(415) 482-5360
24 Hour Emergency # (713) 999-0276 Houston, Texas

2-3 CE

JUNE 3, 1988

3M COMPANY
3M CENTRE
ST PAUL, MN 55144
ATTN: MR. WILLIAM STEVENS

SUBJECT: FOAM SYSTEMS TESTING, BEALE A.F.B. CALIFORNIA.

IN ALL LITERATURE AND DOCUMENTATION THAT IS PUBLISHED BY THE MAJOR MANUFACTURERS OF A.F.F.F. CONCENTRATE, IT IS CLAIMED THAT THESE PRODUCTS ARE BIODEGRADABLE. FURTHERMORE, VERBAL PRESENTATIONS MADE BY VARIOUS MANUFACTURES REPRESENTATIVES HAVE ALSO INDICATED THAT THESE PRODUCTS ARE BIODEGRADABLE. THERE IS ALSO AN ARTICLE PREPARED BY MASSELLI ET.AL. WHICH WITH SOME DEGREE OF ACCURACY, INDICATED THAT MATERIALS WITH A B.O.D. 20/C.O.D. RELATIONSHIP GREATER THAT 0.5 ARE READILY BIODEGRADABLE. SINCE THE U.S. MILITARY SPECIFICATION CALLS FOR A MINIMUM RELATIONSHIP OF 0.65 (MIL-F-24385D (DRAFT)) AND DATA PRESENTED TO THE GOVERNMENT INDICATES THIS RELATIONSHIP TO BE 0.7 - 0.9, WE COULD ASSUME THE PRODUCTS ARE BIODEGRADABLE.

IMAGINE THE SURPRISE AND TOTAL SHOCK WHEN THE BOOTS AND COOTS OFFICE IN OAKLAND, CALIFORNIA RECEIVES A TELEPHONE CALL FROM GRINNELL FIRE PROTECTION IN SACRAMENTO, CALIFORNIA TELLING US **THAT 3M, 3%** A.F.F.F. CONCENTRATE IS NOT BIODEGRADABLE. THIS INFORMATION, THEY CLAIM, WAS GIVEN TO THEM DURING A ONE HOUR TELEPHONE CONVERSATION BY A "PH.D. SCIENTIST, CHEMIST" BY THE NAME OF ERIC REIMER AT THE 3M COMPANY.

IMAGINE FURTHER, OUR EMBARRASSMENT AND CREDIBILITY LOSS SINCE WE HAD BEEN TELLING GRINNELL FIRE PROTECTION, THE SACRAMENTO CORPS OF ENGINEERS AND THE GENERAL CONTRACTOR THAT TO THE BEST OF OUR KNOWLEDGE BASED UPON MANUFACTURERS DATA, THAT 3M 3% A.F.F.F. CONCENTRATE WAS BIODEGRADABLE. THIS INFORMATION WAS REQUIRED IN ORDER THAT WE MAY CONDUCT A ONE (1) MINUTE TEST OF AN A.F.F.F. SYSTEM AT BEALE A.F.B.

SUBSEQUENTLY, AS A RESULT OF THE INFORMATION GIVEN BY THE 3M COMPANY, GRINNELL FIRE PROTECTION WAS INCONVENIENCED AND DAMAGED, IN THAT, THEY HAD TO HIRE A SUCTION PUMP AND HOLDING TANK FOR IN EXCESS OF $10,000.00. BOOTS & COOTS ALONG WITH THE GENERAL CONTRACTOR WERE INCONVENIENCED AND DAMAGED, SINCE THE TEST PROGRAM HAD TO BE RESCHEDULED, WHICH COMPOUNDED THE LIQUIDATED DAMAGES ALREADY IN EFFECT.

Fluorad™ Fluorochemical Surfactants & Fluorochemical Intermediates

6/7/88

Eric -

I just received this FAX this morning & that was the first I had heard of it. There obviously have been some misunderstandings which could have serious repercussions. Sheet;

Technical Assistance (612) 733-5634
To Place An Order (612) 733-1710
Product Information (612) 733-1683

3M

Fluorad™ Fluorochemical Surfactants & Fluorochemical Intermediates

your view on the situation? Pls get a hold of me on this.

Home phone 439-4588
736-3200

Work

Thanks.

Technical Assistance (612) 733-5634
To Place An Order (612) 733-1710
Product Information (612) 733-1683

3M

AS A RESULT OF THE INFORMATION GIVEN OUT BY ERIC REIMER THE CORPS OF ENGINEERS, SACRAMENTO DISTRICT OFFICE REQUIRED BOOTS AND COOTS INDIVIDUALS FILLING THE FOAM TANK TO BE FULLY PROTECTED WITH HARD HAT, SAFETY GLASSES, AND GLOVES, SINCE THE 3M 3% A.F.F.F. IS, (I QUOTE) "A DANGEROUS HARMFUL LIQUID." THIS STATEMENT WAS BASED UPON INFORMATION GIVEN BY ERIC REIMER AND DATA SHEETS SUPPLIED BY THE 3M COMPANY TO THE CORPS OF ENGINEERS.

THE RAMIFICATIONS OF THIS DISCLOSURE MAY BE FELT AT OTHER JOB-SITES CONTROLLED BY THE CORPS OF ENGINEERS, SACRAMENTO OFFICE. IN ADDITION, THEY MAY DECIDE TO FORWARD THIS DATA TO OTHER CORPS OF ENGINEERS OFFICES.

BY COPY OF THIS LETTER BOOTS & COOTS REQUESTS A FULL AND COMPLETE DISCLOSURE OF THE TOXIC, CHEMICAL AND BIODEGRADABILITY EFFECTS OF THE 3M A.F.F.F. CONCENTRATES. WE FURTHER SUGGEST THAT PRIOR TO ERIC REIMER OFFERING INFORMATION TO COMPANIES CONTRACTED WITH BOOTS & COOTS ON SPECIFIC PROJECTS, HE COMMUNICATE WITH US FIRST.

YOUR IMMEDIATE ATTENTION TO THIS MATTER IS GREATLY APPRECIATED.

YOURS FAITHFULLY,

JIM DEVONSHIRE/BILL WALTON

CC: LES WILLIAMS
JOHN SCHUSTER
JOHN YOUNG
STEVE WARD (FOR INFO)

JD\US\2161

3M Internal Correspondence

Surfactant Correspondence file

Date: 30-Dec-1988 06:31pm CST
From: US053491@USSP01
RICKER, DON@PROFS@SSWMB@GRETEL
Dept:
Tel No:

TO: CHASMAN, JON N @PROFS @SSWMB @QUIGLY
TO: KILLIAN, MICHAEL E @PROFS @SSWMB @QUIGLY
TO: PIKE, MIKE T @PROFS @SSWMB @QUIGLY

Subject: FC-129 Biodegradability

To: US009762--USSP01 MIKE T PIKE US082710--USSP01 MICHAEL E KILLIAN
US105996--USSP01 Jon N Chasman

FROM: Don Ricker - US053491 - USSP01
Specialty Chemical Division QA - 236-1B-10 (733-2488)
Subject: FC-129 Biodegradability
IF YOU DECIDE TO PROCEED WITH THIS TESTING, PLEASE HAVE THE SAMPLES SUBMITTED THROUGH ME. BY MEANS OF THIS MEMO I AM NOTIFYING E. REINER THAT MIKE KILLIAN, JON CHASMAN ARE THE RESPONSIBLE PARTIES FOR THE SURFACTANT LINE OF PRODUCTS.
Regards,
Don Ricker
*** Forwarding note from US047816--ALLIN1 12/30/88 14:40 ***
From: REINER,ERICA@A1@EISM
To: US009762__USSP01 MIKE T PIKE
GE071524__GEVMC REESE DETLEF

Subject: FC-129 Biodegradability

With this memo I am:

1) Requesting ICP Division authorization to conduct OECD screening tests to clarify the biodegradability of fluorochemical surfactants FC-129 and FC-170c. The proposed tests will use high temperature-TOC, UV-TOC, and MBAS or BiAS analysis

2) Commenting on point 4. a) of the attached memo from Detlef Reese dated 27-Dec-1988.

I don't think it is in 3M's long-term interest to perpetuate the myth that these fluorochemical surfactants are biodegradable. It is probable that this misconception will eventually be discovered, and when that happens, 3M will likely be embarrassed, and we and our customers may be fined and forced to immediately withdraw products from the market.

If 3M wants to continue to sell and use fluorochemical surfactants as low level specialty components in cleaning products, I believe that 3M has to accurately describe the environmental properties of these chemicals and then lobby in each EEC nation for the adoption of regulations that exempt low level specialty uses. The already adopted German surfactant biodegradation regulation quite clearly does not exempt specialty uses of nonbiodegradable surfactants

EXHIBIT tabbies H

Exhibit 1351
State of Minnesota v. 3M Co., Court File No. 27-CV-10-28862

3M now find itself "trapped" in a situation where it can not lobby the authorities for exemptions because the German authorities currently think that (at least some) fluorochemical surfactants are biodegradable. If we don't correct this misconception and lobby for exemptions, other EEC nations are likely to develop regulations based on this restrictive German model.

Background

In 1984 3M German had an outside laboratory, Research Consulting Company AG (RCC), conduct OECD screening tests on two fluorochemical surfactants, FC-129 and FC-170C. I had previously requested authorization to conduct EEC approved tests on fluorochemical surfactants, but the Commercial Chemicals Division in St. Paul refused to support or approve such testing. The Division refused approval because the 3M position was, and I believe still is, that 3M fluorochemical surfactants, such as FC-129 and FC-170C, fall outside the intended range of the EEC Directive on surfactant biodegradability because they are used for "specialty" purposes not as "detergents," i.e., surfactants that emulsify and thus remove dirt in cleaning products. The Division felt that conducting these tests would imply that 3M agreed that EEC biodegradation restrictions applied to specialty fluorochemical surfactants and would weaken our arguments asking for their exemption from these restrictions. A second reason for refusing to conduct these tests was that it was considered certain that the results would show the fluorochemical surfactants are not biodegradable. The Division couldn't see a benefit of generating this negative data.

The RCC study showed that FC-129 was 90% biodegraded, but they measured TOC using a Technicon Autoanalyser II which uses a UV-persulfate digestion method that is inappropriate for fluorochemicals. Actually, any TOC analytical method is not in strict accordance with the German regulation which calls for MBAS or BiAS analysis, but the representative of an analytical lab in Germany told us that despite the regulation, some authorities prefer TOC analysis because they think (and in this case incorrectly) that TOC analysis is more likely to indicate complete degradation.

Detlef Reese immediately provided me with the RCC results, but the Division did not approve of my proposed response. Detlef Reese thus submitted these results to the German authorities who accepted and believed them. In fact, the German authorities have published a document on surfactant biodegradability in which they state that some fluorochemical surfactants are biodegradable and others are partially biodegradable. While the statement does not reference the 3M data. Detlef Reese believes it probably is based on the 3M data submission.

Best regards,

Eric Reiner

cc: US018376__ALLIN1 BACON, DALE L
US053491__USSP01 DON RICKER

cc: US047816--ALLIN1 REINER, ERIC A

JGiesy@aol.com
03/26/2008 03:49 AM

To wkreagen@mmm.com
cc JNewsted@entrix.com
PMehrle@entrix.com
bcc
Subject Re: Entrix Consulting

Bill:

I will forward the opportunities to you. Then you decide how you would like to proceed. I am attaching two papers that have been assigned to me to review. If you want to take them over, I will write to the journals and tell them that I can no loner review them and suggest that they be referred to whomever in 3M who is appropriate. Some journals will allow this, but others, for conflict of interest issues, will not allow an industry to review a paper about one of their products. That is where I came in for Dale. Since we had been set up as academic experts, about half of the papers published in the area in any given year came to me (continue to come to me) for review. In time sheets, I always listed these reviews as literature searches so that there was no paper trail to 3M.

I have attached the two papers that came this week. One from Environmental Pollution and one from ES&T.

Let me know if you want to take over the reviews of these papers and I will decline.

Sincerely,

John P. Giesy

ENVPOL-D-08-00116.fdf

es-2008-00647k-supplimental.pdf

s1-ln327267-1522787456-1939656818Hwf-983624596IdV1891202298327267PDF_HI0001.pdf

3M_MN00110700

JGiesy@aol.com
07/19/2007 09:47 PM

To dlbacon@mmm.com
wkreagen@mmm.com
cc
bcc
Subject manuscript FYI

A great deal of speculation. I rejected it.

 S1-LN2~1.PDF

Exhibit
2164
State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

3MA02516746

William K. Reagen/US-Corporate /3M/US
03/31/2008 03:00 PM

To Michael A. Nash/LA-Legal/3M/US@3M-Corporate
cc
bcc
Subject Fw: Entrix Consulting

William Reagen
Laboratory Manager
3M Environmental Laboratory
Environmental, Health, and Safety Operations
3M Center, MS 260-5N-17, Maplewood MN, 55144
651-733-9739
wkreagen@mmm.com

----- Forwarded by William K. Reagen/US-Corporate/3M/US on 03/31/2008 03:00 PM -----

William K. Reagen/US-Corporate /3M/US
03/25/2008 02:21 PM

To JGlesy@aol.com
cc
Subject Re: Entrix Consulting

Thank you for the clarification around the literature John. I'd of course defer to your judgement on selected papers for review but would suggest John Butenhoff and myself for 3M reviewers (or to delegate internally).

Also, which journal(s) are you editing?

William Reagen
Laboratory Manager
3M Environmental Laboratory
Environmental, Health, and Safety Operations
3M Center, MS 260-5N-17, Maplewood MN, 55144
651-733-9739
wkreagen@mmm.com

If the reader of this message is not the intended recipient please notify us immediately by telephone or electronic mail and delete or destroy this message and all copies thereof, including attachments.
JGiesy@aol.com

JGiesy@aol.com
03/25/2008 01:39 PM

To wkreagen@mmm.com
cc
Subject Re: Entrix Consulting

Bill:

No problem. I will stop tracking down and reading literature and also stop doing reviews of PFC papers. Most of the "literature" work was spend on doing reviews of PFC manuscripts that were sent to me for review. Because of my duties as the editor for two journals I would normally turn down these opportunities to review papers, but have been taking on the reviews, which generally take about 4 to 6 hours, depending on the paper. I have two that just came in yesterday. Would you like to have me refer them to someone in house at 3M. My personal advise is that you want to keep "bad" papers out of the literature, otherwise in litigation situations they can be a large obstacle to refute. We are dealing with a number of these sorts of papers in the atrazine issue. Judges seem to be of the opinion that if information is in the peer-reviewed, open literature, it is accurate.

I assume that you are keeping track of the literature in case we need it in the future.

Sincerely,

John P. Giesy

Attachment 2: 12/14/95 "SCD Strategic Plan Key Action for Obstacle # 1" (1A + 1D only)

MAJOR VISION OBSTACLE #1

"PRIMARILY BECAUSE OF THE PERSISTENCE OF FLUORO-CHEMICALS, ENVIRONMENTAL, HEALTH, SAFETY AND REGULATORY ISSUES AND TRENDS THREATEN TO LIMIT OUR BUSINESS.'

STRATEGY 1A

PROACTIVELY IDENTIFY AND MANAGE RISKS, KEEPING OUR BUSINESS "AHEAD OF THE CURVE" IN REGARDS TO FUTURE TRENDS, REGULATIONS, LEGISLATIVE INITIATIVES AND INDUSTRY STANDARDS

KEY ACTION 1A1
Gather appropriate data regarding our releases into the environment to determine our "environmental footprint"

KEY ACTION 1A2
Develop and implement a disciplined, systematic SCD EHS&R Management System

KEY ACTION 1A3
Undertake a Chemicals SBC environmental assessment

KEY ACTION 1A4
Establish environmental quality standards (EQS)

KEY ACTION 1A5
Identify and close potential gaps in environmental and toxicity data on existing products, intermediates and waste streams

KEY ACTION 1A6
Continue to maintain regulatory approval to sell PFCs as long and as broadly as we can

KEY ACTION 1A7
Develop full compliance with Responsible Care and ISO 14000

KEY ACTION 1A8
Develop life cycle and risk analyses of our products, including protocols for ensuring adequate environmental and toxicity testing

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

STATE OF MINNESOTA
COUNTY OF HENNEPIN

DISTRICT COURT
FOURTH JUDICIAL DISTRICT

State of Minnesota, by its Attorney General, Lori Swanson, its Commissioner of Pollution Control, John Linc Stine, and its Commissioner of Natural Resources, Tom Landwehr,

Plaintiff,

vs.

3M Company,

Defendant.

Case Type: Other Civil
Judge Kevin S. Burke
Court File No. 27-CV-10-28862

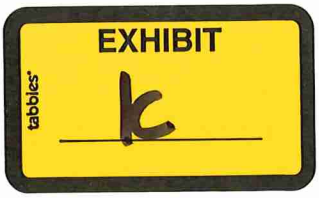
MEMORANDUM IN SUPPORT OF PLAINTIFF STATE OF MINNESOTA'S MOTION TO AMEND COMPLAINT

INTRODUCTION

The State should be permitted to seek punitive damages from 3M because it has established at least a prima facie case that 3M acted with deliberate disregard for the high risk of injury to the citizens and wildlife of Minnesota when it dumped PFC-containing wastes into the Minnesota environment. *See* Minn. Stat. § 549.20, subd. 1(a); *id.* § 549.191 (authorizing punitive damages "upon clear and convincing evidence that the acts of the defendant show deliberate disregard for the rights or safety of others").[1]

3M dumped massive quantities of PFC-containing industrial waste at four disposal sites in the East Metro area for over 40 years, beginning in the 1950s. 3M dumped these wastes largely in unlined pits and trenches, despite the fact that 3M fully understood—by no later than

[1] This action is brought by the State by its Attorney General and the Commissioners of the Department of Natural Resources and Pollution Control Agency pursuant to Minn. Stat. § 115B.04 in the name of the State as "trustee of the air, water and wildlife." *See* Minn. Stat. § 115B.17, subd. 7. This action is not an action for personal injury, and the State is not required to establish harm to a particular individual.



Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

the early 1960s—that its disposal practices were certain to pollute groundwater in the East Metro area.

3M has also been aware for many decades that the PFCs it dumped into the Minnesota environment posed a substantial risk to human health and the environment. Very early studies showed that PFCs accumulate in the human body and are "toxic," and 3M studies from the 1970s concluded that PFCs were "even more toxic" than previously believed. 3M also knew by the 1970s that its PFCs were widely present in the blood of the general U.S. population.

But 3M concealed this critical fact from government regulators and the scientific community for decades. In order to protect its hundreds of millions of dollars in annual revenue from PFCs, 3M misled scientists seeking to determine the source of PFCs in peoples' blood. 3M likewise went to great lengths to distort the broader scientific community's understanding of the serious health effects posed by PFCs, funding friendly research (to which many strings were attached) while simultaneously paying money to ensure that less favorable research would be suppressed. And 3M for decades failed to report important (and legally required) information regarding the adverse health effects of PFCs to the EPA—a failure for which it was eventually required by EPA to pay a large fine. 3M's conduct was so egregious that, in 1999, a 3M PFC scientist and whistleblower (Dr. Richard Purdy) resigned in protest, copying the EPA on a letter explaining that he could "no longer participate" in a 3M process that put "markets, legal defensibility and image over environmental safety."

At around that same time, what 3M had privately known for decades, *i.e.*, that its PFCs were widely present in the blood of the U.S. population, finally became public. As a result of this fact and the work of the 3M whistleblower, EPA began investigating PFCs in 1998. Shortly thereafter, under pressure from EPA, 3M announced that it was "voluntarily" phasing out

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

production of its PFCs. By this time, however, 3M had reaped billions of dollars in profits from a business it had long known was causing serious harm to the environment and risk to human health.

By disposing of its PFC-laden waste in a manner that 3M knew would contaminate the groundwater, and by concealing the risks that PFCs pose to human health and the environment for decades, 3M clearly acted with deliberate disregard for the health and well-being of East Metro area residents and the Minnesota natural environment. As a result of 3M's actions, Minnesota's natural resources have been contaminated. 3M's decades-long course of contamination with deliberate disregard for the risks to the environment and people of Minnesota harmed wildlife and humans. Expert analysis found elevated levels of cancers and premature births among East Metro area residents. The State should therefore be granted leave to amend its complaint pursuant to Minn. R. Civ. P. 15.01 and Minn. Stat. § 549.191 to seek punitive damages from 3M.

BACKGROUND

3M produced PFCs in Minnesota for approximately 50 years. 3M began research into the chemicals in the late 1940s and began commercial production of PFCs in Minnesota in the early 1950s. 3M used PFCs to manufacture consumer, commercial, and industrial products, including stain repellents such as Scotchgard, fire retardants, and other products. The PFCs that 3M produced in Minnesota include perfluorooctanoic acid ("PFOA"), perfluorooctane sulfonate ("PFOS"), perfluorobutanoic acid ("PFBA"), and perfluorobutanesulfonic acid ("PFBS").

During the period in which 3M manufactured PFCs in Minnesota, it also disposed of PFC-containing waste and discharged PFC-containing wastewater into the surrounding environment. 3M's disposal and discharge of PFCs centered on four sites:

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

- 3M's manufacturing facility in Cottage Grove, Minnesota (the "Cottage Grove" site), where 3M disposed of PFC-containing wastes, largely in unlined disposal areas, throughout most of the time it manufactured PFCs in Minnesota, and from which 3M disposed of PFCs directly into the Mississippi River;

- a disposal site located in the City of Oakdale, Minnesota (the "Oakdale" site), where 3M disposed of PFC-containing wastes from 1956 to 1960;

- a disposal site located on the border of the cities of Cottage Grove and Woodbury, Minnesota (the "Woodbury" site), which 3M used to dispose of PFC-containing wastes in unlined trenches from 1960 to 1966; and

- the Washington County Landfill, located in the City of Lake Elmo, Minnesota (the "WCLF"), to which 3M sent PFC-containing wastes from at least 1971 to 1974.

February 1986 Final Remedial Investigation Rep. for Cottage Grove (3MA00364082, at -4094-100) (Ex. 1); July 28, 1980 3M Letter to Metropolitan Council (3MA00456729, at -6729) (Ex. 2); December 1965 Engineering Rep. (3MA00456411, at -6416) (Ex. 3); June 26, 1967 3M Letter (3MA00286355, at -6355) (Ex. 4); December 8, 1980 Points to Describe 3M Involvement with Three Sites in Oakdale (3MA01248573, -8573) (Ex. 5); 2003 Off-Site Waste Disposal Locations (3MA01243198, at -3198) (Ex. 6).

Over time, PFCs that 3M disposed of at the four sites have migrated—and continue to migrate—through the soil and into four underlying drinking water aquifers. As a result of these long-standing and continuing releases, PFCs have been detected in groundwater beneath and down-gradient from each of the four 3M disposal sites. Because of 3M, over 150 square miles of the East Metro area are now contaminated with PFCs, and the pollution is expected to endure for decades to come. Karls Dep. Tr. at 122:10-18 (Ex. 7).

3M also released—and continues to release—PFCs into the Mississippi River and nearby lakes. 3M has released PFCs into the Mississippi River directly from outfalls at the Cottage Grove Site and indirectly, through the flow of contaminated groundwater, resulting in harm to fish and other wildlife in the East Metro area. *See* Ronald Kendall Expert Rep. at 12-13, 16-18

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

(Ex. 8). 3M's releases of waste water from its PFC manufacturing process into the Mississippi River alone totaled over 100,000 gallons per year. Santoro Dep. Tr. at 41:20-42:7 (Ex. 9).

As discussed further below, 3M has known for decades that (1) groundwater in the East Metro area would be contaminated by its dumping of PFC-laden industrial waste, and (2) PFCs accumulate in the human body, are toxic, and have the potential to cause serious harm to human health. Nevertheless, 3M continued to manufacture PFCs and dispose of PFC-containing waste—reaping billions of dollars in profits—until EPA forced 3M to phase out the production of PFCs in the early 2000s.

I. 3M Possessed An Early Understanding Of The Characteristics And Risks Of PFCs.

3M knew from early on that PFCs posed a significant risk to people, wildlife, and the environment.

A. 3M Knew That PFCs Persisted In The Environment And Accumulated In Living Organisms.

By the early 1960s, 3M understood that PFCs are stable and persist in the environment and that they do not degrade. *See, e.g.*, 3M Brand Fluorochemical Surfactants, June 15, 1963 (3MA01201629, at -1635) (Ex. 10) (listing chemical, thermal, and biological stability as "[t]he main features which distinguish these materials"); U.S. Patent No. 2,519,983, August 22, 1950, at 4:33-39 (Ex. 11) (noting the "[h]igh degree of thermal stability and chemical inertness" of PFCs).

As early as 1963, 3M identified the stability of PFCs as a distinguishing feature of these products. *See* 3M Brand Fluorochemical Surfactants, June 15, 1963 (3MA01201629, at -1635) (Ex. 10) ("Some are completely resistant to biological attack."); *see also* Woodard Dep. Tr. at 132:22-134:8 (Ex. 12) (3M expert agreeing that "3M was aware of PFCs' resistance to degradation at the time of disposal"). A 1978 study by 3M on PFOS and PFOA confirmed that

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

"these chemicals are likely to persist in the environment for extended periods unaltered by microbial catabolism." *See* July 19, 1978 3M Technical Report Summary (3MA10054929, at -4930) (Ex. 13).

3M also understood as early as the mid-1950s that PFCs accumulate in humans and animals. In 1956, a study at Stanford University used PFCs manufactured by 3M to conclude that PFCs bind to proteins in human blood. *See* Nordby et al., *Perfluorooctanoic Acid Interactions with Human Serum Albumin*, J. BIOL. CHEM., at 399 (1956) (Ex. 14). Further research into the accumulation of PFCs by the Children's Hospital Research Foundation using 3M's PFCs concluded that certain types of PFCs collected in the liver, where the compounds remained for life. Clark et al., *Perfluorocarbons Having a Short Dwell Time in the Liver*, SCIENCE, at 680 (1973) (Ex. 15). 3M studies from the 1970s confirmed the accumulation of PFCs in living organisms and the extent to which the accumulation occurred. *See* Purdy Dep. Tr. at 41:11-47:10 (Ex. 16); August 16, 1978 3M Technical Report Summary (3MA00326803, at -6820) (Ex. 17); May 22, 1979 3M Technical Report Summary (3MA01409559, at -9559) (Ex. 18); May 16, 1978 3M Central Analytical Laboratory Report (3M_MN02343997, at -4000, -4001) (Ex. 19).

As early as 1976, 3M began monitoring the blood of its employees for PFCs because the company was "concerned" about "health" effects of PFCs. *See* Santoro Dep. Tr. at 110:14-18 (Ex. 9); August 31, 1984 3M Internal Correspondence (3M_MN03269963, at -9963) (Ex. 20) (showing that 3M viewed with "serious concern" that organic fluorine levels in 3M employees were not decreasing and, in some instances, were increasing). These worker tests further confirmed that PFCs bioaccumulate. *See* October 19, 1977 3M Interoffice Correspondence (3M_MN00000479, at -0481) (Ex. 21). The early blood samples of 3M employees showed high

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

levels of PFCs in the workers' blood. *See id.* ("Some Chemolite personnel show organic fluorine compounds at 1,000 times normal [levels]."). 3M's testing of employee blood samples also concluded that PFCs remained in human blood for long periods of time. *See* August 1, 1978 3M Central Analytical Laboratory Report (3MA00967481, at -7481) (Ex. 22); August 31, 1984 3M Internal Correspondence (3M_MN03269963, at -9963) (Ex. 20); June 20, 1978 Report on Blood Levels of RF/F In Selected Employees (3M_MN01692291, at -2292) (Ex. 130).

B. 3M Understood That PFCs Had The Potential To Harm Human Health And The Environment.

3M knew from the scientific literature and its own studies that PFCs were potentially toxic to humans and the environment. Published research on PFCs from the early 1960s established that PFCs exhibited toxic effects on living organisms. A study published in 1961, for example, found that PFCs induced a range of toxic effects, including anesthesia, depression, inhibition of enzymes, metabolic effects, and effects on blood pressure and the sympathetic nervous system. *See* Saunders, *The Physiological Action of Organic Compounds Containing Fluorine*, Advances in Fluorine Chemistry, at 183 (1961) (Ex. 23). Several other publications from the 1960s expanded on the adverse effects of PFCs in living organisms. *See, e.g.*, Hamilton, *The Organic Fluorochemicals Industry*, ADVANCES IN FLUORINE CHEMISTRY, at 117 (1963) (Ex. 24); Hodge et al., *Biological Effects of Organic Fluorides*, FLUORINE CHEMISTRY, at 1 (1963) (Ex. 25); Taylor et al., *Structural Aspects of Monofluoro-Steroids*, ADVANCES IN FLUORINE CHEMISTRY, at 113 (1965) (Ex. 26).

3M's own toxicity research began in 1950 and confirmed the toxic risks posed by PFCs. Throughout the 1950s, 3M's own animal studies consistently concluded that PFCs are "toxic." *See, e.g.*, January 10, 1950 3M Study (3MA02497530, at -7530) (Ex. 27) (acute toxicity study of PFBA in mice); 1954 3M Studies (3MA01828941, at -8941-42) (Ex. 28) (studies on toxic effects

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

of PFOS in rats and PFOA in mice). Additional studies undertaken by 3M in the 1970s demonstrated that PFCs were even "more toxic than was previously believed." April 12, 1978, Meeting Minutes—Fluorochemicals Technical Review Committee (3MA10066974, at -6975) (Ex. 29) (emphasis added); *see also* March 20, 1979 Review of Final Reports and Summary (3MA00593073, at -3073) (Ex. 30) (PFOS "certainly more toxic than anticipated"); August 4, 1978 3M Central Analytical Laboratory Report (3M_MN02343995, at -3995-96) (Ex. 31) (toxicity study of PFOS in monkeys); June 5, 1992 Product Toxicity Summary Sheet (3M_MN02252650, at -2650) (Ex. 32) (acute toxicity study of PFOS in rats). As early as 1979, a 3M scientist recognized that PFCs posed a cancer risk because they are "known to persist for a long time in the body and thereby give long-term chronic exposure." July 6, 1979, 3M Interoffice Correspondence on Fluorochemical Chronic Toxicity (3MA00593079, at -3079) (Ex. 33) ("I believe it is paramount to begin now an assessment of the potential (if any) of long-term (carcinogenic) effects for these compounds [*i.e.*, fluorochemicals]."). It is therefore unsurprising that, by the 1970s, 3M had already become "concerned about exposure to fluorochemicals" in the general population. Butenhoff Dep. Tr. at 59:23-60:4 (Ex. 34).

3M also understood the toxic effects of PFCs on the environment and aquatic life by this time. A technical journal in the 1970s observed after conducting tests on a 3M product containing PFCs that the product was "highly derogatory to marine life and the entire test program had to be abandoned to avoid severe local stream pollution." June 15, 1970 Letter from Chemical Concentrates Corporation (3M_MN02267863, at -7863) (Ex. 35). Studies conducted by 3M confirmed the environmental harm resulting from PFCs. Studies from the 1970s, for example, confirmed PFOS's toxicity on various aquatic wildlife, including bluegill sunfish, water flea and scud, mummichog, grass shrimp, fiddler crab, algae, and Atlantic oysters. *See*

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

Acute Toxicity to Fish (3M_MN00436402, at -6402-03) (Ex. 36); Acute Toxicity to Aquatic Invertebrates (3M_MN01656831, at -6831-32) (Ex. 37); Acute Toxicity to Invertebrates (3M_MN00437323, at 7323-7324) (Ex. 38); Algicidal Activity (3M_MN00436466, at -6466-68) (Ex. 39); Aquatic Toxicity to Aquatic Invertebrates (3M_MN00437343, at -7343-44) (Ex. 40).

3M conducted additional studies on the environmental effects of PFCs throughout the late 1970s and 1980s, further confirming the harmful impact of PFCs in the environment. *See, e.g.*, February 7, 1979 3M Technical Report Summary (3M_MN00000151, at -0162) (Ex. 41); March 15, 1979 3M Technical Report Summary (3M_MN00000745, at -0754) (Ex. 42); March 23, 1979 3M Technical Report Summary (3MA01410327, at -0338) (Ex. 43). After reviewing 3M's studies on the environmental toxicity of PFCs, 3M scientists concluded in 1983 that concerns about PFCs "give rise to legitimate questions about the persistence, accumulation potential, and ecotoxicity of fluorochemicals in the environment." May 20, 1983 Fate of Fluorochemicals - Phase II (3MA10065465, at -5476) (Ex. 44).

C. 3M Attempted To "Command the Science" To Suppress Scientific Research Into The Harmful Effects of PFCs.

3M's understanding of the potential risks associated with PFCs spurred 3M to engage in a campaign to distort scientific research concerning PFCs and to suppress research into the potential harms associated with PFCs. 3M recognized that if the public and governmental regulators became aware of the risks associated with PFCs, 3M would be forced to halt its manufacturing of PFCs and PFC-derived products—resulting in the loss of hundreds of millions of dollars in annual revenue to 3M. *See, e.g.*, Palensky Dep. Tr. at 31:3-32:7 (Ex. 45) (indicating that 3M's eventual phase-out of certain PFCs cost 3M more than $480 million in annual revenue).

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

The potential loss of 3M's massive profits from PFCs drove 3M to engage in a campaign to influence the science relating to PFCs. Internal 3M documents revealed 3M's true goal: conducting scientific "research" that it could use to mount "[d]efensive [b]arriers to [l]itigation." Toxicological Research Program in Perfluorinated Chemistries (3M_MN03589087, at -9088) (Ex. 46); *see also* Zobel Dep. Tr. at 206:21-207:19 (Ex. 47) (discussing 3M's processes for ensuring that scientific papers do not include "information that would appear to be contrary to 3M's business interests"); November 23, 1999 Email (3MA00467427, at -7427) (Ex. 48) (referring to 3M's "[s]cientific [p]ublication [s]trategy," which was designed to "establish the safety of our product and processes"); Howell Dep. Tr. at 184:7-185:20 (Ex. 49) (explaining that 3M "stewarded information about fluorochemicals" in order to "protect the business, protect the investment that they had made in those factories and so that they could get a return on their investment").

A key priority of an internal 3M committee—referred to as the FC Core Team—was to "[c]ommand the science" concerning "exposure, analytical, fate, effects, human health and ecological" risks posed by PFCs. *See* 3M FC Core Team 2004 - 2005 Project / Process Priorities (3M_MN00838661, at -8661) (Ex. 50). As part of this effort, 3M provided "[s]elective funding of outside research through 3M 'grant' money." November 11, 2003 3M Memorandum re: FC Core Team Meeting (3M_MN04778452, at -8452) (Ex. 51). In exchange for providing this grant money to friendly researchers, 3M obtained the right to review and edit draft scientific papers regarding PFCs, January 28, 2008 Email from 3M Employee (3M_MN02295793, at -5793) (Ex. 131), and sought control over when and whether the results of scientific studies were published at all. *See* Reed Dep. Tr. at 196:9-198:19 (Ex. 52); *see also* September 9, 2000 Email from Dave Sanders (3MA00198538, at -8539) (Ex. 53) (discussing 3M's desire to delay publication of a

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

scientific article relating to PFCs and expressing the hope that because the "work [wa]s done under contract to 3M," it would "only [be] publishable if and when we [3M] agree"); August 31, 1999, EHS&R Minutes (3MA00927118, at -7119) (Ex. 54) ("All publications will be reviewed by the Core Team and [3M executive] L. Wendling for approval" prior to publication); November 23, 1999 Email re: Scientific Publication Strategy (3MA00467427, at -7427) (Ex. 48) ("The FC Issues Core team will review external publication or presentation proposals.").

A significant aspect of 3M's campaign to influence independent scientific research involved 3M's relationship with Professor John Giesy. 3M provided millions of dollars in grants to Professor Giesy, who—while presenting himself publicly as an independent expert—privately characterized himself as part of the 3M "team." *See* Giesy Dep. Tr. at 151:7-9 (Ex. 55). Professor Giesy worked on behalf of 3M to "buy favors" from scientists in the field, *see* Cost-Benefit Analyses (3MA02513752, at -3758) (Ex. 56), for the purpose of entering into a "quid pro quo" with the scientists. *See* Giesy Dep. Tr. at 216:4 (Ex. 55). Through his position as an editor of academic journals, Professor Giesy reviewed "about half of the papers published in the area" of PFC ecotoxicology and billed 3M for his time reviewing the articles. March 26, 2008 Email from Giesy to 3M Employee (3M_MN00110700, at -0700) (Ex. 57) (Giesy stating that since he "had been set up as [an] academic expert[], about half of the papers published in the area in any given year came to me (continue to come to me) for review"). In performing reviews of these articles, Professor Giesy explained that he was always careful to ensure that there was "no paper trail to 3M." *Id.* (emphasis added) ("In time sheets, I always listed these reviews as literature searches so that there was no paper trail to 3M").

Professor Giesy routinely forwarded confidential manuscripts on PFCs to 3M, *see, e.g.*, December 11, 2006 Email from John Giesy to 3M Employees (3MA01461356, at -1356) (Ex.

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

58), and bragged about rejecting at least one article that included negative information on the harmful effects of PFCs on humans. *See* July 19, 2007 Email from John Giesy to 3M Employees (3MA02516746, at -6746) (Ex. 59); *see also* February 12, 2006 Email from John Giesy to 3M Employee (3MA01320043, at -0043) (Ex. 60). As Professor Giesy explained, his goal was to "keep 'bad' papers [regarding PFCs] out of the literature" because "in litigation situations" those articles "can be a large obstacle to refute." *See* March 25, 2008 Email from Giesy to 3M Employee (3M_MN05334328, at -4329) (Ex. 61).

Despite spending most of his career as a professor at public universities, Professor Giesy has a net worth of approximately $20 million. *See* Giesy Dep. Tr. at 123:7-22 (Ex. 55). This massive wealth results at least in part from his long-term involvement with 3M for the purpose of suppressing independent scientific research on PFCs. *See id.*

D. Recent Scientific Developments Confirm That PFCs Are Harmful To Human Health And The Environment.

Although 3M's efforts delayed the broader scientific community's understanding of the risks posed by PFCs, scientists are now coming to understand what 3M has long known: that PFCs pose a serious threat to human health and the environment.

Independent studies have now established a link between exposure to PFCs and kidney and testicular cancer, ulcerative colitis, thyroid disease, heart disease, pregnancy-induced hypertension, and diminished immune system responses to standard vaccines among children. These links were established by a panel of epidemiologists, known as the C8 Panel, convened as a result of the settlement of a lawsuit against DuPont related to its releases of PFOA in Ohio and West Virginia. This science panel collected data from 69,000 residents and evaluated the links between PFOA and adverse health effects—including a significantly increased risk of certain cancers. *See* Frisbee et al., *The C8 Health Project: Design, Methods, and Participants*, Envtl.

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

Health Perspectives, Vol. 117, No. 12, December 2009 (Ex. 62); Philippe Grandjean Expert Rep. at 37 (Ex. 129).

In 2016, the National Toxicology Program of the United States Department of Health and Human Services ("NTP") and the International Agency for Research on Cancer ("IARC") both released extensive analyses of the expanding body of research regarding the adverse effects of PFCs. The NTP concluded that both PFOA and PFOS are "presumed to be an immune hazard to humans" based on a "consistent pattern of findings" of adverse immune effects in human (epidemiology) studies and "high confidence" that PFOA and PFOS exposure was associated with suppression of immune responses in animal (toxicology) studies. *See* Nat'l Toxicology Program, NTP Monograph: Immunotoxicity Associated with Exposure to Perfluorooctanoic Acid or Perfluorooctane Sulfonate (Sept. 2016), at 1, 17, 19 (Ex. 63). And the IARC concluded that there is "evidence" of "the carcinogenicity of . . . PFOA" in humans and in experimental animals, meaning that "[a] positive association has been observed between exposure to the agent and cancer for which a causal interpretation is . . . credible." *See* Int'l Agency for Research on Cancer, IARC Monographs: Some Chemicals Used as Solvents and in Polymer Manufacture (2016), at 27, 97 (Ex. 64).

Also in 2016, EPA released a Drinking Water Health Advisory for PFOA and for PFOS, finding that animal studies of PFOA report numerous adverse effects, including developmental effects such as impacts to "survival, body weight changes, reduced ossification, delays in eye opening, altered puberty, and retarded mammary gland development" as well as "liver toxicity," "kidney toxicity," "immune effects," and "cancer," and that human epidemiology studies report associations between PFOA and "high cholesterol, increased liver enzymes, decreased vaccination response, thyroid disorders, pregnancy-induced hypertension and preeclampsia, and

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

cancer (testicular and kidney)." *See* U.S. Envtl. Prot. Agency, Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA) (May 2016), at 9 (Ex. 65). For PFOS, the EPA found that animal studies reported developmental effects, such as "decreased body weight, survival, and increased serum glucose levels and insulin resistance in adult offspring," as well as reproductive effects, "liver toxicity," "developmental neurotoxicity," "immune effects," and "cancer (thyroid and liver)." U.S. Envtl. Prot. Agency, Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS) (May 2016), at 10 (Ex. 66). The EPA concluded that the "developing fetus" is "particularly sensitive" to both "PFOA-induced toxicity" and "PFOS-induced toxicity." *See id.*; U.S. Envtl. Prot. Agency, Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA) (May 2016), at 9 (Ex. 65).

In and after 2002, the Minnesota Department of Health set regulatory limits in drinking water for four PFCs present in the East Metro Area: PFOA, PFOS, PFBS and PFBA. Based on the latest science regarding the adverse health effects of the most studied PFCs—PFOA and PFOS—MDH recently announced still more stringent limits. *See* June 7, 2017, Minn. Dep't of Health, Notice of Health Risk Advisory for Perfluorochemicals, at 2 (Ex. 67). The drinking water in numerous private and municipal wells in the East Metro Area exceed these new limits (either individually or in the aggregate), *id.*, meaning that thousands of Minnesotans have for decades been drinking water containing PFCs in amounts that MDH has concluded may be harmful to human health.

II. 3M'S Disposal Of PFCs Resulted In PFCs Entering The Groundwater And Environment.

During a more-than 30-year period beginning in 1951, 3M disposed of PFCs in a manner that 3M knew would almost certainly result in PFCs contaminating the environment, and in particular the groundwater.

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

A. 3M Knew By The Early 1960s That Its Waste Disposal Practices Were Polluting The Minnesota Environment.

3M understood from at least the early 1960s that the PFC-containing industrial waste it disposed of in the East Metro area would enter the groundwater and pollute the drinking water supply.

Published scientific studies from as early as the 1950s demonstrated that pollutants in industrial waste landfills would enter the groundwater below disposal sites. *See* California State Water Pollution Control Board (hereinafter "SWPCB") 1952 (Ex. 68); SWPCB 1953 (Ex. 69); SWPCB 1961 (Ex. 70). Internal 3M documents from the early 1960s confirm that 3M understood that groundwater near waste disposal sites would be contaminated. For example, an internal 3M memo from 1960 recognized that pollutants from industrial wastes dumped at the Woodbury disposal site "will eventually reach the water table and pollute domestic wells." July 13, 1960 Geology Dep't Rep. #60-10 (3M_MN00000135, at -0136) (Ex. 71) (emphasis added) (summarizing a geological investigation of the site performed by 3M prior to its disposal of wastes at the Woodbury disposal site); *see also* July 28, 1960 Field Letter of John A. Brown and R.C. Collins (3M_MN00000231, at -0232) (Ex. 72) (noting that 3M managers were "again warned of the problems of polluting the underground water" (emphasis in original)); July 22, 1969 Supplementary Engineering Report of Sludge Disposal at Chemolite (3MA00456474, at -6475) (Ex. 73) (noting that "[o]rganic contaminants from the sludge may leach into the ground water at the present dumping site").

3M dumped the vast majority of its waste in unlined pits, and there was no barrier to prevent PFCs from entering the surrounding groundwater. *See, e.g.*, December 5, 1963, Internal Correspondence re: Investigation of Woodbury Dump Site (3MA00335790, at -5790) (Ex. 74) (internal 3M memo explaining that it was "not clearly stated to [government] officials" touring

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

the Woodbury disposal site that "unlined trenches had been used in this area"); March 22, 1978 Interoffice Correspondence (3MA0028220, at -8221) (Ex. 75) (indicating that "ash and sludge" could be disposed of "without clay lining [or] leachate collection and treatment"); Kirk Brown Expert Rep. at 15-16 (Ex. 76). In limited areas, 3M used concrete or bentonite liners, but internal 3M documents from as early as 1963 acknowledged that the liners were "ineffective." July 26, 1963 3M Interoffice Correspondence (3M_MN00048258, at -8258) (Ex. 77) ("[T]he trench used for flowing wet waste had been lined with bentonite in October 1962" but "[i]t appears to the writer that this seal is ineffective."); *see also* December 13, 1961 3M Geology Dep't Rep. No. 61-22 (3MA00335895, at -5896) (Ex. 78) ("A 10% bentonite mixture will create a relatively impermeable seal although it probably will not be 100% effective.").

3M learned from testing conducted in the early 1960s that the groundwater underneath its disposal sites had in fact been contaminated. *See* Kirk Brown Expert Rep. at 29-31 (Ex. 76). For example, by the spring of 1962, 3M knew that chemicals disposed of at the Woodbury disposal site had "reached 75 [feet] below ground"—which was the level of the underlying groundwater at the time—"within about one year of operation." May 14, 1962 3M Interoffice Correspondence (3M_MN00000220, at -0220) (Ex. 79); *see also* July 30, 1963 Interoffice Correspondence (3M_MN00000142, at -0142) (Ex. 80) (acknowledging that "the present waste trenches" at the Woodbury disposal site "are not properly sealed"). 3M's investigation of contamination at the Woodbury disposal site ultimately concluded that "the waste disposal problem has reached the point where some immediate action should be taken." May 14, 1962 3M Interoffice Correspondence (3M_MN00000220, at -0221) (Ex. 79).

Yet no such action was taken. Instead, 3M merely developed a plan to "delay[]" the "ground water pollution" for "a number of years" by dumping its waste at a slightly higher

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

elevation. July 30, 1963 Interoffice Correspondence (3M_MN00000142, at -0142) (Ex. 80). It was not until 1966—nearly four years later—that 3M stopped using the Woodbury disposal site *See* June 26, 1967 3M Letter (3MA00286355, at -6355) (Ex. 4).

Similarly, 3M learned that the groundwater beneath the Cottage Grove disposal site was contaminated in November 1960. *See, e.g.*, November 3, 1960 3M Chemolite Monthly Water Rep. (3M_MN00052163, at -2163) (Ex. 81); *see also* December 1, 1961 3M Interoffice Correspondence (3MA00456329, at -6329) (Ex. 82) ("[T]he pond does not remove any BOD and its leakage is a contributing factor to the contamination of the Chemolite well water."); April 1962 (3MA00456330, at -6331) (Ex. 83) ("Evidence… indicated that the present waste pond has contaminated a nearby water supply well …. We are convinced that contamination will gradually spread to other wells if no corrective measure is taken soon." (emphasis added)). Yet 3M continued to dispose of PFC-containing wastes at its Cottage Grove facility until 1974, and again from 1978 until 1980. *See* Charles Andrews Expert Rep. at 34 (Ex. 84).

B. 3M's Improper Disposal Of PFC-Laden Manufacturing Wastes Caused Substantial Damage To Minnesota's Natural Environment.

3M's improper disposal of PFCs and PFC-containing wastes at its four disposal sites has caused widespread harm to Minnesota's natural environment and to the health of East Metra area residents.

PFCs disposed of by 3M at the four sites migrated (and continue to migrate) into the groundwater beneath the sites. *See id.* at 3-4. After entering the groundwater, 3M's PFCs migrate to the water table. *See id.* at 65, 72. It is clear that 3M's improper disposals are the source of the widespread groundwater contamination now present in the East Metro Area: 3M's own expert, Dr. Franklin Woodard, agrees that "[t]he distribution of PFOA, PFOS and PFBA in groundwater downgradient and downstream of the 3M disposal sites indicates that the primary

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

source of these compounds in groundwater is related to leaching of materials placed in the 3M onsite and offsite disposal areas." Woodard Dep. Tr. at 210:16-211:7 (Ex. 12); *see also* June 1, 2001, Draft—Phase Out Timeline (3M_MN 05367921, at -7921) (Ex. 85) (acknowledging that 3M's manufacture of a PFOS precursor "may have accounted for much of the PFOS in the environment and the general population").

The volume of waste 3M disposed of at each site was enormous. For example, 3M disposed roughly 400,000 gallons of waste solvents and 6 million gallons of "wet scrap" (which included some PFC-containing wastes) at the Woodbury disposal site. Charles Andrews Expert Rep. at 45, 50 (Ex. 84). In one of the multiple disposal sites at Cottage Grove site, 3M disposed of 2.5 tons per day of waste sludge in the early 1970s, some of which contained PFCs. *Id.* at 36. At another portion of the Cottage Grove site, 3M disposed of 2,000 cubic yards per month of PFC-containing incinerator ash and sludge in 1978. *Id.* at 38. Oakdale received "all wastes" generated by 3M's Cottage Grove plant "from 1956 until the fall of 1959." December 8, 1980 Points to Describe 3M Involvement with Three Sites in Oakdale (3MA01248573, at -8573) (Ex. 5). That would have consisted of roughly 20 55-gallon drums per month of PFC-containing acidic tars, hundreds of thousands of pounds of PFC-containing fractionation bottoms per year, thousands of tons of PFC-containing process wastes and byproducts per year, and thousands of cubic yards of PFC-containing sludge per year. Charles Andrews Expert Rep. at 19, 21, 23-26 (Ex. 84); *see also* Woodard Dep. Tr. at 178:1-190:21 (Ex. 12) (3M expert agreeing with the State's estimates of the quantity and PFC content of the wastes disposed of by 3M at the four disposal sites).

As a result of 3M's manufacture and disposal of PFCs, increased concentrations of PFCs have been found in groundwater in the East Metro Area. *See* Robert Karls Expert Rep. at 38-39

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

(Ex. 86). The contamination of groundwater is of particular concern because it is the primary source of drinking water for individuals residing in the East Metro Area. *See id.* at 19. Because PFCs are persistent in the environment and resistant to biodegradation, they are expected to be present throughout wide swaths of the East Metro Area until 2050 and beyond. *See id.* at 38.

As a result of this drinking water contamination, East Metro area residents for decades had—and continue to have—high levels of PFCs in their blood. In 2008 (the first time that testing was performed), East Metro area residents were found to have average levels of PFCs in their blood up to almost four times higher than those of the general U.S. population. *See* Jamie DeWitt Expert Rep. at 17-18 (Ex. 87) (3M's PFCs are so widespread and bioaccumulative that virtually every person and animal in the world has some PFCs in their blood.) While levels have decreased somewhat since 2008, the blood of East Metro area residents continues to this day to have PFC concentrations significantly higher than the national average. *See* Minn. Dep't of Health, East Metro PFC3 Biomonitoring Project – December 2015 Rep. to the Community, at 1 (Dec. 29, 2015), http://www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/PFC3CommunityReport.pdf (Ex. 88).

Dr. David Sunding,[2] an expert for the State, conducted a statistical regression analysis of fertility, birth rates, and cancer incidences in the East Metro area. His analysis concluded that the high levels of PFCs found in the East Metro Area—levels that were presumably present for many decades before testing began—adversely affected the health of people living in the area.

[2] Dr. Sunding is a Professor in the College of Natural Resources at UC Berkeley and is the founding director of the Berkeley Water Center. He received his Ph.D. in Agricultural & Resource Economics from UCLA in 1986. Dr. Sunding has testified before Congress on matters relating to environmental and resource economics, and he has served on expert panels convened by the National Academy of Sciences and the EPA's advisory board. Dr. Sunding's research focuses on environmental externalities from economic activities.

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

In particular, Dr. Sunding has concluded that the fertility and birth outcome rates among women living in the areas affected by PFC contamination is lower than other unaffected communities. Dr. Sunding's analysis of babies born in Oakdale prior to 2006—when there were particularly high levels of PFCs in the municipal water supply—found that low birth weight and premature births were statistically significantly more likely in Oakdale than unaffected communities. *See* David Sunding Expert Rep. at ¶¶ 62-64 (Ex. 89). Dr. Sunding's analysis also reveals that women in Oakdale had lower fertility rates than women living in unaffected communities. *See id.* at ¶¶ 69-70.

Dr. Sunding found further evidence of the harmful effects of PFCs on humans in publicly-available cancer incidence data from the Minnesota Department of Health. *See id.* at ¶ 73. Dr. Sunding found statistically significant increases in certain cancers associated with PFCs in the East Metro area. *See id.* at ¶ 14. In particular, after controlling for demographic factors, Dr. Sunding found evidence of statistically significant higher rates of breast, bladder, kidney, and prostate cancers in Washington County, along with increased levels of leukemia and non-Hodgkin lymphoma, in comparison to the rest of Minnesota. *See id.* at ¶¶ 76-80 & Figures 6-7. In addition, based on a review of death certificates, Dr. Sunding found that children in Oakdale were 171% more likely to have a diagnosis of cancer than children who died in unaffected areas of the State. *See id.* at ¶¶ 91-92.

The high levels of PFCs in the East Metro area have also harmed Minnesota wildlife. Studies in birds have found that exposure to PFOS results in immunological, morphological, and neurological effects. *See* Ronald Kendall Expert Rep. at 28 (Ex. 8). For example, Dr. Kendall's studies on tree swallows (which are often used as a "sentinel species" to study the effect of environmental contamination on avian species generally), have shown PFC accumulation and

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

that the PFCs have altered the DNA of the birds. *See id.* at 32-33. Dr. Kendall's studies have also indicated that accumulated PFCs in Great Blue Heron have resulted in significant levels of PFCs in their eggs and in liver toxicity. *See id.* at 35. Dr. Kendall has also found that exposure to high levels of PFCs has also likely resulted in the accumulation of PFCs in mammals, such as mink and otter. The bioaccumulation of PFCs in mink and otter produces immunotoxicity and other adverse effects. *See id.* at 44. The high levels of PFCs in the East Metro area have also negatively affected fish and other aquatic wildlife. Dr. Kendall found strong evidence, for example, that PFC bioaccumulation in certain mussel species that reside in the Mississippi River has caused oxidative stress, resulting in DNA damage to the mussels. *See id.* at 51-53.

III. 3M Covered-Up The Adverse Effects Of PFCs.

3M actively concealed from State and federal government regulators, the scientific community, and the general public the significant risks posed by PFCs. 3M understood by the mid-1970s that PFCs accumulate in people's blood. *See, e.g.*, August 26, 1977 3M Chronology - Fluorochemicals in Blood (3MA10035028, at -5028) (Ex. 90). 3M also possessed evidence of the risks that PFCs posed to humans and the environment from the internal studies that it conducted. *See supra* II.B; *see also* Kirk Brown Expert Rep. at 19-22 (Ex. 76). Despite 3M's knowledge of these significant risks, 3M employed a wide variety of tactics to suppress information about the considerable risks associated with PFCs for several decades.

A. 3M's Attempt To Misdirect Scientific Researchers

3M's cover-up of the risks posed by PFCs included concealing 3M's early knowledge that PFCs were broadly present in human blood—the very fact that, once publicly disclosed, forced 3M to abandon its highly lucrative PFC businesses.

3M has publicly claimed that it phased out the production of PFCs after it first learned that these chemicals were widely present in the blood of humans. *See* May 24, 2000 Email

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

(3MA00243796, at -3796) (Ex. 91). Several 3M scientists have acknowledged that this discovery was "alarming" and led to 3M's decision to exit the PFC business. *See* Sanders Dep. Tr. at 63:6-65:19, 69:2-5 (Ex. 92); Reed Dep. Tr. at 45:19-46:10 (Ex. 52). According to 3M, the discovery was not made until 1997. *See, e.g.*, May 24, 2000 Email (3MA00243796, at -3796) (Ex. 91); Draft - EPA Proposed Meeting (3MA10071231, at -1231) (Ex. 125); Wendling Dep. Tr. at 56:5-17, 57:4-10 (Ex. 94). In fact, however, internal 3M documents show that 3M knew that its PFCs were present in the blood of human beings since at least the 1970s. *See, e.g.*, August 26, 1977 3M Chronology - Fluorochemicals in Blood (3MA10035028, at -5028) (Ex. 90); August 20, 1975 3M Interoffice Correspondence (3MA10034962, at -4963) (Ex. 95); Wendling Dep. Tr. at 134:20-135:11 (Ex. 94); 1998 Board of Directors Presentations (3MA10081840, at -1842) (Ex. 132).

3M, moreover, took steps to conceal the presence of its PFCs in human blood and misled the scientific community regarding this fact. *See, e.g.*, August 20, 1975 3M Interoffice Correspondence (3MA10034962, at -4963) (Ex. 95); August 20, 1975 Interoffice Correspondence (3M_MN00000293, at -0293) (Ex. 133). For example, two academic researchers—Dr. William Guy and Dr. Donald Taves—contacted 3M in 1975 regarding their finding of organic fluorine in blood from blood banks around the country and their belief that 3M's Scotchgard product may have been the source. *See id.* 3M responded to these researchers by "plead[ing] ignorance," *see id.*, and advising the scientists "not to speculate" about whether Scotchgard was the source of the PFCs. August 26, 1977 3M Chronology - Fluorochemicals in Blood (3MA10035028, at -5028) (Ex. 90). By 1977, however, 3M itself had confirmed that one of its PFCs—PFOS—was the "major OF [organic fluorine] compound" found in human blood nationwide. 3M Timeline (3MA10039277, at -9277) (Ex. 96). Rather than reveal this critical

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

fact to the scientific community, however, "3M lawyers" sought to prevent the "true identity (PFOS) of the OF compound" from being released. *Id.* As a result of this concealment, scientific knowledge regarding the "alarming" presence of PFCs in human blood was delayed by two decades—decades during which 3M reaped billions of dollars in revenue from the manufacture and sale of PFCs while 3M knowingly harmed Minnesota's natural resources.

B. 3M's Concealment Of Information From Regulators

3M also concealed critical information about PFCs from government regulators.

Under federal law, chemical manufacturers are required to immediately notify EPA of information that reasonably supports the conclusion that one of their products presents a substantial risk of injury to health or the environment. *See* 15 U.S.C. § 2607(e) (hereinafter, "TSCA § 8(e)"). 3M, however, withheld from EPA numerous scientific studies relating to the adverse health effects of PFCs—including studies from as early as the 1970s—until after 2000. August 21, 2000 3M Letter to EPA (3MA01220047, at -0048-51) (Ex. 126) (listing 30 PFC-related studies that were first submitted to EPA pursuant to TSCA 8(e) in 2000); August 21, 2000 3M Letter to EPA (3MA01220040, at -0040, -0043) (Ex. 127) (identifying over 30 "potential violations" of EPA's "substantial risk" reporting requirements relating to PFCs). Ultimately, EPA required 3M to pay $1.5 million in penalties for TSCA § 8(e) violations. U.S. Envtl. Prot. Agency, 3M Company Settlement, available at https://www.epa.gov/enforcement/3m-company-settlement (Ex. 136); October 9, 2001 Letter (3M_MN00053722, at -3724) (Ex. 97); Reed Dep. Tr. at 96:5-98:17 (Ex. 52).

In March 1999, a 3M scientist and whistleblower, Dr. Richard Purdy, became so concerned with 3M's failure to inform EPA about the environmental risks of PFCs that he copied the EPA on his resignation letter from 3M. March 28, 1999 Resignation Letter (hereinafter "Resignation Letter") (3MA00480715, at -0715-16) (Ex. 98). In that letter, Dr. Purdy explained

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

that he was resigning due to his "profound disappointment in 3M's handling of the environmental risks associated with the manufacture and use of perfluorinated sulfonates (PFOS)." *Id.* at -0715. As Dr. Purdy explained,

> 3M continues to make and sell these chemicals, though the company knows of an ecological risk assessment . . . that indicates there is a better than 100% probability that perfluorooctansulfonate is biomagnifying in the food chain and harming sea mammals.
>
> . . .
>
> I have worked to the best of my ability within the system to see that the right actions are taken on behalf of the environment. At almost every step, I have been assured that action will be taken—yet I see slow or no results. I am told the company is concerned, but their actions speak to different concerns than mine. I can no longer participate in the process that 3M has established for the management of PFOS and precursors. For me it is unethical to be concerned with markets, legal defensibility and image over environmental safety.

Id. at -0716 (emphasis added); *see also id.* at -0715 (noting that "[f]or more than twenty years 3M's ecotoxicologists have urged the company to allow testing to perform an ecological risk assessment on PFOS and similar chemicals" but that 3M had been "hesitan[t]" to do so); March 29, 1999 Email Containing Statement from Purdy (3MA01373218, at -3219) (Ex. 99) ("For 20 years [3M] has been stalling the collection of data needed for evaluating the environmental impact of fluorochemicals. PFOS is the most onerous pollutant since PCB and you want to avoid collecting data that indicates that it is probably worse. I am outrage[d].").

Among other things, Dr. Purdy's resignation letter highlighted several troubling failures on the part of 3M to comply with its TSCA § 8(e) "substantial risk" reporting obligations. First, Dr. Purdy's letter noted that he had prepared a "risk assessment on PFOS that indicated a greater than 100% probability of harm to sea mammals." Resignation Letter, at -0715 (Ex. 98). Although Dr. Purdy informed 3M that his risk assessment showed that PFOS "constitutes a

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

significant risk that should be reported to EPA under TSCA 8e," 3M ultimately "decided not to submit [the report] to EPA over [Purdy's] objection." Purdy Dep. Tr. at 125:8-127:13, 151:2-5 (Ex. 16).

Second, Dr. Purdy pointed out that a TSCA § 8(e) report filed by 3M regarding PFOS in the blood of eaglets was materially incomplete. As Dr. Purdy explained in his letter (on which he copied several EPA officials):

> Just before that submission we found PFOS in the blood of eaglets--eaglets still young enough that their only food consisted of fish caught in remote lakes by their parents. This finding indicates a widespread environmental contamination and food chain transfer and probable bioaccumulation and bio-magnification. This is a very significant finding that the 8e reporting rule was created to collect. 3M chose to report simply that PFOS had been found in the blood of animals, which is true but omits the most significant information.

Resignation Letter, at -0715-16 (Ex. 98) (emphasis added).

Notably, it was only after 3M's hand was forced by Dr. Purdy that 3M complied with its reporting obligations to EPA. Thus, on May 26, 1999—just weeks after EPA received a copy of Dr. Purdy's resignation letter—3M executive Charles Reich "supplement[ed]" 3M's prior submission to include precisely the information that Dr. Purdy informed EPA had been improperly omitted from 3M's original submission. May 26, 1999 3M Letter to EPA (3M_MN01329658, at -9658) (Ex. 100). Just one year earlier, the same 3M executive had overruled a recommendation by a committee of 3M scientists to report to EPA 3M's finding of PFCs in the blood "of non-occupationally exposed populations at parts per billion (ppb) levels." March 20, 1998, TSCA Section 8(e) Decision (3MA10064459, at -4459) (Ex. 101).

C. 3M's Continued Attempts To Suppress Information About PFCs

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

In addition to 3M's failure to disclose information to regulators, 3M engaged in a widespread campaign to conceal the risks posed by PFCs from the public—a campaign that continues to this day.

Misuse of Attorney-Client Privilege. As part of its effort to conceal information, 3M improperly instructed its employees to stamp virtually all documents related to PFCs as attorney-client privileged, regardless of whether the privilege truly applied to such documents. For instance, a senior 3M scientist testified that it was "very common" for 3M's Environmental Laboratory to mark PFC-related materials as attorney-client privileged. Reagen Dep. Tr. at 123:9-22 (Ex. 102); *see also, e.g.*, Wendling Dep. Tr. at 55:14-19 (Ex. 94) ("I believe at the time most documents relating to the [PFC] issue were marked attorney/client privileged."); Sanders Dep. Tr. at 186:5-13 (Ex. 92) ("[A]lmost everything was—whether it involved attorneys or not, was stamped attorney-client privilege."); Purdy Dep. Tr. at 137:10-138:8 (Ex. 16); Zobel Dep. Tr. at 222:4-11 (Ex. 47); Olsen Dep. Tr. at 51:2-23 (Ex. 103); Renner Dep. Tr. at 117:18-118:2 (Ex. 104). Both Dr. Purdy and Dr. Zobel, 3M's Medical Director, provided public, on the record comments to Minnesota Public Radio stating that they were directed to use an attorney-client privilege stamp on "anything we wrote down" relating to PFCs. Minnesota Public Radio, Toxic Traces, February 2005 (3MA01169469, at -9484) (Ex. 105).

Document Destruction. 3M's campaign to conceal information about the risks associated with PFCs extended to destroying documents related to PFCs. For example, 3M's Senior Vice President Charles Kiester, testified that any "pencil notes" that would be kept during meetings of 3M oversight committees relating to "FC" issues were "discarded . . . right away." Kiester Dep. Tr. at 130:1-131:15 (Ex. 106). Likewise, Jerry Walker, who was in charge of the 3M division that was responsible for manufacturing PFCs in 2000, testified that he was directed by 3M

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

officials to place talking points relating to the phase out "in a secure receptacle" for disposal. Walker Dep. Tr. at 31:24-32:3; 208:12-209:12 (Ex. 107). In addition, a 3M laboratory notebook entry from September 2, 1998, contains a list of instructions relating to "document retention," one of which is "clean out computer of all electronic data" relating to PFCs. 3M Technical Notebook (3M_MN04758351 at -8398) (Ex. 108) (emphasis added).

3M also instructed its employees not to create paper trails regarding PFC issues. For example, as Dr. Purdy explained at the time of his resignation in 1999, "3M told those of us working on the fluorochemical project not to write down our thoughts or have email discussions on issues because of how our speculations could be viewed in a legal discovery process." *See* Resignation Letter, at -0716 (Ex. 98).

Building Demolition. 3M manufactured PFCs at its Cottage Grove plant in a location referred to as Building 15. This building was known by 3M employees to be highly contaminated:

> A The only thing I was aware of is that we -- that the building was -- we didn't enter the building while I was -- during my time there. We just -- we just -- I don't recall that we -- you could just walk into Building 15 like you could other buildings.
>
> Q So you were -- the -- when you say you didn't enter it -- so you were -- was there a policy that you didn't enter the building? Or was it -- do you recall?
>
> A I just -- I don't specifically recall other than I -- just general knowledge that we just didn't go into Building 15.
>
> Q And why was that?
>
> A I think it was because of the -- the PFC materials that were present in the building.

Thornton Dep. Tr. at 82:25-83:16, 85:8-12 (Ex. 109). 3M went so far as to demolish Building 15 after it stopped manufacturing PFCs. *See, e.g.*, Hohenstein Dep. Tr. at 165:21-166:1 (Ex. 110).

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

Press Strategy. 3M has also engaged in a decades-long campaign to control information in the press regarding PFCs and their harmful effects. For example, 3M maintains a list of ostensibly "independent third party experts" to whom it refers reporters with inquiries regarding PFCs. *See* May 24, 1999, 3M FC Issue Communications Plan (3M_MN04732222, at -2242) (Ex.111); November 16, 1998 3M Internal Correspondence (3M_MN02980584, at -0608) (Ex. 134). In reality, however, these "experts" are not independent at all. Rather, the experts are carefully vetted by 3M, and are required to sign "confidentiality and consulting agreements" with 3M. 3M FC Issue Communications Plans at -2245 (Ex. 111). These agreements, among other things, provided that the experts will receive payment from 3M for their service as "independent" experts. *Id.*; Palensky Dep. Tr. at 116:20-117:6 (Ex. 45); 3M Consulting Services Agreement (3M_MN00255852, at -5856) (Ex. 93).

Misleading Customers. 3M's lack of candor regarding its PFCs also extended to its communications with customers. For example, an internal 3M document from 1988 reveals a concern that 3M was "perpetuating the myth" that its PFCs are biodegradable to both customers and regulators when 3M knew that was not the case. December 30, 1988, 3M Internal Correspondence re: FC-129 Biodegradability (3MA10035965, at -5965) (Ex. 112) ("If 3M wants to continue to sell and use fluorochemical surfactants …, I believe that 3M has to accurately describe the environmental properties of these chemicals"); *see also* June 3, 1988 Letter from 3M Customer (3M_MN01315290, at -5292) (Ex. 135). Despite these early warnings, 3M did not take any steps to dispel the myth that PFCs biodegrade. *See* 1989 3M Brand Technical Information AFFF, FC-783 (3M_MN02369894, at -9895) (Ex. 113). In addition, as Dr. Purdy explained, "3M waited too long to tell customers about the widespread dispersal of PFOS in people and the environment." Resignation Letter, at -0716 (Ex. 98).

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

IV. EPA Pressure Forced 3M To Phase-Out Production Of PFCs.

3M continued its strategy of valuing the company's profits over risks to the health of Minnesota's citizens and environment for decades. In 2000, 3M announced that it was "voluntarily" phasing out the production of certain PFCs. Far from being "voluntary," however, 3M only announced the phase-out after EPA began investigating the chemicals and 3M faced the real prospect of a government ban.

Leading up to 3M's phase-out of PFCs, 3M and EPA were in communication about the risks posed by PFCs. *See, e.g.,* April 11, 2000 Email from EPA to 3M (3M_MN02345422, at -5422-23) (Ex. 128) (describing April 10 phone call between 3M and EPA); April 20, 2000 Letter from 3M to EPA (3MA00517725) (Ex. 115); April 21, 2000 Letter from 3M to EPA (3MA10056065, at -6065) (Ex. 116); April 27, 2000 Letter to EPA (3M_MN02457023, at -7023) (Ex. 117) (referring to April 28, 2000 meeting with EPA); 3M Submission to EPA (3MA01657924, at -7924) (Ex. 118); May 3, 2000 Letter from 3M to EPA (3MA00254228, at -4228) (Ex. 119); May 4, 2000 Letter from 3M to EPA (3M_MN02457062, at -7062) (Ex. 120); May 5, 2000 Email from EPA to 3M (3MA10056263, at -6263) (Ex. 121). The threat of enforcement by EPA spurred many of 3M's decisions related to PFCs leading up to the phase-out. *See, e.g.*, December 1998 FC Toxicity/Safety Testing Presentation re: PFOS & N-EtFOSE (3MA10054016, at -4019) (Ex. 114) ("EPA plans to issue TSCA rule mandating [Screening Information Data Set] testing [of PFOS and N-EtFOSE] if chemical companies fail to do testing voluntarily."). 3M also became aware of the extent of EPA's concerns about the health and environmental risks posed by 3M's production of PFCs. *See, e.g.*, April 10, 2000 Notes from Charlie Auer Telephone Call (3MA00470824, at -0824-25) (Ex. 122) (describing phone call with EPA on April 10, 2000, in which a "concerning" health study was raised as well as TSCA § 4(f), which authorizes EPA to severely limit access to chemicals, including by banning the chemical

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

or certain of its applications); Notes from May 8, 2000 Sussman Meeting (3MA00469749, at -9750) (Ex. 123) (describing telephone call in which 3M was advised that PFC situation "appears to meet the requirements of [TSCA] 4(f)," suggesting that EPA might ban the substances); 3M's Big Cleanup: Why it decided to pull the plug on its best-selling stain repellant, Businessweek Online, June 5, 2000 (3MA00745707, at -5711) (Ex. 124) ("'They could see the writing on the wall,' argues the senior EPA official. 'They could see we were going to continue our assessment of this and it would get more detailed and at the end of the day we would make some kind of decision.'").

In short, 3M only ceased manufacturing PFCs because its hand was forced by EPA after 3M's decades-long concealment campaign finally began to unravel.

LEGAL STANDARD

Minnesota law authorizes punitive damages "upon clear and convincing evidence that the acts of the defendant show deliberate disregard for the rights or safety of others." Minn. Stat. § 549.20, subd. 1(a); *id.* § 549.191. Plaintiffs are prohibited from asserting punitive damages claims in complaints—punitive damages may be asserted only by an amended complaint. *Id.* A court "shall grant the moving party permission to amend the pleadings to claim punitive damages" if prima facie evidence supports the moving party's motion. *Id.*[3]

To amend its pleadings, a party must "establish a prima facie case by clear and convincing evidence" that reasonably allows the conclusion that the defendant deliberately

[3] Motions to amend complaints to add punitive damages claims are typically filed after the close of discovery. *See, e.g., Allen v. Fidelity Fin. Servs.*, Civ. No. 98-1725, 1999 WL 33912315, at *1 n.1 (D. Minn. Sept. 9, 1999) (Analysis for punitive damages claim under Minnesota law "is very fact-intensive and is best accomplished at or shortly after the close of all discovery."). Resolving such motions prior to the close of discovery invites inefficiency because a denial "does not finally foreclose the claim for punitive damages, since discovery may lead to evidence sufficient to justify a renewed motion." *McKenzie v. N. States Power Co.*, 440 N.W.2d 183, 185 (Minn. Ct. App. 1989).

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

disregarded the rights or safety of others. *Leiendecker v. Asian Women United of Minn.*, 895 N.W.2d 623, 637 (Minn. 2017) (internal quotation marks omitted). "[I]f the court finds prima facie evidence supports the claim for punitive damages, it shall grant leave to amend." *McKenzie v. N. States Power Co.*, 440 N.W.2d 183, 184 (Minn. Ct. App. 1989) (internal quotations omitted). To establish that prima facie evidence supports such a claim, a party is not required "to actually prove its claim by clear and convincing evidence to the district court." *Leiendecker*, 895 N.W.2d at 637. Instead, the court evaluates the evidence, "mak[ing] no credibility findings" and without "consider[ing] any challenge, by cross-examination or otherwise, to the Plaintiff's proof." *Ulrich v. City of Crosby*, 848 F. Supp. 861, 867 (D. Minn. 1994).

The "deliberate disregard" standard is met if in the jury could find that the defendant:

> has knowledge of facts or intentionally disregards facts that create a high probability of injury to the rights or safety of others and: (1) deliberately proceeds to act in conscious or intentional disregard of the high degree of probability of injury to the rights or safety of others; or (2) deliberately proceeds to act with indifference to the high probability of injury to the rights or safety of others.

Minn. Stat. § 549.20, subd. 1(b). The defendant's conduct, not the resulting damage, is the touchstone of the jury's assessment. *See Jensen v. Walsh*, 623 N.W.2d 247, 251 (Minn. 2001) ("The purposes of punitive damages are to punish the perpetrator, to deter repeat behavior and to deter others from engaging in similar behavior.... It is therefore appropriate, in determining whether punitive damages should be allowed, to focus on the wrongdoer's conduct rather than to focus on the type of damage that results from the conduct.").

Minnesota allows punitive damages awards in cases where there is no personal injury, *id.*, and previous environmental tort litigations in other jurisdictions have resulted in the award of punitive damages. *See, e.g., Exxon Shipping Co. v. Baker*, 554 U.S. 471, 515 (2008) (punitive

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

damages awarded in lawsuit against oil company following oil spill); *Johansen v. Combustion Eng'g, Inc.*, 170 F.3d 1320, 1340 (11th Cir. 1999), *cert. denied*, 528 U.S. 931 (1999) (punitive damages awarded in nuisance and trespass claims against owner of former mine site from which acidic water had escaped); *In re the Exxon Valdez*, 296 F. Supp. 2d 1071, 1110 (D. Alaska 2004), *vacated on other grounds*, 490 F.3d 1066 (9th Cir. 2008); *E.T. Holdings, Inc. v. Amoco Oil Co.*, No. C95-1034, 1998 WL 34113907, at *16 (N.D. Iowa Dec. 27, 1998) (punitive damages awarded after gasoline from defendant's station leaked into soil and groundwater); *City of Modesto Redevelopment Agency v. Dow Chem. Co.*, Nos. 999345, 996443, 2006 WL 2346275, at *4 (Cal. Super. Ct. Aug. 1, 2006) (punitive damages awarded after defendant's chemicals contaminated groundwater and soil).

ARGUMENT

I. The State Should Be Permitted To Ask The Jury For An Award Of Punitive Damages.

Clear and convincing evidence establishes that 3M deliberately disregarded the high probability of injury to Minnesota's natural resources—and the resulting risk to East Metro residents, fish and wildlife—by knowingly polluting the groundwater and surface waters of the East Metro area with its PFC-laden wastes. The State should therefore be permitted to seek punitive damages from 3M.

During virtually the entire period that 3M disposed of massive quantities of industrial waste in the East Metro area, it knew that those wastes contained large quantities of PFCs and that those PFCs were highly persistent in the environment. *See supra* I.A., II.B. 3M likewise knew from the outset that its use of unlined pits and trenches to dispose of its PFC-containing waste would inexorably lead to pollution of the groundwater underneath and down-gradient from

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

its disposal sites. *See supra* II.A. Yet 3M made no effort to prevent this pollution from occurring. *See supra* II.A.

3M has also known for decades that its PFCs accumulate in the blood and organs of humans and wildlife. *See supra* III.A. Even more troublingly, 3M has long known that PFCs were "toxic," and as it conducted additional studies, it learned that they were "even more toxic" than previously believed. *See supra* I.B. By as early as the 1970s, 3M was so concerned about the risks of PFCs—including their potential to cause cancer—that it began monitoring the blood of its workers. *See supra* I.A. Today, there is an emerging scientific consensus that 3M's PFCs are linked to serious health effects, including cancers, immune effects, and birth effects. *See supra* I.D.

Rather than cease manufacturing PFCs or improve its waste disposal practices, 3M did everything in its power to conceal the pernicious effects of PFCs on human health and the environment from regulators and scientists. For example, 3M evaded its "substantial risk" reporting obligations under TSCA § 8(e) by failing for decades to disclose critical studies involving PFCs—a tactic that led to a substantial penalty from EPA after it was revealed. *See supra* III.B. 3M likewise went to great length to "command the science" regarding PFCs: funding and thereby controlling friendly research while suppressing studies it didn't like ("without any paper trail to 3M," of course), "buy[ing] favors" from scientists, and paying supposedly independent scientists to speak on 3M's behalf—all for the avowed purpose of "protect[ing] the [PFC] business" and erecting a "defensive barrier to litigation." *See supra* I.C. And, when those tactics failed, 3M went so far as to destroy—or improperly mark as attorney-client privileged—documents that revealed the true dangers associated with PFCs. *See supra* III.C.

Filed in Fourth Judicial District Court
11/17/2017 6:08 PM
Hennepin County, MN

Perhaps most troublingly, 3M concealed for over two decades the fact that its PFCs were widely present in the blood of the general U.S. population—the very fact that, once revealed, led to 3M's belated and forced withdrawal from the PFC business. Indeed, 3M went so far as to mislead independent researchers who were investigating possible links between elevated fluorine levels in blood and 3M's products, even while confirming internally that a 3M product was the source of those elevated levels. *See supra* III.A.

During the many decades that 3M manufactured PFCs and disposed of PFC-containing waste in the East Metro area, it made billions of dollars from its PFC business. *See supra* I.C. But experts have found that during those same decades, both wildlife and people in the East Metro area were harmed. Indeed, Dr. Sunding has concluded that East Metro area residents who for decades drank water containing high levels of PFCs suffered (among other things) from increased risks of cancers and premature births. *See supra* II.B. Although concealed from regulators and the public, these harms were foreseeable to 3M.

In short, the record contains clear and convincing evidence that 3M, in its pursuit of profit, deliberately disregarded the substantial risk of injury to the people and environment of Minnesota from its continued manufacture of PFCs and its improper disposal of PFC-containing wastes. A Minnesota jury should therefore be given the opportunity to award the State punitive damages.

CONCLUSION

The Court should allow the State to amend its complaint to assert punitive damages for the State's claims for negligence, trespass, and nuisance.