August 8, 2016

Erica Bergman
NJDEP – Bureau of Case Management
401 E. State Street – Mail Code 401-05
P.O. Box 420
Trenton, New Jersey 08625

Re: Perfluorinated Compounds Work Plan, Solvay Specialty Polymers USA, LLC, West Deptford, New Jersey Plant, September 22, 2015

Dear Ms. Bergman,

We are submitting these comments as a named stakeholder to the continuing Solvay Work Plan ("Work Plan") process. Enclosed is a report prepared by Peter Demicco of Ground Water Associates dated August 8, 2016 for Delaware Riverkeeper Network (DRN) ("Demicco Report 2016").

Ground Water Associates makes several recommendations for the expansion and improvement of the Work Plan. These include changes to and expansion and/or completion of the proposed Work Plan.

Based on the enclosed Demicco Report 2016, Delaware Riverkeeper Network concludes that the Work Plan requires changes in order to accurately define the location, migration, and properties of the Perfluorononanoate acid (PFNA) and Perfluorinated Compounds (PFC) contamination. The Demicco Report makes it clear that the inclusion of the Delaware River and river sediment pore waters is essential.

There is great potential for migration of contamination of PFNA/PFC into additional water supplies connected to the river and regional groundwater aquifers, risking further exposure of the public to these toxic compounds.

Further soil sampling, air modeling and the investigation of Gloucester County Municipal Authority sludge application to agricultural fields over the years, some which could be distant from the Solvay facility, are other analyses that are of great importance. Some plan aspects are incomplete or ill-defined such as the site-specific partitioning study and the mixing evaluation from the Gloucester County Municipal Authority outfall into the Delaware River.

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Delaware Riverkeeper Network requests that copies of Solvay's revisions to the Work Plan and the Department's and stakeholder responses and comments be shared with our organization so that we may provide further input on additions to the Work Plan as they become available.

Thank you for the opportunity to submit comments on the Work Plan.

Sincerely,

Maya van Rossum
The Delaware Riverkeeper

Tracy Carluccio
Deputy Director

Enclosure: Peter Demicco, Ground Water Associates, LLC "Perfluorinated Compounds Work Plan Review, August 8, 2016".

Ground Water Associates, LLC

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August 8, 2016

Ms. Tracy Carluccio
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RE: Perfluorinated Compounds Work Plan Review
Solvay Specialty Polymers USA, LLC
West Deptford, New Jersey Plant

Dear Ms. Carluccio:

Ground Water Associates, LLC (GWA) has reviewed the Solvay Specialty Polymers USA (Solvay) Perfluorinated Compound Work Plan (Work Plan) prepared by Integral Consulting, Inc. dated September 22, 2015. Perfluorinated compounds (PFC), including notably perfluorononanoic acid (PFNA, the nine carbon chain PFC) and related compounds, have been detected in the Delaware River watershed. Solvay and preceding companies have used PFC, including PFNA, in manufacturing at the facility. The Solvay Work Plan is described as a voluntary program for investigation of PFC releases from the facility.

Work Plan Content

The Work Plan developed for Solvay has three specific media that are being investigated. The sampling plan includes the following:

- Groundwater from on-site and off-site monitoring wells
- Soils, predominately on-site, for evaluation of the air modeling perfluoroalkyl compounds (PFCs) deposition report
- River surface water, sediment and pore water in the creeks adjacent to the site also to evaluate the results of the air modeling.

Also included in the Work Plan are two tasks to assist in quantifying PFC mobility and movement in soils and surface water:

- Develop a site specific partitioning between soil and groundwater
- Outfall mixing of plant discharge into the Delaware River

The objective of the Work Plan is simply stated as evaluating the presence of PFCs in the environmental media to be sampled. Specifically the following statement appears in Section 2.1 Objectives:

The results of the investigation described in this work plan will be assessed in conjunction with results of previous investigations to provide additional understanding of the distribution of PFCs and their fate in the environment in the vicinity of the Plant.

In summary, my opinion is that the Work Plan is missing critical components to assess exposure pathways of PFC's to a potentially large population along the Delaware River, specifically in the pore water of Delaware River sediments and via air deposition into soils. Understanding these exposure pathways is far more important from an environmental and health protection perspective than defining a site specific local plume. Specifically, the distribution of PFC from the Delaware surface waters into the PRM aquifer, the major water source in the area, is the critical assessment that is required in this study. The Work Plan, as presented, remains focused on the delineation of direct on-site releases and the distribution of PFC that resulted. The result is a localized study not evaluating the potential extent of exposures.

Previous Investigation Results

GWA, has reviewed the Work Plan, three previous site reports, and other related documents including the following:

- Results of the Temporary Well Point Investigation (March 3, 2015)
- Delaware River Surface Water and Sediment Data Report (March 3, 2015)
- Air Modeling Report for Perfluoroalkyl Compounds (March 3, 2015)
- Response to NJDEP Comments – March 07, 2016 (May 6, 2016)

In summary, the sampling results indicate that PFC's are poorly absorbed onto soil particles and remain partitioned into the pore water of the environmental media sampled.

The Delaware River Surface Water and Sediment Data Report (March 3, 2015) presents results that include samples of river waters, sediment samples and pore water obtained from sediment samples. The following description of the results was presented on page 3-10 of the report.

PFNA was detected in pore water at seven stations at concentrations ranging from 18 to 190 µg/L: Reach B (SSI004), Reach C (SSI009), and all five stations at Reach D. At most of these stations, PFNA was not detected in sediment grab samples, so the sample size of paired grab samples and pore water samples with detected PFNA was too small to conduct a correlation analysis. The three sediment grab samples for which PFNA was detected correspond with the three highest pore water concentrations (49, 60, and 190 µg/L). As noted in Section 3.1.1, PFNA was not detected in near bottom and other surface water samples at these locations.

The Solvay results indicate that pore water concentrations up to 190 ug/L still exist within the river sediments from limited areal sampling. The results also indicate that sediment sampling is not as effective as pore water sampling in evaluation of the distribution of PFNA in the sediments below the Delaware River. Future distribution testing for PFNA in Delaware River sediments must focus on pore water sampling. The potential movement of PFC's into the PRM Aquifer still exist although the results do indicate that PFNA no longer remain in the surface waters of the Delaware River at measurable concentrations under the conditions tested. It should be noted that DRBC sampling conducted surface water sampling in 2007 to 2009 (MacGillivray, 2012). PFNA

concentrations at 0.976 ug/l in 2007 to 0.546 ug/l in 2009 were measured at River Mile 80 relatively close to the Solvay facility when the facility was operational.

The sampling of the PRM aquifer materials in the Results of the Temporary Well Point (TWP) Investigation (March 3, 2015) presents similar results with the partitioning of PFNA into the pore waters of the samples. Water and soil samples were taken to evaluate the results of private well testing to the east of the main plume of PFC's along Woodbury Creek. The sampling results contained PFNA in the ground water up to 336 ppt in TWP-2. Soil sampling did not result in the quantifiable detection of PFC's. Most ground water TWP results from the other borings did not exceed 50 ppt except two samples from TWP-4 slightly above 100 ppt. The report states that maximum groundwater concentrations of PFNA and PFOA detected at the TWPs were approximately one-fifth lower than (or 20 percent of) the maximum concentrations detected at residential wells along Woodbury Creek. Concentration detected in the private well testing must have exceeded 1,000 ppt. Their March, 3, 2015 report presents the following conclusion:

> *Results do not support a groundwater pathway between the Plant and the groundwater detected in the residential wells along the Creek.*

The PFC's concentration variation between the five TWP's is large. The sampling intervals were small in size (4 foot intervals) and do not represent the same conditions as encountered in a small private supply well. The ground water elevation data does show the TWP sites to be side gradient to the main plume. Water elevations are below sea level indicating potential induced infiltration from the Delaware River into the aquifer although there are multiple data points that are impacted by drilling operations.

The conclusion that the main plume does not appear to be the source of the contaminants is probable given the data, but not conclusive. However, this leads to the obvious question; if not the direct discharge from the plant, then what is the source? The most obvious answer is induced infiltration from the Delaware River and the continuing source of PFNA in the river sediment pore waters. Therefore, induced infiltration studies must be included in the Work Plan in order to assess potential water supply wells at risk.

Ground Water Sampling

The Work Plan calls for the installation of new pairs of ground water monitoring wells at locations beyond the existing site monitoring wells (see Figure 3 of the Work Plan). The wells are to be screened in two depths. Typically, small lengths of screen 5 to 10 feet lengths are used. However, the Work Plan does not describe any process for selecting the depth for the well screens. The aquifer thickness can exceed 160 feet and the TWP results do show high degrees of variability within the sample results. Typically, the shallowest zones in the aquifer look to be the lowest concentration zones. Therefore, sampling results can be biased by selecting a very shallow screen zone near the very top zone of the aquifer for the well depth.

More detail on the selection of screen intervals is required in the Work Plan. Comparison of grain size to concentrations in the TWP may provide insight on optimal screen settings. Without selection criteria for the well depths, three wells (shallow, intermediate and deep) would provide a more robust data set to evaluate distribution and migration of PFC's. Given the thickness of the aquifer, three well depths, shallow, intermediate and deep, are recommended.

Figure 3 also shows temporary well points TWP 77 through 81. There does not appear to be a corresponding discussion of these well points in the Work Plan.

Soil Sampling Plan

Soil samples are to be collected at 18 locations on site to evaluate the results of the air dispersion modeling. In six of the borings, up to 7 samples of specific six inch intervals in each boring will be obtained in the "high resolution" boreholes. Twelve other borings will have up to 4 specific 6-inch intervals sampled. Additional sampling points have been added (see Solvay, May 16, 2016 response to DEP). The Work Plan specifically states no samples will be obtained from the saturated zone. We share the concern stated by the NJDEP (Solvay, May 16, 2016 reply to DEP Comment 6) that the elapsed time since the ending of air discharge will prevent meaningful soil sampling results due to the relatively high solubility of PFC's and the portioning into the water phase. To assess deposition that may have occurred at distance from the site, pore water samples from the top of the ground water table must be obtained. At this point in time, shallow water table samples may better illustrate the air to soil distribution that occurred historically. The PFC's are likely to have migrated with recharge water to the top of the water table.

In the Solvay letter to NJDEP (May 16, 2016) additional soil sampling is proposed at the well locations shown on Figure 3 of the Work Plan. The plan is for an "adaptive" sampling approach where the northernmost locations are sampled and no further sampling occurs if non-detect results are obtained. Again, our opinion is that pore water samples should be obtained from the first encountered saturated zone in all of these well borings. The first water encountered should be a more representative of historic air deposition of PFC's from the site than shallow, possibly disturbed, soil samples.

It should be noted that PFNA was detected at the Monroe Township MUA well, which is 16 miles to the south, southeast of Solvay. The potential for air deposition at this location should be addressed in the Work Plan. The Monroe wells are believed to be in the Cohansey water table aquifer, with no known link to the water and aquifer system at the Solvay facility. PFNA at Monroe Township will require evaluation of air dispersion as a potential source. Alternatively, Gloucester Township Utility Authority (GCUA) sludge could also be a source of PFNA if it was used in the area. No mention of GCUA was included within the Work Plan. Knowing the potential distribution of sludge may result in understanding the source of PFNA at this location, and possibly others, remote to Solvay.

Water and Sediment Sampling

Section 2.3.3 calls for additional surface water and sediment sampling near the facility in the Little Mantua Creek and Main Ditch. The purpose of the sampling is stated to evaluate deposition of historic air emissions. It would also seem that historical surface runoff or spills from the site may be represented by this sampling event. Surface water runoff may interfere with the proposed analysis of air deposited PFC's.

The sampling program does include pore water sampling which produced the largest detections of PFC's as stated in the Delaware River Surface Water and Sediment Data Report (March 3, 2015). However, the Work Plan is not clear on whether just one pore water sample is being collected at each location or how the samples relate to the sediment samples. Sampling of pore water appears to represent the best methodology to assess distribution of the PFC's in the Delaware River and tributaries.

The Work Plan does not discuss any water, sediment or pore water sampling at the location of the Gloucester Township Utility Authority (GCUA) at 2 Paradise Road just to the south of Solvay. The RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA725) report for Ausimont, USA Inc. (undated) indicates that inorganic and organic waste streams were pre-treated at the facility prior to discharge to GCUA. The treatment probably did not remove PFC's from the waste stream. Further consideration of the GCUA discharge point, which is the Delaware River, should be included in the Work Plan, specifically in the pore water of river sediments adjacent to the outfall.

Site-Specific Partitioning Study

A site specific partitioning study is proposed as part of the Work Plan based on USEPA guidelines. However, as noted by NJDEP (Comment 25) additional detail for using these guidelines over some other test must be explained. In addition, the QAPP (Appendix A) and FSP (Appendix B) do not mention or include any information on the collection and analysis of soil samples for the batch sorption tests, so the QAPP and FSP must be revised to include the relevant information for the batch sorption tests. The Solvay response is to revise the Work Plan.

At this time, the partitioning study does not appear fully defined. Specifically, the plan calls for using site soils and ground water to conduct the analysis. Analysis of site soils may not be extensive enough to characterize partitioning from air dispersion. Therefore, different soil types within a larger area around the facility should be required. The study also needs to evaluate partitioning in the sediments of the Delaware River as these sediments hold large amounts of PFC's that can migrate into ground water aquifers. Further refinement of the partitioning study may result in additional comments.

Outfall Mixing Evaluation

The Outfall Mixing Evaluation is critical in the evaluation of migration of PFC's into the Delaware River. However, the Work Plan is only stating that the study at this time will be to develop a work plan with NJDEP using the CORMIX, an EPA supported application. Further comment is not possible at this time as the actual work plan has not been detailed. However, the Work Plan does state that the evaluation will use monitoring data collected by Solvay in 2015 to characterize the effluent flow and concentration in the Solvay facility surface water outfall. No mention is made of the characterization of potential analysis of outfall from the GCUA site on Delaware River and if this source is being included in the analysis. Further, the estimated water column concentration will be compared with the water column data collected during the summer 2014 and reported in 2015. However, these data were largely below detection and are not comparable to the period of active facility operations. Surface water collected by DRBC, 2007 to 2009, is the only known data set available for comparisons to projected results.

At this time, some modifications to the Work Plan are being developed by Solvay (see Solvay, May 16, 2016 response to NJDEP). Further comment may be forthcoming on these revisions once reviewed.

If you have any questions on this report, please do not hesitate to contact me. We thank you for the opportunity to be of service.

Sincerely,
Ground Water Associates, LLC

Peter M. Demicco, PG
Hydrogeologist

References and Background Sources:

Bilott, R. A., 2013, Letter RE: EPA Docket ID Number OPPT-2004-0113, MOU between USEPA and E. I. DuPont de Nemours, MOU Phase III – Future Work Plan Data Assessment Report, POFA Site-Related Environmental Assessment Program: Taft, Stettinius & Hollister, LLP, Walnut Street, Suite 1800, Cincinnati, Ohio, 12 pages with Attachments.

Davis, K. L., Aucoin, M. D., Larsen, B. S., Kaiser, M. A., and Hartten, A. S., 2007, Transport of ammonium perfluorooctanoate in environmental media near a fluoropolymer manufacturing facility: ScienceDirect Chemosphere 67 (2007), p 2011 – 2019.

Emmett, E. A., Shofer, F.S., Zhang, Hong, Freeman, David, Desai, Chintan, and Shaw, L. M., 2006, Community exposure to perfluoroocoanoate; relationships between serum concentrations and exposure sources: J. Occup. Environmental Medicine, August, 48(8) 759 – 770.doi:10.1097/01.jom.0000232486.07658.74.

Hoffman, Kate, Webster, T. F., Bartell, S. M., Weisskopf, M. G., and Fletcher, Tony, 2011, Private drinking water wells as a source of exposure to perfluorooctanoic acid (PFOA) in communities surrounding a fluoropolymer production facility: Environmental Health Perspectives Volume 119, Number 1, p 92 – 97.

Hyeong-Moo, Shin, Vieira, V. A., Ryan, P. B., Steenland, Kyle, and Bartell, S. M., 2011, Retrospective exposure estimation and predicted versus observed serum perfluorooctanic acid concentration for participants in the C* Health Project: Environmental Health Perspectives Volume 119, Number 12, p 1760 – 1765.

Hyeong-Moo, Shin, Vieira, V. A., Ryan, P. B., Detwiler, Russell, Sanders, Brett, Steenland, Kyle, and Bartell, S. M., 2010, Environmental fate and transport modeling for perfluorooctanic acid emitted from the Washington Works facility in West Virginia: Environmental Science and Technology, 2011, 45, p 1435 – 1442.

Lindstrom, A. B., Strynar, M. J., Delinskky, A. D., Nakayama, S. F., McMillan, Larry, Libelo, E. L., Neill, Michael, and Thomas, Lee, 2011, Application of WWTP biosolids and resulting perfluorinated compound contamination of surface and well water in Decatur, Alabama, USA: Environmental Science and Technology, 2011, Oct 1, 45(19), pages 8015-8021.

Paustenbach, D. J., Panko, J. M., Scott, P. K., and Unice, KL. M., 2007, A methodology for estimating human exposure to perfluorooctanoic acid (PFOA); a retrospective exposure assessment of a community: Journal of Toxicology and Environmental Health, Part+ A, 70: p 28 – 57.

Post, G. B., Louis, J. B., Lippincott, R. L., and Procopio, N. A., 2013, Occurrence of perfluorinated compounds in raw water from New Jersey Public Drinking Water systems: Environmental Science and Technology, in press,

Sepulvado, J. G., Blaine, A. C., Hundal, L. S., and Higgins, C. P., 2011, Occurrence and fate of perfluorochemicals in soil following the land application of municipal biosolids: Environmental Science and Technology, 2011, 45 pages 8106 – 8112.

USEPA, 2013, The third unregulated contaminant rule (UCMR 3) data summary: USEPA, Office of Drinking Water, EPA 815-S-13-002, 11 p.

USEPA, 2013, Letter from Maria J. Doa, PhD, Director of Chemical Control Division to Mr. Robert A. Bilott, Taft, Stettinius R Hollister LLP, RE: the DuPont MOU Phase III – Future Work Plan Data Assessment: USEPA Office of Chemical Safety and Pollution Prevention, Washington DC, 2 p.

USEPA, 2013, Occurrence data: accessing unregulated contaminant monitoring data: http://water.epa/lawsregs/rulesregs/sdwa/ucmr/data.cfm.

USEPA, undated, DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION, RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA725) report for Ausimont, USA Inc.