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IN THE CIRCUIT COURT OF PUTNAM COUNTY, WEST VIRGINIA

ZINA G. BIBB, VICKI BAILEY, HERBERT W. DIXON, NORMA J. DIXON, DONALD R. RHODES, WANDA M. RHODES, BETTY TYSON, and CHARLES S. TYSON

Plaintiffs,

v.

MONSANTO COMPANY, *a Delaware corporation, with its principal place of business in the State of Missouri;* PHARMACIA CORPORATION, *a Delaware corporation, with its principal place of business in the State of Missouri;*

Defendants.

Civil Action No. 04-C-465
Derek C. Swope, Judge

ORDER APPROVING FINAL SETTLEMENT

The issue before the Court is the final approval of the proposed settlements of the above-styled action; specifically, the *Medical Monitoring Class Settlement Agreement* and the *Property Class Settlement Agreement*. These two settlements cover the Medical Monitoring Class and the previously decertified Property Class in this matter.[1]

The proponents of the proposed settlement are Zina G. Bibb, *et al.*, by Class Counsel, W. Stuart Calwell, Jr., Esq., David Carriger, Esq., John Skaggs, Esq., Alex McLaughlin, Esq., and

[1] The global settlement also covers approximately 190 personal injury cases.

Benjamin D. Adams, Esq. of the Calwell Practice, PLLC, and James F. Humphreys, Esq., of James F. Humphreys & Associates, LC; and Monsanto Company, *et al.*, by counsel, Charles M. Love, III, Esq., Leonard Knee, Esq., Fazal Shere, Esq., Michael Pleska, Esq., and Robert L. Hogan, Esq., of Bowles, Rice, McDavid, Graff & Love, PLLC, and Thomas Goutman, Esq., of White and Williams, LLP.

There are also objectors to the proposed settlement. Specifically, there are three categories of objectors; two are represented by counsel and the other category is a number of individual *pro se* objectors. First, are former named Plaintiffs Virdie Allen, Charles and Aileen Agee, and Hilman and Erma Raynes, by counsel, Thomas F. Urban, II, Esq.,[2] of Urban & Falk, PLLC. Second, are Class Members Jane Murdock, Patricia Holstein, and Nel Cox, by counsel, Ruth McQuade, Esq., of the Law Offices of Ruth McQuade. Finally, there are a number of individual *pro se* objectors: Karen Kirkendoll; G. Jacob; Linda Cowley; Clifford Cawley; Fran Kesler; James W. Morrison; Gordon Schronce; Barbara G. Yarbrough; Randolph W. Yarbrough; Michelle Cowley; Connie Burke Smith; James A. Carnes; Fred Murrock; Margaret Castle; Minnie Case; Rose C. Brant; Dennis W. Withrow; Robert L. Smith; Sharon Chaney; William L. Roberts; Francoise Nienke; Connie A. Stone; Karen Sales Childers; Jerry Jeffries; Karen E. Lamb; Michael L. Kelly; Robert A. McClanahan; Wanda L. Jeffries Steorts; Kevin McDaniel; Lisa Williams; Auvil Whited; Larry O. Frazier; Robin L. Mallett; Kelsea L. Mallett; Pat Higginbotham; Patricia Lovejoy; Richard Sanders; Robert Smith; Bernice I. Clark; Gloria Hughes; Mary L. Barnette; Ellen L. Mann; and Helena Johnson.

[2] Mr. Urban alleges that he represents more than 1600 class members in his *Memorandum Identifying the Urban & Falk Objectors* filed on June 11, 2012. (dkt. no. 3135).

The Court preliminarily approved the proposed settlements on February 24, 2012; specifically, the Court found that the terms of the proposed settlement are preliminarily "within the range of reasonableness." *Order Preliminarily Approving Class Settlements* February 24, 2012 (dkt. no. 3028). After notice of the proposed settlement was distributed to the Class, the Court held a fairness hearing on June 18, 2012. Hr'g Tr. June 18, 2012. (dkt. no. 3180).

This case having been fully briefed[3] and argued is ready for adjudication. The Court's review of the *Medical Monitoring Class Settlement Agreement* and the *Property Class Settlement Agreement* is made pursuant to Rule 23(e) of the West Virginia Rules of Civil Procedure. After a thorough review of the case, including the file – which has over 3200 lines – and all legal precedent, the Court **FINDS and ORDERS** as follows:[4]

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[3] There are a number of briefs filed both in support of and opposing the proposed settlement. For brevity's sake, the Court will not list them in this section of this *Order*.

[4] The Court notes that there are accompanying orders to this order which deal with 1) the issues of attorneys' fees, attorneys' liens, and incentive payments, and 2) whether the notice requirements have been satisfied. Consequently, the Court will not deal with these issues in this order.

I. Background

A thorough background is necessary for a full and complete understanding of this order.

A. History of Monsanto and Pharmacia

On November 29, 1901, John Francis Queeny established Monsanto Chemical Works in St. Louis, Missouri. Dan J. Forrestal *Faith, Hope & $5,000: the story of Monsanto* 15 (1977). Mr. Queeny got the name for his company from his wife, Olga Monsanto Queeny. *Id.* Monsanto's first product was saccharin, an artificial sweetener. *Id.* Over the years, Monsanto Chemical Works became what is now referred to as Old Monsanto Company.

Prior to 1997, Old Monsanto Company had an agricultural products business, a pharmaceuticals and nutrition business, and a chemical products business. http://www.monsanto.com/whoweare/Pages/monsanto-relationships-pfizer-solutia.aspx. In 1997, Monsanto sold its Chemical products business to Solutia Incorporated; this sale included ownership of the Nitro, West Virginia plant.

In 1999, Old Monsanto entered into an agreement with Pharmacia & Upjohn, Inc., to merge the agricultural products business and the pharmaceuticals and nutrition business. *Id.* The merger eventually created two separate companies, Pharmacia Corporation and Monsanto Company.[5] Pharmacia held the assets of the pharmaceuticals and nutrition business and Monsanto held the assets of the agricultural products business.

[5] Monsanto was actually spun off from Pharmacia in 2002. *Id.*

B. History of Nitro

Nitro, West Virginia, was a World War I "boom town." Upon entering World War I, it was determined that the United States could not "produce enough [gun] powder to supply troops in combat." William D. Wintz, *Nitro the World War I Boom Town; an Illustrated History of Nitro, West Virginia and the Land on which it Stands* 3-4 (1985). To solve the problem, the United States Congress passed the Deficiency Appropriations Act on October 6, 1917. *Id.*

> The Appropriations Act provided for the construction of three huge explosive plants, each capable of producing 500,000 pounds of gun powder per day.[6] The War Department immediately sent engineers into a ten-state area to find the best suited locations for the proposed plants. The number-one location picked to build the first plant was a wide section of bottomland along the great Kanawha River, 14 miles below Charleston, West Virginia.

Id.

The area was eventually named Nitro by the Ordnance Department. The named was "derived from the chemical term Nitro-Cellulose, which identified the type of gunpowder that was to be produced [at the site]." *Id.*

> Ground was broken December 23, 1917, at the site of the present Nitro city park for construction of the first of twenty-seven, 200-bed barracks. Practically overnight thousands of workers and train loads of materials and supplies began pouring into the muddy pasture field along the river.

Id.

Within less than a year, a town was built including a plant to produce smokeless gun powder. *Id.* at 56. On November 11, 1918, however, a ceasefire was reached and "[w]ithin two weeks of the end of the war, more than half of the population had left town." *Id.* at 60.

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[6] The number of plants was eventually reduced to two. *Id.*

C. Monsanto & Nitro

With no more need for large amounts of gunpowder, the United States Ordnance Department was ordered to sell its rights to Nitro. *Id.* at 60. In 1919, Nitro was sold to the Charleston Industrial Corporation[7] ("CIC"). *Id.* In 1920, the CIC sold a parcel of property to the Southern Dyestuffs Company. *Id.* at 89. "In 1927 the operation was purchased by Rubber Service Labs, and the name was changed to Elko Chemical Company. In 1929 Elko was included in the sale when [Rubber Service Labs] sold out to Monsanto." *Id.* Monsanto produced several products at this site. The one at issue in the above styled case is a byproduct from the production of 2,4,5-Trichlorophenoxyacetic acid ("2,4,5-T"); namely 2,3,7,8-Tetrachlorodibenzo-p-dioxin ("2,3,7,8-TCDD").

2,4,5-T is an herbicide that was "first synthesized in 1941." H.C. Godt, Jr., *Process Chronology for the Production of 2,4,5-Trichlorophenoxyacetic Acid at Monsanto's Nitro Plant (1948-1969)* 3 (1982). "[T]here was little interest in 2,4,5-T until 1947 when Dow found it effective against certain brambles and woody plants resistant to [another prevalent herbicide,] 2,4-Dichlorophenoxyacetic acid."[8] *Id.* 2,4,5-T was seen as a lucrative opportunity for Monsanto's agricultural business. *Id.* Consequently, in October of 1948 Monsanto began production of 2,4,5-T at the Nitro plant. (Expert Report of Bruce Bell, Opinion 6, Feb. 15, 2010) (citations omitted).

Problems arose almost immediately, however, after the start of production of 2,4,5-T. Workers who were around the 2,4,5-T production process developed a skin disease called

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[7] Around 1931, the Charleston Industrial Corporation bankrupted and was taken over by the Nitro Industrial Corporation. *Id.* at 103.

[8] 2,4,5-T & 2,4-D are similar chemicals. *Conner & Amos, Inc. v. Monsanto Chemical Comp.*, No. 2660 (S.D.W.Va. October 2, 1969) at 4. In fact, the two chemicals are within the phenoxy family of herbicides. Both chemicals were produced by Monsanto.

chloracne. David A. Butler, *Connections: The Early History of Scientific and Medical Research on "Agent Orange,"* 13 J. L. & P'cy, at 537-538 (2005). (citations omitted). "Chloracne is a rare skin eruption of blackheads, cysts and nodules . . . . Mild forms may resemble teenage acne."[9]

On March 8, 1949, a major incident[10] happened at the Nitro plant that caused, *inter alia*, hundreds of cases of chloracne.

> When the temperature and pressure in a reactor vessel (called an autoclave) that was used to make 2,4,5-trichlorophenol exceeded limits, a safety valve released and vented the vessel's contents into the air outside the building. Workers tasked with the cleanup (there was no decontamination) and repair of the unit and those who were in the vicinity in the days after the incident reported a number of symptoms, including eye and respiratory tract irritation, headache, dizziness, nausea, and severe skin irritation. Within weeks, chloracne, hyperpigmentation, liver function impairment, muscle pain, and a variety of central nervous system disturbances were observed.

Id. at 537 (citations omitted). 117 workers developed chloracne as a result of the exposure.[11] *Id.* at 538.

At the time, the exact cause of the disease was unknown. Chloracne was certainly not a new disease; in fact, it was first identified by a German scientist in 1899. *Id.* at 528-529. It was unclear, however as to exactly what substance contained in the 2,4,5-T caused the disease. All people knew was that exposure to 2,4,5-T was toxic. Expert Report of Steve Amter at 6, Feb. 15, 2010. There were many studies done, all to no avail, to determine the toxic substance. Butler, *Connections*, *supra*, at 539-540. It was not until 1957, however, that a German scientist discovered that the toxic substance in 2,4,5-T was a tetrachlorodibenzo-p-dioxin ("TCDD"). *Id.*

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[9] http://www.publichealth.va.gov/exposures/agentorange/conditions/chloracne.asp.

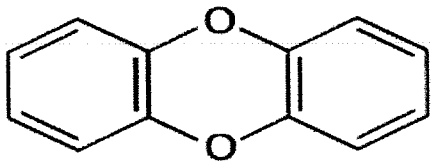
[10] In fact, the incident has been referred to as "the first mass health incident specifically attributable to the dioxin 2,3,7,8- Tetrachlorodibenzo-p-dioxin." 13 J. L. & P'cy, 13 at 537.

[11] "Interestingly, Marion Moses *et al.* indicated that while 117 workers developed chloracne as a result of the incident, an almost equal number (111) showed signs of chloracne prior to this exposure." *Id.* at 538.

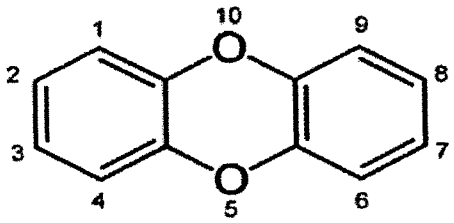
D. 2,3,7,8-TCDD

"TCDD enters the 2,4,5–T product during the manufacture of tri-chlorophenol (TCP), a necessary precursor chemical for 2,4,5–T; some of the TCDD generated in the manufacture of TCP carries forward into 2,4,5–T and thus into the phenoxy herbicides containing 2,4,5–T." *In re "Agent Orange" Prod. Liab. Litig.*, 597 F. Supp. 740, 777-778 (E.D.N.Y. 1984).

As the name suggests, at its base 2,3,7,8-Tetrachlorodibenzo-p-dixoin is a dibenzo-p-dioxin. A dibenzo-p-dioxin is defined as "any of a family of compounds which has as a nucleus a triple-ring structure consisting of two benzene rings connected through a pair of oxygen atoms."[12] 40 C.F.R. § 766.3. The chemical structure of dibenzo-p-dioxin is as follows:

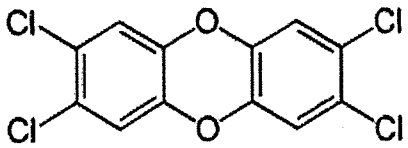


At the moment more than two chlorine atoms attach to this structure it becomes a polychlorinated dibenzo-p-dioxin ("PCDD"). Where the chlorine atoms attach as shown below, plus the number of chlorine atoms that attach will determine the precise type of PCDD.



[12] "Chlorinated dibenzo-p-dioxins (CDDs) are a family of seventy-five different compounds (called congeners)." 13 J. L. & P'cy, at 549.

For instance, 2,3,7,8-TCDD has four chlorine atoms attached to the 2, 3, 7, and 8, position on the dibenzo-p-dioxin; hence its name, 2,3,7,8-tetrachlorodibenzo-p-dioxin. The chemical structure of 2,3,7,8-TCDD is as follows:



There is little doubt as to the poisonous nature and toxicity of 2,3,7,8-TCDD. *In re "Agent Orange"* at 777-778.

> The form of dioxin implicated in Agent Orange [2,3,7,8-TCDD] is a dangerous, stable, long lasting chemical. *See, e.g.*, R.E. Tucker, A.L. Young & A.P. Gray, *Human and Environmental Risks of Chlorinated Dioxins and Related Compounds*, sections on Environmental Chemistry, and Environmental Toxicology, 143–341 (1983); M.P. Esposito, T.O. Tiernan & F.E. Dryden, U.S. Environmental Protection Agency, *Dioxins* 230–256 (1980); A. Hay, *The Chemical Scythe* 32 (1982).
>
> Dioxin is one of the most powerful poisons known, as is indicated by the following table.

Substance	Molecular weight	Minimum lethal dose (moles/kg)
Botulinum toxin A	9.0×10^{5}	3.3×10^{-17}
Tetanus toxin	1.0×10^{5}	1.0×10^{-15}
Diphtheria toxin	7.2×10^{4}	4.2×10^{-12}
2,3,7,8-TCDD	**322**	**3.1×10^{-9}**
Saxitoxin	372	2.4×10^{-8}
Tetrodotoxin	319	2.5×10^{-8}
Bufotoxin	757	5.2×10^{-7}
Curare	696	7.2×10^{-7}
Strychnine	344	1.5×10^{-6}
Muscarin	210	5.2×10^{-6}
Diisopropylfluorophosphate	184	1.6×10^{-5}

Sodium cyanide	49	2.0×10^{-4}

Id.

In relation to dioxins and dioxin-like compounds, 2,3,7,8-TCDD is the "measuring stick" for toxicity. Dioxins and dioxin-like compounds - such as polychlorinated biphenyls ("PCBs"), polychlorinated dibenzodioxins ("PCDDs"), and polychlorinated dibenzofurans ("PCDFs") – use the Toxic Equivalence Factor ("TEF") to measure their toxicity. M. Van den Berg, L.S. Birnbaum, M. Denison, M. De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker & R.E. Peterson, *The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds*, Toxicol. Sci. 93 (2006) 223–241. A TEF of 1 indicates that the dioxin or dioxin like compound is very toxic. The TEF for 2,3,7,8-TCDD is 1. In fact, 2,3,7,8-TCDD is the benchmark for all other dioxins and dioxin-like compounds. *Id.*

E. Waste Disposal Practices at Monsanto's Nitro Plant

Monsanto disposed of waste from the 2,4,5-T production process in two ways; either by discharging it into the sewer system or by burning it onsite or at various landfills. At issue in this case is the waste that was burned. The material that was sent to the various landfills consisted of, *inter alia*, contaminated 2,4,5-T and materials used to produce 2,4,5-T. [13]

As to the contaminated 2,4,5-T, at the end of each shift the production area was cleaned of 2,4,5-T that had fallen out of the production process. *Conner & Amos, Inc. v. Monsanto*

[13] Ray Forrester disputes that any of this was actually burned. (Expert Report of Ray K. Forrester August 16, 2010.) However, it is clear based on findings from another case that 2,4,5-T along with other solid waste from the 2,4,5-T production process was burned. *Conner & Amos, Inc. v. Monsanto Chemical Comp.*, No. 2660 (S.D.W.Va. October 2, 1969) at 9.

Chemical Comp., No. 2660 at 9, *Findings of Fact and Conclusions of Law* (S.D.W.Va. October 2, 1969). Usually, the workers would collect four to eight pounds of 2,4,5-T that had fallen out of the production line. *Id.*

> [I]f [the 2,4,5-T] was not too contaminated, it was screened and reintroduced into the processing system and reworked. If it was heavily contaminated, it was put into a drum and placed outside the building and was picked up on a daily basis and burned in an open fire of paper, cardboard and other trash discard. The quantity of 245-T which was disposed of by this burning process, of course, varied from day to day but could have ranged anywhere from four to eight or ten pounds per day.

Id. at 9.[14]

As indicated earlier, contaminated 2,4,5-T was not the only substance burned; the solid waste from the 2,4,5-T production process was also burned. This solid waste included "[f]ilter cloths[,] NaTCP filter press solids[, c]logs in production equipment[, c]logs in production piping[, c]logs in sewers[, o]ff specification product[, w]aste from cleaning of the 2,4,5-T drier and bagger[, t]orn tray dryer cloths[, d]ust collector bags[, c]ontaminated equipment including contaminated pipes from the autoclave and gaskets and pipe insulation from the 2,4,5-T department." (Expert Opinion of Bruce Bell Opinion 12, Feb. 15, 2010.)

As stated previously, the barrels containing the 2,4,5-T and various other solid waste were collected on a daily basis. Once collected, Monsanto employees took the barrels to various waste disposal sites in and around the Nitro area to be burned. The sites where the burning occurred are the old Nitro landfill, Heizer Creek landfill, Manila Creek landfill, Poca Strip Mine landfill, South Charleston Dump, Beech Hill Dump, Armour Creek Landfill as well as various

[14] Bruce Bell, Ph.D., states that of the 3,000 pounds of dioxin produced by Monsanto, only 616 pounds of dioxin was "shipped in the 2,4,5-T product." (Expert Opinion of Bruce Bell, Opinion 7, Feb. 7, 2010.) In other words, approximately 21% of the dioxin produced was "shipped in the 2,4,5-T product." *Id.* Ray Forrester, states that "25 percent of the TCDD generated in the 2,4,5-T process went out in the product." (Expert Opinion of Ray K. Forrester Opinion 1 at 13, Aug. 16, 2010.)

on-site burning locations. (Expert Opinion of William Auberle at Figure 2.1, Feb. 15, 2010.) As will be discussed below, it is disputed as to whether the waste (1) actually contained any 2,3,7,8-TCDD and (2) whether it was burned at all.

Monsanto's Nitro plant produced about 35,562,974 lbs. of 2,4,5-T in twenty years of operation. (Expert Report of Raymond K. Forrester Report Ex. B, Aug. 16, 2010.) As a byproduct of the production process, Monsanto's Nitro plant produced between 2,186.03 lbs. (Revised Expert Report of Raymond K. Forrester Opinion 7, Oct. 2010) to 3003 lbs. (Expert Opinion of Bruce Bell Opinion 6, Feb. 15, 2010) of 2,3,7,8-TCDD.[15]

F. 2,4,5-T, The Vietnam War, & Monsanto's Nitro Plant

On November 30, 1961[16] President John F. Kennedy "approved a joint recommendation of the Departments of State and Defense to initiate, on a limited scale, defoliant operations in Vietnam." *In re "Agent Orange"* at 775. The defoliant operation became known as Operation Ranch Hand. Spray missions began in January 1962. *Id.* (citing W. Buckingham, *Operation Ranch Hand, The Air Force and Herbicides in Southeast Asia 1961–1971* at 29–31 (1982)("*Operation Ranch Hand*")).

> Initially the aerial spraying took place near Saigon; its purpose was to clear the thick jungle canopy from around roads, power lines and other lines of communications in order to lessen the potential of ambush. There was also some hand spraying from the ground around gun emplacements and the like to reduce surprise attacks and maintain open lines of fire. By late 1962 approval was granted for offensive use of herbicides to destroy planted fields and crops suspected of being used by the Viet Cong. The use of herbicides for crop destruction peaked in 1965 when 45% of the total spraying was designed to destroy crops.

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[15] The Court wants to emphasize the fact that generally both Plaintiffs and Defendants' experts agree on this number. This is discussed *infra*, at IV.E.2, IV.F.2.

[16] W. Buckingham, *Operation Ranch Hand, The Air Force and Herbicides in Southeast Asia* 1961–1971 (1982).

Id.

The spray missions used several different herbicides, most of which contained 2,4,5-T.

> Several formulations of herbicide were used in Vietnam . . . . To avoid cross-contamination and clogging of the fine aerial spray mechanisms, the herbicides were carefully coded. A colored band was painted on each drum for identification purposes. Six colors were used: white,[17] blue,[18] purple,[19] green,[20] pink,[21] and orange.[22]

Alastair Hay, *The Chemical Scythe: Lessons of 2,4,5-T and Dioxin* 151 (Plenum Press) 1982, http://books.google.com/books?id=V524J4zh06MC&pg=PA151#v=onepage&q&f=false. (foot notes omitted). Of the six Agents, four contained 2,4,5-T: Purple, Green, Pink, and Orange. *In re "Agent Orange"* at 755. Of these four, Monsanto produced the ingredients to Agent Orange, Purple, and Pink. Young, Alvin L, *The History, Use, Disposition and Environmental Fate of Agent Orange* 44 (Springer 2009). It has been estimated that at least 11.5 to 11.75 million gallons of Agent Orange were used during the Vietnam War. Alastair Hay, *The Chemical Scythe: Lessons of 2,4,5-T and Dioxin* at 151, *In re "Agent Orange"* at 778. As 11.5 to 11.75 million gallons of Agent Orange were used, then 5.75 to 5.875 million gallons of 2,4,5-T would have been needed just for Agent Orange alone. Given this need for 2,4,5-T, "Monsanto's 2,4,5-T operation at the Nitro [p]lant was devoted substantially, and, at times, *exclusively* to fulfilling its contracts with the United States government[]" during the 1960's. *Defendants' Motion for*

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[17] Agent White was a "mixture of 80% tri-isopropanol amine salt of 2,4-dichlorophenoxyacetic acid (2,4–D) and picloram[.]" In re "Agent Orange" AT 775.
[18] Agent Blue was a "cacodylic acid[.]" *Id.*
[19] Agent Purple was a "formulation of 50% n-butyl ester of 2,4–D, 30% n-butyl ester of 2,4,5-trichlorophenoxyacetic acid (2,4,5–T) and 20% isobutyl ester of 2,4–D[.]" *Id.*
[20] Agent Green was "100% n-butyl ester of 2,4,5–T[.]" *Id.*
[21] Agent Pink was a mixture of "60% n-butyl ester of 2,4,5–T and 40% isobutyl ester of 2,4,5–T[.]" *Id.*
[22] Agent Orange was "a 50–50 mixture of the n-butyl esters of 2,4–D and 2,4,5–T[.] *Id.*

Partial Summary Judgment Based on the Government Contractor Defense. (dkt. no. 1881). (citations omitted)(emphasis in original).

By the end of the 1960's, however, herbicides containing 2,4,5-T were being withdrawn.

> On April 15, 1970, the Secretaries of Health, Education and Welfare, Agriculture and the Interior issued a joint statement suspending domestic use of herbicides containing 2,4,5–T except for limited non-crop uses. W. Buckingham, *Operation Ranch Hand, supra*, at 166; see also *Dow Chemical Co. v. Ruckelshaus*, 477 F.2d 1317, 1318–19 (8th Cir.1973); *Citizens Against Toxic Sprays, Inc. v. Bergland*, 428 F.Supp. 908, 914 (D.Or.1977); *United States v. Vertac Chemical Corp.*, 489 F.Supp. 870, 881 (E.D.Ark.1980). That same day, the Department of Defense suspended military use of 2,4,5–T, including Agent Orange, "pending a more thorough evaluation of the situation." W. Buckingham, *Operation Ranch Hand, supra*, at 166. Thereafter, herbicide spraying for defoliation continued for a short while, using Agent White. Crop destruction, utilizing Agents White and Blue, continued throughout 1970. In January 1971, the last Ranch Hand mission took place.

Id. at 776-777.

G. History of Litigation Concerning Monsanto's Nitro Plant

This Court is aware of three prior cases involving Monsanto's 2,4,5-T production at the Nitro plant, and the resultant production of 2,3,7,8-TCDD.

1. Conner & Amos, Inc. v. Monsanto Chemical Comp. (1960's)

Conner & Amos, Inc. was a commercial nursery located upon the current site of the John Amos Power Plant. Between January and June of 1960, the flora in the Nitro area "showed symptoms of injury or damage of some nature." *Conner & Amos,* Final Order at 3. The damage was so severe and persistent that Conner & Amos shut down in the fall of 1960. *Id.* at 4.

Conner & Amos sued Monsanto Chemical Company for damages to its nursery. In the lawsuit before the United States District Court for the Southern District of West Virginia, Conner & Amos averred that Monsanto's 2,4,5-T produced at the Nitro plant was the cause of the damages. *Id.* They specifically averred that the "nursery was irreparably injured by (1) a single massive emission of [2,4,5-T]; (2) the continuous discharge of [2,4,5-T] into the atmosphere from the two vent pipes of the facility; or (3) *the discharge of [2,4,5-T] into the air as the result of the trash disposal procedure*." *Id.* at 10. (emphasis added).

After a bench trial, the District Court found in favor of Monsanto Chemical Company. The District Court found that there was no evidence of a massive emission primarily because "[h]ad such an emission occurred in a degree sufficient to cause the alleged damages to the plaintiff's nursery three miles downriver from the plant, it would necessarily have devastated the foliage of the native vegetation throughout the entire countryside." *Id.* The District Court found the plaintiffs' second argument to be without merit. The District Court stated that the 2,4,5-T production process had been the same since 1949 and that no problems had occurred until 1960. *Id.* at 12. Therefore, it was highly unlikely that this was the cause.

The District Court also found the plaintiffs' third argument to be without merit. While the District Court did find that 2,4,5-T and waste contaminated with 2,4,5-T were burned, it found that the 2,4,5-T was completely destroyed in the disposal fire. *Id.* at 11. The District Court found the "temperature of the disposal fire was in the range of 1000 degrees centigrade. [2,4,5-T] acid will completely decompose and burn at 330 degrees centigrade producing carbon dioxide, water and some chlorine compounds." *Id.* The District Court found for the defendant because the plaintiff could not meet its burden.

2. James R. Boggess v. Monsanto Company. (1980's)

In the mid-1980's, seven former employees sued Old Monsanto.

> The seven men had contended that their lingering medical problems, including skin cancer, bladder cancer and a variety of nervous disorders, stemmed from exposure to dioxin and five other chemicals at the company's plant at Nitro, where they had worked an average of 35 years. They had sued the company for $4 million each in compensatory and punitive damages.

"*Monsanto Wins Dioxin Lawsuit Filed By Seven*," The New York Times May 1, 1985, http://www.nytimes.com/1985/05/01/us/monsanto-wins-dioxin-lawsuit-filed-by-seven.html. The seven cases are as follows: *James R. Boggess v. Monsanto Comp.*, Civ. Act. 81-2098-265; *Harold Grant v. Monsanto Comp.*, Civ. Act. 81-2098-277; *Gene Wilson Thomas v. Monsanto Comp.*, Civ. Act. 81-2504-93; *Lonnie Hurley v. Monsanto Comp.*, Civ. Act. 82-2566; *John H. Hein v. Monsanto Comp.* Civ. Act. 82-2569; *June B. Martin v. Monsanto Comp.* Civ. Act. 83-2119; and *Charles E. Farley, Jr. v. Monsanto Comp.* Civ. Act. 83-2207.

The trial took approximately one year. With one exception, the jury found in favor of Monsanto.

> The jury awarded $200,000 to one of the plaintiffs, John Hein, who was diagnosed as having bladder cancer in the course of the 10-month trial in Federal District Court. The jury concluded after five days of deliberations that Mr. Hein's illness was linked to his exposure to para-aminobiphenol, or PAB, a rubber additive produced from 1951 to 1953 at the Nitro plant. Medical experts testified that dioxin had been linked to cancer and other ailments and that PAB had been linked to bladder cancer.
>
> . . .
>
> Although it found in favor of Monsanto in six out of seven cases, the jury issued a statement with the verdict, which Judge Copenhaver read:

> "A preponderance [*sic*] of the evidence showed dioxin causes or contributed to some of the health effects the plaintiffs now exhibit. Although Monsanto did not show a willful, wanton and reckless attitude toward its workers' health and safety, it did, in fact, not pursue a diligent course of action in trying to determine the full impact of dioxin on the health of its workers.
>
> []Based on the testimony of many expert witnesses, it's clear that dioxin, although not directly life threatening, has nevertheless a definite effect on humans, usually involving the skin, nervous systems and general fatigue.
>
> []Monsanto bears the major burden of maintaining the health and safety of its workers. The workers must exercise reasonable judgment in insuring good health and safety by asking questions when a health problem becomes commonly recognized."

Id.[23]

3. Carter v. Monsanto Company, et. al. (2000's)

On August 2, 2000, Robert C. Carter ("Carter"), represented by Class Counsel, filed a class action lawsuit against Monsanto Company, Solutia, Inc., the City of Nitro, Amherst Coal Company, Arch of West Virginia, Inc., Arch of Illinois, Inc., and Apogee Coal Company[24] in Putnam County.[25] As explained by the West Virginia Supreme Court of Appeals,

> Carter alleges that in 1929, the Monsanto Company (Monsanto) operated a chemical manufacturing plant in Nitro, West Virginia, and that Solutia, Inc. (Solutia) is the successor to certain liabilities of Monsanto. He asserts that beginning in 1948, Monsanto produced [an] herbicide, [2,4,5-T], which resulted in the formation of a contaminant, [2,3,7,8-TCDD], otherwise known as dioxin. Carter believes dioxin in this formulation is highly toxic. He further contends that Monsanto disposed of large quantities of

[23] The Court made extensive efforts to obtain the court file from the Federal Court in this matter. However, the file was irretrievable due to the document retention policy. Therefore, this Court relied upon the Final Order, jury instructions and verdict form, and newspaper articles to discuss the case and its outcome.

[24] All of these Defendants, with the exception of the City of Nitro, were also represented by the same defense counsel as the case at bar.

[25] By the end of the case, only Monsanto Company and Apogee Coal Company were defendants.

> waste material contaminated with dioxin at various locations including the Manila Creek landfill and the Heizer Creek landfill.
>
> Carter alleges that the City of Nitro, at all relevant times, owned and controlled the Heizer Creek landfill. He contends that Nitro allowed Monsanto to dump toxic chemicals into the Heizer Creek landfill. Carter also alleges that Amherst Coal Company, at all relevant times, owned and controlled the Manila Creek landfill. He contends that Amherst allowed Monsanto to dump toxic chemicals into the Manila Creek landfill. He asserts that Arch of West Virginia, Inc. is a successor to the liabilities of Amherst. He believes that Arch of Illinois, Inc. is a successor to the liabilities of Arch of West Virginia, and that Apogee Coal Company is a successor to the liabilities of Arch of Illinois.
>
> Carter alleges that during the 1980s, the United States Environmental Protection Agency required Monsanto to remove contaminants from both landfills. Despite these efforts, both landfills remain contaminated today and are sources of offsite contamination. Carter maintains that the surface water and sediment of Manila Creek, Heizer Creek, the Pocatalico River, and the Kanawha River are contaminated with dioxin. He states that Manila Creek, Heizer Creek, the Pocatalico River, and an unnamed tributary which flows from the Heizer Creek dump site periodically overflow their banks, thus flooding real property downstream and depositing contaminated sediment on adjoining property.
>
> Based upon these allegations, Carter asserted four counts in his complaint: (1) property inspection/monitoring; (2) risk assessment and health monitoring; (3) interference with use and enjoyment of riparian property rights; and (4) diminution in value of riparian property rights.

Carter v. Monsanto, 212 W.Va. 732, 734-735, 575 S.E.2d 342, 344-345 (2002).

There is no doubt that the predecessor to the case at bar is the *Carter* case.[26] Both cases generally share the same factual predicate; specifically, the contaminated 2,4,5-T waste produced

[26] In fact, at one point, Carter filed a *Motion* to consolidate the *Carter* and *Bibb* cases. However, the Court denied this *Motion* because there were "substantial differences" between the two cases. *Carter, et al. v. Monsanto, et al., Order Denying Plaintiff's Motion to Consolidate "Carter" and "Allen" Actions and to Reconsider Order Setting a Separate Class Certification Hearing Date in "Carter" Action*, May 22, 2006 (Putnam County Civ. Act. No. 00-C-300) (dkt. no. 245).

at Monsanto's Nitro plant and the disposal of this waste at the Manila Creek and Heizer Creek landfills. *Carter* at 734-735, 344-345. Beyond this factual predicate, however, the cases are very different. In the *Carter* case, the contamination allegedly occurred through water deposition, whereas in the *Bibb* case, the alleged contamination originated from burning.

The *Carter* case was novel in that it brought an action for property monitoring. Recognizing that there was no body of law on this issue, presiding Judge O.C. "Hobby" Spaulding certified a question to the West Virginia Supreme Court of Appeals on November 19, 2001. Over a year later, on December 5, 2002, the West Virginia Supreme Court of Appeals found that "[t]here is no common law cause of action in West Virginia for property monitoring." *Id.* at 346, 575 S.E.2d at 736.

After nine years, the Plaintiff voluntarily moved to dismiss the *Carter* case. On December 29, 2009, after notice was effectuated on all potential class members, Judge Spaulding ordered the dismissal of the case. *Carter, et. al. v. Monsanto, et. al.*, Civ. Act. No. 00-C-300 (dkt. no. 486).

II. History of *Bibb et. al. v. Monsanto et. al.* Case

The history of the *Bibb* case is extensive. The case has been ongoing for over seven years. There have been over 53 hearings, most of which lasted several hours, and over 3000 lines of entries into the file. The Court will not go through every entry in the file, but there are several entries that are applicable to the Court's decision.

What follows is the history of this case. The Court has tried to keep the issues in chronological order for easy comprehension. Some issues, however, cannot be so easily categorized. One who examines this section should keep that in mind as they read.

A. The Class Action Complaint

The *Class Action Complaint* was filed on December 17, 2004. (dkt. no. 1). Initially, the named Plaintiffs were Virdie Allen,[27] Zina G. Bibb, Evelyn Smith Cash,[28] Hillman and Erma Raynes,[29] Donald R. and Wanda M. Rhodes, Charles and Eileen Agee,[30] Herbert W. and Norma J. Dixon, Charles S. and Betty Tyson, and Herschell E. and Jeannette Winter. Due to health issues, Jeannette Winter was unable to continue as a named Plaintiff; she was replaced by her daughter, Vickie L. Bailey. (dkt. no. 271).

Initially, the Defendants were Monsanto Company, Pharmacia Corporation, Akzo Nobel Chemicals, Inc.,[31] formerly known as Akzo Chemicals, Inc., Akzo Nobel Services, Inc.,[32] Flexsys America Co.,[33] Flexsys America, L.P.,[34] Flexsys International, L.P.,[35] and Flexsys International Co.[36] By *Order* entered July 10, 2006, the Court granted the Plainitffs' motion to amend the complaint to add Akzo Nobel N.V., Akzo Nobel Chemicals International BV, and

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[27] For reasons explained below, Virdie Allen was not named as a Class Representative in the *Class Certification Order*. (dkt. no. 695).

[28] Evelyn Smith Cash was voluntarily dismissed from the case by an order dated November 27, 2006. (dkt. no. 326). It is unclear from the order why she was dismissed.

[29] For reasons explained below, Hillman and Erma Raynes were not named as Class Representatives in the *Class Certification Order*. (dkt. no. 695).

[30] For reasons explained below, Charles and Eileen Agee were not named as Class Representatives in the *Class Certification Order*. (dkt. no. 695).

[31] Akzo Nobel Chemicals, Inc., was dismissed by an order dated May 27, 2011. *Order Granting Akzo Nobel Chemicals Inc.'s Motion for Summary Judgment* May 27, 2011 (dkt. no. 1921).

[32] Akzo Nobel Services, Inc., was dismissed by an order dated July 10, 2006. (dkt. no. 183). This Defendant was dismissed because it had no connection to the Nitro Plant.

[33] Flexsys America Co. was dismissed for several reasons by order dated May 27, 2011. *Order Granting Flexsys Defendants' Motion for Summary Judgment* May 27, 2011. (dkt. no. 1923).

[34] Flexsys America, L.P., was dismissed for several reasons by order dated May 27, 2011. *Order Granting Flexsys Defendants' Motion for Summary Judgment* May 27, 2011. (dkt. no. 1923).

[35] Flexsys International, L.P., was dismissed by an order dated July 15, 2005. (dkt. no. 38). The Plaintiffs voluntarily dismissed this Defendant because they were no longer an existing business entity.

[36] Flexsys International Co., was dismissed by an order dated July 15, 2005. (dkt. no. 38). The Plaintiffs voluntarily dismissed this Defendant because they were no longer an existing business entity.

Akzo Nobel, Inc. (dkt. no. 183). However, the Plaintiffs never served the amended complaint. Therefore, these entities where never added to the case.

In the *Complaint*, the Plaintiffs sued the Defendants for negligence, nuisance, strict liability, and trespass.[37] The basis for the complaint was contamination of the Plaintiffs' property from the still-contaminated surface, dioxin contaminated dust was released into the atmosphere, and the Defendant's operation of the 2,4,5-T process, which resulted in the by-product of 2,3,7,8-TCDD.

In their *Class Action Complaint*, the Plaintiffs stated that "[t]he Class Affected Area is the area within a range of a five mile radius from the location of the Old Monsanto chemical plant, Putnam County, West Virginia." (Compl. ¶ 138.) (dkt no. 1). They stated that their "claims arise from Old Monsantos' Agricultural Divisions' production of the aforesaid dioxins/furans contaminated agricultural herbicide 2, 4, 5 T at the aforesaid Nitro chemical plant during the period 1949 through approximately 1971." *Id.* ¶8. Additionally, they also claimed that the "[p]laintiff's claims herein relating to environmental contamination, property damage and medical monitoring are strictly limited to Old Monsanto's Agricultural Division's dioxins/furans contaminated product 2, 4, 5 T and any of its dioxins/furans contaminated chemical precursors." *Id.* ¶13. The Plaintiffs alleged that from "May 21, 2004, through May 25, 2004, contractors retained by the plaintiffs collected indoor dust samples at various residential properties throughout the town of Nitro in order to analyze them for Dioxin/Furan contamination." *Id.* ¶110.

[37] At one point there was a challenge as to the appropriate causes of action in this case; this issue, however, was dealt by the Court. *See Order Confirming December 9, 2011 Hearing*, Dec. 20, 2011, 5-6. (dkt. no. 2857).

The Complaint alleges that Class Members possess significantly elevated serum dioxin levels that evidence their exposures to dioxins. [Complaint ¶ 109 ("Based on serum lipid testing of certain putative class members . . . the defendants' dioxins/furans are and have been building up in the bodies of the class members as well.").] The Complaint further asserts that Medical Monitoring Class Members' claims can be proven through reference to "the most recent biomonitoring data reported by the Centers for Disease Control. . . ." [*Id.* ¶ 122.] Moreover, the Complaint further alleges that this data "provides a uniform standard against which to measure the risk elevated blood dioxin levels in the putative class present." [*Id.*] Furthermore, the Plaintiffs averred that dioxin "is so hazardous to human health that no 'safe' level of exposure has been established." *Id.* ¶ 187.

The Complaint alleged an evolving amount of people and property that were part of the respective classes. In Paragraph 20 of the Complaint, several thousand people and pieces of property were alleged as part of the Class. In Paragraph 103, communities were listed which were allegedly part of the Class. They had an alleged population greater than 25,000 people, with greater than 8,000 pieces of commercial and residential property. In Paragraph 117, 25,000 current and former residents were considered part of the Class.

The requested relief in the *Complaint* was the costs for future medical monitoring for diseases that result from 2,3,7,8-TCDD exposure as well as property remediation. Stuart Calwell, Esq., of the Calwell Practice PLLC and James F. Humphreys, Esq., of James F. Humphreys and Associates, LC were the signatory attorneys on this *Complaint*.

B. The First Removal and Remand

On July 19, 2005, Monsanto Company and Pharmacia Corporation removed this action pursuant to 28 U.S.C. § 1446(b). The basis for the removal was federal question; specifically, "that the Nitro plant has operated and continues to operate pursuant to Environmental Protection Agency (EPA) Orders and directives taken under the authority of the federal law of CERCLA." *Allen et al. v. Monsanto Co. et al.*, 396 F.Supp.2d 728, 730 (S.D.W.Va. Nov. 2, 2005); *see also* (dkt. no. 72). On November 2, 2005, the United States District Court, Southern District of West Virginia remanded the case. *Id.* The District Court specifically found that Monsanto Company and Pharmacia Corporation's "notice of removal [was] defective procedurally in its timeliness . . . ." *Id.* The District Court did not discuss the question of subject matter jurisdiction. *Id.*

C. Bankruptcy

When Old Monsanto was splitting, it created a subsidiary known as Solutia. Class Counsel avers that Old Monsanto gave its holdings in the Nitro plant to Solutia in an effort to insulate Monsanto from any and all environmental liabilities. *Petition for Award of Attorneys' Fees and Litigation Expenses* Mar 27, 2012, 18. (dkt. no. 3068). At some time around 2003-2004, Solutia filed for bankruptcy. Solutia specifically sought "discharge in bankruptcy of all liabilities related to claims by 'residents of the Nitro area . . . caused by exposure to . . . 'Nitro Plant Materials',' which included 'inorganic chemicals such as polycyclic aromatic hydrocarbons, phthalate esters, and dioxins/furans.'" *Id.* (citations omitted). After extensive litigation, Class Counsel secured "an agreement by which Nitro area residents' claims . . . would 'pass through' the bankruptcy proceedings unscathed[.]" *Id.* at 19.

D. The Beginning of Class Certification

On May 31, 2006, the Court entered a *Scheduling Order for Class Certification.*[38] (dkt. no. 151). The *Scheduling Order for Class Certification* set forth discovery deadlines and a December 14, 2006, certification hearing date. This *Order*, however, was changed several times;[39] it is unclear from the record, as to the reasons for all of the changes.[40] Ultimately, the issue of scheduling was dealt with at a July 9, 2007, hearing and an October 29, 2007, certification hearing date was set.

E. Appointment of Lead Counsel

The July 9, 2007, hearing was important for other reasons besides scheduling; specifically, the Court dealt with a dispute between Plaintiffs' attorneys. At the inception of this case the Calwell Practice and James F. Humphreys and Associates worked together. At that time Thomas Urban, II, Esq., worked with Mr. Humphreys. However, Mr. Urban and Mr. Humphreys disassociated, and Mr. Urban's law firm, Urban and Falk, became involved in the case. Urban & Falk became counsel of record for Virdie Allen, Hillman Raynes, Erma Raynes, Charles Agee, and Eileen Agee.[41] *Substitution of Counsel* June 14, 2007. (dkt. no. 490).

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[38] Subsequent to this Order, on June 5, 2006, the Plaintiffs, by counsel, Stuart Calwell and David H. Carriger of the Calwell Practice, and James F. Humphreys and Thomas F. Urban, II, of Humphreys & Associates, filed their Motion for Class Certification. (dkt. no. 139). The Court will discuss this Motion specifically in section IV.D, *infra*.

[39] The first change was August 31, 2006, when the Court entered *Scheduling Order Regarding Revised Timeline for Discovery and Class Certifications Pleadings and Hearing.* (dkt. no. 273). On November 27, 2006, the Court entered *Order Suspending August 31, 2006 Scheduling Order and Setting a Scheduling Conference*; the scheduling conference was set for January 5, 2007. (dkt. no. 324). On January 9, 2007, the Court entered *Scheduling Order for Class Certification*; this *Scheduling Order* set a May 17, 2007, certification hearing date. (dkt. no. 355). On April 4, 2007, the Court entered *Order Suspending Scheduling* that suspended the January 9, *Order*. (dkt. no. 487). In the April 4, *Order*, a scheduling conference was set for July 9, 2007.

[40] It appears from the record that both parties agreed to every delay.

[41] Mr. Humphreys filed a *Notice of Attorney's Lien* against all five individuals. (dkt. no. 602).

This split lead to the withdrawal of *pro hac vice* sponsorship, accusations, at least one lawsuit, and major conflict between several of Plaintiffs' attorneys.[42] There was so much conflict, in fact, that the Defendants' filed a *Motion for Designation of Plaintiffs' Lead Counsel with Points of Authority* on June 28, 2007. (dkt. no. 498). Consequently, the Court took up this issue during the July 9, 2007, hearing.

The Court appointed the Calwell Practice as lead counsel because, *inter alia*, Mr. Humphreys' and Mr. Urban's firms were involved in litigation. *Memorandum Opinion and Order Granting Defendants' Motion for Designation of Plaintiffs' Lead Counsel*, July 24, 2007. (dkt. no. 534). This, however, would not be the end of this issue, as there have been several incidents between Plaintiffs' attorneys. *See generally, Order Denying Motion for Issuance of a Rule to Show Cause Why Stuart Calwell and Charles Love Should not be Held in Contempt for Violating the Court's March 27, 2012 Order*, July 10, 2012 (dkt. no. 3214). In fact, two months after the Court appointed the Calwell Practice as lead counsel, the Court had to further clarify the role of lead counsel. *Order Clarifying the Role of Lead Counsel*. Sept. 13, 2007 (dkt. no. 611).

F. Motion for Class Certification

The initial *Motion for Class Certification* was filed on June 5, 2006. (dkt. no. 139). In that *Motion*, the Plaintiffs defined the Class as follows:

> (a) The class is made up of all persons who have had their person and/or property contaminated with . . . dioxins/furans in an area *within a range of a five-mile radius from the location of the Old Monsanto chemical plant in Nitro, West Virginia* . . . .
>
> (b) The putative class of all such persons is divided into two natural subclasses: (1) The Property Owners Class, which is made

[42] *See Class Counsel's Response to Second Supplemental Memorandum of the Urban & Falk Plaintiffs in Opposition/Objection to Proponents' Proposed Settlement of the Property and Medical Monitoring Classes's [Sic] Claims.* (dkt. no. 3267).

> up of current real property owners, including leasehold interests, whose property is contaminated with . . . dioxins/furans; and, (2) The Medical Monitoring Class, which is divided into three sub-classes: (a) all persons presently residing or who in the past resided in the area of contamination . . . for at least one year during the period March 1949 to the present; and (b) all persons who currently are or who in the past have been employed by employers in the Class Affected Area for five years or more during the period March 1949 to the present; and (c) all persons who currently are or who have in the past attended public schools in the Class Affected Area during the period March 1949 to the present.

Id. at 1-2. (dkt. no. 139)(emphasis added).

On August 27, 2007, the Plaintiffs refined this definition in two major ways. First, the Class boundary was specifically defined; the boundary was no longer a blanket five mile circle around the plant. *Plaintiffs' Amended Motion for Class Certification* Aug. 27, 2007. (dkt. no. 587). Second, the Medical Monitoring Class was more broadly defined as follows: "[t]he Medical Monitoring Class is more specifically defined as persons who have either resided, have been employed full-time, or have attended school full-time in the Class Affected Area, during the period 1949 to the present." *Id.* at 2. This definition, as opposed to the previous definition, does not have as many constraints.

On October 29, 2007, the Court took up the issue of class certification. The Court heard three days of arguments, and on January 8, 2008, certified a Medical Monitoring and Property Class. *Class Certification Order*, Jan. 8, 2008. (dkt. no. 695). The Medical Monitoring and Property Class were certified under Rule 23(b)(1)(A), (b)(2), and (b)(3) of the West Virginia Rules of Civil Procedure. *Id.* at 4. The Court named Vicki Bailey, Herbert W. and Norma J. Dixon, Donald R. and Wanda M. Rhodes, and Charles S. and Betty Tyson as representatives for the Property Class. *Id.* at 23-24. All of these people and Zina G. Bibb were named as

representatives for the Medical Monitoring Class. *Id.* The Court did not name Virdie Allen, Hillman and Erma Raynes, and Charles and Eileen Agee as Class Representatives. *Id.*

The Court defined the Class Affected Area[43] as that shown in Exhibit 1 to the *Order.*[44] Exhibit 1 was based upon the Plaintiffs' expert William M. Auberle's ("Mr. Auberle") air modeling. This model assumed that the Nitro plant produced over 6,000 pounds of 2,3,7,8-TCDD.[45] *Id.* at 7-8. The Court found that "[t]he pivotal issues in this litigation relate to whether and to what extent dioxins that were originally created at the Old Monsanto plant were subsequently dispersed by the Defendants into the proposed Class Affected Area." *Id.* at 18. [46]

G. Appeals and Challenges to the Class Certification Order

Shortly after the *Class Certification Order* was entered, the Defendants sought an appeal.[47] Specifically, on March 26, 2008, the Defendants filed a *Writ of Prohibition* to the West Virginia Supreme Court of Appeals. Basically, the Defendants were challenging this Court's *Class Certification Order* and sought to prohibit the case from moving forward as a class action. The West Virginia Supreme Court of Appeals refused to hear the appeal and dismissed the *Writ* on May 22, 2008.

Besides the Defendants' *Writ*, Urban and Falk also challenged the Court's *Class Certification Order*; specifically, as to Virdie Allen, Hillman and Erma Raynes, and Charles and Eileen Agee not being named as Class Representatives. On January 23, 2008, Urban and Falk

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[43] The Class Affected Area is the larger area that surrounds the proposed Settlement Class. *See Order Preliminarily Approving Class Settlements*, Ex. A (dkt. no. 3026) and attached hereto as Ex. 1.

[44] This Exhibit was not attached to the *Class Certification Order*. Instead, the Exhibit was attached to *Order Correcting Class Certification Order Nunc Pro Tunc* entered on September 23, 2008. (dkt. no. 939).

[45] This estimate came from Plaintiffs' expert engineer, Robert Pape, P.E. *Class Certification Order* at 7.

[46] *See* section IV.D. for an in-depth discussion of the metamorphosis of the size and shape of the Class Affected Area, and the Plaintiffs' changing theory as to how the contamination occurred.

[47] Beyond this appeal, the Defendants would file several more motions to decertify including but not limited to a *Motion to Decertify Classes or Alternatively, Amend Both Class Definitions for Failure to Specify a Date on Which the Composition of the Class is Fixed and to Clarify Exhibit 1* filed on June 4, 2008. (dkt. no. 808).

filed a *Motion to Alter or Amend the Judgment or in the Alternative for Certification to the West Virginia Supreme Court on Behalf of Named Plaintiffs Virdie Allen, Charles and Eileen Agee, and Hillman and Erma Raynes*. (dkt. no. 709). Basically, Urban and Falk requested the Court to name these Plaintiffs as Class Representatives. A hearing was held on the issue on April 4, 2008, and the Court subsequently entered an order denying Urban and Falk's *Motion. Order Denying Urban and Falk's Motion to Alter or Amend the Judgment or in the Alternative for Certification to the West Virginia Supreme Court on Behalf of Named Plaintiffs Virdie Allen, Charles and Eileen Agee, and Hillman and Erma Raynes*, April 14, 2008. (dkt. no. 771). The Court found that these Plaintiffs could not fairly and adequately represent either certified class. *Id.*

H. Pretrial Publicity & the Gag Order

The next issue for the Court was alleged inappropriate pretrial publicity. This concern was an ongoing conflict between Class Counsel and Defense Counsel, similar to the dispute among the Plaintiffs' attorneys. The impetus for this dispute began when Class Counsel asked the West Virginia Department of Health and Human Resources ("WVDHHR") to evaluate the exposure to and possible harmful effects of dioxin in indoor dust and outdoor soil in and around Nitro High School, Nitro Elementary School, and the Nitro Community Center. The WVDHHR partnered with the United States Department of Health and Human Services Agency for Toxic Substances and Disease Registry ("ATSDR") and issued a report on April 18, 2007, titled *Dioxin in Dust in Schools and Community Center, Nitro School Dioxin Site Nitro, Kanawha County, West Virginia.*

The report basically found that there were no issues at any of these sites. Specifically, the report stated that "[e]valuations of the site-specific exposures and potential human health effects

indicate that incidental ingestion of indoor dust poses no apparent public health hazard. No adverse noncarcinogenic health effects are likely and the excess cancer risk is less than 1 in 10,000, which is considered a very low risk." *Id.* at 1.[48]

Over a year and five months after the report was published, on or around September 25, 2008, Class Counsel purchased on-line advertising in the *Charleston Gazette* to attack the report. *See* Letter from O.C. Spaulding, Judge, to Counsel of Record (Sept. 26, 2008)(dkt. no. 940). On September 26, 2008, Judge Spaulding sent a letter to the parties' counsel questioning the propriety of a paid advertisement by Plaintiffs' Class Counsel. The Court's letter addressed the advertisement's effect on potential future jurors and whether the advertisement was a possible violation of Rule 3.6 of the West Virginia Rules of Professional Conduct. The Court set a hearing for October 9, 2008, to determine if a gag order was necessary.

Class Counsel responded to the Court immediately by a letter dated September 30, 2008. *See* Letter from Stuart Calwell, Class Counsel to O.C. Spaulding, Judge (Sept. 30, 2008)(dkt. no. 943). This letter stated that Class Counsel had removed the advertisement at issue, but averred that all of the information contained in the advertisement was part of the public record and not a violation of Rule 3.6 of the West Virginia Rules of Professional Conduct due to the public health risks of dioxin. *Id.*

On October 7, 2008, the Defendants' responded to the Court's letter. *Defendants' Response to Court's September 26, 2008 Letter Requiring Class Counsel to Show Cause Why Class Counsel's Case-Related Advertisements Do Not Violate Defendants' Constitutional Right to a Fair Trial and Rule 3.6 of the West Virginia Rules of Professional Conduct.* (dkt. no. 944). In that *Response*, the Defendants argued that Class Counsel was trying theories in the press that

[48] This report is more fully discussed in section IV.B, *infra*.

he will not likely be permitted to try before the Court. *Id.* The Defendants' primarily argued that (1) the advertisement addresses the character and credibility of parties and potential witnesses; (2) the advertisement communicates conclusions about testing conducted on behalf of the Plaintiffs that have yet to be ruled admissible, and (3) the advertisement at issue communicates speculative and inflammatory character evidence that may be not admissible at trial, substantially prejudicing their right to a fair trial. The Defendants further rejected Class Counsel's argument that he did not violate Rule 3.6 because the rule permits publication of matters without elaboration and contained Class Counsel's own opinions and conclusions.

On October 14, 2008, Class Counsel filed *Plaintiffs' Reply to "Defendants' Response to Court's September 26, 2008 Letter*. (dkt. no. 950). In that *Reply*, Class Counsel argued that he did not make inappropriate extrajudicial statements and did not violate Rule 3.6 as they are permitted under this rule because the statements are related to public health and warning of a potential danger of harm. Class Counsel further argued that the online advertisement was to combat allegedly faulty conclusions reached by public agencies regarding dioxin contamination in Nitro Schools and that this advertisement was only a response to the equally prejudicial publications of a report by the WVDHHR and ATSDR. Furthermore, Class Counsel claims that a gag order would be an unconstitutional restraint on an attorney's free speech.

On October 15, 2008, the Defendants' filed *Defendants' Surreply to Plaintiffs' Reply to Defendants' Response to Court's September 26, 2008 Letter*. (dkt. no. 952). In that *Surreply*, the Defendants renewed their prior arguments and argued that the advertisement itself does not complain of adverse publicity and that the government agency findings were never advertised. The Defendants further urged the Court to issue a gag order to protect them from further prejudice.

On October 16, 2008, the Court held a hearing on the issues of whether Class Counsel violated Rule 3.6 of the West Virginia Rules of Professional Conduct and whether a gag order was necessary. (Hr'g Tr. Oct 16, 2008) (dkt. no. 968). On October 30, 2008, the Court entered an *Order* (dkt. no. 969) that found that Class Counsel's advertisement did not fall under the safe harbor provision of Rule 3.6 (c) and thus, presented a substantial risk of prejudicing the Defendants' right to a fair, impartial trial. Furthermore, the Court instituted a gag order to prevent either party from further prejudicing the jury pool. The Order specifically prohibited counsel as follows:

> A. Counsel for any party herein shall not, without prior Court approval, place print, online or television advertisements that elaborate on any facts of this case or which describe either parties' liability theories, damage theories, or other evidentiary theories;
>
> B. Counsel for any party herein shall not, without prior Court approval, issue any extrajudicial letters or other writings to persons that elaborate on any facts of this case or which describe either parties' liability theories, damage theories, or other evidentiary theories; provided, that counsel may issue such writings to (1) persons with whom counsel has a direct attorney-client relationship, (2) expert witness or other such persons with whom counsel may engage in private communications relating to the case, or (3) government officials or agencies whose responsibilities involve the regulation or governance or issues pertaining to public health; and
>
> C. Counsel for any party herein shall not initiate any contact with any member of the media for the purpose of making extra-judicial communications that elaborate on any facts of this case or which describe either parties' liability theories, damage theories, or other evidentiary theories.

Id. at 13-14 (dkt. no. 969). This *Order*, however, would not be the last time that the Court would deal with this issue.

I. The Second Removal and Remand

On November 21, 2008, the Defendants removed the above-styled[49] case for a second time pursuant to 28 U.S.C. §§ 1442(a)(1) and 1331; specifically,

> The defendants argue that removal is appropriate under [§ 1442(a)(1)] because Monsanto produced 2,4,5-T under "federal direction and control" and can assert "federal defenses sufficient for removal." . . . The defendants also assert that [the federal] court has original jurisdiction under § 1331 because the "[Plaintiffs'] right to relief necessarily depends on resolution of a substantial question of federal law." . . . Finally, the defendants argue that removal of these cases is timely because the Plaintiffs revealed a new theory of the case on October 31, 2008 that "render[ed] this litigation (and the Parallel Litigations) ripe for removal."

Order at 17 (dkt. no. 980).

According to the Defendants, the new theory from the Plaintiffs was production of waste, not just burning of waste. *Id.* The United States District Court for the Southern District of West Virginia did not agree and found that the removal was untimely; the District Court found that the *Complaint* in this case was replete with references to production at the Nitro plant. *Id.* at 25-29. Therefore, in an *Order* entered on December 23, 2008, (dkt. no. 980), the District Court remanded the case to this Court.

J. Amendment to Medical Monitoring Class Definition

On March 3, 2009, the Court entered an *Order Amending Definition of Medical Monitoring Class*. (dkt. no. 1055). The Court found that Class Counsel had failed to proffer evidence that persons within the Class Area after 1970 would have received significant dioxin exposures through the ingestion of dust. The modified Medical Monitoring Class definition

[49] The Defendants also removed the *Carter* case and almost all of the personal injury cases against the Defendants. All of these cases, however, were eventually remanded back.

comprised "[t]hose persons who have resided, worked full time, or attended school full time in the Class Affected Area during the period 1948 - 1970." *Id.* at 2.

Several months later, on November 5, 2009, Class Counsel sought reconsideration of the order amending the definition of the Medical Monitoring Class. *Class Counsel's Motion for Reconsideration of the Court's March 3, Order Limiting the Definition of the Medical Monitoring Class* Nov. 6, 2009 (dkt. no. 1096). Class Counsel's motion — noting the prior finding of "a lack of sufficient evidence of any post-1970 dioxin exposure for any group of persons" — provided evidence that some persons present within the Class Area after 1970 were exposed to dioxins within household dust. Class Counsel's new evidence was based upon an analysis of "dust samples obtained from indoor living areas of approximately 100 residences within the Class Area" conducted by George Flowers, Ph.D. in 2009. *Id.* at 2. According to Class Counsel:

> Dr. Flowers has analyzed the results of the recent indoor dust sampling and determined that dwellings in a large portion of the Class Area are currently contaminated at or above a certain baseline level of dioxin (90 ng TEQ/kg).[50] Dr. Flowers believes that this portion of the Class Area has likely been contaminated to this degree since 1970. *Dr. Flowers was able to map the geographic extent of this portion of the Class Area.* This map is included in his report, and is referred to as "the Post-1970 area for Medical Monitoring."

Id. at 3. (footnote omitted) (emphasis added).

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[50] Toxic Equivalence Quotient (TEQ) is a unit of measurement to determine toxicity. "Under the auspices of the World Health Organization, . . .dioxin-like congeners have been assigned toxic equivalency factors ["TEF"] rating their toxicity in relation to 2378-TCDD, which is rated as having a TEF of 1.0. The TEF approach compares the relative potency of an individual congener to 2378-TCDD. The concentration of each component in a mixture is then multiplied by its TEF to determine the toxic equivalency ("TEQ"); all of the TEQs in a mixture are then added to determine the total toxic equivalency of a mixture, which is then compared to reference exposure levels for 2378-TCDD to determine risk." *Allgood v. General Motors Corp.*, 2006 WL 2669337 *6 (S.D. Ind., 2006) (unpublished opinion).

Based on Dr. Flowers's "Post 1970 area," Dr. Sawyer submitted an affidavit asserting an "increased cancer risk based on ingestion of dioxin-contaminated household dust at the aforementioned baseline level of 90 ng TEQ/kg for children and adults during the period 1970 - to the present. . . ." in the Post 1970 area. *Id.* at 3-4.

On March 26, 2010, the Court re-adopted the original definition of the Medical Monitoring Class. *Order Amending the Definition of the Medical Monitoring Class* March 26, 2010. (dkt. no. 1235). The Court noted that:

> Plaintiffs' consultants took a significant number of soil and indoor (living area) dust samples throughout the existing Class Affected Area in May-June 2009. These samples were analyzed for the presence of dioxins. Plaintiffs' expert George C. Flowers, Ph.D. . . . reviewed these sampling results and reported that soil throughout the existing Class Affected Area is currently contaminated with dioxins above the so-called "background" level. Moreover, Dr. Flowers reported that there exists an ascertainable region within the Class Affected Area where, within any given residence, the current concentration of dioxin contained in indoor house dust likely exceeds a certain, significant minimum threshold (90 ng TEQ/kg). According to Dr. Flowers, the current level of indoor dioxin contamination in this ascertainable region has likely existed since 1970.

Id. at 6-7. (citations omitted).

The Court recognized that the "Post 1970 area" "is not co-extensive with the geographic boundary of the Class Affected Area." *Id.* at 8. In recognizing this incongruity, the Court noted that "the region identified by Dr. Flowers . . . is simply a preliminary indication that *not every person* residing, working, or attending school within the Class Affected Area after 1970 *will ultimately be eligible for medical monitoring*." *Id.* (emphasis added).

K. First Case Management Order

After amending the Class definition but before reestablishing the Class definition, on December 9, 2009, the Court entered what would be the first *Case Management Order*.[51] (dkt. no. 1116). The first *Case Management Order* set a trial date of April 4, 2011. Also, the *Order* set a December 11, 2009, deadline for the Plaintiffs to "file a final plan for providing notice to the certified Classes, including a proposed Notice and plan for publishing the Notice. *Id.* at 2. This *Order*, however, was changed several times and this trial date was not kept.

L. Notice of Class Certification

The Plaintiffs complied with the *Class Certification Order* and filed *Plaintiffs' Disclosure Regarding Plan for Class Notification* on December 14, 2009.[52] (dkt. no. 1117). A complete recitation of the proposed legal notices is not appropriate, but one part of the notices to both Classes is relevant. Specifically, under the heading of "What is this Case About," the proposed notices state that "[t]he lawsuit alleges that air emissions from the old Monsanto plant and several other sites where burning of the plant's waste materials occurred contaminated the air of Nitro and the surrounding area with dioxin." *Id.*

On January 26, 2010, the Defendants' filed *Defendants' Response to Plaintiffs' Disclosure Regarding Plan for Class Notification.* (dkt. no. 1168). The Court will not go through every objection, but one objection in particular is pertinent. Specifically, the Defendants' argued that

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[51] In the year between when the remand *Order* was entered and the *Case Management Order* was entered, the Court dealt with three issues: (1) the entry of a trial plan, (2) Plaintiffs seeking further discovery, and (3) Defendants seeking the disclosure of Plaintiffs' counsel's clients. These issues are not important to the ultimate outcome in the case, but they are important to explain what happened in that year. Beyond this footnote, these issues will not be discussed further.

[52] This was not the first time Class Counsel submitted a proposed plan for notice and publication.

> The Court defined the Property and Medical Monitoring Classes by reference to a geographic "Class Affected Area" or "Class Area." The Class Area adopted in the Court's class definitions was bound by an isopleth developed by Plaintiffs' expert, William M. Auberle, P.E., Since Mr. Auberle's isopleth was published, Plaintiffs have also offered evidence by two other experts who have generated different "zones" or "areas" of alleged contamination. Kirk W. Brown, Ph.D. generated isopleths purporting to depict "zones" of predicted concentrations of dioxin in soil in and about the Class Area. Most recently, George C. Flowers, Ph.D., proposed an isopleth defining a "Post 1970 Area for Medical Monitoring." Even more isopleths have been generated by Plaintiffs' experts beyond those expressly mentioned here. The existence of these multiple isopleths and the multiple theories upon which the isopleths were based creates an ambiguity that the Court must resolve before publishing Class notices.
>
> The scope of the Class definitions should be consistent with the liability theories to be presented at trial. The Class definitions and the Class notices are the mechanisms that bind absent class members to the result of the class action trial. The public should not be misled by a Class notice that suggests Class Counsel will zealously pursue a property or medical monitoring claim that is broader than Class Counsel's experts can support.

Id. at 2-3. (footnotes omitted). Beyond this, the Defendants also stated that "[t]he Plaintiffs' disclosure is incomplete because it addresses only the content of the Plaintiffs' proposed class notice and does not address the plan for publishing and distributing notices." *Id.*

In a letter dated April 22, 2010, Judge Spaulding sent a letter to the attorneys in the case stating,

> From my perspective, it appears that you may be falling behind regarding class notice. The scheduling order provides that the Class Notice was to be issued by March 15, 2010. You had a hearing scheduled on this issue, but cancelled it for consideration of "new technology" to deliver the notice.
>
> Have you agreed on the text of the notice? Have you agreed on delivery of the notice? If not, it may be time to schedule the issue for hearing.

. . .

> If you can't agree, will the plaintiffs provide me a final class notification plan to which the defendants can respond? At least that way I'll know what you still can't agree upon notwithstanding your previous changes.

See Letter from O.C. Spaulding, Judge, to Stuart Calwell, Charles Love, III, Ray Lovejoy, and Thomas Urban, II (Apr. 22, 2010)(emphasis in original))(dkt. no. 1255).

The Defendants responded to the Court's letter on April 27, 2010. *See* Letter from Charles Love, III, to O.C. Spaulding, Judge (Apr. 27, 2010)(dkt. no. 1257). In that letter, the Defendants averred that there had been no agreement but that they were open to discussions.

> Agreement on some of the language may be possible. As you know, we have argued that plaintiffs' evidence does not support the geographic, temporal or age-specific scope of the Medical Monitoring Class as presently defined. We have similar concerns regarding the Property Class. . . . [T]he Class definition incorrectly implies that the plaintiffs are pursuing a claim on behalf of *any* person of *any* age who lived in the Class Area for *any* length of time when, in fact, plaintiffs' evidence shows that a person's potential right to recover on a medical monitoring claim is constrained in very specific ways by *where* he lived within the Class Area, *how long* he lived there, and *how old* he was while he lived there.

Id. (emphasis in original).

The Plaintiffs responded to the Court's letter on April 29, 2010. Letter from Stuart Calwell, to O.C. Spaulding, Judge (April 29, 2010)(dkt. no. 1260). In their letter, the Plaintiffs stated that there were two reasons for the delay. First, there was a motion pending that would change the scope of the notice. Second, the Plaintiffs stated that they were working with their experts on notice to use new information and technology to reduce the cost of the notice.

After further briefing,[53] the Court held a hearing on June 24, 2010. Hr'g Tr. June 24, 2010. (dkt. no. 1306). The Court thoroughly went through each line of the proposed notices and the proposed notification plan and made several changes. After that hearing, and further briefing,[54] the Court entered an *Order Adopting Form of Class Notices and Plan for Class Notification with Directions* on August 6, 2010. (dkt. no. 1368).

In addition to describing the controversy and claims alleged in the Complaint, the class notification documents advised class members of their right to opt out of the Medical Monitoring Class, Property Class, or both. The class notification documents advised Class Members that: (1) any relief obtained at trial would be based on the jury's findings on the evidence presented; (2) any relief obtained might be allocated among Class Members, based on the jury's findings, in such a way that not all Class Members would be eligible to receive it; and (3) participating in the case and prevailing at trial would not guarantee that any particular Class Member would receive relief. The documents further advised Class Members of the steps necessary to effectuate an opt-out and the consequences of a failure to opt-out.

Seven months later, on March 24, 2011, the Court found and ordered that notice had been effectuated on the Class. *Order Finding that the Requirements Set Forth in the Courts' Class Action Notification Order Have Been Satisfied* March 24, 2011. (dkt. no. 1711). Specifically, the Court found that "the class notice requirements of Rule 23(c)(2) of the West Virginia Rules of Civil Procedure have been satisfied." *Id.* ¶ 16.

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[53] Specifically, *Plaintiffs' Revised Proposal for Class Notification* filed on May 19, 2010. (dkt. no. 1282) and *Defendants' Response to the Class Representatives Final Proposed Class Notice and Class Notification Plan* filed on June 22, 2010. (dkt. no. 1295).

[54] Specifically, *Defendants' Response Addressing Revised Class Notice Materials and Notification Plan* filed on July 9, 2010. (dkt. no. 1318).

Furthermore, attached to this *Order* were Exhibits A and B. These exhibits listed the names and addresses of those individuals who opted out. The Court fully incorporates those Exhibits into this order as if fully set forth herein.

M. First Enforcement of the Gag Order

While the issue of Class notice was being discussed, the Defendants raised the issue of a violation of the Court's October 30, 2008 *Order. Defendants' Motion to Enforce Gag Order* June 22, 2010. (dkt. no. 1299). As the Court noted in its order,

> The Defendants moved to enforce the Gag Order in regard to a website . . . maintained by the Calwell Practice, PLLC ("the Calwell website"). Defendants objected to the Calwell website on the basis that it contained statements and conclusions regarding facts that will be at issue in this litigation. More specifically, the Defendants complained that the Calwell website contains a "research tool," with a section titled "Chemical Diseases" with a subsection for "Dioxin" which lists numerous disorders, diseases and medical conditions, and relates those diseases to dioxin and dioxin exposure. The Defendants further complained that the Calwell website contains a page entitled, "Chemical Exposure – Dioxin" which specifically mentions this litigation, to wit: "*The Calwell Practice is class counsel in a Class Action involving over 12,000 residences contaminated with dioxin from a Monsanto Chemical plant formerly located in Nitro, West Virginia.*" The Defendants further complained that the Calwell website contains a page entitled "Firm Philosophy," which contains a discussion of Stuart Calwell's prior litigation in the 1980s against the Monsanto Company regarding workers exposed to chemicals at the former Monsanto [plant] in Nitro, West Virginia.

Order Granting, in part, and Denying, in part, Defendants' Motion to Enforce Gag Order Aug. 24, 2010 at 2. (dkt. no. 1407).

The Court noted that "[b]ecause a significant portion of the Putnam County population base will not be eligible to be jurors in this matter, the Court is particularly concerned that those otherwise eligible jurors from Putnam County must not be exposed to or receive biased or

prejudicial information about this case." *Id.* To prevent contamination of the jury pool, the Court ordered that certain parts of the website be taken down. *Id.* at 3-4. No sanctions were ordered.

N. Individual Blood Evidence

During the summer of 2010, several constitutional issues surrounding blood evidence were raised. The issues related to the way in which Class Counsel would prove its case; i.e., his strategy. The Court characterized Class Counsel's strategy as follows:

> Class Counsel and his experts have indicated that, at trial, they intend to prove the Defendants' medical monitoring and property liability by using one or more risk assessment models that purport to use evidence regarding the toxicity of soil and dust in the Class Area to predict or estimate a related human health risk. Class Counsel's approach is to attempt to *prove liability on a class-wide basis*; that is, by using the risk assessment models, Class Counsel seeks to prove that the Defendants are liable to all members of the Medical Monitoring and Property Classes.

Order Granting Defendants' Motion to Require Class Representatives to Produce Blood Samples Sept. 30, 2010 ¶ 1 (dkt. no. 1462)(emphasis added). This method of proving liability – i.e., on a class-wide basis – raised the issue of the extent to which Defendants could use individual evidence in a class action. To put it another way, could the Defendants attack Class Counsel's class-wide theory with individual blood evidence?

The first iteration of this issue was raised in June of 2010, when the Defendants requested blood samples from the Class Representatives. On September 30, 2010, the Court entered an order requiring the Class Representatives to provide blood samples. *Id.* The next issue was whether the Defendants could require absent class members to submit blood samples. On December 8, 2010, the Court entered an order saying that absent class members could not be compelled to give blood evidence. *Order Denying Motion to Allow Defendants to Conduct*

Serum Dioxin Blood Tests of Plaintiffs' Class Soil and Dust Samples Dec. 8, 2010. (dkt. no. 1588).

These previous motions led to the final, more important issue; specifically, whether individual blood evidence was relevant and admissible in a class action. On February 11, 2011, the Court entered an order stating that blood evidence was admissible. *Order Deeming Blood Evidence Admissible* Feb. 11, 2011. (dkt. no. 1660). The *Order* stated that there were three issues. The first was "whether, once a class has been certified, a Defendant may present to a jury evidence relating to specific, individual class members?" *Id.* ¶ 14. The Court found that

> [F]rom its research, . . . the majority opinion in this country is that evidence derived from individuals may be produced. The due process case law rendered by the United States Supreme Court recognizes that a defendant has a due process right to assert any defense recognized by law in a litigation brought against it. The "individualized" evidence principles asserted by Class Counsel would render these due process principles nullities. Moreover, U.S. Supreme Court case law also establishes that absent class members are entitled to constitutionally adequate representation. Without the ability to challenge whether a class representative actually possesses a claim, the adequate representation doctrine would become a dead letter. *Newberg on Class Actions* and M*cLaughlin on Class Actions: Law and Practice* also contradict the "individualized" evidence assertion of Class Counsel.[55]

Id. (footnotes omitted).

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[55] In regards to McLaughlin on Class Actions, the Court was referencing §§ 8:6-8:10 of the sixth edition of that publication. One specific passage that was particularly informative was the following:

> The acceptance of these opinions addressing hypothetical class members who did not exist and therefore were not subject to cross-examination at trial raises important issues. The court's acceptance of such proofs raises significant due process questions because defendants ordinarily are entitled to test plaintiffs' expert proofs with evidence of actual class members whose particular circumstances may have not only contradicted the experts' generalizations, but also disproved class members' individual claims.

McLaughlin on Class Actions (6th ed.) § 8:9 at 357.

The second issue outlined by the Court was whether West Virginia case law forbids the introduction of individualized evidence in a class action. Class Counsel argued that *Perrine v. E.I. DuPont de Nemours and Company*, 225 W. Va. 482, 694 S.E.2d 815 (2010) "mandates the exclusion of all 'individualized' evidence and of all evidence that cannot be 'extrapolated' to a class. *Id.* ¶ 15. The Court found this argument to be unpersuasive. *Id.* ¶ 16.

> Based on a careful analysis of the Supreme Court of Appeals' opinion, the Court FINDS that *Perrine's* discussion of class action principles was limited to the question of whether the class or classes in *Perrine* were properly certified. In contrast, the pending Motions directly pertain to the admissibility of evidence at the trial of a class action.

Id. ¶ 17.

The final issue was whether the probative value of the evidence was substantially outweighed by the prejudicial effect "of having too small a sample to be statistically significant." *Id.* ¶ 19. In this *Order*, the Court found that "the probative value of the blood serum lipid levels of the class members tested to date is not substantially outweighed by its potential prejudicial effect." *Id.* ¶ 20. The Court, however, did subsequently refine this finding by limiting the extrapolation of the samples from the Class Representatives to the Class as a whole. *Order Granting Plaintiffs' Motion in Limine to Preclude Testimony or Argument Suggesting that the Serum Dioxin Results of the Class Representatives and Others can be Extrapolated to the Class* Nov. 3, 2011. (dkt. no. 2701).

O. First, Second, and Third Revised Case Management Order

On November 3, 2010, the Defendants asked the Court to modify the *Case Management Order*; specifically, they requested to extend the trial date. *Defendants' Motion to Modify the*

Case Management Order Nov. 3, 2010. (dkt. no. 1499). There were many reasons cited by the Defendants for the modification, but the central reason was to allow the completion and analysis of the Class Representatives' blood samples. *Id.* at 16. In a letter to the Court, Class Counsel asked the Court to summarily deny this request. Letter from Stuart Calwell, Class Counsel to O.C. Spaulding, Judge (Nov. 3, 2010)(dkt. no. 1501).[56]

On December 9, 2010, the Court held a hearing on the Defendants' *Motion*. Hr'g Tr. Dec 9, 2010. (dkt. no. 1607). Thereafter, the Court entered an order revising the case management order. *Revised Case Management Order* Dec. 23, 2010. (dkt. no. 1603). The trial was set for August 1, 2011. *Id.* at 6.

Shortly after the *Revised Case Management Order* was entered, the Defendants sought to revise certain disclosure times for their experts. *Defendants' Emergency to Modify Paragraphs 1 & 2 of the December 17, 2010 Revised Case Management Order* Dec. 21, 2010 (dkt. no. 1604). The Court held a hearing on this *Emergency Motion* on December 23, 2010. Hr'g Tr. Dec. 23, 2010 (dkt. no. 1617). The Court granted this *Emergency Motion* and entered a *Second Revised Case Management Order* on January 14, 2011. (dkt. no. 1627). The only changes were to certain disclosure deadlines for the Defendants.

On March 24, 2011, the Court entered another revision to the *Case Management Order*. *Third Revised Case Management Order* March 24, 2011. (dkt. no. 1715). The *Third Revised Case Management Order* changed the trial date to September 6, 2011. *Id.* at 3.

[56] There was more briefing done but a further discussion of these briefs is not necessary.

P. Hearings on Motions

Upon the entry of the *Third Revised Case Management Order*, the Court began the hearings on motions. While there were other hearings during this time, there are four hearings of major significance: (1) a May 5, 2011, hearing on five motions; (2) three weeks of hearings on *Daubert* motions starting on May 16, 2011 that covered fourteen different experts; (3) a two day hearing starting on July 12, 2011, on twelve motions for summary judgment; and (4) a July 27, 2011, hearing on Defendants' Property Class decertification motion,[57] as well as seven motions related to the Plaintiffs' property remediation claims.[58]

The Court will not go through ever motion that was ever filed. But there are some motions that are noteworthy and relevant to the posture of the case as it existed at the time of the trial.

- *Defendants' Motion for Summary Judgment as to Claims of all Property Class Members who own Non-Residential Property*

In this *Motion* the Defendants' averred that the Plaintiffs only had evidence of remediation costs for school and residential properties; in other words, the Plaintiffs could not prove damages as to anyone except school and residential properties. *Id.* Consequently, the Defendants moved for summary judgment as to all property owners except school and residential properties. *Id.* The Court granted this *Motion. Order Granting Motion for Summary Judgment as to Claims of Property Class Members owning Non-Residential, Non-School Properties and*

[57] Specifically, the Court is referring to *Defendants' Combined Motion and Memorandum of Law Seeking Dispositive Relief as to all Claims of the Property Class* filed on July 1, 2011. (dkt. no. 2220).

[58] Most of these motions were denied. The Court did not provide a substantive ruling, other than to say that the issues were for a jury to decide. After each hearing, and given the Court's limited resources, it asked the prevailing party to prepare an order that would withstand appellate scrutiny. Furthermore, it adopted the prevailing parties' arguments. These orders, however, were not prepared until further ordered by the Court. Lists of the Motions made and their resulting outcome are attached to this Order as Exs. 2 and 3.

Striking March 2011 Affidavit and Proposed Testimony of Class Counsel's Expert, Robert J. Carr June 1, 2011. (dkt. no. 1940). The main significance of this *Order* was to limit the property class by dismissing the "property claims of all Property Class members who own non-residential, non-school properties . . . ." *Id.* at 7.

- *Defendants' Motion in Limine to Exclude or Limit Testimony of Robert Carr*

Robert Carr was the Plaintiffs' only expert as to the valuation of damages for the property class. The Defendants attacked Mr. Carr's opinions on several grounds, but the two that were most persuasive were their attack on the relevancy and reliability of his opinions. Based on these two reasons, the Court granted this *Motion. Order Excluding the Opinions of Plaintiffs' Expert Witness, Robert J. Carr* June 28, 2011. (dkt. no. 2202).

Specifically, the Court found that Mr. Carr's opinions were minimally probative because they were "not based on sufficient facts." *Id.* at 16. The Court also found that Mr. Carr's opinions were highly prejudicial:

> Mr. Carr's opinions are confusing, misleading and unfairly prejudicial for the reasons stated *supra*; Mr. Carr's opinions are premised on a dearth of information, are only 5% to 10% complete, and stated with a huge margin of error. For Mr. Carr to state that property remediation will cost one billion nine hundred nine million dollars ($1,909,000,000.00) when he has an incomplete report, his opinions are based on almost no information, and could be almost double or half that amount, will certainly cause the jury to be confused as to the exact amount of damages as well as mislead them [into] how much damages the Defendants actually caused.

Id. at 17.

The Court also went so far as to state that his opinions would be excluded under the *Daubert* standard. *Id.* at 19-21. To make this finding, the Court found that *Kumho Tire* – which states that expert opinions from non-scientifically derived expert testimony, was still subject to

the *Daubert/Wilt* test – was the law in West Virginia even though it had not been applied by the West Virginia Supreme Court of Appeals. *Id.* The practical effect of this *Order* was to eliminate the only expert who could value damages for the property class.

The Plaintiffs filed a motion asking the Court to reconsider this ruling. *Plaintiffs' Motion for Reconsideration of the June 28, 2011 Order Excluding the Opinions of Plaintiffs' Expert Witness, Robert J. Carr* July 15, 2011. (dkt. no. 2243). On November 3, 2011, the Court denied the Plaintiffs' *Motion. Order Denying Plaintiffs' Motion for Reconsideration of the June 28, 2011 Order Excluding the Opinions of Plaintiffs' Expert Witness, Robert J. Carr and Granting in Part Defendants' Combined Motion and Memorandum of Law Seeking Dispositive Relief as to all Claims of the Property Class* Nov. 3, 2011. (dkt. no. 2704).

- *Defendants' Combined Motion and Memorandum of Law Seeking Dispositive Relief as to all Claims of the Property Class*

After excluding Mr. Carr's opinions as irrelevant and unreliable, the Defendants moved the Court to decertify the Property Class because they could not prove an essential element of their claim; namely, damages.

The Court granted the Defendants' *Motion* because the Plaintiffs had no expert who could value the damages for the Property Class, and therefore, they could not prove an essential element. *Order Denying Plaintiffs' Motion for Reconsideration of the June 28, 2011 Order Excluding the Opinions of Plaintiffs' Expert Witness, Robert J. Carr and Granting in Part Defendants' Combined Motion and Memorandum of Law Seeking Dispositive Relief as to all Claims of the Property Class* Nov. 3, 2011. (dkt. no. 2704).

- *Defendants' Motion in Limine to Preclude Evidence and Argument Regarding Alleged Similar Occurrences*

On May 16, 2011, Defendants' submitted *Defendants' Motion to Require Class Counsel to Identify Proposed Rule 404(b) Evidence. Id.* (dkt. no. 1863). On August 23, 2011, Class Counsel submitted *Plaintiffs' Designation of Rule 404(b) Evidence. Id.* (dkt. no. 2363). In response, Defendants submitted *Defendants' Motion in Limine to Preclude Evidence and Argument Regarding Alleged Similar Occurrences. Id.* (dkt. no. 1929). The major implication of this *Motion* was whether the Plaintiffs could reference incidents involving Monsanto's other plants. At the time of settlement, the Court had not made a ruling on this *Motion.*

Q. Assignment of a New Judge and Fourth Revised Case Management Order

On August 26, 2011, Judge Spaulding resigned from this case because he was diagnosed with an illness.[59] Hr'g Tr. Aug. 26, 2011 (dkt. no. 2369). On August 29, 2011, the West Virginia Supreme Court of Appeals assigned the Honorable Derek C. Swope, Judge of the Ninth Judicial Circuit, to this case. *Administrative Order* Aug. 29, 2011. (dkt. no. 2372). On the same day the *Administrative Order* was entered, Judge Swope (hereinafter referred to as "the Court") entered an *Order* setting aside all previous scheduling orders as well as the September 6, 2011, trial date.

After a telephone conference with the parties and some additional briefing, the Court entered a *Fourth Revised Case Management Order* on September 12, 2011, that set a January 3, 2012, trial date. *Fourth Revised Case Management Order* Sept. 12, 2011 ¶ 9. (dkt. no. 2399).

This *Order*, however, went beyond simply setting a trial date; it set forth all of the pending issues that needed to be resolved before the case could be tried. For instance, the *Order*

[59] The undersigned would like to sincerely thank Judge Spaulding for his tireless efforts in this case. His guidance and legal acumen have guided this litigation to the doorstep of trial, which made the undersigned's appointment that much easier. He truly is one of the preeminent jurists of the great State of West Virginia.

confirmed that the parties were interested in mediation. *Id.* ¶ 3(D). It required the Plaintiffs to inform the Court "whether they intend to seek immediate relief for the de-certification of the property class." *Id.* ¶ 3(C). The *Order* affirmed all of Judge Spaulding's previous rulings and required the prevailing party to prepare any outstanding orders that had not been written yet. *Id.* ¶ 4 ¶ 5. With nine exceptions, the *Order* found that the motion practice had been completed. *Id.* ¶ 6. Finally, the *Order* found that of the 2,000 jurors initially called only 109 were available after preliminary disqualification. *Id.* ¶ 10.

R. Jury Pool

The Court notes that obtaining a jury in this case was incredibly difficult. The Putnam County Circuit Clerk's Office drew 5,000 Putnam County residences to be jurors in this case. There were three draws; the first draw was 1,000 jurors made on June 3, 2011, the second draw was 1,000 jurors made on June 28, 2011, and the third draw was 3,000 jurors made on November 3, 2011.

The preliminary elimination process started with the standard questionnaire sent out by the Circuit Clerk's Office. Next, as some jurors might reside in the Class Affected Area, jurors residing in certain zip codes were automatically eliminated. Those who were currently represented by Class Counsel were also eliminated.

After this preliminary elimination, those jurors still qualified were summoned to appear and complete a *Confidential Prospective Juror Questionnaire* prepared by the attorneys in this case. This *Questionnaire* contained over 90 questions and was 33 pages long. Certain answers to this *Questionnaire* resulted in automatic elimination from the pool. Also, during the elimination process, several jurors requested to be excused from the case, which further removed more

individuals from the jury pool. These questionnaires were completed on August 15, 2011 and December 9, 2011.[60] The Court had to use Winfield High School to assemble the jurors.

At the completion of the elimination process, there were only 230 individuals qualified to be jurors. In other words, only 4.6% of the Putnam County Residents summoned were qualified to be jurors in this case.

To have a trial by jury, the Court required 28 qualified jurors; 10 were needed to get a jury of 6, and 18 were needed to obtain 6 alternates. To get to 28, the parties went through almost all 230 qualified jurors and took 14 days of *voir dire*.

S. Hearings

Between the time that the Court was appointed to take this case and December 9, 2011, the Court held several hearings. The first was on September 6, 2011, when the Court held a telephone conference to raise several issues and generally schedule the trial. On September 29, 2011, the Court held a hearing on these issues and generally spoke with the then-existing jury pool. On October 18, 2011, at the behest of the parties, the Court held a hearing to allow the parties to give the Court the general history of the case. On November 3, 2011, the Court also heard arguments on several outstanding motions.

T. First and Second Mediation

As stated, the parties informed the Court that they were interested in mediation. After being informed of this, the Court ordered the parties to participate in a mediation that was to encompass the Medical Monitoring Class, the Property Class, and approximately 190 personal injury cases. *Order from September 29, 2011, Hearing* at ¶ 6 Oct. 11, 2011 (dkt. no. 2619). The

[60] The Court notes that August 22, 2011 and December 15, 2011, were reserved for make-up days for jurors who could not attend on August 15, 2011, and December 9, 2011, respectively.

first mediation took 3 days and concluded on November 2, 2011; the mediator was Thomas V. Flaherty, Esq. The first mediation was unsuccessful.

After the first mediation, the Court ordered the parties to globally mediate the case again. *Order Requiring Additional Mediation* Dec. 2, 2011. (dkt. no. 2809). The mediators for this mediation were the Honorable Booker T. Stephens, Judge of the Eighth Judicial Circuit, and the Honorable Alan D. Moats, Judge of the Nineteenth Judicial Circuit, both of whom serve on the West Virginia Mass Litigation Panel. Mediation took place on December 27, 2011, and was unsuccessful. In each instance, the Court ordered that mediation was to be confidential.

U. Second Enforcement and Further Strengthening the Gag Order

On December 9, 2011, the Court once again reminded the parties not to discuss anything regarding the outcome of the upcoming mediation:

> [F]olks, the fact that I'm going–that you all are going back to mediation has got to be confidential. And there's Orders that have been entered, but it has to be confidential. Because what good does it do if I send you back to mediation and then it gets out? How am I going to pick a jury, you know, when we have to start going–I mean, it was in the paper back in the fall that you were going to mediate. Nobody–that's lost. It's gone. Nobody knows what's happened. Any maybe we can ask about it again. But I'm really worried about having this case mediated, and then having somebody say "after an unsuccessful" and then trying to pick a jury. Because I think–I think we've got about one shot to try to get a jury in this case.

(Hr'g Tr. 50:14-51:6, Dec. 9, 2012.)

During the confidential mediation Mr. Calwell made the following statement to the *Charleston Gazette*:

> "This is an extraordinarily important case," lead plaintiff's attorney Stuart Calwell said. "(Plaintiffs) want their town back. What they're interested in is having a safe home to live in–I don't think that's too much to ask."

"*No Settlement Reached in Monsanto Mediation*," The Charleston Gazette, Dec. 28, 2011, http://wvgazette.com/News/201112280044.

On January 3, 2012, the Defendants' filed a *Motion for Issuance of a Rule to Show Cause Why W. Stuart Calwell, Jr., Should Not Be Held in Contempt of the Orders of This Court* regarding these statements. (dkt. no. 2893). Ultimately, the Court did not grant this motion, but instead gave the following oral directive to counsel following Defendants' motion on January 3, 2012,

> [B]ut I want to tell everybody right now, is there anybody who needs to understand in more graphic detail, that none of you, your sisters, your cousins, and your aunts, for you Gilbert & Sullivan fans, any of your folks appurtenant to your operation or your office, paralegals, secretaries, whatever, investigators, you are ***not to discuss this case with any member of the press in any way, shape, or form, other than two words: No comment. No comment.***

(Trial Tr. 237:6-14, Jan. 3, 2012.) (emphasis added).

V. Motions & Issues Surrounding the Decertification – Notice, Statute of Limitations, Motion for Recertification, Appeal, Collateral Estoppel, and the December 9, 2011, Hearing

On November 3, 2011, the Court entered an *Order* decertifying the Property Class. *Order Denying Plaintiffs' Motion for Reconsideration of the June 28, 2011 Order Excluding the Opinions of Plaintiffs' Expert Witness, Robert J. Carr and Granting in Part Defendants'*

Combined Motion and Memorandum of Law Seeking Dispositive Relief as to all Claims of the Property Class Nov. 3, 2011. (dkt. no. 2704). Obviously, the decertification of the Property Class raised several issues before the start of the trial.[61]

First and foremost was whether notice had to be disseminated to the Property Class; this issue was raised by the Defendants who sought to force the dissemination of notice. *Defendants' Motion to Compel Class Counsel to Provide Notice of Class De-Certification to the Members of the Property Class* Nov. 14, 2011. (dkt. no. 2728). The Defendants argued that the members of the Property Class were required to receive notice of the decertification; in support of this argument, the Defendants cited Rule 23(e) of the West Virginia Rules of Civil Procedure.

This also raised the issue of the statute of limitations. Pursuant to *American Pipe & Construction Co. v. Utah*, 414 U.S. 538, 94 S.Ct. 756 (1974), once a class is decertified the statute of limitations begins to run again. The basis for certification of the Property Class was

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[61]The Court notes that this case was going to trial on all issues of liability, including negligence, nuisance, strict liability, and trespass. During the hearings held on December 9, 12, and 13, 2011, the issue was raised whether trespass was a viable cause of action based on some of the Court's previous rulings. Although the Property Class had been de-certified, trespass remained a viable claim for medical monitoring. Under *Bower*, the West Virginia Supreme Court, discussed tortious conduct as follows:

> Liability for medical monitoring is predicated upon the defendant being legally responsible for exposing the plaintiff to a particular hazardous substance. Legal responsibility is established through application of existing theories of tort liability. "Recognition that a defendant's conduct has created the need for future medical monitoring does not create a new tort. It is simply a compensable item of damage when liability is established under traditional theories of recovery." *Potter*, 6 Cal.4th at 1007, 25 Cal. Rptr.2d at 578, 863 P.2d at 823; *see also Hansen*, 858 P.2d at 979 ("the plaintiff must prove that the exposure to the toxic substance was caused by the defendant's negligence, i.e., by the breach of a duty owed to the plaintiff"). This is not to say that a plaintiff may not, as a matter of pleading, assert a separate cause of action based upon medical monitoring; rather, it means that underlying liability must be established based upon a recognized tort— *e.g.*, negligence, strict liability, trespass, intentional conduct, etc.

Bower at 433, 142.

premised on the alleged distribution of 2,3,7,8-TCDD from around 1949 to 1969. Consequently, the statute of limitations was a major issue.[62]

Citing a 2000 unpublished case from the United States District Court for the Eastern District of New York, the Plaintiffs asked the Court to stay the statute of limitations. Furthermore, the Plaintiffs asked the Court to deny the Defendants' *Motion* to require notice.

During a December 9, 2011, hearing, the Court granted the Defendants' *Motion* but did require notice to be distributed until the conclusion of the trial. *Order Confirming December 9, 2011 Hearing* ¶ 1 Dec. 20, 2011. (dkt. no. 2857). Furthermore, the Court found that it did not have the power to stay the statute of limitations. *Id.* Specifically, the Court found as follows:

> 1) The Court GRANTS the *Defendants' Motion to Compel Class Counsel to Provide Notice of Class De-Certification to the Members of the Property Class* (dkt. no. 2728) but will not require notification until after the conclusion of the trial for the purposes of judicial economy. The Court FINDS that under *American Pipe Co., v. State of Utah*, 414 U.S. 538, 94 S.Ct. 756 (1974), the commencement of the class action suspended the running of the limitations period only during the pendency of the motion to strip the suit of its class action character. *See also*, *Culver v. City of Milwaukee*, 277 F.3d 908 (2002), *Birmingham Steel Corporation v. Tennessee Valley Authority*, 353 F.3d 1331 (2003) (once a class has been de-certified, the Statute of Limitations begins to run again and notice must be provided to the former class members.) After an extensive search, the Court cannot located any binding authority allowing it to stay the Statute of Limitations.

Id.

As to the statute of limitations, the Court could find no authority that allowed it to stay the statute. Consequently, it denied the Plaintiffs' request. As to the Defendants' *Motion*, the Court understood that notice had to be administered. The Court, however, was concerned with

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[62] While this was a major issue, the Defendants did waive the statute of limitations defense for the Medical Monitoring trial. *Defendants' Notice of Intent not to Offer Evidence or Argument before the Trier of Fact at Trial in Support of Statute of Limitations Defense* Dec. 19, 2011. (dkt. no. 2846).

judicial economy. Serving notice would be a huge undertaking on the eve of trial. Furthermore, the practical effect of serving notice would be to force the Plaintiffs to file hundreds of individual property cases, and for the Defendants to answer these individual property cases. This would adversely affect the Putnam County judicial system for little to no benefit. This is especially true considering that the trial would only last three months, at which point a verdict would determine if such action would be necessary. As the Court stated in the December 9, hearing:

> All right. They file 500, 5,000, [individual property suits to preserve the statute of limitations] I don't know. And then we try this case, the medical monitoring case, and Question No. 3, tortious conduct of the defendant, you[, the Defendant] win[s]. They find no tortious conduct. You really want to be sued 500 to 1,000 to 2,000 times, then have to file 500 or 1,000 or 2,000 motions for collateral estoppel because you won the liability issue? . . . But at the same time, I look to you all, as a practical standpoint, and say "you all really want to get sued 1,000 times?" Because you have confidence in your case. If you win, what have you won? Other than, I guess, great attorney's fees to file 500 or 1,000 motions for . . . summary judgment on that issue based on collateral estoppel.

(Hr'g Tr. 10-11, Dec. 9, 2011.)

Furthermore, the Court found that while the issue of the statute of limitations was important, given the history of the case if the statute had passed, it had passed a long time ago; in other words, three more months was not going to make or break the case. *Id.* at 15. Therefore, a few more months would have no practical effect.

The next issue to arise from the decertification was the *Plaintiffs' Motion to Re-Certify their Property Claims as a Class Action on all Issues, Excluding Damages; or, in the Alternative, for Permission to Supplement Certain Expert Reports to Account for the Court's Decertification of the Property Class and said Ruling's Impact on the Medical Monitoring Relief Requested* filed on November 21, 2011. (dkt. no. 2761). Before this *Motion* could be heard, however, the

Plaintiffs also filed a *Notice of Appeal* to the West Virginia Supreme Court of Appeals. *Notice of Appeal* Dec. 5, 2011. (dkt. no. 2814). The Plaintiffs also filed a *Motion to Hold "Notice of Appeal" in Abeyance* at the same time as the appeal. (dkt. no. 2815).

At the hearing on December 9, 2011, the Court heard arguments on the *Plaintiffs' Motion to Re-Certify* and denied this *Motion*. Specifically, the Court found as follows:

> The motion encompasses two issues: (1) re-certification of the property class and; (2) supplementing expert reports because of decertification. As to the first issue, the Court FINDS that the class was properly decertified pursuant to the order decertifying the property class on November 3, 2011 (dkt. no.2704) and that this motion encompasses the same issue that was previously ruled upon by Judge Spaulding. As to the second issue, the Court FINDS that discovery has ended and this case will go forward on the evidence as it currently exists. The Court will not entertain new evidence.

Order Confirming December 9, 2011 Hearing Dec. 20, 2011 ¶ 2 (dkt. no. 2857).

In response to this ruling, the Plaintiffs withdrew the *Motion to Hold "Notice of Appeal" in Abeyance* and asked the West Virginia Supreme Court of Appeals for a stay of execution. *Plaintiffs' Motion and Application for Stay of the Execution of the Circuit Court's November 3, 2011 Order Decertifying the Former Property Class, Nunc Pro Tunc, Pending Appeal* Dec. 27, 2011. (dkt. no. 2878). Sometime after settlement, the Plaintiffs dropped their appeal.

The next issue to come out of the decertification was collateral estoppel.

> Collateral estoppel or issue preclusion is a jurisprudential rule that arises in a subsequent proceeding when an issue of ultimate fact has been determined by a valid and final determination in a prior proceeding. The terms generally refer to the effect of a prior judgment in preventing, foreclosing, limiting, or precluding relitigation of issues that have been actually litigated in a previous action, regardless of whether it was based on the same cause of action as a second suit. Collateral estoppel recognizes that a determination of facts litigated between two parties in a proceeding is binding on those parties in all future proceedings and provides

> that once a party has fought out a matter in litigation with the other party, he or she cannot later renew that duel. In other words, collateral estoppel or issue preclusion prevents relitigation of an issue between the same parties or their privies in any future lawsuit based on a different claim.

47 Am. Jur. 2d Judgments § 487 (2012).

According to the West Virginia Supreme Court of Appeals,

> Collateral estoppel will bar a claim if four conditions are met: (1) The issue previously decided is identical to the one presented in the action in question; (2) there is a final adjudication on the merits of the prior action; (3) the party against whom the doctrine is invoked was a party or in privity with a party to a prior action; and (4) the party against whom the doctrine is raised had a full and fair opportunity to litigate the issue in the prior action.

Syl. Pt. 1, *State v. Miller,* 194 W.Va. 3, 459 S.E.2d 114 (1995).

The West Virginia Supreme Court of Appeals has also stated that:

> Collateral estoppel is designed to foreclose relitigation of issues of issues in a second suit which have been actually litigated in the earlier suit even though there may be a difference in the course of action between the practice of the first and second suit.

Syl. Pt. 2 *Conley v Spillers*, 171 W.Va. 584, 301 S.E.2d 216 (1983).

In several hearings the Court generally spoke about the effect a verdict in the Medical Monitoring case would have on the now decertified Property Class and the approximately 190 personal injury cases; specifically on the issue of liability. For instance, if liability is not found in the Medical Monitoring case, then the Plaintiffs may be collaterally estopped from presenting this evidence in the now decertified Property Class and/or the personal injury actions. While the Court did not make a specific ruling, the Court consistently reminded the parties that this issue was ever present.

It has been recognized that the offensive use of collateral estoppel is not precluded, but trial courts have broad discretion to determine when it should be applied. The Court notes that defense counsel raised the issue of collateral estoppel during the class certification hearing held on October 29, 2007, as a means to litigate this case for a binding resolution without certifying a class. (Class Cert. Hr'g Tr. 39-40, Oct.29, 2007.)

Therefore, at the first hearing held by the undersigned in this matter, this Court raised the issue on several occasions. (Hr'g Tr. 43, 54-55, Sept. 6, 2011.) This was a large part of the Court's encouragement to the parties to globally mediate all cases arising from 2,3,7,8. TCDD, including the pending personal injury claims. These concerns were reiterated during the hearings held on December 9, 2011 (Hr'g Tr. 10: 24, 11:1-12, 18: 9-15) and December 13, 2011. (Hr'g Tr. 138:14-24, 139: 1-15.)

Therefore, both parties were keenly aware of the potential effect of collateral estoppel.

W. Jury Selection and the Proposed Settlement

On January 3, 2012, the Court began the *voir dire* process.[63] During the *voir dire* process, questions were posed to the jury pool regarding both medical monitoring and property

[63] The Court notes that during jury selection, Class Counsel filed *Plaintiffs' Motion in Limine to Preclude Defendants', During Opening Arguments, from Identifying Specific Alternative Sources of the Dioxins/Furans in the Class Area* (dkt. no. 2902) on January 4, 2012, the Defendants filed *Defendants' Response to Plaintiffs' Motion in Limine to Preclude Defendants', During Opening Arguments, from Identifying Specific Alternative Sources of the Dioxins/Furans in the Class Area* (dkt. no. 2908) on January 6, 2012, and *Class Counsel filed Plaintiffs' Reply to Defendants' Response to Plaintiffs' Motion in Limine to Preclude Defendants', During Opening Arguments, from Identifying Specific Alternative Sources of the Dioxins/Furans in the Class Area* (dkt. no. 2935)on January 13, 2012. Class Counsel's pleadings essentially argued that the Defendants should not mention alternative sources of dioxin/furans in opening statements because they had not produced any expert witness or other evidentiary support. The Defendants argued that Class Counsel's motion was untimely filed and lacked substantive merit due to their experts' testimony and reports, as well as two U.S. EPA reports. The Court was prepared to enter its Order on these pleadings when it was notified that a settlement had been reached.

The Court also had pending the issue of whether 404(b) evidence would be admissible during the trial. Class Counsel had filed *Plaintiffs' Motion in Limine to Include Certain Documents and Evidence of Monsanto Company's "Other Acts"* on November 18, 2011 (dkt. no. 2755), the Defendants filed *Defendants' Objection and Response to*

issues. The Court sustained several objections by the Defendants because the property claims were irrelevant as they were not triable issues to the jury. These rulings were an impetus for the Plaintiff's filing of a Writ of Prohibition with the West Virginia Supreme Court of Appeals on January 17, 2012, as discussed, *infra*. Towards the end of this process, on January 17, 2012, the proponents informed the Court that they had worked out a tentative global settlement. As indicated, this settlement was not finalized and several crucial details remained outstanding. Therefore, it was very possible that the parties would not agree and a trial could be necessary. The parties argued that the announcement of a settlement would negatively affect the jury.[64] Therefore, the parties asked the Court to continue with *voir dire* and at the conclusion of *voir dire*, continue the proceedings.

After a thorough review of the law, which is discussed below, the Court found that it had the authority to grant such a request. Consequently, the Court continued the *voir dire* process and continued the trial until a later time. *Order Adjourning Trial Proceedings* Jan. 25, 2012. (dkt. no. 2961).

Plaintiffs' Motion in Limine to Include Certain Documents and Evidence of Monsanto Company's "Other Acts" on November 28, 2011 (dkt. no. 2771), Class Counsel filed *Plaintiffs' Reply to the Defendants' Objection and Evidence of Monsanto Company's " Other Acts"* on December 2, 2011 (dkt. no. 2793, Class Counsel also filed *Plaintiffs' Supplemental Submission in Support of Portions of "Plaintiffs' Motion in Limine to Include Certain Documents and Evidence of Monsanto Company's "Other Acts" that Pertain to Documents that Refer to "Aroclor" and/or PCBs* on December 20, 2011 (dkt. no. 2849), and on December 27, 2011, the Defendants filed *Defendants' Response to Class Counsel's Supplemental Submission in Support of Proposed Evidence and Argument Concerning Aroclor and/or PCBS* (dkt. no. 2880). These pleadings essentially raised the issue of Monsanto's production and waste disposal practices of Aroclor, a polychlorinated biphenyl ("PCB") and it's alleged similarity to 2,4,5-T, it's potential health hazards, and Monsanto's notice of these hazards. The Defendants generally argued that Aroclor does not involve 2,4,5-T because they are two distinct chemicals, PCBs were never manufactured at the Nitro facility, and the Plaintiffs did not have any expert to testify as to PCB waste disposal practices. Therefore, allowing "other acts" to be admissible would be highly prejudicial under Rule 404(b) of the West Virginia Rules of Evidence.

[64] Another concern raised by the Defendants was that the announcement of a proposed settlement without more information could negatively impact Monsanto's stock price. The Defendant's concern was realized when the Court announced that there was a proposed settlement without further information. Monsanto's stock fell from $79.75 to $77.78. For a corporation of Monsanto's size, which has millions of shares, this loss was substantial. While this was a concern, it was not the reason for the Court's actions.

On February 19, 2012, the parties submitted a proposed settlement and *Motion for Preliminary Approval* to the Court. On February 23, 2012, the Court held a hearing and generally stated that the proposed settlement had "some merit." Trial Tr. 2035:24, Feb. 23, 2012. (dkt. no. 3029). However, the Court also stated that it had several reservations about the proposed settlement. *Id.* The Settlements are discussed in further detail in section V of this Order, *infra*.

X. Notice of Attorney's Lien Against Mr. Urban

On January 27, 2012, the estate of James Harvey Falk, Jr., by counsel, Joanna I. Tabit, Esq., of Steptoe & Johnson PLLC, filed an attorney's lien against Mr. Urban.[65] *Notice of Attorney's Lien* Jan. 27, 2012. (dkt. no. 2967).

Y. Discovery and Relaxing of the Gag Order

At the end of the February 23, 2012, hearing Mr. Urban raised the issue of discovery and the possibility of lifting the gag order. Trial Tr. 2044-2052 Feb. 23, 2012. (dkt. no. 3029). The next day, on February 24, 2012, Mr. Urban filed a *Motion to Permit Discovery Regarding Fairness and Adequacy of the Proposed Class Settlement* Feb. 24, 2012. (dkt. no. 3018). During the February 24, 2012, hearing, the Court acknowledged Mr. Urban's requests and set a briefing schedule for both issues. *Order Confirming Hearing from February 28, 2012* March 1, 2012. (dkt. no. 3031). The Court further recognized that these issues might contain confidential mediation information and therefore, the Court ordered all briefing to be filed under seal. *Id.*

Pursuant to the Court's order, on March 5, 2012, Mr. Urban filed a *Motion to Lift "Gag Order" to Allow Discussion of Settlement with all Interested Persons* (dkt. no. 3034) and a *Supplemental Motion to Permit Discovery Regarding the Fairness, Reasonableness, and*

[65] The Court will deal with the issue of attorneys' liens in the accompanying order on attorneys' fees.

Adequacy of the Proposed Class Settlement. (dkt. no. 3036). In the *Motion to Permit Discovery*, Mr. Urban listed the exact interrogatories and documents sought for discovery.

After full briefing on the issue, the Court granted limited discovery. *Order Granting Limited Discovery as to the Fairness, Adequacy, and Reasonableness of the Proposed Settlement* March 20, 2012. (dkt. no. 3061). The Court did not grant all of Mr. Urban's requested discovery. However, it did allow a majority of his requested interrogatories and requests for documents. Ultimately, the Court granted limited discovery because it needed the information to make a proper determination. *Id.* at 2.

On May 7, 2012, the Defendants submitted their answers to discovery. *Defendants' Answer to Limited Objectors Discovery Permitted by the Court* May 7, 2012. (dkt. no. 3082). On May 9, 2012, the Plaintiffs submitted their answers to discovery. *Plaintiffs' Answer to Limited Discovery as to the Fairness, Adequacy, and Reasonableness of the Proposed Settlement* May 9, 2012. (dkt. no. 3084). On June 14, 2012, the Plaintiffs also submitted a supplemental answer, which was entered on June 18, 2012. *Class Counsel's Supplemental Answer to Limited Discovery as to the Fairness, Adequacy and Reasonableness of the Proposed Settlement* June 18, 2012. (dkt. no. 3165). Both parties substantially complied with the ordered discovery.

As to the gag order, the Court preliminarily notes that it did lift the gag order for a limited purpose. *Order Relaxing Gag Order For Purposes of Parties Joint Press Release* Feb. 24, 2012. (dkt. no. 3020). The parties had requested that they be allowed to disseminate a press release that generally discussed the terms of the settlement. After thoroughly reviewing the press release, the Court allowed the parties' request. *Id.* However, the Court stated that "[i]n all other respects the gag order in this matter remains in full force and effect until modified or terminated by Order of this Court." *Id.* ¶ 2.

As stated *supra*, Mr. Urban sought to have the gag order lifted to allow discussion of the proposed settlement with any and all interested parties. After full briefing, the Court partially granted Mr. Urban's request. *Order Granting in Part Motion to Lift "Gag Order" to Allow Discussions of Class Action Settlements with all Interested Persons* March 28, 2012. (dkt. no. 3069). The original reason for the gag order was to prevent contamination of the jury pool. *Id.* As there was a proposed settlement before the Court, a jury was not necessary. Consequently, with two exceptions, the Court lifted the gag order.

The first exception was that no one could discuss anything that occurred during the confidential mediations. *Id.* at 15-16. The Court found that any disclosure of this information would violate Trial Court Rule 25.12, which states that confidential mediations are to remain confidential. *Id.* Second, "any statements made must not be false or misleading." *Id.* at 15 (citations omitted).

Z. Transfer of Personal Injury Cases

For the sake of judicial economy, on February 29, 2012, the Honorable Phillip M. Stowers, Chief Judge of the Twenty Ninth Judicial Circuit, and the Honorable James O. Holliday, Senior Status Judge appointed to the Twenty-Ninth Judicial Circuit, asked that the approximately 190 Monsanto personal injury cases be transferred to this Court. On March 2, 2012, the West Virginia Supreme Court of Appeals granted this request and transferred all of these cases to this Court.

AA. Motion for Incentive Payments

On June 4, 2012, Class Counsel submitted a *Motion* asking that the Class Representatives be awarded incentive payments. *Motion for Incentive Payments for Named Class Representatives*

June 4, 2012. (dkt. no. 3120). Specifically, Class Counsel asked for incentive payments for Zina G. Bibb, Vickie L. Bailey, Herbert W. Dixon, Norma J. Dixon, Donald R. Rhodes, Wanda M. Rhodes, Charles S. Tyson, and Betty J. Tyson. In making this *Motion*, Class Counsel stated that since they were appointed as Class Representatives, these individuals "have dutifully represented the Class." *Id.* at 1. Specifically, Class Counsel stated,

> Here the *Bibb* Class Representatives played an important and active role in this litigation including participating in discovery and depositions. Additionally, the [Class Representatives] were routinely involved in various meetings with Class Counsel, maintained consistent contact with Class Counsel regarding the status and progress of the case, and attended and participated in the various mediations sessions; in short, the [Class Representatives] made themselves available to Counsel whenever they were needed. The [Class Representatives'] overall contributions to the Class represented the basis upon which Class Counsel requests approval of this inventive award.

Id. at 3.

Class Counsel stated that the proposed incentive payments would come from Class Counsel's attorneys' fees. *Id.* at 3-4. Class Counsel sought $25,000 for each Class Representative totaling $200,000.[66] *Id.* at 4.

BB. Final Fairness Hearing

On June 18, 2012, the Court held a fairness hearing. Stuart Calwell, Jr., Esq., Class Counsel, was present with David Carriger, Esq., John Skaggs, Esq., Alex McLaughlin, Esq., Benjamin D. Adams, Esq., and Dante DiTrapano, legal assistant. Monsanto was present by Scott Partridge, Esq., and represented by Charles M. Love, III, Esq., Thomas Goutman, Esq., Leonard Knee, Esq., Fazal Shere, Esq., and Michael Pleska, Esq. Objectors' counsel was also present by

[66] The Court will deal with the issue of incentive payments in the accompanying order on attorneys' fees.

Thomas F. Urban, II, Esq., and Ruth McQuade, Esq.[67] Also at the hearing were several individuals including: Betty J. Murad, Gloria M. Hughes, Robert A. McClanahan, Randy McDaniel, Lee Roy Muck, James Gibson, Rebecca Armstrong, Fran Kesler, Rose Carol Brant, and Lisa Hatfield.

Before or during the hearing, the proponents introduced several affidavits including: (1) affidavits from Class Representatives supporting the proposed settlement; (2) a letter from the West Virginia Attorney General's Office to Mr. Partridge; (3) affidavits from Class Counsel's experts Bruce Bell, Robert J. Carr, and Charles L. Werntz who opined as to the fairness and adequacy of the proposed settlement. (Exhibit List from Fairness Hearing June 19, 2012.) (dkt. no. 3169). Also during the hearing, the proponents stated that they would only be putting on evidence as to the administration of the proposed settlement as the other issues had been fully briefed. Fairness Hr'g Tr. 23-25 June 18, 2012. (dkt. no. 3180). Consequently, the proponents only called the Class Administrator, Thomas Flaherty, Esq.

Mr. Flaherty testified as to the procedures for administrating the proposed settlement.[68] Furthermore, Mr. Flaherty also testified that based upon his knowledge, he thought that the settlement was fair, adequate, and reasonable. (Fairness Hr'g Tr. 36:7-11 June 18, 2012.) (dkt. no. 3180). Mr. Flaherty's knowledge of the case came from his role as mediator. *See Order Granting Limited Discovery to Objectors and Granting a Limited Protective Order* July 24, 2012 at 2. (dkt. no. 3232). Mr. Flaherty was cross examined by Mr. Urban.

At the conclusion of the proponents' testimony, the objectors presented their case. The objectors represented by counsel did not call any witness to testify. The objectors' counsel went

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[67] Also present with Ms. McQuade was Edward Cochran, Esq., and John Pentz, Esq., who had moved for *pro hac vice* admission. These attorneys later withdrew their applications for admission *pro hac vice*.

[68] *See*, section IX, *infra*.

first – Mr. Urban and Ms. McQuade – followed by two *pro se* objectors – Fran Kesler and Rose Brant. Mr. Urban essentially presented the same arguments that he filed in his pleadings. (Fairness Hr'g Tr. 128:2-203:10 June 18, 2012). Ms. McQuade then presented her argument on inadequate notice regarding service awards, lack of benefits to Class Members, and sub-classes as submitted in her pleadings. (*Id.* at 208:2-211:2). Next, Fran Kesler spoke regarding the health issues that she and her children have endured/developed and how she feels that the Settlement is inadequate. (*Id.* at 213:6-219:12). The last Objector to speak was Rose Brant who spoke about her husband's death from chronic lung disease and his exposure to chemicals during his years as truck driver. (*Id.* at 219:16-221:7).

CC. Third Enforcement of the Gag Order

On June 19, 2012, the day after the fairness hearing, the *Charleston Gazette* published an article in which Mr. Calwell was quoted as saying that Mr. Urban's "objections are a ploy to get money, and that [Mr.] Urban had written Monsanto attorneys an email stating that 'if they paid him $2 million, he wouldn't object to the settlement.'" Kate White, *Lawyer Asks Judge To Toss Monsanto Settlement*, Charleston Gazette, June 19, 2012, at 1A. The article also stated that "Monsanto lawyer Charlie Love confirmed the email from [Mr.] Urban." *Id.* Furthermore, the article stated,

> [Mr.] Urban said Monsanto attorneys had asked him, after rejecting several of his suggestions, what it would take to make him satisfied with the settlement. He said he regretted sending the email, but only meant to help his clients.
>
> "My co-counsel and I felt at the time if we could get something for our clients we could go on with life," [Mr.] Urban told the Gazette,
>
> "They said, 'we won't negotiate terms for the whole class for you, but we'll give your clients something separate.' I didn't want to do

> that necessarily, but I have an obligation to my clients," [Mr.] Urban said. "Luckily, Monsanto rejected the deal . . . at that point I said 'this settlement is so bad I need to challenge it.'"

Id.

On June 25, 2012, Mr. Urban filed a *Motion for Issuance of a Rule to Show Cause Why Stuart Calwell and Charles Love Should not be Held in Contempt for Violating the Court's March 27, 2012 Order*. (dkt. no. 3175). In this *Motion*, Mr. Urban basically averred that Mr. Calwell and Mr. Love violated the March 27, 2012, Court Order because they discussed private settlement negotiations and/or they made false or misleading statements. The Court found that a show cause hearing was not necessary and granted Mr. Urban the ability to release any and all emails concerning whether a $2 million dollar demand was made. *Order Denying Motion for Issuance of a Rule to Show Cause Why Stuart Calwell and Charles Love Should not be Held in Contempt for Violating the Court's March 27, 2012 Order* July 10, 2012 (dkt. no. 3214).

DD. Second Discovery, Mr. Flaherty's testimony, and Limited Protective Order

During the fairness hearing, Mr. Urban requested discovery from both Mr. Flaherty and Class Counsel. On June 25, 2012, Mr. Urban served his *Discovery to Class Administrator Thomas V. Flaherty* and *Discovery to Class Counsel Stuart Calwell*. (dkt. no. 3179). As to Mr. Flaherty, Mr. Urban stated that when he opined as to the fairness and adequacy of the proposed settlement he "opened the door" to discovery concerning mediation. The Court disagreed and granted a protective order in regards to discovery into confidential mediation. *Order Granting Limited Discovery to Objectors and Granting a Limited Protective Order* July 24, 2012 at 6. (dkt. no. 3232). Furthermore, "[t]o prevent any unfairness to Objectors," the Court struck Mr.

Flaherty's testimony as to the fairness and adequacy of the proposed settlement. *Id.* at 6-7. As to Mr. Calwell, Mr. Urban asked for the production of any documents reviewed by Dr. Bell and Mr. Carr in regards to their affidavits. The Court granted this discovery.[69] *Id.* at 7.

III. The Situation on January 17, 2012

On the morning of January 17, 2012, several important issues were pending before the West Virginia Supreme Court of Appeals and the trial court. In the first place, there were two issues pending at the West Virginia Supreme Court of Appeals. These were Class Counsel's appeal of the decertification of the property class and a Petition for Writ of Prohibition.

At the Circuit Court level, the Court still had pending the *Plaintiffs' Motion in Limine to Preclude Defendants', During Opening Arguments, from Identifying Specific Alternative Sources of the Dioxins/Furans in the Class Area Motion to Exclude Other Sources of Dioxin During Opening Statements* (dkt. no. 2902) and ruling on whether and how much 404(b) evidence would be admissible, particularly on the issue of whether other act evidence would be admitted regarding Monsanto's operations in Anniston, Alabama. Lastly, there was still the pending motion to hold Mr. Calwell in contempt for violation of the gag orders. Rudolph DiTrapino, Esq., was retained by Class Counsel to represent him on this issue.

Key among these matters was the Petition for Writ of Prohibition filed at the West Virginia Supreme Court of Appeals. This action was based upon the Court's serious question about the effect of a liability verdict on other potential actions, including the decertified property

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[69] Mr. Humphries filed a *Motion to Withdraw as Counsel of Record* on October 3, 2012. Mr. Humphries argued that he and Mr. Calwell entered into an agreement to "investigate and, if appropriate, prosecute a civil action against the Monsanto Corporation and other relevant entities for pollution believed by Messer's Humphries and Calwell to have been deposited in the air, soil, water, and buildings near the Monsanto facility in Nitro, West Virginia." He sought relief from the Court because he had "performed his duties and met his obligations under the terms of the agreement with Mr. Calwell." (dkt. no. 3270). The Court addresses his motion in section X, *infra*.

claims and the roughly 190 personal injury actions arising from the Defendants production of 2, 4, 5-T and the resulting creation of 2, 3, 7, 8-TCDD in the process, based upon collateral estoppel. This Court never ruled that collateral estoppel would apply, but repeatedly raised that issue with the parties. Moreover, at the request of Plaintiff's counsel, the Court ordered that this action would be tried on all liability theories asserted in the Complaint, including trespass. (Hr'g. Tr. 59-67 Dec. 9, 2011; Hr'g Tr. 168-173 Dec. 13, 2011.)

IV. A Review of the Critical Evidence and Developments of this Case Up to the Time of Settlement

A. Preface

The Court has reviewed numerous decisions from across the country on the issue of whether the settlement of a class action is fair, adequate, and reasonable, as well as many appellate opinions reviewing those findings. The underlying facts of these cases were not set out in detail. This Court is mindful of the law that the approval of class action settlements is not a trial on the merits. However, in this action, the Court believes that a more in-depth review of the underlying facts is necessary to assess the fairness, adequacy and reasonableness of the settlement, *infra*. Further it is also important that the parties, counsel, any reviewing court, the public, and most importantly, the class members, have a better understanding of the actual state of the case at the time of settlement and the impact that this had on the Court's decision. To these ends, this review will outline the evolution of this case from the time that it was filed to the date of settlement.

This Court has endeavored to review as much of the expert testimony for both sides as it could find. In several instances, the record does not contain every item concerning an expert,

i.e. missing depositions, attachments, etc. There is minimal material available for some experts whose involvement appears to be relatively minor. However, the Court is well satisfied that it has personally reviewed the key documents relative to the major experts presented by the parties in sufficient depth to make an informed decision.

This section will begin with an in depth review of the background work that was completed on this matter by Randy Horsak, P.E., and others, and how it related to some early actions by the Plaintiffs which produced important responses from several governmental entities. It will then discuss how the potential class area changed as the Plaintiffs gathered and refined their evidence. Thereafter, upon certification, as the case focused on development of the evidence, this review will discuss additional major changes in the Plaintiff's case which further crystalized their potential to obtain the relief that they sought for medical monitoring and property remediation. It will then examine the opposing evidence developed by the Defendants on each aspect of the case. Each expert's opinions are briefly summarized in the body of this order.

B. The Work of Randy Horsak, P.E. – and The Nitro Schools Report

As can best be determined from the record available to the Court, the samples referenced in the Complaint, *supra* at II. A., were taken by 3TM Consulting, LLC in 2004 and 2005. (Brown Aff.) (dkt. no. 928); Review Letter of Randy Horsak, P.E.,[70] filed as Ex. A to *Supplemental Memorandum of the Urban & Falk Plaintiffs in Opposition/Objection to*

[70] The Court cannot find a C. V. to provide Mr. Horsak's education, training, and experience, but notes that he states that he is a Professional Engineer and that he was originally retained by the Plaintiffs to do expert work in this matter.

Proponent's Proposed Settlement of the Property and Medical Monitoring Classes' Claims (dkt. no. 3133); *Health Consultation: Dioxin in Dust in Schools and Community Center – Nitro School Dioxin Site – Nitro, Kanawha County,* West *Virginia – April 18, 2007* (dkt. no. 950). Mr. Horsak was then and is now a principal in 3TM. Over this period, Mr. Horsak and 3TM took 70 surface samples from 35 locations and 33 indoor dust samples from the attics of residents. All of these samples were tested for dioxin/furans by GC/MS[71] by Axys Analytical Services of Sydney, British Columbia, Canada.[72] These samples were all apparently taken from South of the old Monsanto plant site to a maximum distance of 3.75 miles (Horsak Review Letter at 3-4, Brown Aff. Figures 4 and 5). All of these locations were within the proposed Class Area. Mr. Horsak reported in his *"Letter"* that both the soil and indoor dust samples indicated widespread dioxin contamination throughout Nitro. He concluded that the need for remediation of the surface soils and indoor dust "necessitates further study." *Id.* at 3-4.

Thereafter, in May 2005, 3TM performed additional testing at Nitro Elementary School, Nitro High School, and the Nitro Community Center to detect the presence of any dioxin/furans contamination in and around these locations, specifically in the surface soils and indoor dust. The reason for this work is outlined, *infra.* 44 soil samples and 26 indoor dust samples were taken from these locations. Mr. Horsak's letter indicates that 17 of the 20 soil samples collected at Nitro Elementary School and Nitro High School had elevated concentrations of dioxins/furans. In some instances, the levels of Dioxins/Furans reported by the laboratory exceeded the State of

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[71] High resolution gas chromatography/isotope dilution high resolution mass spectrometry or "GC/MS" is a method of measuring 17 specific dioxin/furan congeners. 2,3,7,8-TCDD is one of these 17 specific congeners. GC/MS can detect a specific test that positively identifies the actual presence of a particular substance in a given sample. http://en.wikipedia.org/wiki/GC%2FMS (last visited January 3, 2013). There are other forms of GC/MS known as "HRGC" or high resolution gas chromatography and "IDHRMS" isotope-dilution high resolution mass spectrometry. *See also,* note 109.

[72] This information was obtained from Dr. Sawyer's report of 2/15/10. *See* IV. E. 6, *infra.*

West Virginia Tier/level of 3.9 ppt[73] for residential soils.[74] No elevated levels were detected at the Nitro Community Center at the areas where samples were collected and tested. Mr. Horsak's letter notes that 3TM collected 10 indoor dust samples from Nitro High School, Nitro Elementary School and the Nitro Community Center. These samples indicated elevated concentrations of dioxins/furans at all the locations tested. *Id.* at 5. [75] The letter does not address the location or results of testing of the other 16 samples referred to by Mr. Horsak.

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[73] *See* West Virginia Code of State Regulations §60-3-1 et seq. (2002). *See also*, W.Va. CSR 2.12 which defines *de minimis risks* as "[t]hose risks that are so trivial that they would not require remediation under this rule." "[a] *De Minimis* Risk-Based Standard is one in which contaminant levels pose no significant risk to human health based on any current or reasonably anticipated future land and water level use as provided in subsection 9.2 of this rule. If these levels are below natural background, background levels will be considered the *De Minimis* levels. W.Va. CSR 9.1.a.1. Furthermore, the *De Minimis* Standard establishes contaminant levels that do not present a significant risk to human health. If on the basis of the site assessment, these standards are found to be met, no remedial action or further characterization is required and the site is eligible for issuance of a Certificate of Completion by the Secretary or by a Licensed Remediation Specialist as provided by this rule. If at any time during characterization or remedial action the site is shown to meet the *De Minimis* standard, no further action is required and the site is eligible for issuance of the Certificate of Completion. W.Va. CSR 9.2 The *De Minimis* Standards for both surface (<2ft depth) and subsurface (>2ft depth) soils shall be the highest numerical value of sections 9.2.a.1 or 9.2.a.2., and must not exceed 9.2a.3 unless it is shown to the satisfaction of the Secretary that migration of soil contaminants to groundwater will not result in an exceedance of *De Minimis* Groundwater Standards. W.Va. CSR 9.2.a. *De Minimis* Soil Standards for the migration of each constituent from soil to groundwater presented can be found in Table 60-3B which show the *De Minimis* amounts for each specific contaminant.

TCDD for residential soil is 3.9, meaning there are 3.9 parts of TCDD per trillion parts of soil. Additionally, 3.9 ppt=3.9 ng/g=3.9 pg/g. *See* note 141, *infra* for an explanation of these measurements. 3.9 or less is not a clean-up level but essentially a background level. This number is based on a risk-based concentration that corresponds to a specific incremental cancer risk level of 1×10^{-6} for residential land use. A background level is defined as '[a]mbient concentrations of chemicals that are present in the environment and have not been influenced by humans (e.g., iron, manganese). W.Va. CSR 2.35. This definition means, in lay terms, the concentrations of elements that occur naturally in the earth, without any human interference. If De Minimis levels are below the natural background concentrations, the natural background concentrations will be used as the De Minimis standard. The risk assessment protocol is set out in § 60-3-8, which establishes a risk protocol for conduct of human health and ecological risk assessments. It describes general requirements for risk assessments and specific requirements for baseline human health and ecological risk assessments, residual risk assessments, and application of probabilistic risk assessment methods.

Under the federal standards, TCDD is defined as a toxic pollutant under 40 CFR § 401.15. The amount of reportable TCDD is 4.5 ppt under 40 CFR §302.4.

[74] *See* Horsak's Review Letter attached as Ex. A to Mr. Urban's *Supplemental Memorandum of the Urban & Falk Plaintiffs in Opposition/Objection to Proponents' Proposed Settlement of the Property and Medical Monitoring Classes's Claim.* (dkt. no. 3133).

[75] Apparently, these samples were also tested by GC/MS.

3TM contracted with V. Duane Pierce of AQMES, LLC of Houston, Texas to perform air dispersion modeling in order to simulate the nature and extent of surface soil and indoor dust contamination from the Nitro Plant vis-à-vis the airborne pathway. According to Mr. Horsak, Dr. Pierce used the local wind rose (which the Court assumes to be Nitro), and topographic features of the Nitro area. There is very limited information as to the other data inputted to the model, which was performed using SCREEN3.[76] The report of this modeling indicated that all of the stacks/vents (of the Nitro plant) had maximum impacts within 1100 meters (0.7 /miles) and that, using a simple terrain model with 20 stacks/vents, all had some impact out to 50,000 meters (31 miles). Using a complex terrain model with 3 stack/vents and 6 elevation profiles all had some input out to 8,000 meters (5 miles). He opined that the detection and measurement of dioxins/furans in surface soils and household dust was consistent with the air dispersion modeling.[77]

At some point, armed with this information, Class Counsel approached the Kanawha County Board of Education about his concerns for the potential contamination of Nitro's schools. This warning apparently caused the 3TM testing of the schools and community center, mentioned *supra*. The West Virginia Department of Health and Human Resources (WVDHHR), under a cooperating agreement with the United States Department of Health and Human Services Agency for Toxic Substance and Disease Registry (ATSDR), performed a Health Consultation of Dioxin Dust in the Nitro Schools and Community Center, *supra*. Their four step process

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[76] SCREEN 3 is the screening version of ISC 3 "Industrial Source Complex." The EPA replaced ISC3 with AERMOD on 12/9/06. Fed. Reg., Vol 70, No. 216 Wednesday, Nov. 9, 2005 Rules & Regulations 68225. AERMOD is explained in note 91, *infra*. The SCREEN air model is further discussed in Auberle and Arrington, *infra*, sections IV.E.3.a; IV.F.1.a.

[77] Although it is not specifically referenced, this air modeling could account for the original five mile radius pled in the Plaintiff's Class Action Complaint, *supra*, as the proposed Class Area.

consisted of "Evaluating exposure," "Evaluating health effects", Developing Recommendations" and "Soliciting community input." At the conclusion of this study, the WVDHHR reported that:

> Evaluation of the site-specific exposures and potential human health effects indicate that incidental ingestion of indoor dust poses no apparent public health hazard. No adverse non-carcinogenic health effects are likely and the excess cancer risk is less than 1 in 10,000, which is considered a very low risk. Dioxin in outdoor soils poses no apparent public health hazard to people who are in the three facilities on a daily basis, because the amounts detected in soil are well below levels where exposure might cause adverse health effects should daily exposure occur.

Id. at 1-2.

It also stated that:

> WVDHHR assessed the public health implications of dioxin in indoor dust solely based on the available indoor dust data. The estimated exposure doses were calculated as if the children at school were frequently exposed to the dust in seldom accessed or inaccessible areas. WVDHHR believes the actual human exposure threat and consequent health hazard at this site is less than the exposure dose estimates for the following reasons:
>
> - A paper published in 1996 reported significantly higher amounts of dioxin in an attic compared to apartment living area (citation omitted).
>
> - Indoor dust sampling locations are in areas where people would not likely contact the dust.
>
> - The areas sampled had accumulated dust over a long period of time and the sources of the dioxin are unknown. The amount of dioxin in the environment has been significantly reduced in recent years as a result of reductions in the number of chemical plants in the area and the employment of more stringent environmental controls. About one-third of interior dust comes from outdoor soil. The outdoor soil near these facilities contained much less dioxin than found in the dust sampled. Therefore, indoor dust on frequently cleaned and contacted surfaces (e.g. top of desks, chairs, and floors) should contain less dioxin than sampled dust.

- The dust sampling methods were not approved by EPA or WVDEP and analytical quality control data was not provided to WVDHHR.

Id. at 17-18.

The report further found in reviewing the data from the samples originally obtained by 3TM, that 2, 3, 7, 8 TCDD was at a much lower concentration than were hepta – and octa - dioxin congeners. It also noted that "the conclusions of this report must be evaluated based on the fact that dust sampling methods used were not approved by the WVDEP or EPA" . . . and "no quality control data for the dust samples were included in the data package." *Id.* at 7.

Nine indoor dust samples were selected on places where dust was likely to accumulate, and not from areas where children or staff were likely to come into contact with the dust. These samples were collected by 3TM on May 14 and May 15, 2006. Soil samples were also collected by 3TM on May 16 and 17, 2006. The soil samples contained much less TCDD TEQs than the indoor dust. After reviewing these results, the ATSDR performed further evaluation of exposure to dioxin in indoor dust, but found that adverse health effects were unlikely from direct contact with the soil, and further evaluation was not necessary. The ATSDR did further analysis of the potential risk from indoor dust, and concluded that adverse health effects were not likely to children or adults exposed to dioxin in dust in the Nitro Elementary School, Nitro High School, or Nitro Community Center. It concluded that "no recommendations are needed to avoid potential health effects from exposure to dioxin at this site based on the information available." *Id.* at 14.

At the outset of this effort, the WVDHHR coordinated a meeting with representatives of the Kanawha Valley Board of Education, the West Virginia Department of Education, the ATSDR, and the US Environmental Protection Agency (USEPA) to determine if actions were

necessary to protect the health and safety of students and employees in these facilities. On August 30, 2005, Dawn A. Ioven, Toxicologist in the Office of Technical Support, USEPA sent a memo to Marjorie Easton, OSC and Randy Sturgeon, RPM, which was cited in the ATSDR report as Reference 2. Ms. Ioven's memorandum referenced the fact that

> In May 2005, several interior dust samples were collected from the Community Center, the elementary school and the high school in Nitro, West Virginia. This task was conducted by a private contractor hired by a law firm representing some residents in the community. The analytical findings of this effort were then provided to the US EPA for evaluation. The request to formally evaluate this data was made by the School Board in Nitro, West Virginia on 4 August 2005.

USA EPA memo, dated August 30, 2005, Exhibit 9 to *Defendant's Answer to Limited Objection Discovery Permitted by the Court*. (dkt. no. 3174).

The EPA report examined these results, observing that the precise methods and location of sample collection were not known. The EPA was informed by the School Board that the dust samples were collected primarily from ceiling rafters. They stated that "from an exposure perspective, contaminated dust in areas of infrequent contact (such as ceiling rafters) pose much less of an exposure threat (and consequently, less risk) than projected in this memo." They also expressed concern about the manner in which the data was reported in a section entitled "Quality Assurance." They questioned the manner by which contamination concentrations were reported, stating that "[n]o explanation is given for why the data are reported in this manner, casting doubt on the validity of these findings."

The EPA examined the data obtained "in May 2005, (by) the contractor hired by attorneys representing plaintiffs in a lawsuit." The contractor "collected interior dust samples from the Community Center (four grab samples), the elementary school (one composite sample)

and the high school (four grab samples) in Nitro, West Virginia. Additionally, a single sample labeled "Filter Composite" from all three locations was analyzed for dioxin."

The EPA considered Receptors (people in each location) with the greatest potential for exposure, exposure routes, and exposure inputs. They also estimated potential cancer risk for each of the receptors considered in the memo. They determined that the risk of cancer for each receptor, such as day-care child, community center worker, high school student, teacher, and elementary school student, fell within the US EPA's generally acceptable risk range of 10^{-6} to 10^{-4}. The need for action is generally triggered when risks exceed 10^{-4}. The final conclusion was that "[u]nder the given conditions and assumptions, none of the scenarios evaluated in this assessment demonstrated an unacceptable risk from exposure to dioxin."[78]

In August, 2008, the WVDHHR issued a Community Fact Sheet entitled *Nitro Schools Dioxin Update*. (dkt. no. 3174). This document began with a statement in bold type: "The levels of dioxin found during the sampling conducted in 2005 at the Nitro Community Center, Nitro Elementary School, and Nitro High School do not pose a health problem for children, their families, and staff members." The update recited the history in a section entitled "Background." It reviewed the workup done to determine the results and stated that no new test results were submitted. It stated that the conclusions were the same.

At some point, for reasons unknown to the Court, 3TM, Mr. Horsak and Dr. Pierce were no longer offered as witnesses by Class Counsel. The only reference to them is found in Dr. Brown's affidavit, referenced above, and throughout the reports and depositions of various experts, as Mr. Horsak's original soil and indoor dust testing would continue to be used by other

[78] These reports apparently raised concerns from Class Counsel, which formed the basis for the original motion practice related to the gag orders cited in II. H.,*supra*.

Plaintiffs' experts throughout this litigation.[79] Additionally, photographs obtained by Mr. Horsak were included in the Arrington Report, *infra* at IV. F.1.a., and a windrose attached to 3TM was used by Auberle, *infra* at IV.D.n.90.

C. Other Important Information is Learned

Although not part of this action, other significant events were occurring which captured information that would be extremely critical to its development. These were 1) the publication of two articles describing the ongoing efforts of the National Center for Health Statistics at the Centers for Disease Control and Prevention (CDC) to obtain information about the levels of persistent organic pollutants in America, though the National Health and Nutrition Examination Survey (NHANES); and 2) the Kanawha Valley Endometriosis Survey and the Kanawha Valley Serum Levels of Dioxin and Dioxin-Like Compounds Survey conducted by a group of governmental and private agencies.

The NHANES survey years cited in these publications were for the years of 2000-2001, 2001-2002, and 2003-2004. During those years, blood samples were collected from approximately 1800 Americans aged 12 and over. The samples measured levels of 21 persistent organic pollutants (POP's) in the United States. This research was led by Donald Patterson (now a defense expert), *infra.*

The survey showed that levels of dioxin and furans have declined in the overall population. However, while levels of dioxin have decreased over time in the younger part of the population, they have held steady in older people. *Pollutants remain in American's blood despite*

[79] The Court notes that as part of his original work, Mr. Horsak also performed "chemical fingerprinting" of the surface soils and indoor dust samples, which indicated the Nitro plant as the source of the contamination. He also estimated the cost to remediate soils to the 3.9 ppt target to be $958,000,000 to $5,400,000,000, and the cost to remediate dust to the same level at $300,000,000. *See* Horsak Review Letter to Mr. Urban June 1, 2012.

bans, Environmental Science and Technology, February 15, 2009 Erika Engelhaupt. (dkt. no.950).

Dr. Patterson and others published a paper entitled *Levels in the U. S. Population of those Persistent Organic Pollutants (2003-2004) included in the Stockholm Convention or in other Long-Range Transboundary Air Pollution Agreements* in Environmental Science & Technology, Volume 43, 2009 (pp. 1211-1218). (dkt. no.950). At both the 90th and 95th percentiles total TEQ increased significantly with increasing age.[80]

The authors state that:

> By definition, POPs are highly persistent in the environment. They undergo trans-boundary migration via air and water, they bioaccumulate up the food chain, and have been shown to produce an array of toxic effects in animals. These include cancer, allergies, hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system (footnote omitted). The POPs of interest here are lipophilic compounds that tend to bioaccumulate in the fatty tissues of animals and humans. The general population is exposed principally through eating POP-contaminated fatty foods, dairy products, and fish.

Id. at 1211.

The paper states that blood concentrations of POPs integrate exposures from all pathways over time, and with the possible exception of dioxin patterns from various sources, and DDT, neither the route or time period of exposure is differentiated in the serum concentration. Further, because of advances in analytical methods, measurement of low levels of environmental chemicals is possible in humans, but that does not mean that the chemical causes disease. Separate studies of varying exposure levels are needed to determine those blood levels that result

[80] This represents the combined measurement of all POPs expressed as dioxin TEQ and includes other substances besides dioxin.

in disease. These studies must focus on other factors, such as the duration of the exposure. (footnote omitted).

Dr. Patterson described the 2003-2004 NHANES protocol as consisting of a home interview followed by a standardized physical examination in a mobile center. As part of the examination, blood was drawn, without regard to fasting status. It was shipped to the CDC, where serum concentrations of the substances, including PCDD's and PCDF's (dioxins and furans) was determined by GC/MS. The relative potency of the various POP's was calculated using the TEF for 2, 3, 7, 8 TCDD as the bench mark. These were multiplied by the congener concentration to give the total toxic equivalency (TEQ). *See* n.50. This was calculated using both the 1998 and updated 2005 TEF's.

Dr. Patterson and others also reported the NHANES data from 2001 – 2002 in an article published in Chemosphere, entitled *Total TEQ reference range (PCDD's, PCDF's, PCF's, mono-PCB's) for the U. S. population 2001 – 2002.* (dkt. no. 3174).[81] The authors stated that PCDD's and PCDF's are chemicals that are produced in several chemical processes such as the synthesis of 2, 4, 5 trichlorophenol. Trace levels of these compounds are also produced during the incineration of waste materials, combustion of leaded gasoline, and the bleaching of wood pulp. These compounds can enter the environment by a variety of means, and once there, they are remarkably stable and bioaccumulate in the human food chain. These compounds are generally found at the parts per trillion level in human lipid stores, particularly in an industrialized society. For that reason, fat tissue was the best choice to measure these levels. A means was developed to test blood serum in lieu of fat tissue which resulted in high participation

[81] Chemosphere is an international journal designed for the publication original commentaries as well as review articles. As a multidisciplinary journal, it offers a maximum dissemination of investigations related to all aspects of environmental science. It includes a section on POP's and dioxins.

rates in several large-scale epidemiological studies of potentially exposed populations. Dr. Patterson and the other authors used several data sets in an effort to develop a U. S. reference range for these compounds. The 2001 – 2002 NHANES survey used the same protocol as the 2003 – 2004 survey mentioned above. The blood samples were measured by HRGC (IDHRMS).[82] These results were presented in a series of tables. Significant among them is Table 8, which sets out the 95th % for total PCDD's by age breakdown between the ages of 20-39, 40-59, and 60+ by 90th and 95th percentile for both the 1998 and 2005 TEQ. This includes the PCDD dioxin congeners. The study showed that there were significant increases in TEQ levels with age for males, females, and non-Hispanic whites. As age increases, the percentage concentration for PCDD's TEQ levels increase while those of PCDF's decrease.

Table 8 showed a significant increase in the total TEQ and the various sub-factors of TEQ's with age at the 90th and the 95th percentiles for all combined race/ethnicity and sex. *Id.* at 5273.[83] The authors postulated that the increase in serum TEQ's with age is probably a result of the exposure decades ago when the environmental concentrations were higher and elimination of these chemicals is relatively slow. *Id.* at 5274-5275. They also noted that in all but the youngest age groups (12-19) females had higher TEQ's than males for all race/ethnicity groups. This was also true for the sub-factors, including PCDD's. Based on the finding made by others that the half-life of 2,3, 7, 8 TCDD is longer in females than in males, they opined that an exposure effect predominates for the younger population while the pharmacokinetic properties predominates in the older population. *Id.* at 5276-5277.

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[82] HRGC is a form of GC/MS testing. *See* note 71, *supra.*

[83] The triggering event provision built into the medical monitoring settlement is based on the Medical Monitoring participants having serum dioxin readings which exceed the results set out in this table.

At roughly the same time as this litigation moved forward, two studies were conducted by the USEPA, the WVDEP, the Marshall University Medical Center, EnviroSolutions Consulting, Inc., the CDC, and others. These studies were driven by the suspicion that there were health consequences resulting from Monsanto's production of 2, 4, 5-T with the resulting 2, 3, 7, 8-TCDD byproduct. The first compared the body burdens of dioxin and dioxin-like chemicals, expressed as lipid-corrected serum concentrations of these compounds in women who were long term residents of the Kanawha River Valley with suspected endometriosis confirmed by surgical observation and histological evaluation during laparoscopy with a control group of patients undergoing a laparoscopic procedure unrelated to endometriosis.[84] This group contained women aged 21 to 55. Serum samples were obtained from this group and were analyzed by high resolution gas chromatography/isotope-dilution high resolution mass spectrometry for dioxin and dioxin-like chemicals. Results were reported on a whole-weight and lipid-adjusted basis and as international toxicity equivalents (footnote omitted). Serum concentrations in the Kanawha River Valley cohort were compared to the general U. S. population based on data available from NHANES for 2003-2004. The result was that the Kanawha River Valley participants were comparable to the U. S. general population. Distributions and means of TEQ were found to be similar to or lower than a national representation of women aged 20-59 years old. Further, the results of a principal components analysis demonstrate that Kanawha River Valley participants with and without a diagnosis of endometriosis could not be distinguished on the basis of dioxin,

[84] *Cohort of Women Living in a Highly Industrialized Area of Kanawha River Valley in West Virginia: Endometriosis and Blood Levels of Dioxin and Dioxin-Like Chemicals.* (dkt. no. 950).

furan, and PCB congener profiles, indicating that endometriosis is not likely related to serum TEQ.[85]

The second study was conducted by the same group on the serum levels of dioxin and dioxin-like compounds.[86] Women who were patients at Marshall University, aged 25 to 46, and who were residents of the Kanawha River Valley had their blood serum drawn and tested by the same methods and compared to CDC NHANES data for 2001. The results showed that the body burdens of dioxin and dioxin-like compounds in this population in the years in question for the study (2005-2007) were lower than women of the same age in the 2001-2002 CDC national sampling.

Both studies postulated that living in areas associated with elevated environmental levels of dioxins is not correlated to elevated levels of serum concentrations of TEQ or in the body burden for this class of chemicals.

D. Class Certification: Modification of the Class Affected Area[87]

Concurrent with Mr. Horsak's testing and these developments, Class Counsel began to seek Class Certification of the property remediation and medical monitoring classes. *Plaintiff's Motion for Class Certification.* (dkt. no. 139). The Complaint asserted that the Class encompassed an area within a five mile radius of the old Plant.[88] This was repeated in the *Motion for Class Certification*, and may have been based on the Pierce air modeling *see infra,* at IV. B. However, subsequent to the filing of that motion Class Counsel chose another option.

[85] *See infra*, at IV.E.4. Wade, for a discussion of Principal Component Analysis.
[86] *Cohort Study of Women in West Virginia Serum Levels of Dioxin and Dioxin-Like Compounds.* (dkt. no. 950).
[87] By necessity, this section will deal with some aspects of the Plaintiff's expert testimony preliminarily to the more detailed summaries set out, *infra.*
[88] A map depicting this radius and prepared by the Defendants is attached hereto as Ex. 4.

The Plaintiff's case ceased to focus on the amount of 2, 3, 7, 8-TCDD lost in production, and shifted to the theory that it was spread by the burning of contaminated waste. Given the Plaintiff's theory that 2, 3, 7, 8 TCDD was spread by air, an air model was absolutely necessary to "get the molecule over the fence and into the body." (Hr'g Tr. 62:11-24 to 80: 1-17, Nov. 3, 2011.) This would require development of the evidence to obtain the many inputs necessary to create a credible air model.

The inputs included, but were not limited to: the amount of 2, 3, 7, 8 TCDD created and burned, the duration of and location where it was burned, the temperature at which it was burned, the method by which it was burned, the height of release of smoke/vapors from the burn site, the wind direction and speed, and terrain and weather data.

Chief among these items was the amount of 2, 3, 7, 8 TCDD created during the relevant time frame. This critical evidence was initially provided by Robert Pape, P.E.[89] Mr. Pape was a Senior Engineer for Carpenter Environmental Associates, Inc. In his report *Estimated Production and Loss of TCDD from 1948 to 1969 Monsanto Company, Nitro, West Virginia* from January 22, 2007 and attached to *Memorandum of Law in Support of Plaintiffs' Motion for Class Certification* Ex. 2 (dkt. no. 622), Mr. Pape stated that he performed a "standard engineering mass balance calculation around the 2, 4, 5, T process" to provide an estimate of the amount of 2, 3, 7, 8 TCDD produced, shipped, and lost to the environment. He created two process flow diagrams showing how 2, 4, 5 T was produced from 1953 to 1963, and from 1963 to 1968. He stated that the process flow system for 1948 to 1953 was similar to that of 1953 to

[89] Mr. Pape held a B. S., in Chemical Engineering from Rutgers University and was a Registered Professional Engineer (Chemical) in New York.

1963. He also reviewed information from documents which appear to have been largely provided by Monsanto.

Mr. Pape estimated that from 1948 to 1952, 45 pounds of TCDD was produced per year, of which 6 pounds per year was shipped with the product, and 39 pounds per year was lost to the environment, for a total of 195 pounds lost to the environment during those years. He next provided an estimate for the years between 1953 and 1963. This interval saw 332 pounds of TCDD produced per year, with 42 pounds per year shipped with the product and 290 pounds per year lost to the environment, for a total of 3,190 pounds lost to the environment during that period. Finally, for the peak years of 1964 to August 1969, he opined that 617 pounds of TCDD was produced per year, with 81 pounds per year shipped with the product, and 536 pounds per year lost to the environment, for a total loss of 2,680 pounds lost to the environment. He provided a separate calculation for 1968, determining that 980 pounds of TCDD was produced, of which 128 pounds was shipped with the product and 852 pounds was lost to the environment. The total TCDD lost to the environment from 1948 to 1969 was 6,917 pounds. *Id.* at Ex.2, Table.

At the same time, William R. Sawyer, Ph. D., of Toxicology Consultants and Assessment Specialists, Inc. determined that dioxin air emission contours of 0.00016 and 0.000082 (in units of ug/m^3 TEQ)[90] would be toxicologically significant to individuals living in the Nitro Area. *See Sawyer letter of August 24, 2007*, attached to *Memorandum of Law in Support of Plaintiff's Motion for Class Certification* (dkt. no. 622).[91] The medium of exposure was inhalation.

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[90] Ug/m^3 represents micrograms per cubic meter, i.e. 0.000082 ug/m^3 equates to 0.000082 micrograms per cubic meter of air. TEQ is defined at note 50, *infra*.

[91] Dr. Sawyer's opinions and credentials are set out in detail, *infra*, at IV.E.6.

William M. Auberle, P.E., prepared a report dated January 26, 2007, which contained the first air model actually found in the record. *Motion to Continue Class Certification Hearing and to Open Expert Discovery Related to Plaintiffs New Definition of Class Affected Area, Ex. 4* (dkt. no. 615)[92] As mentioned above, air modeling requires many inputs. The first choice is the model to be used. Mr. Auberle used the AERMOD[93] (version 02222) model, which he stated was the EPA's proposed guideline dispersion model "to assess near-field dioxin impacts." *Id.* at §3.1. Mr. Auberle used one year of surface meteorological data from Charleston, West Virginia, from January 1994 to December 1994 for that input category. He used upper air data for the same year from Huntington, West Virginia, to characterize the vertical atmospheric profile. He stated that while meteorological data was available for Charleston for 1950 to 1969, it was not compatible for use with the AERMOD model. Mr. Auberle then processed the Charleston and Huntington data together using the AERMET preprocesser to produce a dataset compatible with AERMOD. He also looked at on-site data collected at Nitro during 1994 to evaluate the "representativeness" of the Charleston data for the Nitro site. The onsite data was not quality

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[92] This report was titled "*Distribution of Dioxin Emissions in the Atmosphere to the Kanawha Valley from Monsanto Company, Nitro, West Virginia,*" was dated January 26, 2007, and was signed by Mr. Auberle. Mr. Auberle's credentials are listed, *infra.*

[93] AERMOD (or the AERMOD Modeling System) is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. There are two input data processors that are regularly components of the AERMOD Modeling System: AERMET, a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP, a terrain data preprocessor that incorporates complex terrain using USGS Digital Elevation Data. AERMET processes commercially available or custom on-site met data and creates two files: a surface data file and a profile data file. USEPA Meteorological Processors and Accessory Programs, http://www.epa.gov/scram001/metobsdata_procaccprogs.htm (last visited Jan. 2, 2013). On November 9, 2005, AERMOD was adapted by the EPA and promulgated as their preferred regulatory model, effective as of December 9, 2005. Federal Register, Nov.9, 2006 (Vol. 70, No.216) Final Rule. It is used to model short-range (up to 50 km) dispersion of air pollutant emissions from stationary industrial sources. http://en.wikipedia.org/wiki/AERMOD (last visited Jan. 2, 2013). It is used by governmental agencies to determine whether existing or proposed new industrial facilities are or will be in compliance with the National Ambient Air Quality Standards (NAAQS) in the United States or other nations. It is used in worst case scenario modeling to determine appropriate protective action if a release occurs.

assured and the data collection efficiency for 1994 was 89.6% [94]. He stated that while the data was of uncertain quality, the wind directions were representative of the Nitro area. "The Charleston and Nitro wind roses are very similar in wind directions, except that the Nitro data indicate a shift counter clockwise of 20 degrees. Accordingly, the resultant modeling results are shifted 20 degrees." *Id.* at §3.2.

The emissions and stack data were then reviewed. Although Mr. Auberle stated that some dioxin escaped to the atmosphere as a fine particulate during the actual 2, 4, 5-T manufacturing process, he believed that the greatest atmospheric releases occurred when dioxin-containing materials were burned as waste materials. These included packaging waste, off-specification product, waste water treatment sludge and other solid wastes. He believed that atmospheric emissions of dioxin occurred continuously during the 1948 to 1969 production period, with the peak omissions occurring during 1968. He also stated that most dioxin containing waste was burned in two coal-fired boilers (on-site), a tee pee burner (on-site) and open burning (primarily off-site).[95]

Notwithstanding the potential use of these other sites for disposal, Mr. Auberle used only the two onsite coal-fired boilers with stack heights of 90 feet located approximately 10 meters apart, and gas exhaust temperatures of 546 deg. F and 600 deg. F, to run his modeling. *Id.* at §3.3 (for a complete breakdown of data for this model).

He also prepared a receptor grid, using the Special Grid elements of AERMOD, to project the destination of particles across the area. He chose a terrain model to provide receptor

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[94] *See* IV.F.1, *infra* for further discussion of the requirement that data must be 90% complete in order to be used in air modeling.

[95] A "tee pee burner" is a metal conically-shaped structure, with an open top covered by grating to collect large particles of ash. *See* 6-19 of Arrington's report, *infra* at IV.F.1.a. for a photograph of an exemplar.

height parameters. He also used the annual averaging model result as the most representative of the spatial distribution of the dioxin emissions. He ran the model for the peak year of 1968, assuming that 426 pounds of dioxin was burned in each boiler. He produced a map, shown as Figure 3.1 to his report, which depicted an irregularly shaped area in which the annual average concentration of dioxin in the air in Nitro was $0.000133 ug/m^3$. This area is approximately 15km by 10km. He determined an area of $0.00133 ug/m^3$ (or one order of magnitude less than the maximum value) to be roughly 1.5km by 1km in area, located on the northeast fenceline of the plant. *Id.* at Figure 3.1 and §3.7. He attached an Appendix providing the sources of his information.[96,97]

Mr. Auberle was deposed on March 23, 2007 and the Defendants' filed their *Motion to Continue Class Certification Hearing and Open Discovery Related to Plaintiff's New Definition of Class Affected Area* and attached this deposition as Ex. 5. (dkt. no. 615). He testified that he decided to use AERMOD for this investigation in the Fall of 2006 because it was "the state-of-the-art science in dispersion modeling from complex sources of air pollution and was formally adopted by the US Environmental Protection Agency on December 18...2006." *Id.* at 29. He also testified that Dr. Warner Reeser of Carpenter Environmental Associates (which employed Mr. Auberle for this case) actually ran the model. *Id.* at 31.

He then explained who provided the data for the model and each source of the same. Mr. Auberle provided the source characterization portion of the input which was set out in Section 3.3 of his report. *Id.* at 35. He stated that while he knew there were other emission sources, he focused on the emissions from the boiler because that source was likely to cause the widest

[96] Mr. Auberle noted that he used a "Summary Windrose Data, Monsanto, Nitro Facility, WV" from 3TM Industrial, Inc., in his Appendix of sources used to prepare his report.
[97] Ex. 3.1 is attached to this Order as Ex. 5.

dispersal of dioxins from the facility. *Id.* at 61-62. He discussed a conference call with Dr. Sawyer, who said the quantifiable values he needed were in Mr. Auberle's report. Mr. Auberle also stated that he had received written materials from Carpenter Environmental Associates, (including Dr. Bell), from the EPA, WVDEP, and the USGS. The largest volume of material came from counsel. *Id.* at 75.

Mr. Auberle also testified that the terrain information for the model came from Lou Matthews[98], and that the surface meteorological data from the Charleston airport, the upper air profile data from the Huntington airport, and the West Virginia Department of Environmental Protection wind data from Nitro were provided by Dr. Reeser. *Id.* at 86-87. He assumed that all of the emissions released (as calculated by Mr. Pape) went to the atmosphere, but understood that some dioxin emissions went into the water but may have found their way to the atmosphere. *Id.* at 92. He also testified that he relied principally upon Mr. Pape's work as the basis for the amount of the emission that he used. *Id.* at 94-95. He also testified that he did not focus on any other release sources because he was trying to focus on the spatial distribution of dioxin as opposed to the actual concentration at any given point, and because he had insufficient information to quantify releases from other points. *Id.* at 97-98. He planned to do another dispersion analysis. *Id.* at 99. He also testified that another modeling run was done because of errors in the size of the mouth of stack no. 8 and in the emissions rate. *Id.* at 103-107.

Mr. Auberle also testified that additional scenarios were run using other emission sources. *Id.* at 118-119. He also discussed the 20 degree counterclockwise rotation. *Id.* at 124-125, and the choice of AERMOD as opposed to other models available. He also testified why he used the data from Charleston and Huntington instead of that from Nitro. *Id.* at 129-137.

[98] Mr. Matthews was an employee of Carpenter Environmental Associates. *Id.* at 32, 41.

Specifically, Nitro was not used because there was no upper air data, forcing the use of Huntington as the closest source for that information. Moreover, there was no quality assurance data for the Nitro data, as it had a recovery rate of 89%, which was not at an appropriate level for this kind of air-dispersion modeling. *Id.* at 137. He stated that there was only one receptor that modeled to the maximum offsite value of 0.0133 micrograms per cubic meter. *Id.* at 142. He also testified that the isopleth depicted established reasonable boundaries for opportunity for the disposition of dioxins from the Nitro plant as introduced into the air from the boilers. *Id.* at 152-153.[99] He agreed that if only 50% of the emissions were modeled, then all other things being equal, the ambient concentrations would be 50% less than that shown in the report. *Id.* at 157. He did not render an opinion as to where the class boundary should be. *Id.* at 159. Mr. Auberle was never asked why he chose to establish an isopleth at 0.00013 ug/m^3, or why that figure was relevant to this action.

After his deposition, Mr. Auberle continued to refine his opinion on the size and shape of the potential affected area. As a result, on August 27, 2007, Plaintiffs filed their *Amended Motion for Class Certification* (dkt. no. 587). This sought Class Certification for those "persons who have had their person and/or real property contaminated with dioxins and/or dioxin-like compounds within the geographic boundary (i.e. the purple line) shown on the attached map of Nitro, West Virginia, and the surrounding region ("the Class Affected Area") (*See* Figure 1)."[100]

Mr. Auberle was re-deposed on August 27, 2007. (dkt. no. 615, *Ex.* 6). He submitted a new map, which now depicted two isopleths of "8.2 times 10 of the minus 5 micrograms per

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[99] An "isopleth" is a line drawn on a map through all points of value of some measurable quantity. A contour line on a map is the most common type. In this action all parties have assumed that the measurements of 2,3,7,8-TCDD equaled or exceeded the measured value of the boundary.

[100] Figure 1 would ultimately be the area that was chosen as the "Class Affected Area" upon class certification and is Ex. 6 to this Order.

cubic meter of air; 1 at 1.6 times 10 of the minus four micrograms per cubic meter of air". These atmospheric concentrations were associated with emissions from the sites that are identified on this plot. *Id.* at 6-7. Mr. Auberle remodeled the emissions sources, reducing the emissions from the 90 foot towers (boilers) to 20% of the total emissions, and using other sources. He now opined that 40% of the waste was burned in one of eight disposal operations. He could not account for the other 60% of the waste. He estimated that 40% of the dioxin in Mr. Pape's January 2007 report was burned at one of these eight sites. This number was chosen based on statements made by operators at the facilities, employees of Monsanto, and Mr. Pape's examination of other means of disposal for the waste material. This estimate represented the collective judgment of Mr. Auberle and Mr. Pape. *Id.* at 10. Mr. Auberle's new analysis discounted the boiler stacks, relying on emissions from various landfills where waste was burned off-premises, and from the tee pee burner and the on-site burning facility. *Id.* at 15-16.[101] He believed that "the dioxins got to the atmosphere from each of these burn sites, and additionally some dioxins got to the atmosphere through disposal in the two boilers." *Id.* at 16.

Mr. Auberle reviewed statements of Monsanto employees and Monsanto documents to apportion what amount of dioxin was burned each year at the off-site locations (landfills) and on-site. He used all of Mr. Pape's yearly dioxin loss and determined what amount was burned where and when each site was used. *Id.* at 20. Dr. Reeser re-ran the AERMOD program to develop the above-referenced Figure 1. Since the boiler stacks were no longer the sole focus for emissions, Mr. Auberle did not rotate the diagram 20 degrees counterclockwise to use the Nitro Weather data, but instead relied on the Charleston and Huntington airport data without the

[101] The onsite burning facility will later be identified as the "World War I structure". It was basically a three- sided roofless building, remaining from the ammunition plant discussed *supra*, at I.B.

localized adjustment mentioned in his earlier deposition. *Id.* at 24. Mr. Auberle provided Dr. Reeser with the locations of the landfills, the quantities for each emission source, and the description of the emission sources, specifically, the emission rate, the size of the area from which it was emitted, the release point above the ground surface and the dimensions of the onsite burn facility. *Id.* at 25-26.

Mr. Auberle testified that he chose the isopleths modeled on Exhibit 1 to his deposition after consultation with Dr. Sawyer. *Id.* at 32. He thought that these lines were chosen because of the exposure of people in the region to atmospheric concentrations of dioxin. *Id.* at 33.

Mr. Auberle also testified that AERMOD categorized the eight sources as six area sources, one volume source and one point source. He described, for the first time, the volume source as an onsite partial building site, commonly known as the World War I structure. He categorized the six landfills as area sources and the tee pee burner onsite as a point source. *Id.* at 34-35. Mr. Auberle had information in an e-mail from Plaintiff's counsel that the area of 1.6×10^{-4} was the area in which area in which a person so exposed for 10 years had an additional 1 in 1,000 chance of developing cancer. The same e-mail indicated that the 8.2×10^{-5} area represented that area in which a person exposed for 20 years would have an additional 1 in 1,000 chance of developing cancer. He agreed that this was Dr. Sawyer's area of expertise. *Id.* at 40.

He testified that the same Exhibit 1 indicated when each source was emitting at a maximum level. *Id.* at 42. Based on his conversation with an EPA employee, he believed that 50% of the waste stream burned in the landfills went into the atmosphere, while the tee pee burner put 2/3 of the mass of dioxin burned within it into the atmosphere. *Id.* at 44-45. He opined to a reasonable degree of scientific certainty that 40% of the waste was disposed of by open burning. *Id.* at 50-51.

Faced with this change in the potential Class affected area, as mentioned above, the Defendants asked to continue the Class Certification hearing. (dkt. no. 615). They argued that the Plaintiff's *Amended Motion for Class Certification* changed the definition of the Class Affected Area and materially changed the allegation of how dioxin contamination occurred. As to the proposed Class Affected Area, they traced the metamorphosis from the five mile radius pled in the Complaint, to the Auberle map (Figure 3.1) filed with his report of January 26, 2007, to the map attached to the Amended Motion (Figure 1). They pointed out that the Plaintiff's expert used different assumptions in creating the third map. They also stated that Dr. Sawyer used different definitions in his report, and that the Auberle map depicted different isopleths. Each model had different emission sources, located at different locations. Moreover, they argued that the Plaintiff's theory changed from contamination by dust from the plant site, to contamination by the burning of waste, first onsite, and in the final map, both on- and off-site, from different sources. Most importantly, they argued that the isopleths changed from annual average concentrations of 0.00133 and 0.00013 ug/m^3 to 0.000082 ug/m^3: "The concentration of the dioxin alleged to have been dispersed is lower, although the geographic area covered by the isopleths is larger." *Id.* at 6.

On October 1, 2007, the Plaintiffs filed a Memorandum of Law in Support of Plaintiff's *Motion for Class Certification*. (dkt. no. 622). While this Memorandum was written to convince the court that classes should be certified, and was not an argument on the merits, it did crystalize the rough state of the Plaintiff's case as of that date. Specifically:

> By way of example, it is clear that some of (sic) central issues in this case relate to Old Monsanto's manufacturing process for its 2, 4, 5-T herbicide, the resulting generation of dioxin-contaminated waste during this process, and the subsequent burning of the dioxin-contaminated waste at the old plant, which resulted in

> dioxin being released into the air. Plaintiff's engineering expert, Robert J. Pape, P.E., reviewed numerous Old Monsanto documents provided in discovery in this case. Mr. Pape was able to painstakingly recreate, by creating "process flow diagrams" the method by which Old Monsanto manufactured its 2, 4, 5-Trichlorophenoxyacetic Acid herbicide (2, 4, 5-T) at its Nitro plant from 1948 to 1969 (citation omitted - Report of Robert J. Pape, P.E., attached as Exhibit 2). Mr. Pape was then able, using "standard engineering mass balance calculations," to determine the amount of dioxin that would have been generated during the 2, 4, 5-T manufacturing process at the Old Monsanto plant from 1948-1969 (citation omitted). Mr. Pape was further able to calculate the average amount of dioxin that was likely lost from the manufacturing process to the environment at the Old Monsanto plant during this period (citation omitted). For most of the period from 1948 to 1969, hundreds of pounds of dioxin per year were lost to the environment at the Old Monsanto plant (citation omitted).
>
> Another one of Plaintiff's engineering experts, William M. Auberle, P.E., has determined how far, and in what pattern, airborne dioxin has traveled from the Old Monsanto plant (Deposition of William M. Auberle at *Id.* at 5, attached as Exhibit 3). Mr. Auberle consulted with Mr. Pape and also reviewed information provided by Old Monsanto's employees about the methods that dioxin-contaminated waste from the 2, 4, 5-T manufacturing process was disposed of (citation omitted). *Id.* at 10. From this information, Mr. Auberle was able to determine that approximately 40% of the dioxin-contaminated waste during the 2, 4, 5-T manufacturing era was likely burned (citation omitted). Mr. Auberle was then able to use an airborne emissions model to determine how much, and in what pattern, dioxin was emitted into the Nitro area during the 2, 4, 5-T manufacturing era, as a result of the burning of Old Monsanto's dioxin-contaminated waste. *Id.* at 16. Mr. Auberle also consulted with Plaintiff's expert toxicologist, Dr. William Sawyer, *Id.* at 31-33. At Dr. Sawyer's request, Mr. Auberle was able to produce a map that shows how far from the Old Monsanto plant dioxin was emitted at certain air concentrations that Dr. Sawyer believes are toxicologically significant. *Id.* at Depo. Ex. 1. As set out more fully below, this map is the basis for Plaintiff's definition of the Class affected area

Id. at 10-11.

Plaintiff's counsel further stated that:

> In the instant matter, there is no doubt that the claims of the representative Plaintiffs are typical of those of the other class members, in that the claims of the Plaintiffs are based on the same legal theories – strict liability, nuisance, negligence and medical monitoring – and all of which arise out of the same course of conduct – the release of toxic and dangerous dioxins by the Defendants into the Class Affected Area. The definition of the Class affected area is supported by exposure and risk analysis performed by Plaintiff's toxicologist, William R. Sawyer, Ph. D. Using the airborne emissions modeling performed by Mr. Auberle, Dr. Sawyer has been able to calculate the likely dose of dioxin from the Old Monsanto plant that persons within the Class Affected area have received

(Report of William R. Sawyer, Ph.D., dated August 24, 2007, at p. at 1, attached as Exhibit 4).[102]

After a three day hearing, as mentioned at II. F., *supra*, the Court entered an Order on January 8, 2008, certifying a property class and a medical monitoring class as defined in the Plaintiff's *Amended Motion for Class Certification.* (dkt. no. 695). The Court noted Dr. Sawyer's preliminary determination of persons within the class area who could be at significant risk. It further found that "Dr. Sawyer has indicated he can further refine the 'residency requirements' for the Class. The court would expect that Plaintiffs will present to the court more comprehensive 'residency requirements' after the parties have had the opportunity to litigate the merits of Plaintiffs' Medical Monitoring claims." *Id.* at n.1, in part. The Court also acknowledged the Plaintiff's belief, based on Mr. Pape's calculation, that over 6,000 pounds of 2,3,7,8 TCDD would have been in the waste generated by Monsanto at its Nitro plant from 1948 to 1969. The Court adopted the map provided by Mr. Auberle and attached to the Plaintiff's *Amended Motion for Class Certification* as Exhibit 1, as the Class Affected Area. This map was

[102] Dr. Sawyer's report of August 24, 2007, described the significance of the two more recent isopleths shown in Ex. 1, the Class Affected Area. He opined that persons of various ages, living in areas of these concentration of dioxins in the air, for specific minimum timeframes relevant to their age, would have additional risks of cancer requiring medical monitoring.

filed with an *"Order Correcting Class Certification order Nunc Pro Tunc"* entered on September 23, 2008. (dkt. no. 939).[103]

After Class Certification, the Defendants petitioned the West Virginia Supreme Court of Appeals for a Writ of Prohibition, which was refused. *See* II. G., *supra*. Moreover, there were other procedural delays also described above. Upon their resolution, discovery and preparation continued. The Court entered a new scheduling order, and the parties worked toward preparing for trial.

E. The Plaintiffs' Expert Evidence

1. The Plaintiffs Establish Evidence that the Class Area is Contaminated with 2,3,7,8-TCDD

a. Kirk Brown, Ph. D.

After Class certification, the Plaintiffs continued to develop their case. As mentioned above, Kirk W. Brown, Ph.D., worked on this matter on behalf of the Plaintiffs.[104] To form his opinions, Dr. Brown made a site visit in May 2008 and reviewed numerous materials generated in this action, along with governmental and learned treatises. He specifically reviewed the 3TM LLC report of October 25, 2005, which had been provided to the Kanawha Valley School Board, *infra*, and the data generated by Mr. Auberle's 2007 air modeling. (*Aff. Kirk Brown, Ph.D.*) (dkt. no.928). He also reviewed the ATSDR Health Consultation provided to the Kanawha County School Board, dated April 18, 2007, discussed, *supra*. Dr. Brown stated that "modeling of the air emissions from Monsanto's manufacturing facility indicated an area of potential impact from

[103] This map is attached to this Order as Ex. 6., and only depicts the 0.000082 isopleth.

[104] Dr. Brown holds a Ph. D., in Agronomy from the University of Nebraska, a Master of Science in Agronomy/Plant Physiology from Cornell University, and a Bachelor of Science Degree in Agronomy from Delaware Valley College. At the time of his report he was Professor Emeritus at Texas A&M University. ¶5 of Brown Aff.

2, 3, 7, 8-TCDD in the air (CEA, 2008a) and was used as the basis for defining the Plaintiff's Class Area (Figure 1). *Id.* ¶25. Dr. Brown stated that the air modeling for deposition showed deposition throughout the Class Area. *Id.* ¶ 27. He predicted that the soil concentration of 2, 3, 7, 8-TCDD would range from 22.8 ng/kg at the perimeter of the Plaintiff's class area to greater than 6,000 ng/kg at the facility boundary. (*Id.* ¶30). Dr. Brown reviewed the soil samples collected by 3TM in 2004 and 2005 from the Southern side of the plant. The dioxin in 94% of the samples exceeded the 3.9 *de minimis* cleanup standard. These samples showed a total dioxin concentration of 3.87 ng/kg to 677 ng/kg. He also reviewed a 2008 set of data from house samplings taken from a transection of the Class area which indicated the presence of dioxins across the class area in excess of the expected concentration in the soils.[105] He believed that dioxins from the Monsanto facility contributed to the concentration of dioxin in the soil and in the household dust. (*Id.* at ¶9, 48 and 50).[106]

b. George Flowers, Ph. D.

Dr. Brown divided the Class affected area into four soil zones. (Exs. 5 and 6 to Brown Aff.) His work was then provided to George C. Flowers, Ph.D.[107] Dr. Flowers generated a sampling plan which projected a total of 250 and 450 potential sampling sites from which to obtain 70 soil and 100 living area dust samples within the Class Area. The sampling protocol potential sites were described in a document entitled *Sampling Plan for the Monsanto Dioxin Site*

[105] The source of this data was not provided in his report, however it may be samples referred to in a letter from Michael J. Wade, Ph.D., dated February 10, 2010.

[106] Although the record refers to Dr. Brown having been deposed, the Court has not reviewed his deposition as it does not appear to have been filed in the record.

[107] Dr. Flowers holds a Ph. D., in Geology and a Master of Science from the University of California at Berkeley, a Master of Science in Environmental Engineering from Tulane University, and a Bachelor of Science in Geology from the University of South Alabama. At the time of his reports he was a Professor of Earth and Environmental Sciences at Tulane University. (Flowers Aff. attached to *Spatial Distribution of Dioxin Contamination in the Vicinity of Nitro, West Virginia.*)

in Nitro, West Virginia Prepared For: the Calwell Practice, PLLC by George C. Flowers, Ph. D. May 11, 2009.[108] These locations were within three of Dr. Brown's four zones. The soil protocol and random dust sampling protocol was discussed. The results would be measured by CALUX bioassay.[109]

Dr. Flowers had the sampling completed and provided a report entitled *Sampling Report for the Monsanto Dioxin Site in Nitro, West Virginia Prepared For : The Calwell Practice, PLLC by George C. Flowers, Ph. D. July 14, 2009.*[110] This report discussed the actual execution of his sampling plan. Dr. Flowers was able to get 99 living area dust samples and 77 soil samples collected within the Class Area. He noted that "[i]n the event that the generated soil sample locations were inaccessible due to physical/geographical conditions or on private property, soil samples were taken along the roadway in the vicinity of selected stations. Stations were chosen in order to provide good geographic coverage of the Class Area." As to the collection of dust samples, potential stations were chosen by selecting residences within three of Dr. Brown's four zones. However, "there were limitations in sampling homes due to owners not being interested or willing to participate in the study. As a result, additional contacts were made with home owners in the Class area to obtain the requisite number of samples." *Id.* (Introduction). Dr. Flowers described how the soil and dust samples were collected. The samples were submitted to Xenobiotic Detection Systems, located in Durham, North Carolina, to determine dioxin and PCB TEQs by the CALUX Bioassay method. He then provided a map and address listing, and the chain of custody for each sample.

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[108] This report was in documents provided to the Court at some time past, presumably during the Motion hearings, but does not appear to have been filed in the Circuit Clerk's office. A copy is attached to this Order as Ex. 7.

[109] CALUX is a measurement of the total TEQ of dioxin congeners, not broken down by congener. GC/MS, also known as HRGC/IDHRMS provides a distinct measurement of each of the 17 dioxin congeners. *See* note 71.

[110] A copy is attached to this Order as Ex. 8.

On November 2, 2009, Dr. Flowers produced his report entitled *"Spatial Distribution of Dioxin Contamination in the Vicinity of Nitro, West Virginia" Prepared For The Calwell Practice, PLLC By George C. Flowers, Ph. D. November 2, 2009*, attached to the Defendants' *Reply in Support of Defendants' Renewed Motion for Summary Judgment to Decertify the Medical Monitoring Class and Alternative Motion to Amend the Definition of the Medical Monitoring Class* (dkt. no. 2346).[111] Dr. Flowers recounted that 99 living-area dust samples and 77 soil samples were collected within the Class area and subjected to CALUX Bioassay. According to the testing lab, the CALUX bioassay includes a patented cleanup procedure that removes biologically active PCB's prior to the dioxin bioassay, thus providing a direct and accurate measurement of the biological activity (TEQ's) of dioxins in soil and dust samples.

As to the soil, the lab first determined the level of dioxin concentration in rural areas removed from major dioxin emission sources. It used the 95th percentile upper confidence level for rural soil mean CALUX TEQ to determine a background level of 8.44 ng TEQ/kg. With that background level established, it noted that 54 out of 77 soil samples exceeded that level. It also showed that 67 out of 77 or 87% of the soil data exceeded the USEPA (2008b) *de minimis* health screening level of 4.5 ng/kg TEQ/kg.[112]

Dr. Flowers also reported that Dr. William Sawyer reviewed the bulk living space data generated by this process and generated four gradations of house dust loadings, with the probability of a house falling into each group: (1) dioxin levels below the USEPA (2008b) *de minimis* cleanup level, 0% probability; (2) moderately contaminated residences with dioxin levels between the *de minimis* level and the Michigan Direct Contact level (90 ng, TEQ/kg)

[111]Dr. Flowers' report of November 2, 2009 was modified to change the medical monitoring area from "Post 1970" to "Post 1969" in his subsequent report of February 15, 2010. (dkt. no. 1220).
[112] This report had limited revisions dated February 15, 2010.

where a health evaluation is warranted, 14% probability; (3) highly contaminated residences with dioxin levels between 90 and 1000 ng TEQ/kg where a serious health concern exists, 81% probability; (4) acutely contaminated residences with dioxin levels in excess of 1000 ng TEQ/kg, 5% probability.[113] *Id.* at 7.

He opined that soils throughout the Class Area were contaminated with dioxin, and that dioxin contamination in the soils exceeded the background levels of dioxin soil contamination across the United States. He also stated that living space dust was more contaminated with dioxin than the soils in the Class Area. He said that deposition of dioxin in residences remained high after 40 years, but that these were probably higher in 1970. He also stated that soil loadings have probably lessened due to erosion, microbial degradation, and volatization. He measured the average dioxin concentration to the 95% confidence level and determined that most houses in the proposed medical monitoring area will have dioxin base dust loadings that raise serious health concerns. He also stated that there was a decrease in contaminated loadings of soil and dust samples with distance away from primary burning areas at the Monsanto facility, indicating that the facility is a dioxin source. His proposed medical monitoring area was roughly 50% of the original Class area shown on Exhibit 1, and is found at Figure 15 of his report.[114] He estimated that there were approximately 8,137 residences in the serious health concern area and 502 residences in the acute health concern categories. *Id.* at 8-9.[115]

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[113] The Court could not find an explanation of the Michigan Direct Contact Level in the record.

[114] A copy of this Figure is attached hereto as Ex. 9.

[115] The Court was not provided with any deposition of Dr. Flowers, nor can it find that they were ever filed in the record.

2. The Plaintiffs Recalculate the Amount of 2,3,7,8 TCDD Produced by Monsanto: Bruce A. Bell, Ph. D., P.E.

As discovery produced additional information, the Plaintiff's case was further refined. One of the most critical changes was a reassessment of the amount of 2, 3, 7, 8 TCDD produced by Monsanto during the 2,4,5 T process. This reassessment was performed by Bruce A. Bell, Ph. D., P.E., BCEE. [116] Dr. Bell was the President of Carpenter Environmental Associates, Inc., the employer of Mr. Pape. On February 15, 2010, Dr. Bell submitted his *Expert Report of Bruce A. Bell, P.E., BCEE, Zina Bibb, et al., Plaintiffs v. Monsanto Company, et at., Defendants.* (dkt. no. 2975.) Dr. Bell's report contained fifteen (15) opinions; specifically:

> Opinion 1: Monsanto produced dioxin in an autoclave reactor as a byproduct of production of 2, 4, 5-T from 1948 to 1969 at its Nitro, West Virginia, facility.
>
> Opinion 2: From 1948 to 1968, the average concentration of dioxin in the autoclave contents was approximately 47 parts per million (ppm) expressed in term of total phenols.
>
> Opinion 3: The average concentration of dioxin in the autoclave contents in 1969 was approximately 6 ppm expressed in terms of total phenols.
>
> Opinion 4: Monsanto produced over 56 million pounds of 2, 4, 5-T from 1948 to 1969.
>
> Opinion 5: Monsanto produced over 66 million pounds of phenols in the autoclave reactor from 1948 to 1969.
>
> Opinion 6: From 1948 to 1969, Monsanto produced over 3,000 pounds of dioxin during its production of 2, 4, 5-T. The amount of dioxin product in each year is shown in Table 1.[117]

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[116] Dr. Bell holds a Ph. D., a Master's Degree in Environmental Energy, and a Bachelor's Degree in Civil Engineering from New York University. He is a registered Professional Engineer in New York, New Jersey, and Pennsylvania. He is Board Certified by the American Academy of Environmental Engineers. *Id.* at 1.

[117] The exact amount is 3,003 pounds.

Opinion 7: An estimated 2,384 pounds of the approximately 3,000 pounds of dioxin produced by Monsanto during the manufacturing of 2, 4, 5-T was lost to waste streams. The remainder was shipped in 2, 4, 5-T product. The amount of dioxin lost to the environment each year is shown in Table 2.[118]

Opinion 8: In 1948 and 1949, the production process was in flux and little information exists as to the amount of dioxin discharged to the sewer. In my professional opinion, the best estimate of the amount of dioxin discharged to the sewer is made by assuming dioxin discharged to the sewer in 1948 and 1949 were approximately the same percentage of the total dioxin lost to the environment as was discharged to the sewer in later years. Less than 1% of the dioxin produced by Monsanto at its Nitro Facility was produced in 1948 and 1949.

Opinion 9: In my professional opinion, the best estimate of the amount of dioxin discharged to the sewer is made by assuming dioxin discharges to the sewer from 1950 through 1954 were approximately the same percentage of the total dioxin lost to the environment as was discharged to the sewer in later years. Less than 15% of the dioxin lost to the environment by Monsanto at its Nitro Facility was lost between 1950 and 1954.

Opinion 10: In my professional opinion, approximately 32% of the total dioxin was lost to the environment as sewer discharge from 1955 to 1969; approximately 635 pounds of dioxin.

Opinion 11: The amount of dioxin discharged to the sewer from 1948 through 1969 was approximately 755 pounds.

Opinion 12: The amount of dioxin lost to the environment from dust releases to the atmosphere was negligible. (Approximately one pound from 1948 to 1969).[119]

Opinion 12: Approximately 1,628 pounds of dioxin were disposed of by Monsanto as solid waste between 1948 and 1969.

Opinion 12: Material disposed as solid waste from Monsanto 2, 4, 5-T process contained or was contaminated with dioxin.

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[118] The exact amount is 2,384.4 pounds.

[119] The report contains three "Opinion 12's".

> Opinion 13: In my professional opinion, the dioxin in solid waste Monsanto burned onsite or at landfills was more likely than not between 30% to 60% of the total amount of dioxin lost to the environment and 40% is a reasonable, conservative estimate.[120]

Id.

Dr. Bell was deposed by the defense on May 6, June 23, and June 24, 2010 . (dkt. no. 2975). He was first contacted about this matter in 2006. *Id.* at 14. Dr. Bell testified that he relied on all of the documents cited in his report as footnotes 145 to 198 to form his judgment that 40% of the total dioxin lost to the environment was solid waste that was burned on – off-site. He testified that:

> "the opinion is of the total amount lost, this percentage was burned. So it requires that the total amount lost be reduced by the amount that went to the sewer and to the air; because I'm talking about percentage of the total amount, not percentage of what went to landfills or on-site, period. So they're a necessary part of the opinion.
>
> That left a range of burning from zero percent to, rounding off, 70% of the dioxin that could be lost could be burned. Based on the qualitative and semi-qualitative information, it's unlikely that more than 60 percent of it could have been burned and unlikely that more than – less than 30 percent of it could have been burned.
>
> That's a best professional judgment when based on all these references and knowing how much went elsewhere."

(Bell Dep. 124:1-19, May 6, 2010).

He also testified that he was referring to 2, 3, 7, 8-TCDD when he referred to dioxin in his report. *Id.* at 139-140. He testified that Robert Pape was the original expert, and that he

[120] Dr. Bell used 198 footnotes to reference the source of the information upon which he based his opinion. The bulk of these are historical documents obtained from Monsanto about the process and production of 2, 4, 5-T in Nitro, and depositions, testimony and statements of Monsanto employees, including portions of the transcript of the 1965 *Conner and Amos, Inc. v. Monsanto Chemical Company* trial from 1965, *supra*.

produced a report. Apparently, Plaintiff's counsel wanted Dr. Bell to be the expert, which occurred when Mr. Pape left the firm. *Id.* at 186-188.

He stated that during production, the lower the temperature, the longer the hold time, the more dioxin was produced. *Id.* at 193. Dr. Bell was responsible for referring Plaintiff's counsel to Mr. Auberle and Dr. Flowers. *Id.* at 203-204. He also discussed the exchange of information between Mr. Pape and Mr. Auberle on the issue of burning at the different landfills. *Id.* at 209. He also testified that Mr. Auberle discussed plotting the data on a map with Lou Matthews, Carpenter's "GIS guy." *Id.* at 209-212. Dr. Bell was aware of Dr. Sawyer's requests for air concentrations for given periods of time from Mr. Auberle. Dr. Bell also testified that he had no role in suggesting what concentration should be depicted as the border of any particular isopleth. *Id.* at 229.

Dr. Bell's deposition continued on June 23, 2010. He gave a detailed explanation of the basis of his opinion that 40% of the total 2, 4, 5-T waste stream was burned over the production period. *Id.* at 260-270. He also testified that the estimate of what dioxin was generated changed one time, "because the internal documents we had did not make it clear that the amount of dioxin being produced was being produced in, was being expressed in terms of phenols rather than total mass." *Id.* at 323. Dr. Bell also explained how he calculated the dioxin produced during the various stages of production from 1948 to 1969. *Id.* at 327-380. He stated that Mr. Pape and Mr. Auberle made the determination as to how much solid waste was burned at each site. *Id.* at 383-384. Dr. Bell agreed that if 2,384.4 pounds of dioxin was lost to the environment over the 20 some year period, and 40% of that was burned, that would equal 953.76 pounds that were burned. *Id.* at 392. He stated that only about one pound of dioxin was actually lost during production over the entire period. *Id.* at 402-404. He also acknowledged that Mr. Auberle

testified that he (Bell) assisted in determining the burning sites, but said that Mr. Auberle's recollection was incorrect. *Id.* at 426.

Dr. Bell's deposition was concluded on June 24, 2010. He testified that he had a vague recollection that Mr. Auberle reduced the amount of dioxin that actually went into the air during the burning by about 50%, which he believed would remain in the air. *Id.* at 532.[121]

3. The Plaintiffs Further Refine Their Case: Changes to the Air Model Based on the Above Developments

a. William M. Auberle, P.E.

In February, 2010, Mr. Auberle[122] prepared another report containing his conclusions, describing qualitatively and quantitatively the fate of the dioxin released during the 22 year period of 2, 4, 5-T production. *See Fate and Transport of Dioxin Emissions from Monsanto Company Nitro, West Virginia, during the period 1948 – 1969.* (dkt. no.3174). He stated that some dioxin escaped to the environment during the manufacturing of 2, 4, 5-T, while the greatest atmospheric releases occurred when dioxin-containing materials were burned as waste materials. This occurred continuously from 1948 through 1969. Some dioxin emissions to the atmosphere were inhaled by those exposed to the contaminated air. Other dioxin molecules were deposited on soil and constructed surfaces in the Nitro area.

Mr. Auberle started with the assumption, based on Dr. Bell's report, that 2,384 pounds of dioxin was released by various means. He accepted that the amount of waste dioxin lost to

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[121] Dr. Bell provided a nine page affidavit dated June 11, 2012, which was attached as Ex. A to *Class Counsel's Reply to the Memorandum (and Supplemental Memorandum) of the Urban & Falk Plaintiffs' Proposed Settlement of the Property and Medical Monitoring Classes's [sic] Claims.* (dkt. no. 3156). In this affidavit, Dr. Bell countered the affidavit of Randy Horsak, P.E., *supra* at IV. B. Dr. Bell's final conclusion was that only emissions of 2,3,7,8-TCDD from the 2,4,5-T process could be reliably calculated and modeled. He directly refuted Mr. Horsak's assertion that "numerous sources of dioxin from the 2,4,5-T process were not properly determined or ignored." *See*, Bell Aff., *passim*.

[122] Mr. Auberle holds a B.S.I.E., and an M.S.E., Environmental Engineering from West Virginia University.

burning was 40%, or approximately 954 pounds. He believed the loss of dust from production was small.

Mr. Auberle identified the amount of dioxin burned in each year from 1948 through 1969, along with the location where it was burned. *Id.* at Table 2.1. He estimated the mass of dioxin disposed of at each site, when and where air pollution came from the open burning of waste, the characteristics of combustion and emissions from the tee pee burner, the characteristics of combustions and emissions from the onsite structure known as the former World War I Building, and any changes in the mass of dioxin as a result of waste combustion. He stated that "a conservative estimate of dioxin emission from waste burning at each site, regardless of burning techniques, is that 50% of the dioxin in the waste escaped to the atmosphere." *Id.* at 4.

Using AERMOD (version 09292), Mr. Auberle modeled each year for the entire 22 year period from 1948 to 1969 to determine ambient air quality and deposition concentrations for dioxin.[123] "To comport with information required for human exposure assessments, average concentrations were determined for the periods 1948 through 1962 and 1963 through 1968. These are characterized as periods of lower exposure and higher for the twenty-two year record (1948 – 1969), and the total accumulated deposition for all years was determined." *Id.* at 5.

Surface meteorological data for five years (2004 to 2008) from Charleston, West Virginia was used in the analysis. Upper air data for the same time period from Wilmington, Ohio was used to characterize the vertical atmospheric pressure. Charleston meteorology data included hourly surface measurement of wind speed, wind direction, standard deviation of wind direction, and temperature. The upper air data included twice daily vertical soundings. The AERMET

[123] This appears to be a different version of AERMOD than was previously used. *See*, IV. D, *infra*.

preprocesser was used to process these two sets of readings to produce a dataset that could be used with AERMOD. Mr. Auberle also opined that the data from 1948 to 1969, although available, was not compatible for use with AERMOD. The 2004 to 2008 data was used because it was readily available, properly quality assured, and AERMOD compatible. As a check on the representativeness of the data from 2004 to 2008 with that for 1948 to 1969, he cross-referenced the 2004-2008 Wind Rose from Charleston with that from 1984 to 1992.

As for emissions and stack parameters, Mr. Auberle assigned a 9.14 meter stack height to the tee pee burner. He estimated area sources (landfills or dumps), to have a 50 meter by 50 meter size, with a one (1) meter release height, and the volume source, the World War I Building, to have a two (2) meter release height. Unlike his earlier report, Mr. Auberle did not model for the two 90 foot stacks off the boilers. He projected the emissions for each source for each year that such source/site was used from 1948 to 1969. He used a receptor grid out to a distance of 31 kilometers. The fence line of approximately 2000 meters by 1500 meters was used for the plant and the fence line grid spacing was set at 25 meters. The spacing among receptors increased with distance from the plant site. He used digitalized terrain data for 7.5 minutes; AERMAP was used to determine receptor height parameters from the 69 digitalized elevation map (DEM) files used to define the area terrain. He broke down the particle size and amount of each sized particle that was produced to model the deposition, both wet and dry, during the period from 1948 to 1969. He used input parameters developed by the University of Michigan in 2006 as the source for particle information. He opined that variability in precipitation was not a significant factor, and that at any one receptor wet deposition contributed 1 to 5% of the total deposition. *Id.* at 5-10.

Having received all of this data, Mr. Auberle completed three new air models. In this summary, the court will discuss them chronologically. The second air model depicted in his report was based on dioxin inhalation exposure from 1948 to 1962, the earliest period, and was identified as Exhibit 5.2.[124] It was based on an isopleth of 0.000020 ug/m^3, (which was determined to be significant by Dr. Sawyer).[125] This was a smaller area, based on lower and more dispersed sources of dioxin emission during this period, and was depicted by a blue line which indicated the impacted population. All residences or other points of exposure within the blue line were exposed to dioxin concentrations above 0.000020 ug/m^3 averaged over the fifteen year period. The location of greatest concentration over that period had an average concentration of 0.00095 ug/m^3. (This location was not depicted on Exhibit 5.2).

The first air model depicted in the report, identified as Exhibit 5.1, depicted dioxin air inhalation exposure during the later period from 1963 to 1968. This demonstrated the highest long-term exposure to dioxins from waste burning by Monsanto. The same isopleth describing an average exposure over this period of 0.000020 ug/m^3 was established. All residences or other points of exposure within the blue line depicting this isopleth were exposed to higher concentrations of dioxin in the ambient air. The highest exposures were at points approximately one kilometer from the Monsanto property boundary, with the maximum average concentration at any one location of 0.009 ug/m^3. [126]

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[124] Attached as Ex. 10 to this Order.
[125] *See, infra* at 111,114, IV.E.3.b.
[126] Attached as Ex. 11 to this Order.

Finally, Mr. Auberle modeled dioxin deposition for the period from 1948 to 1969. He created Exhibit 5.3 depicting an isopleth in which all properties received dioxin deposits in excess of 0.0000032 ug/m^3, with one location receiving 0.00085 ug/m^3. [127]

Mr. Auberle was re-deposed on his new report on April 23 and July 8, 2010. (dkt. no. 3000). He stated that he would be providing opinions on the emissions of dioxins generated at the Nitro site between 1948 to 1969, and on both the atmospheric concentrations and the deposition of dioxins in the greater Nitro area. *Id.* at 6-7. In testifying about his work on another case while on the general topic of his qualifications, Mr. Auberle testified that he used the SCREEN model initially, then used AERMOD for the more expanded work. He testified that "SCREEN is a basic calcium dispersion tool that – that's very useful from looking at emissions from a point source in – without acquiring specific meteorological data considering terrain features and the like. It is as its name implies a screening model to take a quick look at what kind of dispersion one would expect from a point source." *Id.* at 22-23. Mr. Auberle testified that he has never operated a computer with AERMOD because it is a specialized skill set that also requires special hardware and software. *Id.* at 24-25. He chose AERMOD and Dr. Reeser ran the model.

Mr. Auberle and Dr. Reeser each contributed data to the AERMOD model in this case. Dr. Reeser acquired two meteorological sets and one topographical set of data, while Mr. Auberle provided all of the emissions characterization inputs to the model directly. Dr. Reeser ran the preprocessing of the meteorological data, and Mr. Auberle, Dr. Reeser, and Lou Matthews created the isopleths. *Id.* at 28-29.

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[127] Attached as Ex. 12 to this Order.

In 2009, Mr. Auberle met with Drs. Sawyer, Flowers, Carpenter, and a representative from Class Counsel's firm to determine the relationship between their work. Mr. Auberle stated that his work was important to both Drs. Sawyer and Flowers. Dr. Sawyer was interested in the inhalation exposure values over a six-year period, while Dr. Flowers wanted to know if Mr. Auberle had looked at deposition data in the context of his sampling analysis. *Id.* at 37-38. Mr. Auberle developed the air concentration isopleths in part because of conversations with Dr. Sawyer. *Id.* at 39.

He believed that Dr. Flowers' data compared with the AERMOD results in that Dr. Flowers found the highest values where the model would expect them to be, although he recognized that the shape of Dr. Flowers' isopleth was a little different from the isopleths developed by Dr. Flowers' monitoring. However, he did not do a statistical quantitative comparison of his model data with Drs. Flowers' data. He did not know if anyone had done that. *Id.* at 41-42. Mr. Auberle was aware of Dr. Flower's isopleths because that was the basis for the isopleths that Mr. Auberle ultimately drew. *Id.* at 44-45.

Mr. Auberle participated in a conference call with Robert Carr and other experts on February 10, 2010. He recalled stating that the deposition isopleth generally looked similar to that developed by Dr. Flowers, and then confirmed with Dr. Sawyer that he would be reporting a maximum six year average and a fifteen year average for atmospheric concentration. *Id.* at 52-54. Mr. Auberle revised his map to remove "localized hotspots" around the landfills because apparently no one lived near them, although to his knowledge, this was never confirmed. *Id.* at 57-58. He believed that there was a dramatic change in the estimate of the dioxin that escaped in the process from the original estimate of 6000 pounds. The decision as to how to allocate the amount of waste that went to a particular site was the collective judgment of Bell, Pape and

Auberle. *Id.* at 70-71. Any conflicts as to the allocation between sites would have been resolved in favor of the more conservative – i.e. to assume that there was no burning at that site. *Id.* at 73. He testified that Dr. Bell and he concluded that direct emissions from plant operations to the atmosphere were relatively small and were not modeled. *Id.* at 74-75. He discussed his conversation with Mr. Matthews about how to turn the data into a continuous isopleth. Mr. Matthews decided to use the "Natural Neighbors' Method." *Id.* at 76-77.[128] Dr. Reeser and Mr. Auberle agreed with this method. *Id.* at 78.

In reviewing the contacts he had with the various Class experts, he stated that Dr. Flowers developed sampling data and generated an isopleth from those data that he (Auberle) used to develop Figure 5.3. *Id.* at 83. Mr. Auberle testified that for the atmospheric concentration the model was run for fine particles. *Id.* at 92-93. He did not believe that waste burning occurred around the clock for 22 years. *Id.* at 97. Dr. Bell determined how much dioxin was produced each year, and they collectively determined where, and in what amount, it was burned at each location. (*See* Table 2.1 of Auberle report of February, 2010, Auberle Dep. 102-103 April 23, 2010.) He again acknowledged that the estimate of the amount of dioxin lost had been substantially reduced between the time he performed the initial analysis and when those were performed for his final report. *Id.* at 118. He agreed with the estimate that 40% of the dioxin was in the waste stream. *Id.* at 118-119.

Mr. Auberle estimated that 50% of the dioxin that was disposed of at each site became airborne. He believed that some of the dioxin subjected to burning was not exposed to sufficient temperature to become airborne, but that some was reformed which would increase the value. He believed that some dioxin was potentially destroyed when exposed to sufficient temperature,

[128] The "Natural Neighbors' Method" was not explained.

and that any residue remained in the ash at the disposal site, or was hauled away if the ash was removed. *Id.* at 124. He used a variety of sources to make this estimate. *Id.* at 125-133. He acknowledged that the modeling went through several iterations, changing as additional information was learned. *Id.* at 140-145. He also discussed the assumptions that were made as to when the burning occurred at each site. *Id.* at 146-156. Mr. Auberle testified about the source of the information he used to make assumptions about the location of the burning, the percentage of waste that went into the air, and the characterizations of the various sources of emission. *Id.* at 156-185.

He agreed that this was complex terrain, and stated that Dr. Reeser and he discussed the terrain dataset. They used a newer data set than was used in the previous modeling. Mr. Auberle chose the model and Dr. Reeser acquired it. *Id.* at 185-187. He also testified about why the weather data set was chosen. He found the five years that were chosen, 2004 to 2008, to be the most representative and best data set that could be obtained, including that for the period from 1948 to 1969. *Id.* at 189. He agreed that using a different set of meteorological data would provide a different result, all other things being equal. *Id.* at 191.

He testified that when he ran his model in 2007, he adjusted the wind direction from the Yeager Airport to make it more consistent with Nitro because he was modeling for emissions from the Nitro facility. He did not do this for the final modeling because the sources in that model were from different parts of the valley and at different elevations. *Id.* at 196. He also testified that upper air data from Wilmington, Ohio (located approximately 35 miles northeast of Cincinnati, Ohio) was used because upper air data tends to be "mesoscale data, large regional data and these are the closest data that … are usable for this model and it not likely that upper air data are dramatically different given the proximity of here – from here to Wilmington, Ohio."

Id. at 198. He also testified as to how each site's size and release height was estimated. *Id.* at 198-205.

Mr. Auberle's deposition was resumed on July 8, 2010. (dkt. no. 3000). He explained why he established the receptor grid in the manner that he did. He wanted to include all of the Class in the area examined. The spacing between receptors increased with distance from the plant and no other terrain data was considered. *Id.* at 213-215. He explained how he obtained data about how to model the particle-size and particle-sized distribution from a University of Michigan study. Mr. Auberle focused on a Dow incinerator that was used for dioxin treatment. This was the only source he could find that was readily available and relevant to the information he needed. *Id.* at 219. He agreed that one would expect different particle sizes for open burning than for incineration. *Id.* at 222.

He explained Figures 5.1, 5.2, and 5.3. Figure 5.1 was developed at the request of Dr. Sawyer to model the maximum dust inhalation exposure for a given six year period. These years were 1963 to 1968. This is when the emission of dioxins from the multiple sources was the greatest. The number of two times ten to the minus five micrograms of dioxin per cubic meter of air was chosen by the modeling. He testified that the isopleth created was the number that came out from the modeling to best approximate the class boundary. He believed that the isopleth shown in Figure 5.1 was close to the class boundary and that it was the best approximation that he could come up with given the changes in the model output between the different analyses. *Id.* at 229-231. He explained the difference between the original class boundary and the isopleth depicted in Exhibit 5.1 as reflecting newer and better meteorological information and some adjustments to the emission characteristics that became available subsequent to the class determination. These may have included different rates of emission. The isopleth created in

Exhibit 5.1 includes all of the sources for 1963 to 1968, with the main source being the WWI building. He also noted that different numbers were used to develop the original isopleths used to determine the class certification as opposed to the isopleth depicted in Exhibit 5.1. *Id.* at 231-234.

Mr. Auberle then testified about Exhibit 5.2. This exhibit displayed the exposure to dioxin for persons in the area from 1948 to 1962. Each year was run separately. The isopleth was not based on Dr. Sawyer's request, but was used to provide the same values as given for 1963 to 1968. *Id.* at at 234-236.

The dioxin deposition model shown in Exhibit 5.3 created an isopleth that "was largely chosen to define the area where sampling had taken place I believe by Dr. Flowers and the value of 3.2 times ten to the minus six represents an approximate boundary that's consistent with the results of his sampling analysis." *Id.* at 236. He looked at Dr. Flowers' sample results and had the computer create an isopleth basis for them. *Id.* at 236. Dr. Flowers "produced an isopleth based upon sampling and in this particular case, that looked similar to the output of the model shown here in that I was able to inscribe an isopleth that actually turned out to be 3.2 times ten to the minus six as shown in this figure. So his isopleth actually overlaid on the model produces this line." *Id.* at 237. The purpose of the deposition air model was to provide a similar kind of distribution as did Dr. Flowers' sample results. *Id.* at 239. Figure 5.3 modeled all emission sources for the entire 22 year period.

Dr. Flowers agreed that 477 pounds of 2, 3, 7, 8 TCDD, which represents 50% of the 954 pounds of 2, 3, 7, 8 TCDD burned, was actually available to be emitted. *Id.* at 239-241. He believed that using a steady state model was appropriate, even though various sources were added and dropped off throughout the period. *Id.* at 242. He believed that the various dumpsite

emissions and deposition were highly localized, and that while they were a minor source to the entire class, they were potentially a major source to those in immediate proximity. *Id.* at 243-244.

The isopleth created in Figure 5.1 was dominated by the emissions from the World War I building onsite. The isopleth created in Figure 5.2 was dominated by other sources. He deleted the small isopleths created by the outer landfills from Figure 5.3, because it was driven by actual sampling results as opposed to the ambient air concentrations that were based upon emissions over the 22 year period. *Id.* at 245-247. Although he agreed that retroactive analyses have some uncertainty, he has a high level of confidence in this output. *Id.* at 248. Mr. Auberle maintained that Dr. Bell was involved in the discussions with he and Mr. Pape and them to determine the allocation of waste among the burning sites depicted in Table 2.1 of his report of February, 2010. *Id.* at 269-279. Mr. Auberle also stated that anecdotal information provided largely by statements suggested that the preference was for disposal of waste on-site versus off-site when those options were available. *Id.* at 288. He stated that changes in the particle diameter, mass fraction, and particle density would only affect the deposition model and not the inhalation model. *Id.* at 294.

When he first looked at this matter in 2006 he assumed that the principal source of emissions would be plant operations and that the boiler would be used for waste disposal. *Id.* at 296. The actual loss during production and the March 8, 1949 incident were not modeled in his analysis. *Id.* at 297. He agreed that if the amount of 2,384 pounds of 2, 3, 7, 8-TCDD created was incorrect it would influence the results. *Id.* at 306.

b. Warner Reeser, Ph.D.

The computer operator for the air modeling, Warner Reeser, Jr., Ph. D., was deposed on July 12, 2010. (dkt. no. 3000).[129] He stated that he was an expert in air pollution modeling and in emissions calculations, and the application of environmental factors. *Id.* at 9-15. He stated that he was also an expert in AERMOD, and described it as a steady state dispersion model, multisource, that can handle complex terrain. It is particularly applicable in the near field that is less than 50 kilometers from the source. It is generally used to identify ambient air concentrations and deposition results downwind. *Id.* at 23. He has run the model 400 to 500 times. *Id.* at 23-24. He believed, in conjunction, with Mr. Auberle, that AERMOD was the appropriate modeling tool for this case. He stated that Mr. Auberle provided the air emission source information, including the source location and other source characteristics. Dr. Reeser provided the meteorological and terrain inputs. The model was run for dioxin. *Id.* at 29-34.

Dr. Reeser stated that the modeling changed over time as more information was gathered about the amount of the pollutant, and the sources that were modeled. The ambient concentrations were changed, and a deposition model was added. There was also more extensive meteorology data. *Id.* at 36-37. He also ran the model to account for wet and dry deposition. *Id.* at 39. He did not attempt to determine the sources of TCDD or dioxin in the Nitro area. *Id.* at 45. Mr. Auberle made the final decision as to what inputs should be used. *Id.* at 45.

Dr. Reeser also agreed that AERMOD is linear, in that, so long as everything else remained constant, the isopleth would contract or expand, depending on the amount of pollution. He did the modeling over several runs with different amounts of dioxin. *Id.* at 48. Dr. Reeser

[129] Dr. Reeser's resume was made an Exhibit to the deposition, but it was not filed in the record. Further, pages 77-85 of his deposition are missing from the record copy.

obtained the information on the particle size of dioxin found in Table 4.1 of Mr. Auberle's report of February 10, 2010, particularly modeling done by the University of Michigan for a dioxin incinerator. *Id.* at 58.

Dr. Reeser testified that he followed EPA's guidance for using AERMOD and the related programs. He used five years of meteorological data for the latest model runs, specifically from 2004 to 2008, but only one year of data for the earlier runs, specifically, 1994. They had trouble finding complete sets of data for earlier years, particularly 1948 to 1962. They chose the 2004 to 2008 data because it was readily available and had been properly quality assured and checked by both the National Weather Service and EPA guidelines and guidance so that it could be used in the modeling process. *Id.* at 62-64. Another problem was that a lot of the information from earlier periods was not compatible with some of the requirements of AERMET, the meteorological processing tool for AERMOD. While some of them could have been made compatible, they may not have been of sufficient quality to be useful. *Id.* at 64-65. He believed that the data from 2004 to 2008 was representative of the period from 1948 to 1969. *Id.* at 65-66. He believed that the data from the Charleston Airport was representative of the general area. *Id.* at 69-70. He noted that the estimate of time that was categorized as calm – 43.56% – was not unusual, but was a little on the high side. He stated that AERMOD did not handle calms very well. *Id.* at 73-74. While this number was on the high side, it was not necessarily significant. *Id.* at 76. He testified about how the various source inputs were derived. *Id.* at 86-90. He described how the receptor grid was established, and did not believe that smaller receptor grid spacing would have changed the size of the isopleths. *Id.* at 90-93. He stated that the 2006 University of Michigan study was the only source of information he could come up with for dioxin deposition modeling. *Id.* at 95-97. Dr. Reeser noted that the Michigan report indicated

that 99% of the emissions were at 1.26 microns, and this figure was used in the model. Smaller-sized particles travel further, settle out more slowly, and are deposited more slowly on the ground. *Id.* at 98-100.

Dr. Reeser did not compare the AERMOD results with the actual sampling data. *Id.* at 103. To create the 22 year total deposition isopleth in Figure 5.3, he ran each year and took the sum of the years. *Id.* at 104. He does not know why the isopleth figure was chosen. *Id.* at 105. Dr. Reeser's modeling assumed that the sources were burning concurrently. *Id.* at 109. The modeling for Figures 5.1 and 5.2 assumed that all sources were burning for the entire time. *Id.* at 110-111.

Dr. Reeser believed that certain emissions and meteorology were important factors, as were the quantity of the pollutants and the stack parameters. *Id.* at 118. He also testified that the modeling assumed that the emissions continued on a "24/7" basis. *Id.* at 119. He also stated that Mr. Auberle provided him with the information on what levels to model for in creating the isopleths. *Id.* at 124. Dr. Flowers and he discussed some concerns that Dr. Flowers had with the data South and West of the plant, specifically that it was an area of a different concentration than what he thought the isopleths should have displayed. *Id.* at 130-132. He also testified about Mr. Auberle's effort to try to make the data correspond with and be as close as possible to the old Class boundaries. *Id.* at 101-152.

4. The Plaintiffs Identify Monsanto as the Source of the 2,3,7,8-TCDD Contamination: Michael J. Wade, Ph. D.

Class counsel offered Michael J. Wade, Ph. D., as an expert witness to report and discuss his finding that Monsanto was most likely responsible for the dioxin in the area.[130,131] Dr. Wade used "Principal Component Analysis" described by Class Counsel as "a statistical data analysis often used by experts to determine the likely source of chemical contamination" to reach his conclusion."[132] Dr. Wade issued three reports containing his development of various data and his conclusions. His original report, dated November 17, 2006, reviewed polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congener data from soil, dust and creek sediment samples collected from the Nitro, West Virginia area. Dr. Wade utilized the data provided by 3TM International, Inc. in its three reports dated October 25th and 26th, 2005. (*See Analysis of Polychlorinated dibenzo-p-dioxin and Polychlorinated dibenzofuran Data from Soil, Dust and Creek Sediment Samples collected from Nitro, West Virginia and Environs,* dated November 17, 2006, Michael J. Wade, Ph. D) (dkt no. 2973). He described the analytical process he used, which included three-dimensional modeling, and concluded that most, but not all, of the soil and dust samples consisted mostly of a higher proportion of PCDD's versus PCDF's, in a ratio of approximately 89% to 11%. He believed that the PCDD/F data defined a high percentage of the total variability in the combined data set, and that conclusions reached using PCDD/F data would be accurate to greater than 80 to 95% of the time depending

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[130] Dr. Wade holds a Ph.D., from the University of Rhode Island and a B.A. from Grinnell College.

[131] *Plaintiff Omnibus Response in Opposition to Defendant's Various Motions for Summary and Partial Summary Judgment as to Medical Monitoring Claims* (dkt no. 2010).

[132] Principal Component Analysis is a mathematical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. The most fundamental use of this mathematical analysis is to determine the number of "sources ... to be found in the data." Wade Dep. 93:1-2, Sept. 21, 2010.

on materials and compounds of the PCDD/F data being considered. He compared data from Nitro with data from sites where use of 2, 4, 5-TCP was documented in the manufacture of other chemicals, such as 2, 4, 5-T, and found the data to be in close agreement. He also looked at other combustion-based sources, such as the John Amos power plant, fuel burning, scrap waste burning, and auto exhaust, and did not find such agreement with the data. He concluded that the main data trend identified by Principal Component Analysis "reasonably can be attributed to sources resulting from a combination of past waste management practices at the Monsanto chemical plant, and losses derived from both routine chemical manufacturing operations as well as extraordinary occurrences during manufacture of the herbicide 2, 4, 5-T at the Nitro facility." *Id.* at 7-8.[133]

Dr. Wade performed additional work using the 15 samples collected in July 2008 and referenced in the affidavit of Kirk W. Brown, Ph. D., *supra*. The new data did not alter his conclusions (*See Analysis of Polychlorinated dibenzo-p-dioxin and Polychlorinated dibenzofuran Data from Soil, Dust and Creek Sediment Samples Collected from Nitro, West Virginia and Environs*, dated October 9, 2008, filed as Exhibit 10 to Deposition of Michael J. Wade, Ph. D., taken on September 21, 2010. (dkt. no. 2973).

Finally, Dr. Wade issued an updated report on February 10, 2010, in which he commented on the evaluation of selected PCDD/F high resolution GC/MS and XDS CALUX bioassay data for the 15 household dust samples mentioned above.[134] Dr. Wade added the individual congener data for the 15 samples to the master data set and redid his fractional distribution analysis. These did not alter the statistical results completed on the master data set

[133] He also commented on findings related to *Carter v. Monsanto*, *supra*.

[134] *See Letter to David Carriger, Esq. from Michael J. Wade, Ph. D., Subject: WRI Project No. 10-01, Nitro MS/Toxicity Data Evaluation*, dated February 10, 2010. (dkt. no. 2973).

in 2008. He opined that "based upon the two sets of statistical analyses, it appears that while the XDS-CALUX TEQ analytical approach will provide an equal substitute for TEQ data calculated by summation of individual TEF's from high resolution GC/MS data and given the equal substitution, the XDS-CALUX bioassay data will also provide a defensible method to track the TEQ derived from PCDD/F lost to the environment from the Monsanto waste management practices at and in the vicinity of Nitro, West Virginia." *Id.* at 3.

Dr. Wade was deposed on three occasions. He was deposed on August 21 and 22, 2007 as part of the discovery surrounding class certification. (See Wade Dep. Aug. 21, 2007.) (dkt. no.2973).[135] He testified that he was engaged to do hydrocarbon fingerprinting and source identification. *Id.* at 8. He explained his use of the 3TM (Horsak) data and his efforts to collect data from other sources. *Id.* at 16-19. He examined data from the EPA, from a New Zealand site that manufactured 2, 4, 5-T, and other sources. He concluded that there was no single dioxin and dibenzo-furan fingerprint coming from Monsanto's site, but there are multiple fingerprints attributed to Monsanto and the activities that went on there. *Id.* at *27.* He eliminated any other recognized source of dioxins for which he could find data in the literature, and that left the Monsanto plant. "The data track right up to the edge of the facility and the EPA Kanawha River data track right up to the outfall or whatever outfall it was." *Id.* at 30-31. He identified "subtle changes between the 7 chlorine isomer and the 8 chlorine isomer for dioxins that were really driving the distribution." *Id.* at 35. He testified that there was a rumor that pentachlorophenol waste had been shipped to the Nitro facility to be burned in their incinerator, but he could find no evidence of any concentration of PCDD's or PCDP's at Nitro for pentachlorophenol waste. He

[135] The Circuit Clerk's office recently found the transcript for the 8/22/07 deposition, but for the sake of time, giving the timeframe of the deposition and its purpose for Class Certification it has not been reviewed.

also stated that there is no single "Monsanto fingerprint" for dioxins from the plant. He believed that there were multiple processes occurring, "and these are very unusual data, very highly sequence (sic) toward 2, 3, 7, 8-TCDD presents (sic) probably to the exclusion of other congeners, it's very unusual." *Id.* at 83-85.

Dr. Wade was re-deposed on July 20, 2010. Because of confusion over his report, the deposition was adjourned until September 21, 2010. (dkt. no. 2973). On the latter date, he was questioned about his three reports. They were issued in progression. In the first report of 2006, he analyzed approximately 162 data points which were the soil and dust results provided by Class counsel. In the 2008 report, he added 15 dust samples, and in the 2010 report he compared the CALUX results with the GC/mass spec results and also with the main database to determine whether the numbers were in the same trend. *Id* at 32-35. He testified that he performed a principal component analysis and a distribution analysis. *Id.* at 61. He believed that the Monsanto sources of dioxin came from the way things were incinerated at the Monsanto facility, from fugitive dust emissions, and how waste was physically handled. He could not determine the breakdown between them. *Id.* at 85-86. He believed that if the PCDD's and PCDF's were generated by combustion, then PCDF should dominate. However, he believed that the PCDD's that dominated the dust and soil data were already present when the Monsanto waste was burned. *Id.* at 90-91.

According to Dr. Wade, principal component analysis is more precise and detailed than distributional analysis. *Id.* at 92. He also believed that no individual dioxin congener was characteristic of any one source. *Id.* at 93. He testified that 2, 3, 7, 8 was the big dioxin product generated by Monsanto by the manufacturing process, but there were others. *Id.* at 120-121. Dr. Wade did not believe that hydrocarbon fingerprinting of blood would be useful because the body

tries to eliminate and break up the pollutants. He believed that the soil and dust fingerprint would be different than the blood fingerprint. *Id.* at 124-125.

Dr. Wade testified that the advantage of CALUX was its cost. With the 17 congener EPA method there are 17 pieces of information versus one on the CALUX. This allows one to do hydrocarbon fingerprinting analysis and principal component analysis. That cannot be done with CALUX TEQ. *Id.* at 178-179. He also believed that GC/Mass spectrometry was more accurate for TEQ than CALUX. *Id.* at 187. While he believed that the dust and soil data in this matter were comparable, he stated that a much more statistically significant relationship was found in the soils than in the dust. He believed this may come from different sources of PCDD's and PCDF's, such as fireplaces. *Id.* at 188-189. Dr. Wade also noticed an amazingly high relative percentage of 2, 3, 7, 8 TCDD in the Kanawha River samples. *Id.* at 196.

5. The Plaintiffs Establish The Danger of 2,3,7,8 TCDD To The Medical Monitoring and Property Class

a. James R. Olson, Ph.D.

James R. Olson, Ph. D.,[136] was prepared to testify about the hazardous nature of dioxins, due to their environmental and biological persistence and toxicity even at low rates of exposure, and on the carcinogenic and tumor promoting activities of 2, 3, 7, 8-TCDD stated in his report dated February 28, 2010. (dkt no. 2010). He stated that dioxins were very stable, lipophylic compounds that bioaccumulate in the food chain, and persist in the environment and in humans for many years. *Id.* at 1. He further stated that:

[136] Dr. Olson holds a Ph. D., from the Medical College of Wisconsin in the combined area of Pharmacy and Toxicology.

> [H]umans can be exposed to TCDD and related compounds through oral, dermal (skin) and inhalation routes. Once these compounds are absorbed into the body, they distribute to most tissues and are retained in the body for many years. Long term, low level exposure to these compounds will result in an increase in the tissue levels of the chemical with age, because the daily intake is much greater than the rate of daily elimination of these compounds. As the tissue levels of these chemicals increase in the body, the risk of developing a wide range of adverse health effects due to the chemicals also increases.

Id. at 1-2.

He also believed that merely moving away from an area of dioxin concentration did not necessarily reduce the risks to humans because the human body continued to carry a very persistent chemical on board that does not necessarily instantly turn off the promotion of disease. *Id.* He summarized his opinion by stating that, "[a]long with being the most toxic man-made chemical, dioxin is the most potent or active tumor promoter. Excess, unwanted exposure to dioxin results in an increased risk of many diseases that one knows to be caused by dioxin, including cancer." *Id.* at 3-4.

TCDD is one of the most extensively investigated environmental contaminants, as it is the most toxic man-made chemical. It has been shown to be a multi-site carcinogen. It produces cancer because it is a tumor promoter. *Id.* at 2. It can also produce a number of non-cancerous biological and toxicological effects, including, modulation of immune function, endocrine function, and a range of reproductive and developmental effects. *Id.* at 3.

Dr. Olson described carcinogenesis as a multi-stage process, consisting of initiation, promotion, and progression. He described dioxin as the most potent or active tumor promoter. He stated that excess, unwanted exposure to dioxin results in an increased risk of many diseases that are known to be caused by dioxin, including cancer. He concluded by opining that "[d]ue to the exceptional persistence of dioxin in the body, excess environmental exposure to dioxin over

many years results in a long-term, life-long increase in cancer risk, due to the potent long-term tumor promoting activity of dioxin in the body." *Id.* at 4.

Dr. Olson was deposed on April 13, 2010. (dkt no. 2010). Dr. Olson testified that he was employed in the Departments of Pharmacology and Toxicology and in the Department of Social and Preventative Medicine at the University of Buffalo. *Id.* at 5. He was asked to address the human toxicology of dioxin and the human health effects related to its action. *Id.* at 8. He reviewed the reports of Drs. Flowers and Sawyer, but they were not used in the preparation of his report. *Id.* at 12-13. He had research experience studying the population in Anniston, Alabama for PCB exposure. *Id.* at 15. His opinion in this case would go to the general effects of how dioxin works to produce a wide spectrum of effects. He did not perform a risk assessment here. *Id.* at 50.

Dr. Olson stated that his work on dioxins began in 1978. *Id.* at 58. In 1984, he was involved in authoring a chapter in the EPA's TCDD Environmental Criteria document. *Id.* at 59. He worked on a health assessment document on dioxin in 1985. *Id.* at 61. He also helped draft the Dioxin Reassessment published in 2000. *Id.* at 61. He served as a special expert consultant for the USEPA Science Advisory Board, and served as a panelist at the EPA/National Academy of Sciences Workshop on the Dioxin Reassessment in 2009. *Id.* at 63-64.

He reviewed the documents and publications which he considered specifically relevant to his work in this case. *Id.* at 74-82. He also reviewed his notes of communication with counsel, stating that a goal should be to get funding for research assessing health. *Id.* at 86-87. Dr. Olson was examined about his report, and Class counsel stated that Dr. Olson's testimony would be limited to why dioxin is a toxic substance and how it acts on the human body. He was not

offered to testify about the facts of this case or to give opinions about the conditions of any living human being in Nitro or the condition of any house in Nitro. *Id.* at 99-100.

He agreed that food intake was the primary source of dioxin in the general population, but stated that Nitro would not be considered as part of the general population, due to the history of 2, 4, 5 T production. *Id.* at 105. He could not think of another source which could have produced the levels of dioxin seen in indoor dust, or that would have made TCDD a major contributor to the toxic equivalent in household dust. *Id.* at 111. He stated he was not qualified to do a fingerprint analysis. *Id.* at 114.

Dr. Olson described how dioxin distributes in the body, particularly to those tissues that have fat content. There are several proteins in the liver that retain dioxin, namely C4P1A2 and P-450 1A2. *Id.* at 114-115. Dr. Olson believed that human studies were similar to animal studies insofar as they relate to tissue distribution. *Id.* at 116. He thought that dioxins were far more persistent in humans than in rodents or lab animals. *Id.* at 118. He was examined about whether cancer promoters acted with a threshold. He stated that with regard to dioxin, exposure is not necessarily the best way to assess risk because exposure results in a persistent level of a chemical in a body that can continue to act over the lifetime of an individual because it is retained in the body. Even if the exposure decreased, the presence of a persistent chemical on board will not necessarily instantly turn off the promotion event. In that regard, dioxin has a half-life of 7 ½ years in the body. *Id.* at 125-126.

He also reviewed the cancers that were caused by dioxins, listing soft-tissue sarcoma, Non-Hodgkin's lymphoma, Hodgkin's disease, multiple myeloma, B-cell lymphoma, and prostate cancer. His source was the Department of Veterans Affairs. He also said that would be a good source of information to look for non-cancerous diseases caused by TCDD, such as

immune deficiency, endocrine function, and reproductive and developmental defects. *Id.* at 129-131. He believed that there was basically no "no effect level" for dioxin as a carcinogen, in that "anytime you're adding an unwarranted excess risk above that which is currently a body burden in an individual it's going to present increased risk." He was undecided as to whether there was a threshold for non-cancerous effects, although he stated that "[i]n general, numerous effects are thought to have a threshold." *Id.* at 136-137. Dr. Olson was also questioned in depth about whether animal studies were helpful in studying the effects of dioxin on humans. He opined that animal studies are a valid model to study the biological and toxicological actions of dioxin. *Id.* at 138 -150. Finally, he disagreed with the ATSDR Nitro school study, stating that the cancer risk level should be 1 in 1 million, and not 1 in 10,000. *Id.* at 174-176.

b. David O. Carpenter, M.D.

Class counsel also offered the opinions of David O. Carpenter, M.D.[137] Dr. Carpenter offered his initial opinion in a report dated January 21, 2007, and titled *"Health Effects of Dioxin."* (dkt. no. 2849). Dr. Carpenter pointed out that dioxins were never intentionally manufactured, but were the by-product of the incineration of substances that contain both carbon and chlorine. TCDD was the by-product of the production of 2, 4, 5 T. He stated the dioxins are very persistent in the environment and in the human body, because of the presence of the chlorine ions around the ring structure, *see supra* I.D. The half-life of dioxin in the environment is many years, even decades. In the body it appears to vary with exposure dose, specifically, the higher the dose, the shorter the half-life, the lower the dose, the longer the half-life. *Id.* at 1.

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[137] David O. Carpenter, M.D., obtained a B.A. from Harvard College in 1959 and an M.D. from Harvard Medical School in 1964. *Plaintiffs' Preliminary Disclosure of Expert Witness Information* Jan. 19, 2010, Ex. 7 (dkt. no. 1162). Dr. Carpenter is a Senior Fellow at the Alden March Bioethics Institute in Albany, New York as well as a Director for the Institute for Health and Environment, at the University of Albany in Rensselaer, New York. *Id.*

He explained that TCDD is the most toxic dioxin in that it binds to one particular cellular protein, the aryl hydrocarbon (AhR) receptor. It is a fat-soluble substance which easily passes through cell membranes where it binds to the receptor. It is most often studied in the liver. The activated receptor-TCDD complex migrates to the nucleus where it binds to the DNA and induces many different genes. Some increase the expression of their product, while other depress it.

He described the link between TCDD and various diseases, offering a series of opinions based on his review of various studies. As to cancer, it is rated as a known human carcinogen by the World Health Organization and the U. S. National Toxicology Program. It is seen as a promoter, rather than an initiator, of cancer. Thus, it increases the risk of cancer. He also stated that the USEPA concluded that dioxin is a known human carcinogen, and that the upper limit of risk to humans from ambient exposure is of the order of 1 in 1,000. Among the several studies cited was one from the National Academy of Sciences, which studied Ranch Hand Veterans. This showed links to several of the cancers referred by Dr. Carl Werntz, *infra*. *Id.* at 2-3.

He also discussed the potential for increased risk of birth defects and of suppression of the immune system. These opinions were based on studies from several sources, among them, studies from Vietnam (birth defects), and Japan, Taiwan and Europe (immune suppression). *Id.* at 3-4.

He also presented studies with respect to increased risk of skin and teeth lesions. He described the diagnosis of chloracne as a hallmark of exposure to high levels of dioxin: "Chloracne is a chronic acne-like eruption that is a specific consequence of exposure to dioxins (citation omitted). It is seen only in individuals with high dioxin levels, albeit not always in all individuals with high dioxin levels (citation omitted). While exposure to dioxin or dioxin-like

compounds is the only known cause of chloracne, diseases of other organ systems may develop whether or not one has chloracne." *Id.* at 4.

According to Dr. Carpenter, dioxin also has been found to have an effect on neurobehavioral function, thyroid hormones, and reproductive function. These are manifested, by way of example for each, by reduced verbal memory function and peripheral neuropathy, increased levels of thyroid disease, and increased menstrual cycles and inhibition of testosterone in women and men, respectively. It is also related to an increased risk of endometriosis. *Id.* at 4-6. Finally, it elevates the risk of ischemic heart disease and of liver disease, because of its effects on the liver and liver function. It has also been linked to an elevated incidence of impaired fasting glucose and of diabetes in exposed populations. *Id.* at 6-7. Dr. Carpenter also offered a proposed medical monitoring plan, which was not offered by Class counsel.

He updated his opinion in another report titled *"Health Effect of Dioxin"*, dated December 2, 2009. (dkt. no. 2880). He added additional opinions about why dioxin is dangerous, describing the ability of dioxin to bind to a common receptor as the basis for the concept of the toxic equivalent factor (TEF). He also opined that a very large number of genes are altered in expression by various dioxin, furan, and PCB congeners, stating that the situation is even more complex than expected. *Id.* at 4.

Dr. Carpenter also added comments on several of the disease categories. Specifically, he noted that the U. S. Department of Veterans Affairs recognized certain cancers as eligible for disability compensation and health care benefits as a consequence of exposure to dioxin from Agent Orange in Vietnam, specifically, B cell leukemia's, chronic lymphocytic leukemia, Hodgkin's Disease, multiple myeloma, non-Hodgkin's lymphoma, prostate cancer, and soft-tissue sarcomas. He also discussed the potential for an additional risk of breast cancer. He also