UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF WISCONSIN

UNITED STATES OF AMERICA and
STATE OF WISCONSIN,

Plaintiffs,

v. Case No. 10-C-910

NCR CORP. et al.,

Defendant.

FINDINGS OF FACT AND CONCLUSIONS OF LAW ON PLAINTIFFS' FIFTH CLAIM FOR RELIEF

I. Introduction

This is an action brought by the United States and the State of Wisconsin under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., seeking, among other relief, an injunction requiring the defendant paper manufacturing and coating companies to comply with the most recent order of the United States Environmental Protection Agency (EPA) concerning the remediation of polychlorinated biphenyls (PCBs) that they discharged into the Lower Fox River between 1954 and continuing into the early 1970s. On April 27, 2012, this Court issued a preliminary injunction requiring Defendant NCR Corporation to comply with a Unilateral Administrative Order ("UAO") issued by the Environmental Protection Agency (EPA) in 2007. That decision was affirmed by the Seventh Circuit United States Court of Appeals in August 2012. The United States and the State of Wisconsin then sought to make the injunction permanent, and to have it deemed enforceable against the other defendants as well. To that effect, in December 2012 the defendants appeared for an

eleven-day trial to the Court on the fifth claim for relief presented in the Plaintiffs' amended complaint. In that claim, the Plaintiffs sought a judicial determination that the defendants—NCR and other paper companies situated in Little Lake Butte des Morts and along the Lower Fox River—must comply with the 2007 UAO and continue cleaning up the Lower Fox River, particularly the stretch between De Pere and Green Bay, a portion of the river designated Operable Unit 4, or just OU4. In large part, the trial and its related pre- and post-trial motion practice were a comprehensive effort designed to allow this Court to determine whether the *preliminary* determinations it had made in its April 27, 2012 ruling should be made permanent.

Prior to trial, the court granted summary judgment affirming the propriety of the clean-up remedy, holding that the Administrative Record compiled by the EPA and the Wisconsin Department of Natural Resources demonstrates that the selected remedy is not arbitrary and capricious or otherwise contrary to law. Based on that ruling, along with the stipulations of several parties, the liability of all of the recipients of the UAO, with the exception of Appleton Papers Inc., which had been previously dismissed from the case, was established. The central issue that remained for trial was whether the financial responsibility for the clean-up of the downstream sections of the river was a joint and several obligation of the upstream defendant dischargers or merely several. In other words, the key issue was whether the general public, represented by the Plaintiffs, was entitled to a ruling requiring each of the defendants to comply with the UAO, leaving those defendants free to seek further resolution among themselves of any disputes they may have over what share of the clean-up costs each should bear.

Section 107(a) of CERCLA imposes strict liability for contamination upon the owner of any facility that discharges hazardous substances into the environment. 42 U.S.C. § 9607(a). But what

is the rule where the owners of two or more facilities discharge hazardous substances into a body of water such as a river? Federal courts have consistently interpreted section 107(a) to impose joint and several liability on responsible parties unless they can show that a reasonable basis for apportionment of the harm exists. *Burlington N. & Santa Fe Ry. Co. v. United States,* 556 U.S. 599, 6013-15 (2009). This rule is consistent with the RESTATEMENT OF THE LAW OF TORTS: "Where the tortious conduct of two or more actors has combined to bring about harm to the plaintiff, and one or more of the actors seeks to limit his liability on the ground that the harm is capable of apportionment among them, the burden of proof as to the apportionment is upon each such actor." RESTATEMENT (SECOND) OF TORTS, § 433B(2). The reason for the rule placing the burden of proof as to apportionment on the defendants is to avoid the injustice of allowing multiple defendants who have combined to cause the plaintiff harm to further burden the plaintiff by requiring that he or she present such evidence or, even worse, allow the defendants to escape liability where the nature of the harm makes apportionment difficult or impossible. "As between the proved tortfeasor who has clearly caused some harm, and the entirely innocent plaintiff, any hardship due to lack of evidence as to the extent of the harm caused should fall upon the former." *Id.*, cmt d.

Further, while it would be unjust to hold a defendant liable for the entire harm sustained by the plaintiff when such defendant caused only a portion of it, the same is not the case when the defendant's own conduct, either by itself or combined with others, was a cause of all or substantially all of the harm. In the latter case, the plaintiff can look to such a defendant for the entirety of the loss and leave it that defendant to seek equitable contribution from other parties who may be liable.

This is what is meant by joint and several liability: "Each of two or more persons whose tortious conduct is a legal cause of a single and indivisible harm to the injured party is subject to liability to the injured party for the entire harm." RESTATEMENT (SECOND) OF TORTS, § 875.

These are the principles of law that underlie the instant dispute. In many cases, the question of whether a party's liability for harm is both joint and several or merely several is almost entirely academic. This is because it will often make little difference whether the liability of multiple responsible parties is apportioned in the trial of the plaintiff's claim against the defendants or in the trial of a separate claim for contribution among the several responsible parties. As long as all of the defendants who share responsibility for the harm are solvent and share the same level of culpability, they are assured it will all be sorted out in the end. Where either condition is absent, however, a finding of joint and several liability can dramatically increase a responsible party's ultimate liability.

If, for example, one or more of the parties responsible for the pollution of a river was insolvent, the remaining parties, assuming their liability is joint and several, would be liable for the entire clean-up even though they had no chance of recovering in contribution from the other responsible party or parties. This result rests on the view that an innocent plaintiff should not suffer the wrong caused by an insolvent wrongdoer when another wrongdoer is also liable. *Matthies v. Positive Safety Mfg. Co.*, 2001 WI 82, ¶ 11, 244 Wis.2d 720, 628 N.W.2d 842. The rule holding responsible parties jointly and severally liable, where appropriate, is therefore an important tool in furthering CERCLA's policy of promoting the timely clean-up of hazardous waste sites and ensuring that the costs of such cleanup efforts are borne by those responsible for the contamination. *Burlington*, 556 U.S. at 602.

Whether or not responsible parties are jointly and severally liable also takes on greater significance when the level of culpability of those responsible for the harm differs. Again, the RESTATEMENT provides guidance: "There is no right of contribution in favor of any tortfeasor who has intentionally caused the harm." RESTATEMENT (SECOND) OF TORTS, § 886A(3). Although the rule speaks of harm that is intentionally caused, the comments to this section make clear that the rule has been applied to reckless, wilful or wanton conduct as well. *Id.*, cmt k; *see also Browning-Ferris Industries of Illinois, Inc. v. Ter Maat*, 195 F.3d 953, 959 (7th Cir. 1999) (noting that "polluters differ in the blameworthiness of the decisions or omissions that led to the pollution, and blameworthiness is relevant to an equitable allocation of joint costs," while acknowledging that "it would not entitle the judge to make one polluter pay for separable costs wholly imposed by other polluters"). This factor is what makes the issue of joint and several liability key in this case.

In 2008 NCR, along with Appleton Papers Inc., brought a lawsuit for contribution against the other Potentially Responsible Parties (PRPs) in this action. In a 2009 decision, however, the court ruled that equitable principles (which apply in contribution cases but not in divisibility/apportionment cases) precluded NCR from receiving contribution from the other PRPs and required that the other PRPs receive contribution from NCR for the money they had paid. Specifically, the court concluded that NCR either knew or should have known that PCBs were environmentally toxic, but instead of halting sales of its PCB-laden product it actually increased production to record levels. In the court's view, NCR brought about the PCB problem and failed to mitigate its extent when it had the chance, and therefore should bear the cost of the cleanup rather than having it shared by parties who had no idea they were using dangerous toxins in their

manufacturing process. *Appleton Papers Inc. v. George A. Whiting Paper Co.*, No. 08-C-0016, 2009 WL 5064049 (E.D. Wis. Dec. 16, 2009).

The fact that NCR has been held barred under equitable principles from obtaining contribution from other contributors to the PCB contamination distinguishes this case from most other CERCLA actions. If that ruling stands, NCR would be responsible for paying the entirety of the estimated $700 million remediation costs for OU2 through OU5. But if NCR can show that the harm is divisible, it will no longer be considered jointly and severally liable for the harm but only severally liable for its portion of the harm, which NCR argues is at most 20%. The distinction between joint liability and merely several liability thus has major implications for NCR and for the other defendants.

A finding of joint liability also has serious implications for the government's enforcement efforts. First, a finding of joint liability would allow the government to pursue any of the jointly liable PRPs for funding of the cleanup effort. Second, NCR has already paid substantially more for the cleanup in OU4 than the 20% or less it believes is its divisible share. Thus, if NCR succeeds in proving its divisibility defense, the government can no longer require NCR to keep funding the remediation.

This, then, is the underlying context in which the dispute between the parties arises. Having considered the evidence presented and the arguments of counsel, the court now concludes that NCR and the upstream defendants have failed to prove that the harm at issue is divisable for purposes of determining liability under CERCLA. This is not to say that the costs of the clean-up cannot be reasonably apportioned among the responsible parties. Clean-up costs in CERCLA actions can always be apportioned among the responsible parties; that is the whole point of section 113(f),

which explicitly authorizes a court to "allocate response costs among liable parties using such equitable factors as the court determines are appropriate." 42 U.S.C. § 9613(f)(1). If the costs of clean-up were not reasonably divisible in some fashion, it would make little sense to allow for contribution. Rather, as explained below, it is the upstream defendants' failure to demonstrate how the downstream harm can be reasonably apportioned among the multiple causes of that harm that makes their liability joint and several. More specifically, neither NCR, nor any of the other responsible parties have proved that each individually was not either a sufficient or necessary cause of the harm at issue. Accordingly, the relief requested in the fifth claim in the plaintiffs' amended complaint will be granted.

II. Background

A. The PCB Problem

Between 1954 and 1971 the NCR Corporation sold a product called carbonless copy paper, which proved to be a useful product having a wide array of commercial applications. A key component of that paper was an emulsion containing Aroclor 1242, a type of PCB manufactured by the Monsanto Company. PCBs have subsequently been shown to cause serious health problems in humans. Throughout this period, NCR sold its emulsion to a company called Appleton Coated Paper Company ("ACPC"), which coated paper with the emulsion to produce the carbonless copy paper. NCR then sold that coated paper on the commercial market.

The process of coating paper with NCR's emulsion resulted in releases of emulsion into the Lower Fox River from ACPC. As discussed in more detail below, estimates of ACPC's releases of emulsion into the river were between roughly 10 and 40% of the total PCB releases to the river.

In 1970 NCR purchased Appleton Coated Paper Company, and as a result NCR is liable for the discharges made by ACPC. The fact that NCR happened to be the source of the PCBs in the first place does not impact its liability, although (as the court held in the parallel case and as discussed in Part II below) it has major implications if equitable considerations rule the day.

Most of the remainder of the PCB pollution in the Lower Fox River arises out of the recycling, rather than the production, of carbonless copy paper. Many paper mills take in bales of used paper (called post-consumer waste paper), mix the paper into a watery slurry, and then recover the paper fibers for use in producing new paper. Discharges from this process represented a relatively small 4 to 12 % of PCBs discharged into the river, according to 1998 government estimates. (Ex. 2127 at NCR-FOX 438509.) The rest of the PCB discharges (the majority of the total) resulted from several mills' use of the "broke" and trim from ACPC's coating process. Broke is an industry term denoting the unusable paper scraps that are produced during the manufacture of coated paper. In these ways, many paper mills along the river unwittingly took in large quantities of contaminated paper products for re-use in their own paper. The papermaking process is water-intensive, and these mills ultimately released significant quantities of PCBs from recycled NCR paper into the river, either directly or through publicly owned treatment works ("POTW"). (After a previous trial in the parallel case, the court determined that ACPC had not "arranged" for the disposal of its broke, and thus NCR is not liable on the basis of its sales of broke to other paper companies. Instead, its liability results from the discharges ACPC itself made during the production of NCR paper.) In sum, there were three principal ways that PCBs were released into the River: (1) ACPC released emulsion containing PCBs during the production of NCR paper; (2)

some mills recycled post-consumer waste paper that had small quantities of NCR paper in it; and (3) some mills directly recycled NCR "broke," which contained NCR's emulsion.

B. PCBs and the Lower Fox River

When PCBs are discharged into a waterway, they tend not to dissolve. Instead, because PCBs are "hydrophobic" substances, they adsorb (attach) to sediments in the river and then either deposit in the riverbed or flow through the river into Green Bay. This affinity for solids (particularly finer solids, which have relatively more surface area than larger solids) is the primary reason that many PCBs have deposited in substantial quantities in the river bottom. The depositing of PCBs in the riverbed is thus dependent not only on the quantity (mass) of PCBs released but also on the amount and kind of sediment available to which the PCBs can adsorb and then deposit.

The Lower Fox River stretches some 39 miles from Lake Winnebago to the mouth of Green Bay. For remedial purposes it has been administratively divided into five "operable units," called OUs: OU1 is Little Lake Butte des Morts; OU2 is the stretch from Appleton to Little Rapids; OU3 is Little Rapids to De Pere; OU4 is De Pere to Green Bay; and OU5 is Green Bay itself. OU1 has already been cleaned up (at a cost of nearly $100 million), and most parts of OU2, OU3 and OU5 are being monitored rather than remediated because levels of contamination are relatively low. At trial the key issue was the ongoing cleanup effort in OU4, which is the most complex and expensive cleanup site in the whole project, with estimates suggesting it could cost on the order of $700 million to remediate.[1]

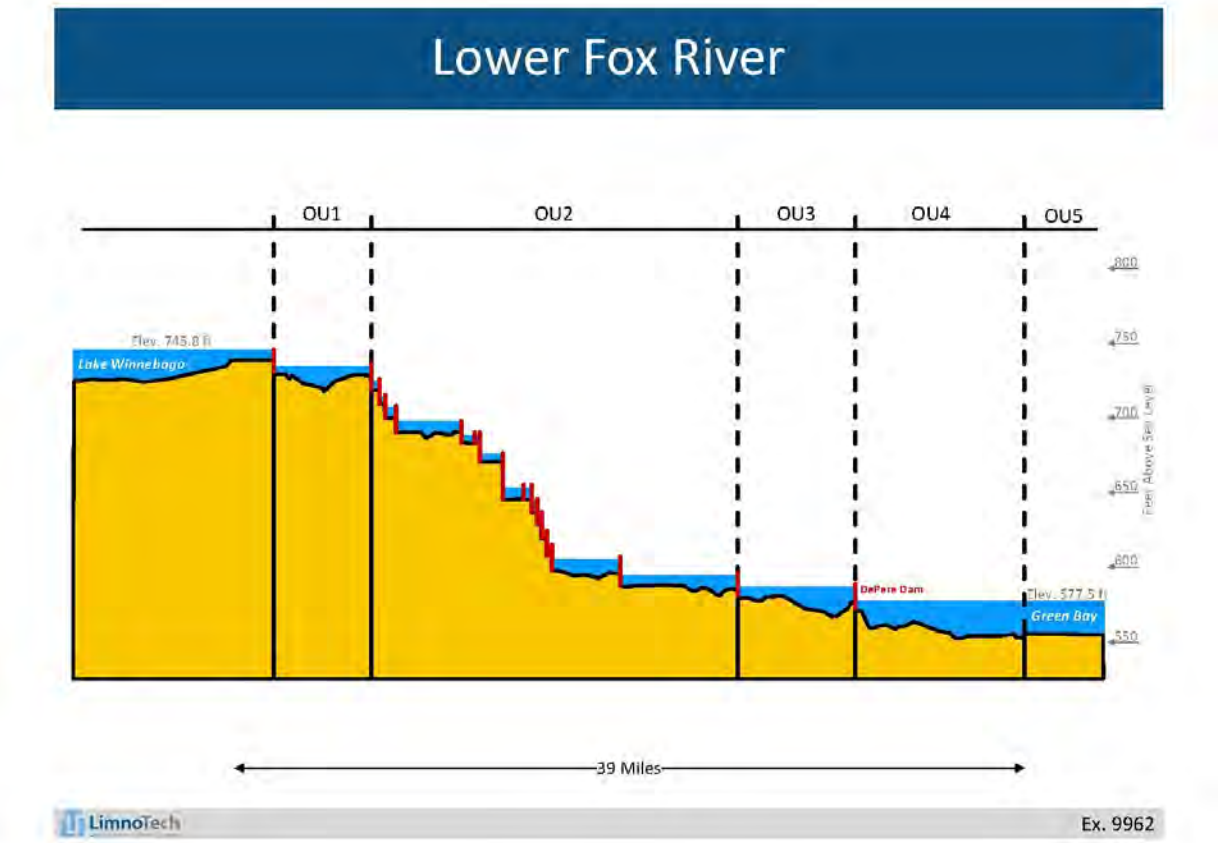
[1]The government also sought rulings of joint and several liability with respect to OU2, OU3 and OU5. Joint and several liability for those operable units was not contested, except to the extent the arguments the parties made with respect to OU4 might also apply to those operable units.

Much of the complexity of this case is due to the fact that there were a number of companies discharging PCBs from different locations along the river. For example, the PCBs from dischargers far upstream in OU1 deposited themselves in different quantities and concentrations all along the river's entire 39-mile stretch, with a large but unknown quantity not depositing at all and making their way out into the Bay. Even without knowing anything about hydrodynamics or bathymetry (the study of underwater geography), one can envision the difficulty in tracing PCB concentrations in OU4 to the various dischargers, some of which are more than thirty miles upstream.

Each discharge site has its own idiosyncratic characteristics, which adds still further to the difficulty in tracing PCBs. OU1, OU2 and OU3 are faster moving sections of river that, according to one expert, have a "trapping efficiency" of between 0.2 (OU2) and 7 % (OU1). (Tr. 2183-84.) This means that PCBs discharged into those faster-moving sections do not settle as readily as they do in OU4, which is a slower and deeper stretch of river. And PCBs that do settle in these areas are subject to "scouring," which is the process of being swept up by currents after settling. These PCBs are then resuspended in the water column and then they either redeposit or travel farther downstream. Thus, in order to settle to the river bottom in significant quantities, PCBs need a sufficient quantity of solids to attach to, and they need a hospitable environment for settling as well. This partially explains why the slower-moving OU4, parts of which were described as a "sediment trap," contains the largest amounts and concentrations of settled PCBs.

The varying speeds of the river are explained in large part by the river's elevation changes. Lake Winnebago and the Appleton stretches of the Lower Fox River are nearly 750 feet above sea level, whereas Green Bay and OU4 are less than 600 feet above sea level. This drop in elevation is roughly equivalent to that of Niagara Falls, and much of the elevation change occurs in a small

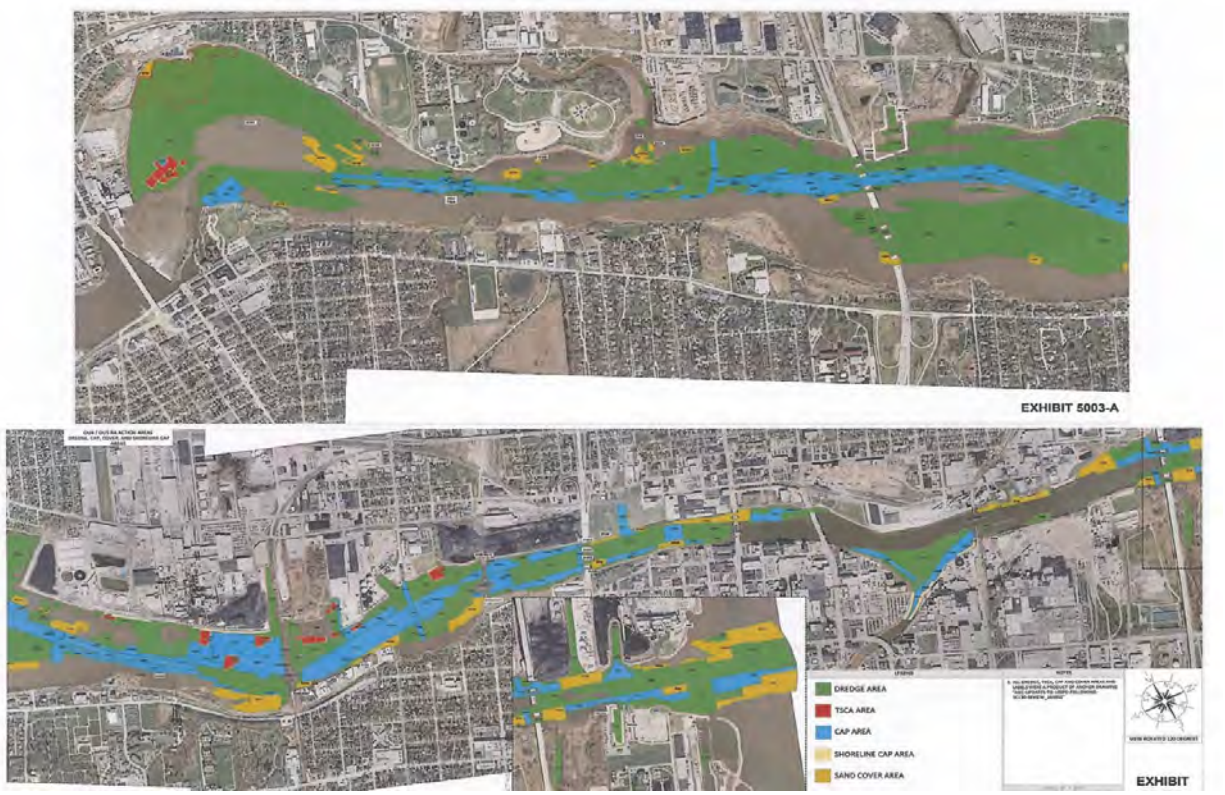
section of the river in OU2. Thus, as discussed at some length below, sediment containing PCBs has a general tendency to flow downriver rather than settle. Exhibit 9962 demonstrates the drop in elevation:



A further feature aiding the downstream movement of PCBs is the design of its nine federally-operated dams. These dams all contain what are known as Tainter gates (named for their inventor, Jeremiah Burnham Tainter, who designed the first such gate at a dam in Menominee, Wisconsin). For our purposes, the salient design feature of Tainter gates is the fact that they open from the bottom, rather than letting water spill over from the top. (Tr. 2307:12-14.) This means that sediments that accumulate at the base of a dam are allowed to sluice through the bottom rather than build up behind the dam. (Tr. 2307:18-21.)

A final characteristic of OU4 is the presence of a shipping channel that was dredged periodically by the Army Corps of Engineers. The dredging process removed layers of sediment and moved the sediment to the sides of the channel, thus redistributing the PCBs that had already settled. In addition, the increased depth of the dredged channel, combined with the slower current, made the channel area a sediment trap, an area highly conducive to the deposition of solids and the PCBs that had attached to them. Thus, large masses of PCBs that had arrived from upstream sources ended up settling in the dredged channel of OU4 and then being dispersed by dredging.

The map below shows the length of OU4, from the De Pere dam in the upper left to the mouth of Green Bay in the inset on the bottom. The areas that are subject to dredging are shown in green (the majority of this dredging has already been done in upper OU4), as well as high-concentration areas in red. (Ex. 5003, 5004.)



In sum, several features of OU4 render it a far more depositional area than the other sections of the river. Its lower elevation, greater depth and slower currents made it a hospitable place for PCBs to settle, and the dredging channel added to that effect. On top of that, the swift current of other sections of the river, as well as the dams' Tainter gates, all aided the process of PCBs flowing downstream and settling in OU4.

C. The Defendant Facilities

As noted above, the paper companies that discharged PCBs into the river were not consolidated in a single area. Instead, they lined the river from its source in OU1 (Little Lake Butte des Morts) all the way to OU4. The environmental harm in OU4 was caused primarily by three major dischargers: P.H. Glatfelter, located in OU1; NCR, in OU2; and Georgia-Pacific, in lower OU4. What follows is a thumbnail sketch of each PRP and its location along the river.

1. Bergstrom Mill (P.H. Glatfelter)

The Bergstrom mill, now owned by P.H. Glatfelter, lies at the upstream end of OU1, some 39 miles from the mouth of Green Bay. The Bergstrom mill took in large quantities of NCR broke to recycle for use in its paper. As with the other recycling mills, it released significant amounts of PCBs into the river when it discharged its effluent. Initial government estimates suggested that Glatfelter's mill was responsible for some 16 to 27% of PCBs released into the river. (Ex. 2127 at NCR-FOX 438509; Ex. 7257, Table 4.)[2]

[2]These initial estimates are relied upon only to show context, not to determine allocation of PCB concentrations in OU4.

2. Wisconsin Tissue Mills (WTM I Company)

Wisconsin Tissue Mills is also an OU1 Defendant. During the production period (1954-71), it discharged directly to the Lower Fox River only sporadically during sewer bypass events. After 1976, it discharged its wastewater through its own treatment plant. Its liability arises from the fact that during the PCB era it took in significant (but relatively smaller) quantities of NCR broke and then discharged effluent to the river through the Neenah-Menasha publicly owned treatment works.

3. Menasha Corporation

Menasha Corporation owned the John Strange Paper Mill in Menasha, Wisconsin, until 1983. Unlike many of the other mills, the John Strange facility was not a de-inking mill, meaning that it did not remove the inks from paper it recycled. The John Strange facilities recycled little or no NCR broke directly, but it did recycle post-consumer waste paper, called mixed paper. It used this paper to manufacture paperboard products such as boxes and cardboard tubes rather than traditional office paper. Mixed paper, as the name implies, included all sorts of office paper, including NCR paper in quantities that are disputed. Because mixed paper includes only a small but unknown amount of NCR paper, the presence of PCBs in post-consumer mixed paper is believed to be significantly lower than the levels found in NCR broke.

4. CBC Coating

CBC Coating, Inc. operated the Riverside Paper production facility in Appleton. Like Menasha, CBC was not a de-inking mill, meaning that it did not use NCR broke directly in its recycling process. Instead, it took in post-consumer wastepaper, some of which contained PCBs from NCR's paper. CBC discharged its wastewater to the City of Appleton's POTW. Its releases are not believed to be a significant source of PCBs, however.

5. Appleton Coated Paper Company (NCR)

As noted earlier, Appleton Coated Paper Company, now owned by NCR, discharged PCBs differently than the other mills. Instead of discharging through the process of recycling broke, ACPC's discharges were a direct byproduct of the process of coating NCR paper with the emulsion that contained PCBs. These production releases of PCBs were released to the river when small amounts of the emulsion (somewhere between 1 and 5%) were lost during production and after occasional events like spills. A preliminary government estimate suggested that ACPC's facilities were responsible for nearly 40% of PCBs released into the river. (Ex. 7257, Table 4.)

6. U.S. Paper

U.S. Paper Corporation operated a mill in De Pere at the bottom of the De Pere Dam, which is located at the beginning (upstream) end of OU4, also known as OU4A. Like Menasha's John Strange mill, U.S. Paper's mill was a paperboard mill making cardboard products, including toilet paper rolls. Thus, it did not recycle NCR paper, which was white, as a significant part of its business. In about 1966, however, it began manufacturing white paper rolls using white NCR broke, but even then it used only a small portion of NCR broke in the process, as white rolls themselves constituted only a limited portion of its recycled product business.

7. Georgia-Pacific

Finally, the Fort Howard mill owned by Georgia-Pacific operated in the downstream portion of OU4, known as OU4B. Georgia-Pacific discharged significant quantities of PCBs into lower OU4, but unlike the other mills it has settled its liability with the governments by virtue of a

consent decree. As such, although it is a significant party and one of the three major dischargers, it is not currently the subject of the governments' request for injunctive relief.[3]

III. Legal Standards for Divisibility and Apportionment

The Seventh Circuit has described exceptions to joint and several liability as "rare." *Metropolitan Water Reclamation Dist. of Greater Chicago v. North American Galvanizing & Coatings, Inc.*, 473 F.3d 824, 827 n.3 (7th Cir. 2007). The exception to joint and several liability arises if the defendant can demonstrate that the harm in question is capable of being divided. Historically, this so-called divisibility defense had not been well-received, but in 2009 the Supreme Court issued its decision in *Burlington N. & Santa Fe Ry. Co. v. United States*, which NCR argues revived the defense. To demonstrate that the harm is divisible, a defendant bears the burden of showing two things. First, it must prove that the harm is theoretically capable of being divided. This is a question of law that depends largely on the RESTATEMENT (SECOND) OF TORTS. *United States v. NCR, 688* F.3d 833, 838 (7th Cir. 2012). Citing the RESTATEMENT, both the Supreme Court and Seventh Circuit framed the analysis this way:

> [W]hen two or more persons acting independently caus[e] a distinct or single harm for which there is a reasonable basis for division according to the contribution of each, each is subject to liability only for the portion of the total harm that he has himself caused. Restatement (Second) of Torts, §§ 443A, 881 (1976); Prosser, Law of Torts, pp. 313–14 (4th ed. 1971).... But where two or more persons cause a single and indivisible harm, each is subject to liability for the entire harm. Restatement (Second) of Torts, § 875; Prosser, at 315–17.

Id. (citing *Burlington Northern,* 556 U.S. at 614) (ellipses in original).

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[3] For simplicity the United States and the State of Wisconsin will be referred to simply as "the government."

Although a question of law, the analysis relies on policy and facts; at its essence it asks whether one polluter should be considered such a significant cause of the harm that the harm attributable to that cause is incapable of being divided, or whether the parties' contribution to the harm is so impossible to trace that the harm is indivisible. If a court concludes that the harm *is* theoretically capable of being divided, the second question is whether a reasonable factual basis for an apportionment exists. *Id.*

The *Burlington Northern* case, which addressed only this second question, has already been discussed at length in numerous previous iterations of this action and its companion contribution action. It is clear that *Burlington* lowered the bar for defendants in the sense that they need only show "rough" calculations of apportionment in order to clear the second hurdle, *i.e.*, in demonstrating a reasonable basis for apportionment. *United States v. NCR*, 688 F.3d at 842. For example, in *Burlington Northern* the district court conceded that its apportionment could have been off by as much as 50%, but the fact that the court included an uncertainty factor of 50% in its calculations allowed the Supreme Court to uphold it. Yet, even though it is undeniable that *Burlington Northern* loosened the rules governing *how* a given harm might be apportioned, it did not address the key issue here, which is *whether* the harm is theoretically divisible in the first place.

In this case we are guided not only by *Burlington Northern* but by the Seventh Circuit's consideration of this court's grant of preliminary relief to the government in 2012. The Seventh Circuit affirmed by concluding, on the sparse record then before it, that NCR's discharges were a sufficient cause of the environmental harm in OU4. The Court began by noting that apportionment is improper "where either cause would have been sufficient in itself to bring about the result, as in the case of merging fires which burn a building." 688 F.3d at 839 (citing Rest. (2d) Torts § 434,

cmt. i). It then found it dispositive that NCR had not refuted "the government's contention that NCR's contributions of PCB would, alone, require approximately the same remedial measures." 688 F.3d at 839. Although there was some evidence that dredging costs would be lower if there were fewer PCBs, the Court found that point to be poorly developed. Instead, it found that although the "details" of the cleanup might vary if NCR had been the only discharger, there was not enough of a difference to suggest that the harm was divisible. *Id.* at 840. Thus, because NCR's discharges would, on their own, require roughly the same remedial measures that are now being undertaken, it could be deemed a sufficient cause of the harm. And because it would have essentially caused almost all of the harm just on its own, as a legal and policy matter it made sense to conclude that NCR should be deemed jointly and severally liable for the OU4 harm. In addition, the Seventh Circuit observed that some kinds of harm are simply unsuitable for divisibility by their very nature. For example, divisibility may be improper when "a chemical is harmful when it surpasses a certain amount" or when "a chemical may not be very harmful but becomes so when mixed with other chemicals." *Id.* at 841.

IV. Using NCR's Approach, the Harm in OU4 is Not Theoretically Capable of Being Divided

The first question is whether the harm in OU4 is theoretically capable of being divided. In its decision preliminarily answering that question "no," the Seventh Circuit appeared most persuaded by the fact that NCR had not meaningfully disputed the government's claim that the cleanup in the river would be similar or identical even if NCR had been the only contributor of PCBs to the Site. 688 F.3d at 839. In other words, at the preliminary injunction stage, it appeared

that NCR's PCB discharges would have been sufficient, *on their own*, to require approximately the same remedial measures that are now being undertaken. As such, dividing the harm on the basis of each party's degree of contribution to the harm would be inappropriate.

A. NCR's Divisibility Argument

NCR marshaled substantial resources in its attempt to demonstrate the falsity of the premise that had proven dispositive during the preliminary injunction stage. In an effort to "refute the government's contention that NCR's contributions of PCB would, alone, require approximately the same remedial measures," *id.*, NCR's expert, John Butler, used a "stand-alone" cost method to demonstrate the remedial measures and costs that would be required by each PRP's relative PCB pollution. Relying on estimates of the parties' PCB discharges, Butler concluded that the remediation effort would be substantially more modest if NCR had been the only discharger. As such, NCR could not be considered a sufficient cause of the harm in OU4.

Butler's analysis depended on the work of other experts, however. First, James Braithwaite analyzed the most fundamental question facing the PRPs, namely, how many pounds of PCBs each party discharged. Using that data, Dr. Craig Jones built a model that attempted to demonstrate how PCBs moved within the river and where they ended up. Philip Simon assessed the costs that would be required based on the discharges of each PRP, and then Mr. Butler tied everything together by explaining how, in his view, the remedy would be much more modest had NCR been the only discharger. Before addressing Mr. Butler's analysis, the court must describe the data and models that formed the basis of his opinions.

1. James Braithwaite

Mr. Braithwaite is an environmental engineer with more than 40 years of experience in hazardous waste management and remediation of hazardous waste sites. (Tr. 691-92.) As noted above, Braithwaite's principal role was to estimate how many PCBs each PRP discharged into the river. Naturally it is a difficult task to determine PCB discharges from numerous parties, given that most of the discharges occurred in the 1960s. Braithwaite thus relied heavily on a 2000 report drafted by a consulting firm called Amendola Engineering on behalf of the United States Fish and Wildlife Service. (Tr. 695.) In addition to the Amendola Report, which itself relied partly on an earlier study by the Wisconsin DNR known as Tech Memo 2d (Ex. 2127), Braithwaite spent some three years investigating matters on his own—reviewing documents, conducting interviews, and the like.

Mr. Braithwaite did not simply adopt all of the Amendola Report's figures, however. In fact, he altered many of them. With respect to Appleton Coated Paper Company (ACPC)—NCR's predecessor and the source of NCR's liability in this action—Braithwaite downwardly adjusted the Amendola PCB discharge calculations. The discharge estimates rely on a key figure that the parties have heavily disputed: the emulsion loss rate. Although the NCR-produced emulsion was valuable and efforts were made to save as much of it as possible, some of the emulsion was inevitably "lost" during ACPC's paper-coating process and was flushed into the sewer and eventually into the river.

Case 2 of the Amendola Report, which represented a middle range of many variables, had assumed an emulsion loss rate of 2.5%. This, along with other assumptions, produced an estimate for NCR's discharges at about 313,000 pounds, or roughly 40% of the total amount released to the

river. (ECF No. 90, Ex. 1 at 12 (Case 2)). Braithwaite, however, concluded that the proper loss rate should be a mere 1.0% rather than 2.5%. Braithwaite relied in part on the interviews and testimony from ACPC employees who stated that they treated the emulsion like "gold" because its high cost made up some 60% of the entire cost of making carbonless copy paper. (Tr. 703:6.) Employees had several mechanisms for conserving the emulsion, including weighing the emulsion more than once and capturing as much of it as possible. (Tr. 703-704.) They monitored emulsion use with weekly reports and used every conceivable measure to conserve it.

This information (which was not accounted for in the Amendola Report) was corroborated in Braithwaite's view by other information suggesting that the loss rate was even lower than 1%. For example, a contemporary document hand-written by the late Thomas Busch, of ACPC, suggested that the loss rate could have been as low as 0.22%. (Ex. 4223.) Busch, who would later become president of ACPC, entitled the document "Potential Aroclor to Appleton Sewer in 1954 to 1969." (Recall that Aroclor was the trade name of the type of PCBs involved here.) Braithwaite testified that, based on the figures within the document as well as its title, his understanding was that the document was intended to estimate how many PCBs were discharged by ACPC during the relevant period. Although the document did not contain a loss rate, Braithwaite was able to calculate one (0.22%) using the numbers Busch provided. Braithwaite believed that although the document was hand-written, its level of detail and facts rendered it reliable and not a rough, "back-of-the-envelope" type of effort. In addition, he also relied upon another contemporary document prepared by Mr. Busch. (Ex. 4221.) Using a number of calculations and estimates he described as conservative, Braithwaite arrived at an emulsion loss rate of about 0.9% after interpreting the figures from the Busch report, which was a formal, typed business report. Rounding up and using

an emulsion loss rate of 1.0% (which he asserted was conservative), Braithwaite calculated that ACPC and the Combined Locks mill were responsible for discharging some 68,000 pounds of PCBs into the river, or only about 10.74% of the total. (Tr. 728.)

Mr. Braithwaite also disagreed with the Amendola Report's conclusions about PCB discharges from non-deinking mills, namely Menasha (the John Strange mill) and U.S. Paper (De Pere mill). The Amendola report had assumed that these mills, which made paperboard products rather than white paper, would not be able to recycle much carbonless copy paper ("CCP") because color from the paper would show up in the final product, a fact that would be unacceptable in the industry. Braithwaite, however, concluded that these mills *had* recycled significant quantities of NCR's carbonless copy paper, both as broke from ACPC and from the recycling of post-consumer mixed paper, which had small amounts of CCP in it. Relying on the testimony of mill employees, Braithwaite testified that these mills could, in fact, have used CCP without color problems. He further found that if mixed paper constituted between 16% and 30% of their recyclable stock, and if CCP constituted 1% of incoming mixed paper (a conservative estimate), then the John Strange mill discharged some 13% of all of the PCBs into the river while U.S. Paper discharged some 3%.

Braithwaite's estimates of discharge percentages for all of the PRPs are as follows:

NCR (ACPC and Combined Locks):	10.74%
Glatfelter:	20.14%
Menasha (John Strange mill):	13.34%
WTM I:	4.40%
CBC Coating (Riverside Paper):	1.26%
U.S. Paper (De Pere):	3.19%
Georgia-Pacific:	46.93%

(Ex. 5044.)

2. Dr. Craig Jones

Mr. Braithwaite's discharge estimates are simply estimates of the amount of PCBs each PRP discharged. As such, they do not explain how, or whether, or to what extent, the discharged PCBs actually made their way into sediment at the bottom of OU4. That is where Dr. Jones comes in. Dr. Jones, an environmental engineer, has been working on hydrodynamic modeling for eighteen years. (Tr. 1091.) Using the estimates provided by Mr. Braithwaite, Dr. Jones input that data into a fate-and-transport model designed to simulate the movements of sediment and PCB transport in the river. Key to the model was the use of EFDC software ("Environmental Fluid Dynamics Code"), which was described as the state-of-the-art model for applications such as this. (Tr. 1108:17.) In addition to the discharge estimates from Braithwaite, Jones used other data, such as information about water levels and wind, as inputs. The model also incorporated variables, or parameters, that account for water movement, as well as the transport of sediments and PCBs. (Ex. 5114.) To take just a single example, one parameter is what's called shear stress, a measurement of how much friction the water current exerts on the river bottom. As the stress level increases (in faster currents), more sediment is disturbed and resuspended in the water column. (Tr. 1110-11.) Thus, the model attempts to account for areas of the river where resuspension occurs due to scouring effects as well as those areas where sediments are more likely to deposit permanently. With these inputs and parameters, including bathymetry data (the topography of the river bottom), Jones divided up the Site into roughly 8,000 grid cells and was able to simulate water and sediment movement, as well as PCB deposition, within those individual cells. (Tr. 1120.)

Dr. Jones testified that he was able to calibrate the hydrodynamics of the model and was able to validate it using actual data from the river. He testified, for example, that the sediment

transport model was able to show accurate deposition rates throughout a number of sediment sample cores that were taken. (Tr. 1137-40; Ex. 5123.) Jones also testified that the model accurately predicted PCB contamination as well. In other words, he showed that the model's predictions of PCB contamination roughly matched up with actual core samples taken from the river. (Ex. 5124.) Finally, Dr. Jones testified that the model results passed a sensitivity analysis, meaning that even if the variables and inputs were altered dramatically, the relative contributions of the PCB dischargers did not change dramatically. (Ex. 5162.) This allows increased confidence in the model because it demonstrates that the results are not due to any idiosyncracies that might exist in the model's inputs or parameters.

3. Philip Simon

Philip Simon's role was to take the conclusions arrived at by Dr. Jones and Mr. Braithwaite and link those with actual remediation costs within OU4. Simon divided OU4 into 73 "apportionment polygons," (Ex. 5067) which were areas of relatively similar characteristics, and using cost data and the PCB fate and transport information from Dr. Jones, he was able to calculate each party's share of the remediation cost in each polygon. For example, Simon was able to determine that polygon 4-31, would cost roughly $6.3 million to remediate. Of that amount, he determined that Georgia-Pacific owed the lion's share, or 76%, while NCR owed 5% and Glatfelter owed 10%. (Ex. 5068.) Aggregating all this information from the 73 different polygons, Simon concluded that NCR's share of the cost to remediate the harm in OU4 was only about 15%.[4]

[4]NCR has apparently chosen to focus on Mr. Butler's analysis and his 20% apportionment figure as the centerpiece of its apportionment case. Thus, while Mr. Simon's analysis is useful to the extent it bolsters Butler's conclusions, neither NCR nor I have given extended treatment to it. The same holds true for Dr. Connolly's conclusion that NCR is only responsible for a 6-9% share of OU4 harm.

4. John Butler

John Butler, a chemist and former EPA employee with 35 years of experience analyzing environmental economic issues, reached his conclusions by using estimates from Dr. Connolly and the experts described above. The other experts in effect painted a picture of what OU4 would look like if NCR had been the only discharger of PCBs. Based on that picture, Butler then applied the remedy criteria used by the government to determine what kind of remedy OU4 would require if NCR had been the only polluter. One of the key remedial rules is the 1.0 ppm threshold that separates areas that need to be remediated from those that do not. Applying this and other of the government's remediation rules, Butler went about determining which remedial actions, if any, would need to be applied to different parts of the river, which he had conceptually divided up into polygons. For instance, if a certain polygon would have a concentration lower than 1 ppm if NCR were the only discharger, he could determine that that polygon would not need to be dredged or remediated at all. In other cases, a polygon that otherwise needed to be dredged might have been a candidate for capping (a cheaper remedy) had NCR been the only polluter. Thus, Butler's analysis determines areas that would not need to be remediated at all in the NCR-only scenario, as well as areas for which different remedies could be applied. Using the estimates provided by the Simon team and Dr. Connolly, Butler concluded that the remedy in OU4 would be much less extensive and substantially cheaper.[5]

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[5]Under the Toxic Substances Control Act (TCSA), 15 U.S.C. §2601 et seq, waste areas exceeding 50 ppm of PCBs must be disposed of under certain strict guidelines. The current remedy includes several areas, sometimes called hotspots, that exceed the 50 ppm threshold and thus require extra care and expense to remediate. Although it is likely that some of these areas are TSCA areas due to the discharges of other parties, TSCA dredging was a small part of the overall remedy. Moreover, although there would be some added expense due to these areas' TSCA status, the areas would in all likelihood need to be dredged anyway. The added TSCA expense was not explained in any detail, and in any event would not suffice to render the entire operable unit divisible.

Butler also claimed to have reached a similar result using assumptions provided by Dr. Wolfe, Georgia-Pacific's expert. Dr. Wolfe's analysis had found that NCR had contributed some 43% of the PCBs in OU4A and 27 % for OU4B, and Butler applied these figures to the data in the same way he had with the estimates given by Dr. Connolly and the Simon team. Even with these much higher estimates of NCR's PCB contribution, Butler testified that the NCR-only scenario would still require 40 % less dredging than the Site currently requires—a substantial reduction. (Tr. 2783 at 25.) Thus, in NCR's view, even using the numbers of an adversarial party (Georgia-Pacific), the remedy would be 40 % less if NCR had been the only discharger of PCBs. In fact, NCR claims that even the government's principal witness, Richard Fox, accepted the premise that if NCR were the only discharger, the costs of remediation would naturally be lower. (Tr. 333:22.) And during the preliminary injunction phase, the same witness had agreed that the costs involved in an NCR-only scenario would be "dramatically lower." (Tr. 334:3-8; ECF No. 365 Tr. 125:1-4.)

B. Analysis

NCR's analysis was thorough and it addressed, in a comprehensive fashion, one of the key questions that the Seventh Circuit had focused on, namely: to what extent can NCR (or anyone else) be considered an independent, sufficient cause of the harm in OU4? But several problems with the analysis and its underlying assumptions and data convince me that NCR has not met its burden to show the harm in OU4 is theoretically capable of divisibility.

1. The Loose Relationship Between PCB Mass and Harm

Before determining whether the harm is theoretically capable of divisibility, it is important to define what the "harm" is. As set forth in my previous decision granting the government's

motion for a preliminary injunction (ECF No. 172), I noted that the harm could include the danger to the public, the actual volume of PCB-containing sediment at the bottom of the river, the cost to remediate (remove or cover) that sediment, or the remediation work itself. The Seventh Circuit concluded that the harm was best defined with reference to the contamination, as set forth in the government's remediation rules. As noted above, the government has established a remedial threshold of 1.0 ppm, meaning that areas containing concentrations higher than that ratio are contaminated and thus subject to remediation. Thus, if a PRP's discharges were necessary for that area to require remediation, that PRP contributed to the harm in that area. "Here . . . contamination occurs whenever PCBs pass a threshold level (thereby triggering remedial requirements.)" 688 F.3d at 841.

The question, therefore, is whether a logical connection may be drawn between the amount of a given party's PCB discharges and the contamination in OU4. On its face, it would seem reasonable to conclude that if Party A discharged 1,000 pounds of PCBs into the river and Party B discharged 500, then the harm would be capable of division based on the 2:1 ratio of the parties' discharges. But the harm in this case is not so easily divided. At the preliminary injunction stage and during the trial, it was made clear that the amount of PCBs a given party had discharged bore little relation to the harm that existed in OU4. Since "harm" is defined with reference to the 1.0 ppm remedial action level, a given area of sediment will be considered contaminated harm regardless of whether it has 1.1 ppm or 35 ppm of PCBs. Because the need to remediate that parcel exists once that 1.0 ppm threshold is reached, even a very large increase in PCB concentration does not move the needle in making that area any more harmful. Put another way, once an area qualifies

as contaminated, additional PCB loads do not make that area any more contaminated, at least from a remedial perspective.

For purposes of determining the cause of the harm in OU4, what this means is that the relationship between the mass of PCBs discharged and the resulting contamination is quite loose. Suppose it were possible to trace a given discharge of PCBs from A into a given spot in OU4. If that spot had a concentration of 2.0 ppm due to A's discharges, it would not matter from a remedial perspective if B proceeded to discharge large masses of PCBs that brought that spot's concentration from 2.0 up to 30 ppm. The area would require remediation either way. Because the exact same harm would have occurred with or without B's discharges, we would consider A (as well as B) to be a sufficient cause of that harm. Throughout the Lower Fox River there are countless areas reflecting similar patterns. Because the 1.0 ppm threshold is relatively low, these areas would need remediation even if many of the PCBs had never been discharged to the river in the first place. In other words, a hypothetical reduction in PCB discharges—even by two-thirds—does not necessarily mean the remedy is reduced in any meaningful way.

These examples merely demonstrate what might be called the binary characteristics of contamination (as we have defined it) in a river: either the river is contaminated, or it is not. Just as one cannot kill a corpse by shooting more bullets into it, one cannot change the remedy in a given area by discharging more PCBs, assuming the minimum threshold of contamination has already been reached. Mr. Butler conceded that the relationship between the mass of PCBs discharged and the harm the PCBs ultimately caused was non-linear, meaning that there is not a strong correlation between discharges and harm. His task, however, was to show that the contamination in OU4 was *not* binary, that is, that the extent of the harm in the river was sensitive

enough to PCB loads that it would get better or worse depending on the masses of PCBs discharged into the river.

At the extremes, it is obvious that there is *some* relationship between discharge masses and harm. For example, if A discharged only an eyedropper full of PCBs into the river, surely there would not need to be a $700 million remedial action, or any remedial action at all, since such a small discharge would not produce concentrations high enough for any areas to reach the 1.0 ppm threshold. At the other extreme, suppose that A discharged 10,000,000 pounds of PCBs into the river. In that case, it is easy to imagine how the discharges of *other* parties might have had no effect at all on the contamination. If A discharged 10,000,000 pounds, the discharges of B and C would have produced no marginal increase in the harm because A's discharges had already resulted in concentrations in excess of 1.0 ppm throughout the entirety of the river. In short, the more contamination our hypothetical Party A causes, the more likely it is that A's discharges were a sufficient cause of the resulting harm.

In essence Mr. Butler was attempting to demonstrate that NCR's discharges were more like the eyedropper example and less like the 10,000,000 pound example. Based on the discharge estimates provided by Mr. Braithwaite, Butler believed that NCR's discharges were low enough that the discharges of the other PRPs made a difference to the remedy required. At the risk of repetition, it is worth exploring the mechanism of how Butler's theory would work. As discussed above, if the other parties' discharges raised the concentration in a given area from 4 to 6 ppm, then those discharges had no affect on the remedy, and NCR would be deemed the "sufficient cause" of the need to remediate that area. Butler conceded that large areas of OU4 fit that description because, in his view, even a two-thirds reduction in PCB loads would have resulted in only a 40%

reduction in the remedy, meaning that there was not a 1:1 relationship between PCB masses and remedial work. So in order to show that there was *some* meaningful relationship (albeit non-linear) between NCR's PCB discharges and harm, Butler had to show that there were large swaths of river bed where the discharges of other parties actually made a difference to the remedy. Specifically, he had to show that there were areas of the river where: (1) NCR's discharges alone produced concentrations *below* the 1.0 ppm remedial action level; and (2) the concentration actually exceeded 1.0 ppm, due either to the other parties' discharges or to a combination of their discharges with NCR's.

Mr. Butler's testimony on these crucial points was limited and unconvincing. He testified that there would be significant reductions in both TSCA and non-TSCA dredging if NCR had been the only discharger, but his testimony was short on details and did not get to the heart of the issue identified above. The loose, non-linear relationship between PCB discharges and harm is a substantial hurdle to overcome. Given the very large discharges by NCR, the assumption is that the remedy would have been roughly the same whether the other parties discharged or not. *NCR*, 688 F.3d at 839 ("Even if all that were present in the river were NCR's contributions, the Lower Fox River would still need to be dredged and capped . . .") Mathematically speaking, there is a universe of potential concentration increases that would increase the concentrations in ways that would *not* impact the remedy. For example, concentration increases from 2 to 3 ppm, 3 to 4, 6 to 9, 12 to 13, 14 to 35 or 25 to 40, etc. have no impact on the remedy because in each case the concentrations are already above 1.0 ppm. By contrast, the kinds of concentration increases that would actually make a difference to the remedy are limited to a very narrow category of areas where the concentration was *below* 1.0 in an NCR-only scenario and then rose *above* 1.0 due to the

discharges of other parties. Thus, all things being equal, we would have no reason to assume that contamination in a given parcel of river bed would fall into that more narrow category; unless a good explanation is given, we would assume instead that contamination in a given area would *not* be sensitive to PCB discharges from other sources because most contamination increases fall into the immaterial category (say, from 6 to 8 ppm) rather than the narrow, threshold-crossing category that triggers remedial action (e.g., 0.8 to 1.3 ppm).

NCR did not provide any convincing reason to undercut these assumptions. Knowing what we know about the non-linear relationship between mass and harm, and given the low remedial action threshold, it was incumbent on NCR to show exactly how the other PRPs' discharges would have materially increased the remedy. This would have required a detailed showing of large numbers of polygons where remedial action was actually required (because concentrations exceeded 1.0 ppm) but where NCR's contribution to the concentration was *less* than 1.0 ppm. Butler testified that that was the case, but he did not give anything approaching a detailed explanation of, for example, how many polygons fit that description. He did not suggest that most areas of the river were contaminated at a relatively low level that was close to the threshold (say, 1.2 ppm) where we might expect the contamination would actually be sensitive to discharges by other PRPs. Nor did he highlight specific areas of the river where it would be reasonable to conclude that substantial areas fall into the category of being sensitive to other PRPs' discharges. Thus, although it is likely that there are certain discrete areas in the river where the contamination might have been sensitive to additional PCB loads, it would be speculation to conclude that these areas constituted a significant part of OU4—certainly not as much as Butler suggested. Mr. Butler's analysis would likely be somewhat persuasive as a method of apportioning damages, but the RESTATEMENT

requires us to divide not damages but *causation*, and his testimony on that score was limited. RESTATEMENT (SECOND) OF TORTS, § 443A. Here, the initial question is who caused the need for OU4 to be remediated, not how much each party should pay. Accordingly, even if there were not other problems in NCR's analysis (as discussed below), I would not be persuaded that NCR had met its burden to show that the remedy would be materially different even if NCR had been the only polluter.

2. NCR's Discharge Estimates Were Flawed

As noted above, Mr. Butler's goal was to make NCR appear more like the eyedropper discharger than the 10,000,000 pound discharger. The importance of NCR discharging a relatively low mass of PCBs cannot be understated. In a general sense, it is easy to imagine why NCR would want to minimize its contribution to the PCB problem and limit its apportioned share, just as any tortfeasor would want to limit its damages. But minimizing PCB discharges is crucial not only in that general damages sense but in the more fundamental *causation* sense as well. As discussed above, given the low 1.0 ppm remedial threshold, a lower discharge assumption makes it much more likely that many areas of the river would be sensitive, from a contamination perspective, to additional PCB loads from other dischargers. In other words, a low discharge assumption for NCR makes it more likely that discharges from *other* PRPs had a material impact on the remedy, which is another way of saying NCR is an insufficient cause of the harm. In short, as NCR's PCB discharge estimates rise, OU4 becomes less sensitive to additional PCB loads as more and more areas in OU4 reach the 1.0 ppm threshold based on NCR's discharges alone. Mr. Butler's causation

analysis thus only works in a world where NCR discharged a relatively small amount of PCBs. Keeping the numbers low was therefore crucial to NCR's entire analysis.[6]

Mr. Braithwaite's discharge estimates were the foundation upon which Mr. Butler built his causation analysis, and the United States and some of the other parties concentrated their greatest efforts at undermining Braithwaite's discharge estimates. Some of the Defendants suggest that the errors inherent in Braithwaite's analysis resulted in a "garbage in, garbage out" situation rendering NCR's entire causation and apportionment framework unreliable. These criticisms are addressed below.

a. Reliance on the Amendola Report

First, the other parties note that the bulk of Braithwaite's figures came from the 2000 Amendola Report, which was a "preliminary" report that itself acknowledged major uncertainties. In fact, according to the government, the report used the word "preliminary" no fewer than 16 times. The report employed four "cases" to demonstrate how a wide range of assumptions about PCB discharges would affect the final results. (Ex. 7257 at 366445.) Braithwaite, without having any actual hands-on knowledge of the paper-coating process at ACPC, simply chose a mid-range case (Case 2) as a starting point for his estimates. The report's "key assumptions" themselves had ranges of possibilities. For example, the report used ranges of 2-5% for emulsion loss during the production of NCR paper, and changing the percentage of emulsion loss by only two percentage

[6]This is true not only in a relative sense but in an absolute sense as well. With a large enough discharge, a hypothetical discharger could be deemed a sufficient cause of the harm even if other parties contributed much more than it did. (This is possibly true in this case, particularly in OU4B.) Conversely, a small discharge could be deemed an insufficient cause even if the discharger was responsible for more than any other discharger.

points (from 3% to 5%) had a major effect on PCB discharges: the estimate for NCR's discharges rose from 452,000 pounds in Case 3 to 836,000 in Case 4. (*Id.* at 366452.)

In addition, the numbers in the Amendola report changed after the 2000 report was issued. In 2001, Amendola issued an updated report altering its estimates for the PRPs. Some of the changes were marked: for example, the estimate for Georgia-Pacific's discharges was cut nearly in half. Despite these changes, Braithwaite did not use these figures. (He testified that he believed the government had refused to turn over the 2001 report. (Tr. 696:18-19.)) The government also argues that Braithwaite violated a basic rule of mass balance analysis when he upwardly adjusted the discharge estimates for Menasha and U.S. Paper but made no downward adjustment for other recyclers to balance that out. (The estimate for the total amount of recycled broke in the Fox Valley was to remain constant.)

Although these problems with Mr. Braithwaite's analysis are not necessarily fatal to NCR's divisibility analysis, they result in (at best) an uncertain footing for the defense. It goes without saying that there simply are no hard numbers from the PCB era that can be relied upon. Thus, the fact that Braithwaite relied on estimates from the government's own reports cannot, in itself, be surprising. Even so, the failure to account for the updated Amendola estimates is puzzling, especially given the nature of the problem here. Specifically, the Amendola Report attempted to estimate the PCB discharges of *all* of the significant PRPs, which means changes to one PRP's estimates at least implicitly affect estimates for the others. Moreover, as discussed in Section VII below, Amendola himself was not produced to testify as to his methods or the underlying data he used. Although this does not warrant the outright exclusion of Braithwaite's testimony, it certainly speaks to the weight that should be afforded his conclusions. In essence, NCR's divisibility case

is based largely on estimates made thirteen years ago by someone who was not called as a witness, and the actual data that individual used were not subject to inquiry in these proceedings. It is true that the report in question was prepared on behalf of the government, and so I have assumed, like many of the parties, that its conclusions are at least within the ballpark of reasonableness. But without an assessment of how Amendola actually reached his conclusions (apart from the spare explanation given in the report itself), the foundation on which NCR built its divisibility defense is somewhat shaky.

b. Use of 1% Emulsion Loss Rate

A more salient and specific objection came by way of an expert, Charles Klass, an industry consultant who has worked in the paper industry since the 1950's. He persuasively testified that machines like those in use at the ACPC facility during the PCB era would produce emulsion losses of at least 2 to 3%, far higher than the 1% figure Braithwaite used. (Tr. 1935-36.) Klass had performed loss audits on more than 30 facilities using air knife coaters like the one ACPC used, and had never seen losses less than 2%. Klass also testified quite credibly that the 0.22% figure Braithwaite had calculated based on Mr. Busch's handwritten notes was essentially impossible to achieve, even with modern technology. (Tr. 1977.) At best, the most modern coating devices could get down to 0.4%. (Tr. 1977:17-18.) Klass conceded that there could be a great deal of uncertainty about the efficiency of a company's coating process several decades ago, but much of that uncertainty was on the high side. (Tr. 1985:15-16.) Mr. Klass also explained that the losses he calculated were only losses that occurred during the coating process itself; there were inevitably other losses during the rest of the process, including spills, washing out of tanks and trucks, leaking seals, and the like. (Tr. 1978:2-6.)

Unlike Braithwaite, Klass had actual industry experience and had been an auditor of the exact process that is at issue here. He was a believable and highly competent witness, and his estimations of loss rate should be given more weight than Braithwaite's estimates. Ultimately, using a mid-range loss rate of 2.5%, rather than 1%, means that NCR's facilities discharged a substantially greater mass of PCBs than Braithwaite believed. Instead of the 68,000 pounds he ascribed to NCR, it is far more likely that the actual number is much closer to 150,000 pounds.[7] Although the estimate for NCR's discharges is the most important number, I will also address Braithwaite's estimates for the other dischargers because their discharges impact the question of whether the remedy would be approximately the same if NCR had been the only discharger.

c. Menasha Corp.

As discussed above, Mr. Braithwaite rejected the Amendola Report's assumption that the non-deinking mills (paperboard manufacturers like Menasha and U.S. Paper) did not use NCR broke for recycling. Instead, he assumed that these mills used NCR broke in proportion to their production capacities. For example, he believed that Menasha took in some 23% of all the NCR broke ever generated— a very large quantity. The government and some of the Defendants note, however, that there was no concrete evidence that the non-deinking mills ever used broke at all. Mr. David Ruby, an industry veteran and consultant, visited the John Strange mill (Menasha's

[7]NCR argues that this loss rate does not account for treatment in ACPC's "honey tanks," or clarifiers. In actuality, the testimony on that point was unclear. Klass cited documents from the Wisconsin DNR indicating that solids loss estimates from the 1970's (calculated because they incurred municipal sewer fees) were estimates *after* treatment at ACPC. (Ex. 8869; Tr. 1947-1951.) And, as noted further below, removal of some solids from effluent does not remove PCBs at the same rate as the solids are removed, because PCBs on the smaller particles, which are not removed by settling tanks, actually exist in higher concentrations. Thus, in my view NCR has not adequately shown that ACPC's treatment processes would have materially altered the emulsion loss rate.

facility) and concluded that they would not have used NCR broke. (Tr. 2079.) He also credibly explained that NCR broke would have been inappropriate for use in paperboard manufacturing because it would not have produced a robust enough product to be used as a cardboard box, for example. (Tr. 2047-49.) Mr. David Austin, who worked at the mill for forty years, testified that during the 1960's he was responsible for buying paper stock for use at the mill. (Tr. 1524.) He testified credibly that 75 to 80 percent of paper stock came from old corrugated containers, with the remainder being newspapers, mixed paper and craft cuttings. (Tr. 1527.) Mr. Roger Ackerman, an ex-Marine who became a purchasing agent for Menasha in the 1970's, echoed Austin's testimony and noted that white paper, such as NCR's, was more expensive and was not suitable for use in making paperboard. (Tr. 1571-72.)

There was simply no use for NCR broke in the making of standard paperboard products during the PCB era, and thus the Amendola Report's assumption that Menasha did not use broke was sound. There was no evidence that Menasha actually purchased NCR broke, and there was little reason to assume that it did. Although these mills did discharge PCBs by virtue of their recycling of mixed paper, which would have contained uncertain but small amounts of NCR paper, Braithwaite's view that these mills discharged PCBs as a result of recycling significant quantities of NCR broke is not supportable. Accordingly, his discharge estimates for the non-deinking mills, particularly Menasha, should be adjusted downward.

d. Wisconsin Tissue Mills

WTM also attacked Braithwaite's assumption that WTM had used NCR broke during the entire production period. Braithwaite had assumed that WTM used NCR broke for the entire seventeen-year PCB period (1954-1971), but WTM cited a letter indicating that it had only used

broke for "several" of those years. A 1973 letter from WTM's wastepaper buyer indicated that "We did buy [NCR paper] on a regular basis for several years but somewhere along the line there were objections on the part of the papermaking people who did not wish to do any blending . . ." (Ex. 8602.)

WTM's argument thus depends on what is meant by "several." But the letter it cites indicated not only that WTM purchased broke for "several" years, but that it did so "on a regular basis," which suggests more than a fleeting association with NCR broke. (*Id.*) "Several" does not mean "every," and the letter in fact makes reference to the fact that they stopped using NCR broke "somewhere along the line." (*Id.*) If WTM stopped in 1972, it would not matter, because PCBs were already absent from broke by that time. But if WTM stopped using NCR broke in 1965, it would have avoided using NCR paper during the period that NCR paper was at its highest levels of production. Since we do not know exactly what the author of the letter meant, it is important to refrain from reading too much into the forty-year-old document. Instead, the letter is useful simply for rebutting Mr. Braithwaite's assumption that WTM used broke during the *entire* PCB era. The most plausible conclusion is that WTM *did* purchase a significant amount of NCR broke during the PCB era, but that it did not do so during the entire period. Thus, it would be reasonable to reduce Braithwaite's assumptions about WTM's broke usage by a significant amount—perhaps forty percent— a figure that accounts for the 1973 letter but still acknowledges that WTM did use a substantial amount of NCR paper.

e. U.S. Paper Mills

U.S. Paper operated a mill in De Pere in the upper portion of OU4, also known as OU4A. Like the other PRPs, it argues that Braithwaite overestimated its discharges in order to downplay

NCR's own contribution to the harm in OU4. Braithwaite had assumed that all of the mills had used NCR broke throughout the entire PCB era, but there was no evidence that U.S. Paper's mill used NCR broke until 1966. Based on samples taken from two different lagoons that were in service at different times, U.S. Paper's expert David Merrill was able to show that concentrations in the earlier-used lagoon were some 100 times lower than in the lagoon that was used after 1969. (Tr. 2324-25.) Merrill's analysis was a credible rebuttal of Braithwaite's assumption that the U.S. Paper mill had used NCR broke during the entire PCB era, and thus a reduction of U.S. Paper's discharge estimates is warranted.

And as a non-deinking mill, the same considerations that applied to Menasha apply to U.S. Paper as well. That is, there was little use for recycled white wastepaper in the production process because it was more expensive and the mill's ultimate product was paperboard, not white paper. Thus, although U.S. Paper did use NCR broke, it was only for a limited product called white core stock that it made a few days per month—not, as Braithwaite had assumed, in proportion to its overall production capacity. In sum, Braithwaite's estimates for U.S. Paper's discharges were not credible, meaning that a substantial departure is warranted.

f. Heinritz Letter

One further issue concerning PCB discharge estimates offered by NCR should be addressed. U.S. Paper and several other defendants have cited a 1965 letter allegedly written by Bud Heinritz, of ACPC, to Wiggins Teape in London as support for their contention that NCR has overestimated their discharges. In the letter, Heinritz suggests that "the bulk" of NCR broke was being recycled by the Kimberly-Clark Company in Ohio. (Ex. 8427.) He acknowledged that other papermakers,

such as Bergstrom, used its broke, and he further conceded that ACPC's wastepaper was sold through dealers, meaning that ACPC was not privy to the final destination of much of its broke.

On cross-examination, Mr. Braithwaite admitted that he did not consider this letter in his discharge analysis. If Braithwaite had believed the letter meant what U.S. Paper and the other Defendants believe it meant, he should have considered it because it implied that use of NCR broke in the Fox Valley was much less than he had assumed. If in fact "the bulk" of NCR broke had been shipped to Ohio for recycling, rather than being recycled in the Fox Valley, then the broke recyclers were not using as much NCR broke as was previously thought. This of course would also mean that NCR—which discharged PCBs through the process of coating paper, not through broke recycling—was a greater cause of the PCB problem than the broke recyclers.

But Braithwaite plausibly explained on cross-examination that he didn't consider the Heinritz letter because he didn't read it the same way U.S. Paper's counsel did. (Tr. 793-94.) He explained that the Mead Corporation also manufactured NCR paper, and it did so in Ohio. Thus, Braithwaite believed Heinritz was likely referring to the fact that the mills in Ohio were using a large amount of NCR broke from Ohio's Mead Corporation—*not* that most NCR broke had been shipped from the Fox Valley to Ohio.

Braithwaite's reading is plausible for a number of reasons in addition to the one Braithwaite himself provided. First, the notion that most NCR broke had been shipped elsewhere, rather than recycled in the Fox Valley, has no other evidentiary foundation in this action. If such a phenomenon had actually occurred, one would expect more evidence of it than a single cryptic sentence in a 1965 letter. Second, no party has explained why it would have made sense to ship NCR broke *out* of the Fox Valley, where there was a demonstrated and strong demand for it. The

volumes of material at issue—railcars carrying tons of paper waste—would have been expensive to ship, and thus one would expect to find some explanation for why material that was needed locally would have been shipped elsewhere. Third, and perhaps most important, the idea that most broke was shipped outside the Valley does not comport with the evidence of PCB pollution in the Fox River, which is characterized by large concentrations of PCBs that we *know* were caused by broke recycling rather than making NCR paper, such as the entirety of OU1, and the downstream sections of OU4 that Georgia-Pacific is largely responsible for. No expert has even attempted to suggest that broke recycling was not a major cause of the PCB problem in the Fox River, and thus there is no basis to believe that the Heinritz letter (which I will assume to be authentic) means what U.S. Paper suggests it does.

g. Conclusion

Mr. Braithwaite's analysis rests on the uncertain footing of the Amendola Report and other information and data that was not particularly transparent. In addition, his estimates for the emulsion loss rate dramatically understated NCR's contribution to the PCB problem, which means an estimate closer to 150,000 pounds (roughly in line with the amended Amendola Report) is more appropriate than Braithwaite's figure. Braithwaite's overestimation of the other PRPs' discharges should also be taken into account. Of course we do not know exactly how many PCBs were discharged into the river, and so it cannot be said with certainty that a downward adjustment in the other PRPs' estimates would automatically equate to an upward adjustment in NCR's. Even so, Braithwaite's somewhat systematic overestimation of the PCB discharges of other PRPs, combined with his underestimation of NCR's discharges, overstates the impact the other PRPs would have had on the harm in OU4. It also suggests that any uncertainty in NCR's figure exists almost entirely

on the high side, making a general range of 150,000 to 200,000 pounds appropriate as a rough estimate.

3. Criticism and Analysis of Dr. Jones' Model

In addition to relying on Braithwaite's discharge estimates, Butler relied on Dr. Jones' model as a basis for determining where the PCBs discharged by the various PRPs might have ended up in OU4.

a. Model Calibration

The government and some of the other parties argue that Dr. Jones' model had not been properly calibrated. As such, they believe the results of the model are unreliable and assert that we cannot have any confidence in NCR's apportionment estimates. As Menasha's witness Dr. Robert Annear and others explained, calibration is the process of adjusting model parameters so that the model produces results that approximate existing data. To validate a model, one runs the model (without adjustment) and compares its results with other known data. (Tr. 1795-98.)

Dr. Annear, a modeling expert, testified that it was not good modeling practice for Dr. Jones to have failed to calibrate the model. At a minimum, he believed the hydrodynamic, sediment transport and PCB fate and transport components of the model should have, and could have, been calibrated. Although Dr. Jones did calibrate the hydrodynamic component of the model to water levels and velocities, his calibration was limited to OU3 and OU4, and, as the government's expert Dr. Bravo noted, it did not account for changes in river velocity or bed shear stress over time. (Tr. 2594)

Dr. Jones explained that calibration of the entire model was not possible because there was not sufficient data, particularly data from the PCB era. But that, of course, helps prove the government's point: we do not especially care *why* the model was not calibrated, but merely *that*

it was not. Dr. Jones proclaimed confidence in the model's results because he had validated some aspects of the model and had performed a sensitivity analysis. (Tr. 1134-35.) He validated the hydrodynamic portion of the model by comparing measured water levels in OU4 to his model's predictions, and the results showed a close association between predictions and reality. (Ex. 5121.) He also compared measured water levels at dams and water velocity data to the model's predictions and concluded that the model was effectively predicting the hydrodynamics of the river. (Tr. 1136.) Dr. Jones validated the sediment transport model as well. Comparing sediment cores in different parts of the river, Jones was able to match sediment deposition to his model's predictions within a centimeter per year. (Ex. 5123.) This told Jones that the model was "reliably predicting and quantitatively predicting the deposition patterns in the OU4 area." (Tr. 1139.) Finally, Dr. Jones also validated the PCB transport model by comparing PCB distributions in the river to distributions predicted by the model.

But validation of some parts of a model does not rule out the possibility that the other parts were not properly calibrated. This is especially true given that the parts of the model *not* calibrated were the sediment and contamination transport components—highly relevant aspects of the overall model, particularly since the model's overarching purpose was to model the fate and transport of PCB contamination. Dr. Annear credibly testified that reliable modeling could not be achieved absent calibration of the entire model. (Tr. 1842.)

As noted earlier, Dr. Jones also performed a sensitivity analysis. He conceded that a sensitivity analysis does not confirm that a model is producing correct results, but it demonstrates how sensitive the results are to various inputs. (Tr. 1160.) Some of the parameters he measured for sensitivity include bathymetry, shear stress and erosion rate. (Ex. 5125.) Dr. Jones concluded

that the model's changes were small in relation to a number of parameter variations, which meant that the model was a reliable tool for use in apportionment.

But it is clear that a sensitivity analysis does not cure defects in a model's calibration or overall reliability. Although it demonstrates how sensitive the model is to inputs, that has nothing to do with whether the model is actually reliable or not. As Dr. Bravo testified, "Reliability is related to if the model can reproduce processes that occur in reality and can be measured. The sensitivity analysis, all it is saying is if you vary some of the parameters within a certain range, what is the relative change in this case on the results of the model. But it's not telling you that the results are accurate or not." (Tr. 2598.)

The court is satisfied that there are substantial uncertainties in the calibration process that lead to a lack of confidence in the entire modeling process. Added to this uncertainty is the fact that Dr. Jones relied on Mr. Braithwaite's data, which appears to dramatically understate NCR's contribution to the PCB mass in the river. Even so, the court would be reluctant to reject Dr. Jones' analysis out of hand, if only because it was clear that modeling PCB fate and transport in *any* river would be very difficult, particularly given the lack of underlying data and the number of parameters that must be measured. This is not to suggest that perfect modeling of fate and transport is a *sine qua non* of a divisibility defense. Instead, the uncertainty here is merely another factor among many that convinces the court that NCR has not met its burden to demonstrate that the harm in OU4 is divisible.

b. Partition Coefficient and Actual River Contamination

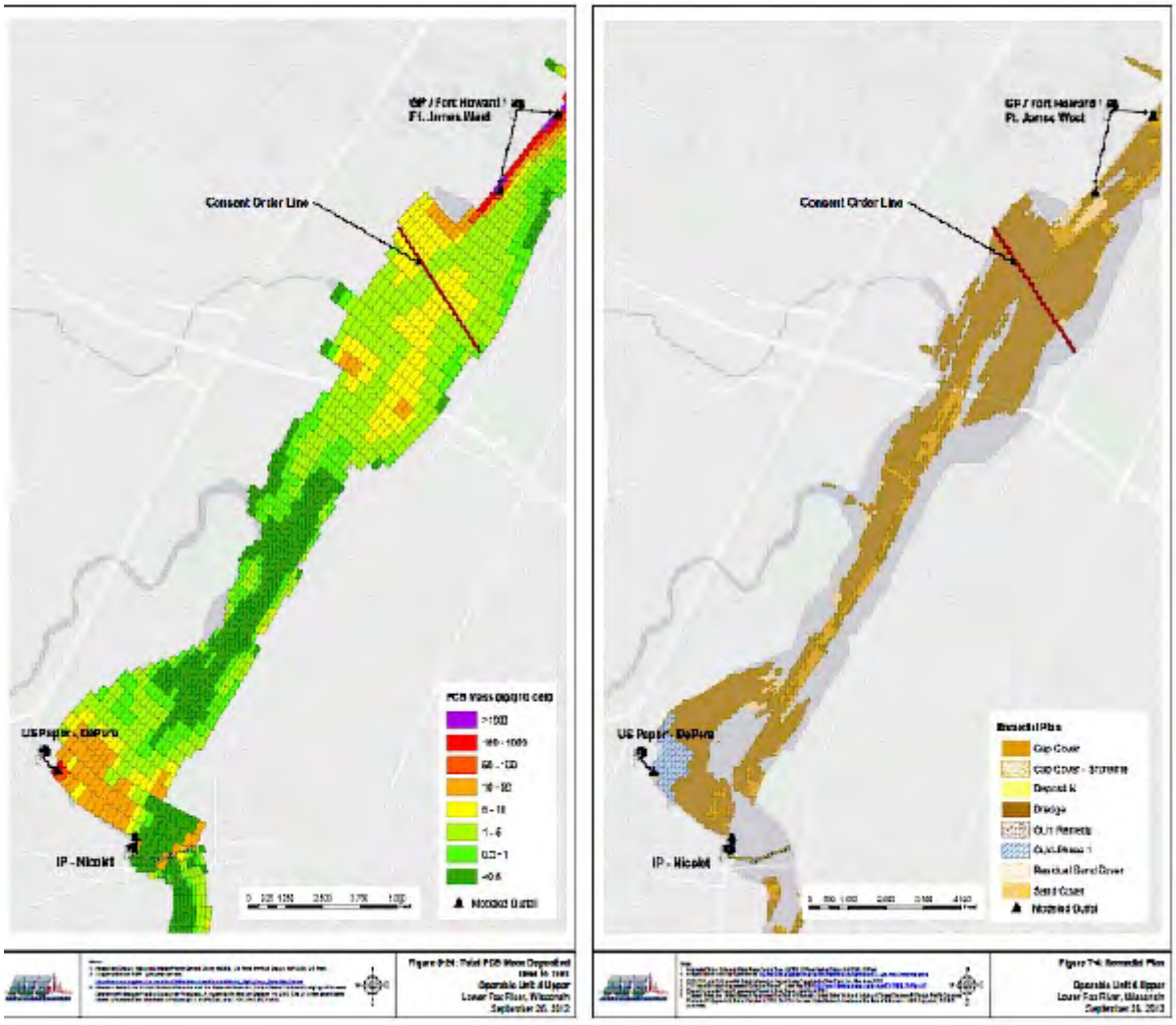
The government also argues that NCR's model overestimated the amount of PCBs that would dissolve into the water. In essence, Jones' model assumed a phenomenon called "preferred partitioning," whereby PCBs were far less likely to attach to solids in the river than to solids that

were part of the discharge from the PRPs. Dr. Jones explained that "it takes a long time for PCBs to desorb or come off of those solids. So as those PCBs move downstream associated with those solids, not all of the PCB comes off those solids and goes immediately onto adjacent solids, watershed solids, natural solids." (Tr. 1146.) As Georgia-Pacific's Dr. Wolfe explained, this means that once the PCBs *de*sorbed from those solids, which happened frequently during the course of the last half-century, they were unlikely to reattach themselves to river solids. As a result, in NCR's model the PCBs that desorbed from solids did not reattach themselves but dissolved into the water and were transported out into Green Bay. If this were true, it would have a mitigating effect on upstream dischargers, whose PCB discharges traveled more distance and spent more time in the river while subject to this phenomenon. In other words, in NCR's model PCBs either deposited with discharge sediment near the discharge source or dissolved and went into the Bay. Thus, in NCR's model there is less deposition of PCBs in the first section of OU4 because the assumption is that many of the PCBs have dissolved. As Georgia-Pacific's Dr. Wolfe explained, in NCR's model "either they [PCBs] settle with solids from that discharger or almost all of them are dissolved and transported downstream, in particular through OU4A, OU4B, and all the way to Green Bay. It's the best way to understand why there's so little deposition of upstream sources in OU4 [in NCR's model]." (Tr. 2210:12-16.)

NCR was not able to point to strong support for its assumption that PCBs are dramatically less likely to reattach to river sediments than to discharge sediments. More importantly, the evidence in the riverbed does not support its assumption either. A large deposit exists in OU3 just above the De Pere Dam, while NCR's model predicted just the opposite. As Exhibit 9970 shows, the actual contamination in OU3 is almost exactly the opposite of what the NCR model predicts: the highest levels of contamination are downstream, whereas NCR's prediction (due in part to its

assumptions detailed above) was that the *up*stream portion of that section of the river would contain the highest concentrations. (Ex. 9970.) There are no PRPs in OU3, and so the PCBs had to come from upstream sources, demonstrating that they did not dissolve in the manner NCR suggested.

In OU4 the contrast is stark. NCR's model predicts relatively little contamination in the upstream end of OU4 and almost none in the dredged navigation channel, yet those areas are key to the actual remediation project. The dredged channel was, in fact, a sediment trap stretching the length of OU4. As the exhibit below shows, the model thus does not put PCBs in the right places. (Ex. 9971.) On the left is the model's prediction for OU4A, and on the right is the actual remedial plan for that stretch of river based on actual PCB contamination levels.



NCR contends that it is not important that its model fails to predict the actual location of the PCBs because what's really important is the *relative* contributions of the parties, which NCR argues is "all that is required for apportionment." (ECF No. 764 at 34.) But that obscures the dual purpose of the model. It might be true that relative figures are all that is required for *apportionment*, as NCR says, but that is not true for causation. Location *is* important. As described above, in order to prove divisibility, Mr. Butler had to show there would be specific areas in the river where the contamination would be less than 1.0 ppm in an NCR-only scenario but where it exceeds that level when the discharges of the other PRPs are added in. If the model he relies on puts large amounts of PCBs in the wrong areas, we can have no confidence that Butler would have been able to demonstrate that certain polygons would have been sensitive to additional PCB loads from other sources. In fact, if the model Butler relied on has little relationship to the river as it actually is, we can have no confidence in his analysis of the contamination in all of the polygons. As Dr. Wolfe credibly explained, "if the model's not putting the PCBs in the right place and in addition if it's tending to put them too close to the source and underestimate deposition at a distance from the source, that it can't be getting the mix right, PCBs delivered to any particular apportionment polygon, and so is unreliable." (Tr. 2206.)

4. The Complexity of the Lower Fox River

The sediment found at the bottom of the Lower Fox River—as in most rivers—is a reflection of a number of independent factors that render it difficult or even impossible to pinpoint the source of contaminants found in that sediment. For example, the shipping channel in OU4 has been dredged by the Army Corps of Engineers for some 150 years. In dredging millions of cubic yards of sediment, the Corps repeatedly spread out the sediment and stirred up the bottom. (In fact,

the Corps of Engineers is itself potentially liable as a discharger.) For much of the period during which PCBs were discharged into the river, the Corps would dispose of the dredged sediment in other areas of the river. (PCBs were not widely known to be toxic until later.) And when the Corps stopped dredging the shipping channel below the Fort Howard turning basin in the late 1960s, that portion of OU4 filled in and became a sediment trap.

Things are also made more complicated by the seiche effect, a phenomenon whereby the river actually flows backwards during certain weather events, and the fact that countless water craft, from fishing boats to large coal ships, have been stirring up the water for decades. (Tr. 155.) The government's principal witness, Mr. Fox, testified that a ship's propellers and bow thrusters result in "scour," or degradation of the river bed, and sometimes larger ships can become grounded in the river, leaving deep gouges that are eventually filled in by new sediment. (Tr. 272-74.) In addition, Dr. Wolfe testified that "bioturbation" occurs when mussels, fish or worms stir up the river bottom and disturb sediment. (Tr. 2193.) Finally, high flow events after major storms can exert pressure on the sediment and cause resuspension and redistribution of PCBs. All of these natural and anthropogenic factors have resulted in a riverbed where PCBs from different sources are commingled; some are buried deep under layers of sediment, while others lie near the surface and are resuspended over and over. To take just one telling example, Mr. Fox tested for a chemical called Santosol, which was NCR's replacement for the toxic Aroclor 1242. NCR used Santosol 100 in the mid-1970's and later switched to Santosol 150, but in some sediment cores Fox found Santosol 100 layered on *top* of the more recently used chemical—just the opposite of how one would expect to find it. Fox found this "co-occurrence" to be "surprising" and indicative of the high level of sediment disturbance in the river. (Tr. 311:18-25.)

The government argues that all of these factors led to the riverbed we have now, which is a dynamic environment characterized by a patchy and jumbled distribution of PCB contamination. Given the complexity of the sediment distribution and the number of natural and man-made forces that have stirred up sediment for decades, it is essentially impossible to predict where PCBs from the numerous PRPs along the river would have ended up. As government expert Dr. Jill Singer testified, "while we have a general understanding of how the sediments are moving and behaving through the system, to be able to essentially quantify that and specify where a particular particle originated and where it ends up is not possible." (Tr. 166-67.)

The court adopted much of the government's complexity argument in granting the motion for a preliminary injunction. I reasoned that the numerous forces that disturbed the sediment were essentially independent factors that disrupted the chain of causation linking the discharge of PCBs to the actual harm manifested in the river. In essence, because so many independent factors played a role, we could not link a given volume or concentration of contaminated sediment to a particular discharger. In light of the inability to make this link, as well as the relatively loose correlation between PCB masses and remediation efforts, the court concluded that the harm was a unitary, rather than divisible, one. *See United States v. Monsanto*, 858 F.2d 160, 173 n.27 ("Volumetric contributions provide a reasonable basis for apportioning liability only if it can be reasonably assumed, or it has been demonstrated, that independent factors had no substantial effect on the harm to the environment.")

The examples given in the RESTATEMENT have played a key role in this Court and the Seventh Circuit, and at this point it is worth exploring them again. At the preliminary injunction phase, the Seventh Circuit agreed (or at least found no abuse of discretion) with my initial conclusion that the PCB problem resembles the RESTATEMENT's example 14:

> A Company and B Company each negligently discharge oil into a stream. The oil floats on the surface and is ignited by a spark from an unknown source. The fire spreads to C's barn, and burns it down. C may recover a judgment for the full amount of his damages against A Company, or B Company, or both of them.

RESTATEMENT (SECOND) OF TORTS § 433A, illus. 14.

The salient point about this example is that the spark acts as an independent actor that severs a direct causal link between the pollution and the harm. We do not know if one company's oil discharge would have ignited and burned down the barn, or whether the amount of oil was correlated with the extent of the fire damage. As the Seventh Circuit pointed out, "it is impossible to draw a logical connection between the amount of oil each company discharged into the stream and the ultimate injury." *United States v. NCR*, 688 F.3d at 842. Here, each of the natural and man-made influences on the riverbed are analogous to the spark—independent forces that transform the nature of the pollution and sever the causal link between the mass discharged and the harm that actually exists, which continues even now to change on a daily basis. For example, suppose A releases 100 kg of PCBs into the river, while B releases 1,000 kg. In light of all the factors described above—river currents, attachment to solids, seiche, dredging, ship traffic, etc.—it is conceivable that A's much smaller releases could prove just as dangerous as B's because the independent forces could have moved A's PCBs into areas with high concentrations that require remediation, whereas B's could be buried, or more safely dispersed.

NCR argues that the PCB problem more closely resembles the RESTATEMENT's fifth illustration:

> Oil is negligently discharged from two factories, owned by A and B, onto the surface of a stream. As a result C, a lower riparian owner, is deprived of the use of the water for his own industrial purposes. There is evidence that 70 per cent of the oil has come from A's factory, and 30 per cent from B's. On the basis of this

> evidence, A may be held liable for 70 per cent of C's damages, and B liable for 30 per cent.

RESTATEMENT (SECOND) OF TORTS § 433A, illus. 5.

In this illustration, however, there are no independent forces at work, and thus nothing to sever the intuitive link between the amount of oil discharged and the harm caused. Without these independent forces, it is easier to conclude that there is some reasonable proportionality between the harm caused and the amount of oil discharged. But because these forces are absent from the example, it does not closely resemble the situation we face here.

NCR also protests that most of the independent factors such as current, boat traffic, dredging, seiche, etc., are phenomena common to almost every waterway. The government's witnesses agreed that there was nothing particularly unusual or complex about the Lower Fox River, and thus NCR suggests that a heavy focus on these factors would unduly imply that environmental harm in a river is *never* divisible. Of course, the complexity of a river system should not always preclude divisibility, and in truth it is not a dispositive factor in the court's analysis here. (It is noteworthy, however, that NCR has not pointed to another similar case involving a river where the harm *was* found divisible.) In this case, the complexity issue is important because NCR's analysis assumed, at least in some minimal degree, that it could predict where PCBs would deposit in OU4. As noted above, in order to demonstrate divisibility, Mr. Butler needed to possess the ability to show that there were significant areas of the river where NCR's discharges did not cause the need for remediation. Thus, while not dispositive of the issue, the fact that the PCBs have been whisked about in the river by numerous independent forces for the last half-century further undercuts any confidence we can have in NCR's ability to show that the harm is capable of division.

5. Summary and Conclusions about NCR's Approach

In short, Butler's testimony did not explain in sufficient depth why so many areas of OU4 would not require remediation had NCR been the only discharger of PCBs. And his approach cannot be viewed in a vacuum. It relied on estimates from Mr. Braithwaite and models from Dr. Jones, and these factors play a critical role in determining whether the contamination in OU4 would be substantially less had NCR been the only discharger. Because the inputs Butler used to reach his conclusions were substantially flawed, his overall analysis would be unreliable even if his testimony were otherwise convincing. Finally, the uncertainties in the river itself, as well as in the modeling, undercut any confidence we can have in Butler's conclusion that NCR was an insufficient cause of the harm in OU4.[8]

6. Divisibility Beyond the "Sufficient Cause" Approach

So far, the court has discussed divisibility as though the only relevant question is whether NCR could be deemed a sufficient cause of the harm in OU4. In the court's view, however, joint and several liability may (and should) attach even if a party is *not* a sufficient cause of the harm, so long as the party is *necessary* to the harm. In other words, even if NCR had met its burden to demonstrate that it was not an independent, sufficient cause of the harm in OU4, that would not suffice to show that OU4 would be theoretically capable of division.

NCR proceeded as though the question of sufficient cause was the exclusive lodestar of divisibility, and it is true that the Seventh Circuit's decision highlighted that as a key issue. *United*

[8]Some of this analysis could be applied with equal force to the second question in the divisibility analysis. Thus, even if the harm were *theoretically* capable of being divided, I would conclude for the reasons stated herein that NCR has not shown a reasonable factual basis for apportioning the harm.

States v. NCR, 688 F.3d at 839 (holding that "NCR did not put forth any evidence to refute the government's contention that NCR's contributions of PCB would, alone, require approximately the same remedial measures.") But although the Court noted that NCR had not won the day on that issue, I do not read the Court's opinion to mean that other arguments or ways of looking at the divisibility question are foreclosed. *Id.* at 841 (noting that "there is not necessarily one universal way that we should approach apportionment in pollution cases.")

In fact, the Seventh Circuit observed that, in some complex cases, looking at a party's contribution to the problem fails to solve the disability question. "But for more complicated situations like this one, in which a chemical is harmful when it surpasses a certain amount, or instances in which a chemical may not be very harmful but becomes so when mixed with other chemicals, it will not suffice to look solely at the amount of contamination present in order to estimate the harm." *Id.* As noted at length above, ours is a case in which a chemical is harmful when it surpasses a certain amount, and so it is an uphill battle for a PRP trying to show a meaningful causal relationship between amounts discharged to causation of harm. In addition, however, our case also bears a great deal of resemblance to the case in which a chemical "may not be very harmful but becomes so when mixed with other chemicals." *Id.*

For remediation purposes, PCBs are not considered harmful unless they exceed 1.0 ppm in a given location. Thus, one party's PCBs may not be very harmful on their own, but when mixed with other PCBs the concentrations in a given area might cross the 1.0 ppm remedial threshold and become harmful. In such a case, A's PCBs might not be a *sufficient* cause of the harm in a given section because they resulted only in, say, a 0.7 ppm contamination level. But when mixed with the PCBs of B, the threshold level is reached and remediation is required. Discharger A can therefore be deemed a *necessary* cause of the harm because without its discharges there would be

no remedy, even though its discharges were not sufficient, on their own, to bring about the need for a remedy.

All this is simply another way of saying that the harm in OU4 is not divisible in terms of degree because there was no evidence as to whether NCR was a necessary, if insufficient, cause of any harm in OU4. Even if Butler had succeeded in showing that, say, 40% fewer polygons would need remediation if NCR had been the *sole* discharger, he said nothing about the presumably large number of polygons that would need remediation *in part* because of NCR's discharges. Suppose Butler had identified a polygon that actually had 1.3 ppm of PCBs (thus requiring remediation) but would have had a concentration of only 0.6 ppm if NCR had been the sole discharger. He would place that polygon in the "no remedy" column and use it as evidence that the remedy would have been different had NCR been the only discharger—NCR, in other words, was not a "sufficient cause" of harm in that polygon. That was the end of Butler's analysis.

Given NCR's large discharges of PCBs, one would expect that many or most of the polygons that Butler put in the "insufficient cause" category would fall into this "necessary cause" category as well. If NCR's large discharges were not enough to cause the remediation on their own, surely they were *a* cause of the remediation in a great number of polygons, if not all of them. And Butler certainly recognized this. As he testified in reference to a hypothetical example, "through the collective contribution of all the parties you would get remediation in this core because it exceeds the thresholds, but when you look at the individual parties by themselves, they do not contribute sufficient concentrations so that there would be no remedial action by themselves on a stand-alone basis. Collectively they contribute." (Tr. 1450:1-7.) Butler himself admitted that he had encountered this "collective" contribution scenario "a number of times" in his analysis. (Tr. 1450: 8-15.)

But Butler never took the additional step of considering polygons where there was a "collective" cause of the need for remediation. In his view, these collective polygons were evidence supporting divisibility because they showed that NCR was not the sufficient cause of harm. But in reality they are evidence that NCR was still a *necessary* cause of the harm in many or most of the "collective" polygons that needed remediation. Because Butler's analysis ended at the question of sufficient cause, it did not account for the countless areas that need remediation because NCR's contribution, when mixed with other PRPs' discharges, caused the harm. Thus, even if Butler had showed that there would be 40% less dredging in an NCR-only scenario, he likely would not be able to show that there would be *any* change in the remedy if we also counted those polygons for which NCR was a necessary, if insufficient, cause. And since there was no evidence on that score, NCR has not met its burden to show divisibility.

The example in which two harmless chemicals mix to create a harmful situation applies squarely to the situation before us. Neither discharger in such an example is a sufficient cause of the harm; it is only when they mix that the harm is realized. The same holds true here, even though the dischargers released the same chemical rather than different ones. On its own, NCR's contribution of 0.7 ppm of PCBs to a given area would not require remediation, but it becomes harmful (requiring remediation) when mixed with the PCBs from other sources. NCR protests that this "necessary cause" analysis is "moving the goalposts," but that is only true if the Seventh Circuit's opinion is read to mean that the "sufficient cause" analysis should be the exclusive framework for answering the divisibility question. As noted above, however, the Court explicitly mentioned the mixed chemicals example in its opinion. Additionally, the Court observed that the RESTATEMENT OF TORTS is what governs divisibility, and the RESTATEMENT explicitly includes exactly this scenario:

> Where two or more causes combine to produce such a single result, incapable of division on any logical or reasonable basis, and each is a substantial factor in bringing about the harm, the courts have refused to make an arbitrary apportionment for its own sake, and each of the causes is charged with responsibility for the entire harm. The typical case is that of two negligently driven vehicles which collide and kill a bystander. The two drivers have not acted in concert, and the duties which they owe are separate and distinct, and may not be identical in character or scope; but the entire liability of each rests upon the obvious fact that each has caused the single result, and that no rational basis for division can be found.

RESTATEMENT (SECOND) OF TORTS, § 433A, cmt. i.

Many areas of OU4 resemble the example of the two vehicles that collide and kill a bystander. Like the PRPs here, they have not acted in concert, but the entire liability for the harm they produced *together* "rests on the fact that each has caused the single result." *Id.* The entire liability in such a case "is imposed also where both are essential to the harm." *Id.* Thus in areas where NCR causes 0.7 ppm of contamination and Glatfelter causes 0.5 ppm, both parties are essential to the harm and are held jointly and severally liable, just as the two drivers who collide and cause a single harm. As a matter of policy, there would seem to be no reason to exclude from a causation analysis areas of harm for which NCR was actually a necessary cause, but that is exactly what NCR did. Because Butler's analysis did not account for these considerations, NCR failed, for this additional reason, to meet its burden to show that the harm is theoretically capable of division.[9]

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[9] NCR makes much of the fact that the government's principal witness, Richard Fox, accepted the premise that if NCR were the only discharger, the costs of remediation would naturally be lower. (Tr. 333:22.) In fact, during the preliminary injunction phase, the same witness had agreed that the costs involved would be "dramatically lower" if NCR had been the only discharger. (Tr. 334:3-8; ECF No. 365 Tr. 125:1-4.) But what NCR glosses over is that Mr. Fox was being asked to opine about a river in which NCR was responsible for only 6 to 9% of the PCBs (based on Dr. Connolly's estimate).

If NCR truly discharged only 6 to 9% of the PCBs that settled in OU4, Fox's concession would likely make this an easy case. The mass of PCBs caused by NCR would be so low that it would overcome the problems set forth above because we could expect such small loads would not produce the need for *any* remedy in many areas of OU4. But for the reasons given above, I cannot conclude that Dr. Connolly's very low estimates are reliable, and even NCR has relied on Butler's conclusion that it should be deemed responsible for 20%.

V. The OU1 Defendants' Divisibility Theory Also Fails

The OU1 Defendants (Glatfelter, Menasha Corp. and WTM I) have a much different, although more straightforward, approach. These Defendants argue that although PCBs from OU1 undoubtedly made their way in large quantities into OU4, they did not materially contribute to the need for a remedy or increase the remedy in any way because they entered OU4 only in very small concentrations. In other words, they argue that because their share of the harm in OU4 is *zero*, the harm in OU4 is distinct from any harm they may have caused in OU1.[10]

A. Dr. Victor Magar

The OU1 Defendants' theory was based almost entirely on the expert opinion of Dr. Victor Magar, who testified that *no* cleanup would have been required in OU4 if the OU1 Defendants had been the only dischargers of PCBs. Magar has a Ph.D. in environmental engineering and over twenty years of experience with sediment management, contaminant fate and transport, and hazardous waste remediation.

1. Concentration versus Mass

In Dr. Magar's view, the remedy and overall harm is a product of the *concentration* of PCBs in the sediment rather than the mass. The remedial action threshold of 1 ppm means that remedial action is triggered not by how many PCBs are in a given spot, but by how many PCBs are there in proportion to how much other material is there. The ratio—the numerator and the denominator—is what counts, not just the numerator. A high-concentration area of, say, 20 ppm needs to be remediated, while an area having *more* PCBs might not need to be remediated if the concentrations are lower. The OU1 Defendants assert that most of the evidence was directed at

[10]In many ways this is not a question of whether to impose joint and several liability but of whether these Defendants are liable at all.

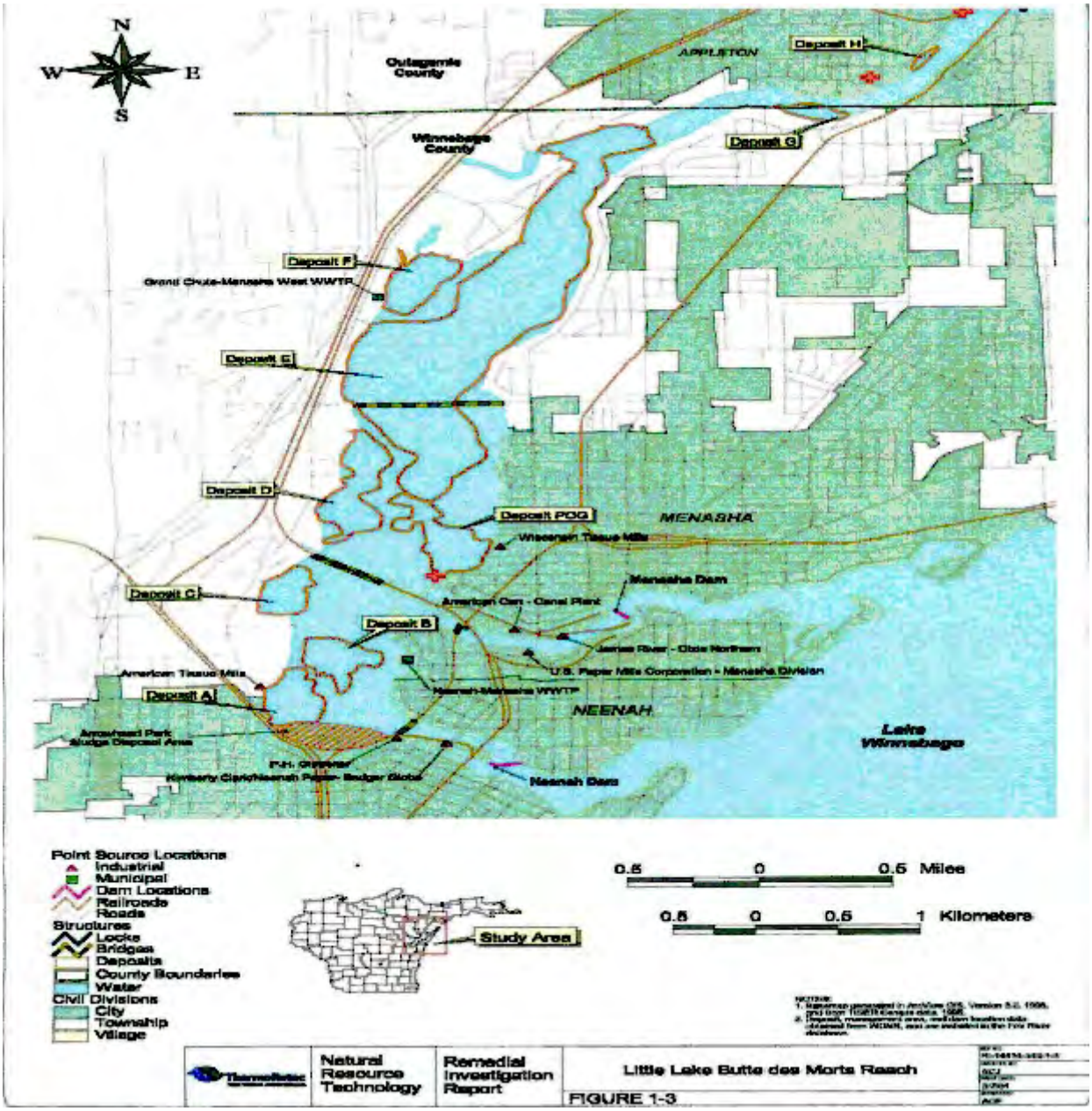
demonstrating the *mass* of PCBs that went into OU4 (the numerator) without regard to the amount of sediment that the mass was attaching to (the denominator).

According to Dr. Magar, dilution causes PCB concentrations to drop as the solids to which they are attached become more distant from the source. Using OU1 as an example, he noted that concentrations of PCBs were highest at the upstream end of OU1 nearest the OU1 dischargers. When one moves into the middle or downstream end of OU1, concentrations are much lower, as evidenced by the fact that the sediment there did not require remediation. (The OU1 cleanup has already been completed.) (Tr. 1610.) Magar asserted that the PCBs that made their way out of OU1 would have been in the lower concentrations found at the downstream end of OU1, and concentrations would have dropped even more during the long transit through OU2, OU3 and OU4. This dilution occurs through volatilization (evaporation) as well as the introduction of clean sediment, which further lowers the concentrations by boosting the denominator in the ratio. (The same mass of PCBs becomes mixed with a greater amount of clean sediment, thus diluting the concentration.)

Dr. Magar testified that what he called "Middle OU1" in many ways resembled OU4. This section of OU1, downstream from the dischargers, required no remediation because the concentrations were below the 1.0 ppm remedial action level. (Ex. 8560E.) Middle OU1 contains a depositional area that is very similar to OU4, he argued, because Exhibit 4000 (Mr. Simon's report) shows that the shear stress in Middle OU1 is the same or lower than that in much of OU4. (Ex. 4000, Figures 5-13, 5-16 and 5-17.) The lower the shear stress (the force exerted by the current of the river), the more likely it is that solid particles will deposit. Thus, if the solids that deposited in Middle OU1 did not exceed the 1.0 ppm threshold, it is unlikely that they would

deposit in concentrations exceeding that threshold once they were transported twenty or more miles downstream into a similar depositional area.

The following illustration shows Glatfelter's location at the southern end of Little Lake Butte des Morts, as well as the Arrowhead Park sludge disposal area. (Ex. 3 at WDNR060002806.)



In sum, Magar argued that downstream portions of OU1 did not meet the 1.0 ppm threshold and required no remediation. Moreover, PCB concentrations dilute as solids are transported down the river due to evaporation and the addition of clean particles in the water column. Given these factors, Magar believed it was unlikely that PCBs from OU1 would exist in sufficient concentrations to trigger remedial action in OU4. Accordingly, Magar asserted that the OU1 Defendants did not contribute in any way to the harm in OU4.

2. Glatfelter's Discharges

Dr. Magar also conducted a study to determine the mass of PCBs Glatfelter discharged. To recall, government estimates from the Wisconsin DNR and the Amendola report had been in the range of 128,000 to 188,000 kg. (Ex. 9968) NCR's Simon team adopted the 128,000 figure. Dr. Magar, however, concluded that his client Glatfelter (then known as Bergstrom) had discharged a mere 14,000 kg of PCBs to OU1, or roughly one-tenth of what had been previously assumed. (Tr. 1651:15.)

Dr. Magar conducted a mass balance analysis and tested it by taking cores from the Arrowhead landfill, where some solids removed during the de-inking and coating process ended up after being sent through a clarifier. (Tr. 1642.) A clarifier is a large settling tank in which some of the solids settle out of the wastewater; these solids would be sent to the landfill. Some of the solids did not settle, however, and these were released into the river. (Tr. 1679.) If we know what the solids removal rate of the clarifier is (i.e., its efficiency), we can calculate how many solids went into the landfill versus how many went into the river. In essence, Dr. Magar used the solids found in the landfill as a proxy for those that were discharged to the river.

Dr. Magar testified that the core samples in the Arrowhead landfill showed that the landfill contained some 50,000 kg of PCBs. He stated that he was able to calculate the volume of the

landfill itself by using simple measurements; he also knew what the "sludge mass" of the landfill was. (Tr. 1644:21.) By measuring the concentration of PCBs in the sludge, he was able to calculate the total mass of PCBs in the landfill. He corroborated this number by using company records that established how many solids were piped into the landfill. Multiplying this number by the concentration of PCBs on the solids (as he had measured it with sample cores) resulted in a figure that closely matched his own measurements. (Tr. 1645.)

Having measured the mass of PCBs in the landfill, Dr. Magar then proceeded to extrapolate from that a calculation of the mass of PCBs that went into the river. He used company records to establish the efficiency of the clarifying process at various time periods. For example, during the period 1965-69, he found that the clarifier's efficiency was 77.6%. (Ex. 8350 (Magar Expert Report), Ex. 31 (Mass Balance), Table 1.) Thus, during that period, Dr. Magar would say that the clarifier removed 77.6% of the solids (and thus the PCBs) from the wastewater, and only 32.4% wound up in the river. Using clarifier data for the entire PCB era, Dr. Magar was able to arrive at the total of 28,792 pounds, or roughly 14,000 kg of PCBs released to the river. In sum, his method assumed that the clarifier efficiency rate could be applied to what was in the landfill to determine the mass of PCBs that did *not* make it in the landfill. Thus, when he applied the clarifier efficiency rate to PCBs found in the landfill, the mass of PCBs in the landfill became a proxy for the mass of PCBs released to the river.

B. Criticism of and Analysis of Dr. Magar

One key criticism of Dr. Magar's work involves the depositional nature of OU1. Dr. Magar believed that the downstream portions of OU1 were comparable to portions of OU4 in terms of their depositional qualities. In other words, PCBs could be expected to settle in downstream OU1

because the shear stress there was comparable or even lower than OU4. Thus, the fact that PCBs did *not* settle in downstream OU1 in large concentrations suggested that the concentrations by that stretch of the river were already lower than the 1.0 ppm remedial action level. Accordingly, in his view it was doubtful that any PCBs flowed into OU2 at levels *higher* than 1.0 ppm.

But the government and the downstream Defendants rejected the idea that OU1 was as depositional as Magar claimed. They argued that high-concentration PCB deposits were absent in lower OU1 not because PCB concentrations had already petered out, but because the PCBs simply were not permanently depositing in that part of the river. Instead, they were moving into OU2 (where almost nothing deposited) and finally depositing in OU3 (in small amounts) and OU4 (the most depositional of the operable units). (Most PCBs, of course, never deposited at all and flowed out into Green Bay.)

Georgia-Pacific's Dr. Wolfe credibly testified that solids in the river "mostly move downstream rather than settle and form deposits." (Tr. 2183:6-7.) Even OU4, which is the slowest-moving part of the river, transmits large quantities of solids to Green Bay. In Dr. Wolfe's view, OU4 has a "trapping efficiency" of 22%, meaning that some 78% of the suspended solids simply pass straight through without depositing. By contrast, OU1 has a trapping efficiency of only 7%. It is much slower and more depositional than OU2 (the portion of the river with an elevation drop tantamount to Niagara Falls), but 93% of solids make their way downstream rather than settling.

The conclusion that OU1 did not retain many PCBs was supported by the testimony of Dr. Connolly, who stated that based on the core samples of OU1 prior to remediation, the PCBs that stayed within OU1 represented only a small fraction of the total: he credibly testified that "the vast majority of the PCBs that entered OU1 would have had to have left OU1 and proceeded

downstream." (Tr. 607:19-21.) Connolly conducted a mass balance analysis in an attempt to show how many kilograms of PCBs left OU1. He noted that there were some 6000 kg of PCBs in the sediments of OU1 prior to remediation. If the amount entering OU1 was 113,000 kg (the figure from the Simon team analysis), that meant that some 107,000 kg, or some 95%, left OU1 and flowed down the river. (Tr. 574-75.) This very closely tracks Dr. Wolfe's conclusion that roughly 93% of solids would pass through OU1 without permanently depositing. Ultimately, after combining his mass balance analysis with a chemical marker analysis, Connolly concluded that OU1 sources were responsible for far more of the PCBs in OU4 than OU2 sources.

Dr. Magar's analysis of Glatfelter's discharges is also unsupportable. The government and the downstream Defendants have highlighted a number of problems with his analysis, but a key one is his assumption about the relationship between clarifier efficiency (solids removal) and PCB removal. Dr. Magar conceded on cross-examination that he had assumed the ratio would be one-to-one; in other words, that if a clarifier removed 50% of solids, it would also remove 50% of PCBs. If that did *not* turn out to be true, he admitted that the extrapolation he was making would not hold up. (Tr. 1685.)

Dr. Magar is not a wastewater treatment or papermaking expert, and he established no basis for his assumption that PCBs would be removed at the same rate as solids. Although such an assumption appears reasonable on its face, throughout the trial it was made clear that all solids are not equal when it comes to PCB adsorption. As a general principle, larger solids have more mass than smaller solids, but less surface area as a *percentage* of that mass. To use a more concrete example, even though smaller grapes have less mass and volume, they have a higher percentage of skin (surface area) than larger ones.

PCBs adsorb, or attach, to the surface area of solids. Given that smaller solids—what industry people call "fines"—have relatively greater surface areas as a percentage of mass, smaller solids also attract more PCBs as a percentage of mass. This means that 1 kg of tiny solids will have higher concentrations of PCBs than 1 kg of larger solids. Dr. John Cameron, a professor of chemical and paper engineering at Western Michigan University, explained that "because the fines have a higher surface-to-mass ratio, they're going to absorb more PCBs and they're going to have a higher concentration of PCBs than the heavier, larger particles that have a lower surface-to-mass ratio. So therefore in the fines you're going to see a higher concentration of PCBs than you are within a larger particle." (Tr. 2517:20-25.)

Thus, smaller particles are relatively more attractive to PCBs than larger ones. That fact would not matter if a clarifying system treated all solids alike. As Dr. Cameron testified, "the basic assumption [of Dr. Magar] is that the PCB content in the sludge [sent to the landfill] is the same as that of the solids being discharged." (Tr. 2517:3-4.) That is, if a clarifier removed small solids and larger solids at the same rate, it would be reasonable to conclude that the sludge in the landfill had the same PCB characteristics as the solids that were not removed by the clarifier and were sent into OU1, and thus it would be reasonable to use the solids in the landfill as a proxy. But both Dr. Cameron and Mr. Braithwaite credibly testified that clarifiers do not work in such a fashion. Instead, clarifiers allow the heavier, *larger* solids to settle while leaving the finer particles suspended in the wastewater. A clarifier is a still, or "quiescent" settling vessel or tank that allows particles to settle. (Tr. 2518-19.) The heavier particles naturally settle to the bottom, and of course these are the particles with the *lowest* concentration of PCBs because they have smaller relative surface areas. The finer particles, by contrast, are less likely to settle and are thus more likely to

be discharged. Thus, a clarifying system actually discharges the solids with the *highest* concentrations of PCBs while sending the lower-concentration solids to the landfill. (Tr. 731.) And this effect is actually magnified as the efficiency of the clarifier increases: "Because the clarifier will remove the higher density, larger particles but discharge more of the fines, as it becomes more efficient one would expect to see a higher concentration of PCBs discharged as the efficiency increases." (Tr. 2521:4-7.) Thus, it is likely that Glatfelter's clarifiers had little or no mediating impact on its PCB discharges. Accordingly, Dr. Magar's attempt to use the PCB concentrations of sludge in the Arrowhead landfill as a proxy for PCBs discharged to OU1 was not persuasive.

Instead, it is likely that reliance on PCBs in landfill sludge significantly—or even dramatically—understated Glatfelter's discharges. On cross-examination, Dr. Magar was asked about a 1977 letter from the Appleton-based Institute of Paper Chemistry to Bergstrom indicating that some 80% of the PCBs were contained in the "fines," even though the fines constituted only 10% of the solids. (Tr. 1686-87.) Magar conceded that he had been aware of that information but had not included it in his analysis. If 80% or so of PCBs had indeed been in the fine solids, which were probably not captured by Glatfelter's clarifying systems (particularly earlier in the PCB era), then the 50,000 kg of PCBs Dr. Magar found in the landfill sludge is really only the tip of the iceberg in terms of Glatfelter's actual discharge. It would thus not be surprising to find, as the other estimates bear out, that Glatfelter's actual discharge was in the neighborhood of 125,000 to 150,000 kg, or even more.

In sum, the weight of the evidence showed that solids in OU1 did not deposit there in large quantities but instead moved through the six miles of OU1 and passed into the much faster current of OU2, from which they made their way into OU4, where they either deposited or ended up in

Green Bay. In other words, the absence of high concentrations of PCBs in lower OU1 is not due primarily to dissolving or "petering out," it is because the PCBs were attached to finer particles that would only deposit in a slower moving area such as OU4. Moreover, Dr. Magar's estimate of Glatfelter's discharges was undermined by his unsupported reliance on landfill sludge as a proxy for PCB discharges. For all of these reasons, the court finds Dr. Magar's conclusions unpersuasive and concludes that the OU1 Defendants are, in fact, a significant cause of the harm in OU4.[11] And of course the same "necessary cause" considerations discussed in Section IV B-6 apply with equal force here. The OU1 Defendants' argument was that their discharges did not reach OU4 in sufficient concentrations to meet the 1.0 ppm threshold, but they proffered no evidence that their discharges would not have been enough to constitute a necessary (if insufficient) cause of much of the harm in OU4.

VI. Injunctive Relief

Having concluded that the harm in OU4 is not capable of being divided, the court must consider whether the relief the government seeks is appropriate. The Fifth Claim for Relief seeks "a judgment in favor of the United States and against each of the UAO [Unilateral Administrative Order] Recipients, that each UAO Recipient is required to comply with all provisions of the UAO applicable to such UAO Recipient, other than the provisions of UAO Section XIX (Reimbursement

[11]The OU1 Defendants did not attempt to show that the harm was divisible under NCR's "sufficient cause" approach, even though some of them would have had a better chance than NCR at proving divisibility. The reason, presumably, is that if they cannot succeed in showing *zero* liability, their fallback preference would be joint and several liability, given this Court's rulings in the contribution action. That is, they would rather all be jointly liable and have NCR pay for everything than be severally liable and have to pay, say, 25 percent.

of Response Costs)." (ECF No. 30 at 32.) The parties agree that enforcement of a UAO is a kind of injunction. Before a court may award permanent injunctive relief, a party must demonstrate (1) it has succeeded on the merits; (2) no adequate remedy at law exists; (3) the moving party will suffer irreparable harm without injunctive relief; (4) the irreparable harm suffered without injunctive relief outweighs the irreparable harm the nonprevailing party will suffer if the injunction is granted; and (5) the injunction will not harm the public interest. *Old Republic Ins. Co. v. Employers Reinsurance Corp.*, 144 F.3d 1077, 1081 (7th Cir. 1998). *See also Monsanto Co. v. Geertson Seed Farms*, 130 S. Ct. 2743, 2756 (2010).

The UAO cited the health risks (by then well-established) posed by PCBs due to their consumption by fish, which are then consumed by humans despite posted warnings. (Ex. 1127 at 15-16.) The government's witness, Dr. Michelle Watters, holds both a Ph.D. in environmental engineering as well as an M.D. and a Masters Degree in public health. She testified credibly that PCBs in the river have a "completed exposure pathway" from sediments to humans (Tr. 30:3), and consumption of PCBs leads not only to higher rates of cancer, but also certain developmental, reproductive, immunologic and endocrine problems. (Tr. 19:4-7.) She noted that PCBs can cross the placenta and impact the development of fetuses and can also be ingested by infants through breast milk; PCBs are particularly harmful at these sensitive developmental ages. (Tr. 19-20.) Ultimately, she agreed with other assessments that PCBs in the Lower Fox River posed a public health hazard. Dr. Watters also concluded that consumption warnings were not an effective means of controlling the risk because many people did not know about or simply ignored the warnings because fishing was an inexpensive way of obtaining significant amounts of protein-containing food. (Tr. 34-35.)

Dr. Watters was persuasive and convincing on both the general nature of PCB contamination as well as the continuing danger that they pose. Some of the Defendants suggest that many of the PCBs have now been cleaned out of the river due to their efforts to-date, and that mitigates the danger and reduces the need for injunctive relief. Although that might lessen the urgency in some small way, it does not materially change the fact that PCBs continue to cause health problems and continue to be washed into Green Bay, where they will never be able to be removed from the ecosystem. In short, the government has demonstrated that an injunction would be in the public interest and that there is no adequate remedy at law.

The OU1 Defendants also argue that there is no reason to order them to comply with the UAO given that NCR will be ordered to continue complying and NCR has the means to do so. They also suggest that if long-time adversaries are forced to work together, the project could become hamstrung by disputes and lack of coordination. But these hypothetical concerns do not suffice to undermine the need for injunctive relief. And under these Defendants' view, any PRP in a joint liability case could point the finger at all of the other PRPs and ask "why not them?" This, of course, would create a situation in which the government could never enforce a UAO because no *single* PRP is ever essential to the cleanup if others can be made to perform the work. In short, the fact that one PRP is currently performing the work does not mean that the others cannot be enjoined to do so as well. For these reasons, the court concludes that the government has adequately shown the need for injunctive relief.

VII. Evidentiary Issues

Following the trial, the parties raised and briefed a substantial number of evidentiary objections ranging from hearsay and authenticity to relevance, as well as the question of whether

demonstrative exhibits should be admitted as "substantive" evidence. Countless evidentiary objections were simply stated, in spreadsheet form, without briefing. Given the number of exhibits, witnesses and depositions, it is perhaps not surprising that there would be a number of objections. Even so, having reviewed the post-trial briefing, the court is satisfied that, for the most part, the objections are not material to the findings and conclusions set forth above. Most importantly, the court has not relied upon any evidence whose authenticity has been called into question, with the exception of the Heinritz letter which I have assumed (without deciding) to be authentic. Objections on relevance grounds are themselves of questionable relevance, given that (as discussed further below) this was a bench trial. More fundamentally, in this context, hearsay and other more technical objections speak more to the weight to be given to the evidence than to its admissibility. But the key point is that the court's conclusions above have not depended on any evidence to which there has been a salient objection, which means that most of the objections are rendered moot or, at most, that they speak to the weight, rather than the admissibility, of the evidence in question. *Cotton Patch Cafe, Inc. v. Micros Systems, Inc.,* 2012 WL 5986773, *9 (D.Md. 2012) (finding evidentiary objections moot because "The Court would reach the same summary judgment decision with or without the evidence at issue."); *Lake v. First Nat. Ins. Co. of America*, 2010 WL 4807059 at *7 n. 4 (N.D. Cal. 2010). The one exception is the motion to strike the testimony of Mr. Braithwaite.

A. Motion to Strike Testimony of James Braithwaite

The central objection made by the non-NCR Defendants involves Mr. Braithwaite's reliance on the 2000 Amendola Report. They argue that Braithwaite simply adopted certain discharge estimates from that report without having any idea how they were calculated. As such, because he

did not do his own discharge analysis and because Mr. Amendola himself did not testify, NCR was improperly using Braithwaite as a "mouthpiece" for the opinions of another expert.

The government does not join in this objection, presumably because Amendola is the government's own expert: it cannot very well object to another party's reliance on its own figures, particularly when it is the party prosecuting this action. One problem with the motion to strike is that the basic reasonableness of Amendola's conclusions is one of the foundational premises of this entire action. We may assume that Amendola, being a government-retained expert, had no financial incentive to shift blame from one party to another or to otherwise produce anything but good faith and unbiased estimates. Certainly no one has argued anything contrary to that assumption. Thus Amendola's estimates have guided the remedial action and have been repeatedly relied on for more than a decade by the government itself. Thus, it is hardly surprising that Braithwaite chose to start his analysis by relying in certain key respects on estimates that had already been produced by an unbiased source.

Additionally, we must remember that this was a trial to the Court, not a jury trial. The Federal Rules of Evidence arose out of doubts about the ability of lay jurors to sort through evidence and understand its limitations. *See* Kenneth S. Broun et al., McCormick on Evidence § 60 (6th ed. 2006). When the factfinder is the judge, and when all the arguments about the limitations of a given piece of evidence are laid out and explored at some length, there seems little reason to exclude entirely a piece of evidence unless its inadmissibility is obvious. *Id.* ("Judges possess professional experience in valuing evidence, greatly lessening the need for exclusionary rules.") The judge is thus perfectly capable of using evidence in a more nuanced way than simply giving it a thumps-up or thumbs-down.

> Proud complains that the summaries did not meet the test for admissibility of summaries in the Federal Rules of Evidence. . . . Such a complaint has a hollow ring in a bench trial. A district judge can be trusted in general, and in this particular instance, to give evidence its proper weight without regard to the technical rules of evidence . . . which insofar as they relate to matters of probative force rather than to privilege are designed primarily for the control of juries.

Greycas, Inc. v. Proud, 826 F.2d 1560, 1567-68 (7th Cir. 1987).

Even ignoring these background concerns, however, it is evident that Braithwaite was entitled to rely on the Amendola report because it was the kind of data on which experts in his field would reasonably rely. Fed. R. Evid. 703. Braithwaite gave uncontroverted testimony that experts in his field do traditionally rely on government reports and regulatory investigations, and as an expert his opinion about what is ordinarily relied on in his profession is entitled to weight. (Tr. 901:5-15.) He admitted that he had never before used an opposing party's expert report, but the Amendola report is not akin to the typical expert report—it is instead part of an extensive fact-finding effort the government undertook more than a decade before this litigation commenced. And even if there is something unusual about using an opposing party's expert report, that fact does not suggest impropriety.

There remains the question of whether Braithwaite improperly acted as the "mouthpiece" for another expert. In *Dura Automotive Systems of Indiana, Inc. v. CTS Corp.*, a hydrogeologist conceded that he was not an expert in mathematical models of groundwater flow, yet he essentially adopted such modeling, which was done by other employees of his consulting firm, into his conclusions. 285 F.3d 609 (7th Cir. 2002). After these other employees were barred from testifying due to their late disclosure, the district judge granted summary judgment on the grounds that the hydrogeologist had no independent expertise upon which to verify the reliability of the

models he relied upon. "A scientist, however well credentialed he may be, is not permitted to be the mouthpiece of a scientist in a different specialty." 285 F.3d at 614.

Dura lies at one end of a spectrum of possible scenarios.[12] In that case, Dura Automotive attempted to use an expert in one specialty to offer expertise about another specialty. Although experts in the other specialty had contributed to his conclusions, they were unable to testify due to late disclosure. Here, by contrast, Mr. Braithwaite is an acknowledged expert in environmental engineering, wastewater treatment and contaminated sites who "grew up in the business" (his father was also an environmental engineer) and now has more than 40 years' experience in the field. (Tr. 691-92.) The report he relied on was well within his area of expertise—in fact, it involved the exact same questions (PCB discharges by PRPs) that he was asked to answer in this action, without any objection on the basis of his qualification to do so. Thus, this is not a case of one expert trying to "smuggle" another's expertise into a case, as with a surgeon who purports to testify about the negligence of a radiologist. 285 F.3d at 613. Instead, it is simply a case in which one expert relies on the conclusions of another expert in his own field. Given that the two experts share the same area of expertise, the testifying expert is qualified to render judgment about the conclusions of the non-testifying expert, which is exactly what Braithwaite did here.

The limitations of Mr. Braithwaite's testimony have been explored at great length in both the trial and the post-trial briefing. The court has considered these arguments and factored them

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[12] *Dura* had a strong dissent that makes the point that the expert's conclusions were not actually challenged by CTS' experts during any *Daubert* proceedings. There was thus no evidence that the expert hydrogeologist would not have commonly relied upon the computer model choices of the experts who were barred from testifying. Here, these concerns are salient because no one has suggested (certainly not the Plaintiffs) that the Amendola report is not something that an expert would commonly rely upon, and Braithwaite testified that it was.

in when considering what weight to give his testimony. Striking an expert's testimony is a drastic remedy, particularly in a bench trial, and I conclude that there is no reason to do so here. Accordingly, the motion will be denied.

It should also be noted, however, that even if the motion to strike Braithwaite's testimony was granted, the result would be the same. Mr. Braithwaite's testimony was offered by NCR to prove its divisibility defense. Recall it is the defendants' burden to prove the harm is divisible. Given the court's rejection of Dr. Magar's opinion as to the PCBs discharged in OU1, the divisibility defense would still fail even absent Braithwaite's testimony.

B. NCR's Motion to Exclude Testimony and Admit Demonstrative Exhibits

NCR first asks that the testimony of government witness Dr. Singer be excluded because she did not perform her sediment trend analysis ("STA") herself. NCR cites the *Dura* case, *supra*, for the principle that one expert cannot serve as the "mouthpiece" for a non-testifying expert. 285 F.3d at 614-15. But Dr. Singer was an expert in the general area of expertise in which sediment trend analysis is used, namely geology (the field in which she has a Ph.D.). She was familiar with the use of STA from previous experience and understood each step of the process, as well as the computer software. NCR's view would require a testifying expert to be not just an expert in her field, but an expert in every tool used in her field. Just as a surgeon does not have to know the details of how a surgical laser is made in order to testify about how it is *used*, a geologist does not need to understand in great detail each tool she uses in her work. The court was satisfied by Dr. Singer's testimony that she was able to use STA without necessarily having independent and detailed knowledge of STA's inner workings.

Additionally, although the testimony of Dr. Singer was useful and persuasive in demonstrating the complexity of the sediment movement process, the complexity argument is not crucial to my finding of indivisibility. As such, even were I to exclude her testimony, the outcome would not change. Accordingly, the motion will be denied.

NCR also moves to strike the testimony of Dr. John Cameron to the extent he attempted to rebut the testimony of Mr. Braithwaite. As I noted during the trial, however, there would seem to be little prejudice arising from Cameron's testimony because it reflected concerns, detailed at length above, that had been made by other witnesses and through cross-examination. (Tr. 2534.) And, because the court did not rely on Cameron's criticisms of Braithwaite, it is clear that no prejudice has resulted from such testimony.

Finally, NCR asks that its demonstrative exhibits be admitted as "substantive" evidence. As suggested earlier, the distinction between substantive and demonstrative evidence is a fine one that probably need not be made in the course of a bench trial. Even so, the court has not relied on any of the demonstratives other than for their demonstrative purpose (e.g. charts, tables, etc.), and they have not been treated by the parties as substantive evidence. Accordingly, the request to admit them as substantive evidence will be denied.

C. Defendants' Motion to Strike Declarations

A debate has arisen about the admissibility of the administrative record documenting the selection of the remedy. The government believes it has already been stipulated and agreed that the entire record will be admitted and may be used as evidence for any purpose. Some or all of the Defendants disagree, believing instead that the record was admitted solely for use in determining the propriety of the remedy, which this court did in a November 2012 decision. (ECF No. 666.)

Some of these parties have raised objections based on the authenticity of certain documents, and the government filed three post-trial declarations in an effort to satisfy these concerns. As with much of the other disputed evidence, however, materials from the administrative record did not play a material role in my conclusions regarding divisibility and apportionment. In concluding that injunctive relief was warranted, the court relied primarily on the testimony of Dr. Watters, not materials from the administrative record. Accordingly, the objections to the declarations are rendered moot.

VIII. Motion to Reconsider Decision and Order Upholding the Remedy

Finally, P.H. Glatfelter and Menasha have filed a motion seeking reconsideration of my grant of summary judgment to the government on the question of the propriety of the remedy. They assert that a genuine issue of material fact exists as to whether the EPA and Wisconsin Department of Natural Resources executed a proper Superfund Cooperative Agreement delegating authority to the state to become the "lead agency" in the remedy selection process.

Under CERCLA, the remedy is to be selected by the "lead agency," which also has responsibility for developing the investigation and feasibility study. 40 C.F.R. § 300.430(d)-(f). Under the implementing regulations, known as the National Oil and Hazardous Substance Contingency Plan, or more commonly just NCP, the "lead agency" may be the EPA itself, another federal agency, or (as relevant here) "a state (or political subdivision of a state) operating pursuant to a contract or cooperative agreement executed pursuant to section 104(d)(1) of CERCLA, or designated pursuant to a Superfund Memorandum of Agreement (SMOA) entered into pursuant to subpart F of the NCP . . ." 40 C.F.R. § 300.5. Such agreements are governed by Subpart F of the

NCP, 40 C.F.R. §§ 300.500 to 300.525, as well as Subpart O, 45 C.F.R. §§ 35.6105, which is entitled "State-lead remedial Cooperative Agreements."

That section sets forth the requirements an applicant must submit to the EPA, which include an application, narrative statements describing the project's goals, and other certifications involving procurement, maintenance of a drug-free workplace, and the like. One of the requirements is the submission of a statement designating "a lead site project manager among appropriate State offices. This statement must demonstrate that the lead State agency has conducted coordinated planning of response activities with other State agencies. The statement must identify the name and position of those individuals who will be responsible for coordinating the State offices." 40 C.F.R. § 6105(a)(iii).

The state's application named Mark Giesfeldt, the Director of the Bureau of Remediation and Redevelopment (part of the state DNR) as the project manager. (ECF No. 620-2 at 2.) The actual agency that acted as the lead agency, however, was the Bureau of Water Resources Management, also a part of the Wisconsin DNR. For this and a few other related reasons, Glatfelter and Menasha assert that there was an improper delegation of authority to the appropriate state agency.

The United States and Wisconsin argue, however, that the regulations the Defendants cite do not govern "authority" to devise and create a remedial plan but merely the *funding* of that process. The regulations define a "cooperative agreement" as "A legal instrument EPA uses to transfer money, property, services, or anything of value to a recipient to accomplish a public purpose in which substantial EPA involvement is anticipated during the performance of the project." 40 C.F.R. § 35.6015. Throughout the entire process the EPA must approve the state

agency's conclusions, and in fact all of the relevant documents we have seen in this action were issued under the auspices of both the DNR and the EPA. Thus, the particulars about whose name was on the original application are irrelevant because there was never a "delegation" of authority in the first place.

Glatfelter and Menasha argue, however, that the process matters and that they are entitled to demonstrate that the process was flawed because the paper trail does not perfectly add up; the fact that the EPA later signed off on the relevant documents and remedial actions cannot paper over any of these procedural flaws. But nowhere do these Defendants cite authority for their premise, which is that the statutes and regulations governing cooperative agreements create some sort of mandatory method for delegating authority rather than just a mechanism for issuing a grant to fund a state-led process. The premise, in other words, is that if the cooperative agreement procedures aren't followed, then the entire remedy created by the governments cannot be imposed. There is nothing within the statutes, regulations or precedent, however, that would suggest that the Wisconsin DNR was acting *ultra vires* and that its actions in developing the remedy should somehow be thrown out. In fact, given that government bureaucracies and their employees change all the time, it would be surprising if an entire remedial process—a major administrative undertaking—could be thrown out merely because employees of one state agency subdivision did much of the work rather than those of another subdivision.

In sum, the court is satisfied that if there was any flaw in the governments' paperwork, that flaw would only pose an issue between the two governments and would not undermine the legitimacy of the remedy chosen. As such, it would not create a right on behalf of a third party to challenge the process on that basis. The motion for reconsideration will therefore be denied.

IX. Conclusion and Order

The United States and State of Wisconsin have sought an injunction and declaratory judgment finding that the defendants, except as otherwise agreed, are jointly and severally liable for the harm resulting from PCB contamination in the Lower Fox River downstream from their respective facilities and ordering that they comply with the remedial measures set forth in the Unilateral Administrative Order. For the reasons given above, I conclude that they are entitled to the relief they seek. A separate order will be entered accordingly. In addition, the following actions are taken in this matter:

The joint motion [719] to terminate the previous preliminary injunction is **GRANTED**.

The motion [734] to reconsider is **DENIED**.

The evidentiary motions [744, 747] are **DENIED**.

The motion to strike [783] is **DENIED**.

SO ORDERED this 30th day of April, 2013.

s/ William C. Griesbach
William C. Griesbach, Chief Judge
United States District Court