

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NORTH CAROLINA
Civil Action No.: 7:23-CV-00897**

IN RE:	)	PLAINTIFFS' MEMORANDUM IN
	)	RESPONSE TO DEFENDANT
CAMP LEJEUNE WATER LITIGATION	)	UNITED STATES' MOTION TO
	)	EXCLUDE PLAINTIFFS' PHASE I
This Pleading Relates to:	)	EXPERT TESTIMONY IN SUPPORT
	)	OF USING ATSDR'S WATER
ALL CASES.	)	MODELS TO DETERMINE
	)	EXPOSURE LEVELS FOR
	)	INDIVIDUAL PLAINTIFFS

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I. INTRODUCTION

Independent of this litigation, the Agency for Toxic Substances and Disease Registry (ATSDR), a federal government agency, spent ten years and tens of millions of dollars designing, developing and running water models to determine the level of contaminants in the water at Camp Lejeune. That modeling work has been vetted by expert peer review panels, published in the peer-reviewed literature, and been the recipient of a preeminent national award. The PLG's Phase I experts properly rely on the ATSDR's water models to provide this Court and the PLG's general and specific causation experts with opinions regarding the levels of chemicals in the water at Camp Lejeune from 1953 to 1987. The Government's motion pursuant to Fed. R. Evid. 702 should be denied because the PLG Phase I experts are qualified to offer these opinions, and the opinions are relevant and reliable.

The PLG's Phase I experts have expertise in hydrology, water modeling and engineering; they are not toxicologists, epidemiologists or medical doctors, and they do not offer opinions on any individual plaintiff's exposure level, or how to calculate it. The determination of exposure levels of individuals (as opposed to the determination of the levels of contaminants in water) is a Phase III specific causation issue that is outside the PLG's Phase I experts' areas of expertise. Thus, the Government's motion "to preclude use of ATSDR's water models for individual exposure determinations in this litigation," D.E. 367, does not seek proper relief pursuant to *Daubert*, is premature, and should be denied.

II. LEGAL STANDARD

A. Federal Rule of Evidence 702 and Daubert

Expert testimony is admissible if the expert is qualified, the testimony is relevant, and the testimony is based on reliable scientific methodology. *Daubert v. Merrell Dow Pharms, Inc.*, 509

U.S. 579, 594-95 (1993); Fed. R. Evid. 702. Factors that guide the reliability analysis may include: (1) whether a theory or technique can be (or has been) tested; (2) whether it has been subjected to peer review and publication; (3) its potential rate of error; (4) whether standards exist to control the technique's operation; and (5) the degree of acceptance of the methodology within the relevant scientific community. *Daubert*, 509 U.S. at 593-94. Another factor that courts consider in the reliability analysis is whether the expert developed his opinions independent of litigation. *Daubert v. Merrell Dow Pharms, Inc.*, 43 F.3d 1311, 1317 (9th Cir. 1995); Fed. R. Evid. 702, Advisory Comm. Notes (2000 Amendments). In determining "whether proffered testimony is sufficiently reliable, the court has broad latitude to consider whatever factors bearing on validity that the court finds to be useful; the particular factors will depend upon the unique circumstances of the expert testimony involved." *Westberry v. Gislaved Gummi AB*, 178 F.3d 257, 261 (4th Cir. 1999). "[R]ejection of expert testimony is the exception rather than the rule." *Gillis v. Murphy-Brown, LLC*, No. 7:14-CV-185-BR, 2018 WL 5284607, at *2 (E.D.N.C. Oct. 24, 2018).

Because this Court will serve as fact finder in this case, the Court has increased latitude in how to perform its gatekeeping role. *City of Huntington v. AmerisourceBergen Drug Corp.*, No. 3:17-01362, 2021 WL 1596355, at *2-3 (S.D.W.Va. Apr. 22, 2021) (collecting cases; concluding "Given that, in a bench trial, the gatekeeper is keeping the gate only for itself, courts will often conditionally admit expert testimony subject to later exclusion if the expert's testimony does not satisfy Rule 702."). Although the Rules of Evidence still apply, there is a relaxation of the gatekeeping function due to the significantly reduced risk of confusion or being swayed by dubious testimony in a bench trial. *Id.* See also *United States v. Wood*, 741 F.3d 417, 425 (4th Cir. 2013) ("because the district court was also the trier of facts, the district court's evidentiary gatekeeping function was relaxed").

B. Standard for Proof of Exposure, Dose and Causation

Contrary to the Government's repeated assertions, Plaintiffs are not required to prove the "absolute concentrations for individual exposure determinations." *E.g.*, D.E. 368 at 12 (emphasis added). Neither Rule 702 nor *Daubert* hold experts to a standard of "absolute" certainty – *i.e.*, they are not required to be "irrefutable or certainly correct." *Westberry*, 178 F.3d at 261. *See also Daubert*, 509 U.S. at 590 ("Of course, it would be unreasonable to conclude that the subject of scientific testimony must be 'known' to a certainty; arguably, there are no certainties in science.").

Moreover, in toxic tort cases like this one, both the Fourth Circuit and this Court have recognized that quantifying with precision the specific level of exposure is often difficult, if not impossible, and is not always necessary. *E.g.*, *Westberry*, 178 F.3d at 264 (evidence of substantial exposure to talcum powder was sufficient); *Lightfoot v. Georgia-Pacific Wood Products, LLC*, No. 7:16-CV-244-FL, 2018 WL 4517616, at *20 & *23 (E.D.N.C. Sept. 20, 2018) (allowing "qualitative" opinions that wood dust exposures were "substantial" and "significant" and noting that "most 'other toxic tort cases (talcum powder, for instance, or asbestos)' involve circumstances where it is 'sufficient for the plaintiff to introduce evidence of 'substantial exposure'"). The Government agrees; it relies on *Westberry* for its expert Dr. Remy Hennet's anticipated opinions regarding Plaintiffs' substantial exposure to contamination at Camp Lejeune. D.E. 368 at 29-30 ("while precise information concerning the exposure necessary to cause specific harm to humans and exact details pertaining to the plaintiff's exposure are beneficial, such evidence is not always available, or necessary, to demonstrate that a substance is toxic to humans given substantial exposure and need not invariably provide the basis for an expert's opinion on causation.").

Furthermore, as this Court previously explained, plaintiffs in these Camp Lejeune Justice Act (CLJA) cases may prove causation "by a reduced burden of proof ('sufficient to conclude that a causal relationship [between exposure and harm] is at least as likely as not')." *In re Camp Lejeune*

Water Litig., 736 F. Supp.3d 311, 319 (E.D.N.C. 2024). Because exposure, general causation and specific causation “are not separate ‘elements’ of a CLJA claim,” but rather “[c]ausation subsumes all three,” *id.*, the reduced burden of proof applies to proof of the concentrations for individual exposure determinations. There is no burden to prove “absolute” concentrations.

III. STATEMENT OF FACTS

A. Purpose of the ATSDR Models

The purpose of the ATSDR models was to provide historical estimates of the monthly concentrations of contaminants in drinking water “to facilitate the estimation of exposures.” DOJ Ex. 19, TT Ch. A, at A5.¹ The ATSDR modelers were asked to provide the mean monthly concentrations for use by the epidemiologists. The epidemiologists used the concentrations to calculate exposures of individuals. At times, those individuals were grouped in order to perform specific epidemiological analyses.² Contrary to the United States’ repeated assertions, use of the mean monthly levels was *not* limited to estimating relative exposures among groups.

¹ DOJ Ex. 19, TT Ch. A, at A5 (“The **purpose** of the analyses described in this report and associated chapter reports is to provide epidemiologists with historical monthly concentrations of contaminants in drinking water **to facilitate the estimation of exposures.**”). *See also id.* at iii (“To obtain estimates of historical exposure, ATSDR is using water-modeling techniques and the process of historical reconstruction. These methods are used to quantify concentrations of particular contaminants in finished water and to compute the level and duration of human exposure to contaminated drinking water.”); *id.* at A2 (“ATSDR is using water modeling techniques to provide the epidemiology study with quantitative estimates of monthly contaminant concentrations in finished drinking water because contaminant concentration data and exposure information are limited. Results obtained by using water-modeling techniques, along with information from the mother on her water use, **can be used by the epidemiological study to estimate the level and duration of exposures to the mother** during her pregnancy and to the infant (up to one year of age).”). ATSDR made similar statements regarding the HP/HB model. *E.g.*, DOJ Ex. 25, HP/HB Ch. A, at A2 (“Results obtained from the historical reconstruction process, along with household information regarding water use and consumption, can be used in the epidemiological studies to estimate the level and duration of contaminant exposures.”).

² The purpose of such groupings is to assess the exposure-response relationship to evaluate whether there is a trend such that the risk increases with increasing exposure. DOJ Ex. 20, ATSDR Childhood Birth Defects and Cancer Study, at 3 (“We used two criteria to assess associations: magnitude of the OR [odds ratio] and the exposure-response relationship. ... emphasis was given to monotonic trends ... A monotonic trend occurs when every change in the OR with increasing category of exposure is in the same direction...).

The ATSDR models were developed to address the following five specific objectives and questions that were presented to the modelers by the epidemiologists and discussed at a meeting held on October 8, 2003 at ATSDR headquarters:³

- **Objective 1:** What chemical compounds contaminated the drinking water and where did they come from (determine sources of contaminants)?
- **Objective 2:** When did contaminated groundwater reach water-supply wells and what was the duration of the contamination (determine arrival dates)?
- **Objective 3:** What were the mean monthly drinking-water concentrations?
- **Objective 4:** How was contaminated water distributed to housing areas (quantify and identify water transfers)?
- **Objective 5:** What were the ranges of concentration values (based on modeling results) for a specific month (conduct sensitivity and uncertainty analysis)?

DOJ Ex. 5, Maslia Report, at 26-27. The above objectives guided the ATSDR modelers in designing the models. DOJ Ex. 14, Maslia Dep., 47:22-28:11; 168:17-169:18. For example, the use of monthly time steps for the model was dictated by the need for monthly mean drinking-water concentrations. DOJ Ex. 12, Konikow Dep., 212:16-214:4. However, the use of relative or ranked levels of concentrations and/or the grouping of exposed individuals for analysis were decisions regarding post-modeling use of the results that were made by epidemiologists; these decisions had no effect on the design, development, or calibration of the models. *Id.* at 142:5-8; 149:23-150:9; 355:17-357:1.⁴ Similarly, because the goal of the water models was to estimate as accurately as possible the mean monthly drinking-water concentrations, health-protective assumptions were not made. *Id.* at 191:10-193:1; DOJ Ex. 35, 9/26/24 Maslia Dep., 223:22-234:12.

The United States incorrectly represents that Mr. Maslia wrote or signed off on language in a communication to the Navy regarding the ranking of exposed individuals based on relative

³Attendees of the meeting included ATSDR scientific staff, management and contractors; ATSDR's University partner; USMC Camp Lejeune staff; USMC-HQ Staff, DON staff, NAVFAC-HQ staff, and DOD staff. Ex. 1, 10/8/2003 Sign-in Sheet.

⁴Mr. Maslia and his team were not involved in post-modeling use of the mean monthly concentrations and were not aware of how the epidemiologists planned to use the data. DOJ Ex. 14, Maslia Dep., 43:12-18; 44:8-17; 166:10-13; 168:17-169:18.

levels of exposure for epidemiological analysis. D.E. 368 at 6 & 26. Mr. Maslia made it crystal clear in his deposition that an epidemiologist authored that paragraph. DOJ Ex. 14, Maslia Dep., 161:8-22; 162:20-24; 164:4-165:2. More importantly, Mr. Maslia explained that the particulars of epidemiological analyses were not relevant to model development; rather, anyone should be able to take the results of the model (the mean monthly levels) “and apply them as they see fit given the uncertainties, the limitations of modeling.” *Id.*, 168:17-169:18; 166:10-13.

The United States also references a disclaimer regarding the exposures. D.E. 368 at 6-7 (quoting disclaimer as stating “[t]he results however, may not reflect actual exposure of specific individuals to contaminants in the water system.”). Mr. Maslia testified that this disclaimer did not appear on any ATSDR model chapter up through the time of his retirement at the end of 2017. DOJ Ex. 14, Maslia Dep., 131:24-132:16. It is not clear who added this language to the Tarawa Terrace Chapter I appendix years after it was finalized, or for what purpose (*e.g.*, liability) it was added. In any event, due to the Monte Carlo uncertainty analysis (which provides a range of contaminant concentrations) and the fact that the concentration level does not represent a cumulative exposure from ingestion, inhalation and dermal contact, Mr. Maslia agrees with the disclaimer language. *Id.* at 147:6-148:13.

Review of the ATSDR’s epidemiology studies demonstrates that the modeled mean monthly concentrations were used for more than “relative” assessments. For example, in the ATSDR’s Childhood Birth Defects and Cancer Study, one of the evaluations was a comparison of mothers who were exposed to the contaminants at levels above and below the EPA Maximum Contaminant Level (MCL) for TCE, PCE and vinyl chloride. DOJ Ex. 20, at 3, 7. Such a comparison required calculation of actual (not relative) dose.

Significantly, ATSDR used the modeled mean monthly concentrations to calculate

exposure doses (*i.e.*, actual doses) as part of its 2017 Public Health Assessment (PHA) for Camp Lejeune.⁵ See *In re Camp Lejeune Water Litig.*, 736 F. Supp.3d at 322 (citing ATSDR, 2017 *Public Health Assessment*) (acknowledging that ATSDR used its water models' mean monthly concentrations to calculate "'estimates of exposure doses' for 'groups who lived or worked at ... Camp Lejeune.'"). ATSDR then used the exposure doses to calculate cancer risks and noncancer health effects for children who lived on base, adults who lived on base, workers employed at the base, and marine personnel who trained and lived on base.⁶ For example, "[t]o evaluate exposure to a pregnant woman, ATSDR used the monthly concentrations estimated from historically reconstructed modeling (Maslia et al. 2013; Appendix A7 and A8) for the estimated dose...". Ex. 2, 2017 PHA, at 8. ATSDR explained that the goal of the PHA "is to find out if people are being exposed to hazardous substances, and, if so, whether that exposure is harmful." *Id.* at foreword. Nowhere in the PHA does ATSDR state that its calculated exposure doses are "relative";⁷ rather, here the ATSDR epidemiologists used the modeled monthly concentrations to calculate actual, or "absolute," exposures of individuals.

ATSDR justifiably cautioned the public that "ATSDR's exposure estimates cannot be used alone to determine whether you, or your family, suffered any health effects as a result of past exposure to TCE-contaminated drinking water at USMCB Camp Lejeune." DOJ Ex. 25, HP/HB

⁵ "To estimate the historical concentration of contaminants in Tarawa Terrace and Hadnot Point-Holcomb Boulevard drinking water supplies, ATSDR used water-modeling techniques and historical reconstruction to estimate concentrations of particular contaminants in drinking water and to determine the level and duration of human exposure to contaminated drinking water. ... This current public health assessment uses the modeled, historical contaminant concentrations from the 2013 ATSDR report to estimate the exposures." Ex. 2, 2017 PHA, at 5.

⁶ "This drinking water public health assessment uses the concentrations generated by ATSDR's historical reconstruction modeling effort published in 2013 to complete a new exposure evaluation that estimates potential exposure doses, upper-bound cancer risks, and potential noncancer health effects." Ex. 2, 2017 PHA, at x. See also *id.* at xii-xvi (providing conclusions regarding increased cancer risk and noncancer health effects based on the estimated levels of exposure from the water models).

⁷ The ATSDR used the modeled concentrations for the PHA, while acknowledging the data limitations and referencing the uncertainty analyses. Ex. 2, 2017 PHA, at 43.

Ch. A, at A182. As the ATSDR explained on the very same page that it made this statement, much more information than the modeled monthly concentrations *alone* is required in order to determine whether an individual suffered harm from the water:

Many factors determine whether people will suffer adverse health effects because of chemical exposures. These factors include

- Dose (how much),
- Duration (how long the contact period is),
- When in the course of life the exposures occurred (for example, while in utero, during early childhood, or in later years of life),
- Genetic traits that might make a person more vulnerable to the chemical exposure, and
- Other factors such as occupational exposures, exposures to other chemicals in the environment, gender, diet, lifestyle, and overall state of health.⁸

Id. The ATSDR's PHA, which calculates exposure doses and whether they were harmful, demonstrates the complexity of determining whether an exposure to the modeled monthly contaminant concentrations was harmful – the PHA is nearly 200 pages long and contains complex mathematical calculations applying epidemiological and toxicological concepts. *See generally* Ex. 2, 2017 PHA. ATSDR recommended that individuals consult their healthcare providers if they are concerned about their water exposures at Camp Lejeune.⁹ Thus, ATSDR's precautionary language, rather than discounting the value of the modeled concentrations for calculating individual exposures, as the Government implies, instead communicates that a complex analysis similar to that of the PLG's specific causation experts is required to determine whether there have been health

⁸ For Tarawa Terrace, the ATSDR made a similar statement: "ATSDR's exposure assessment cannot be used to determine whether you, or your family, suffered any health effects as a result of past exposure to PCE-contaminated drinking water at Camp Lejeune." The identical explanation regarding the factors that must be considered to determine whether an individual will suffer harm from a chemical exposure appears on the same page. DOJ Ex. 19, TT Ch. A, at A98.

⁹ "[H]istorical reconstruction produced modeled concentrations for VC, TCE, and PCE that are of concern. If former residents and workers are concerned about past exposures, they should discuss those concerns with their healthcare providers." Ex. 2, 2017 PHA, at 63.

effects from exposure to the contaminated water.¹⁰

B. Summary of ATSDR Modeling

From 2003 to 2013, Morris Maslia and his team of 20 engineers and scientists designed, developed and ran groundwater flow and contaminant transport models to estimate the contaminant concentrations in water delivered via the Tarawa Terrace, Hadnot Point and Holcomb Boulevard Water Treatment Plants (WTPs). DOJ Ex. 5, Maslia Report, at 10, 20, 145 (App. B). To determine the level of contaminants in the water that was distributed by the WTPs for consumption (the “finished water”), the ATSDR used a four-step process. First, they modeled the pre-development subsurface flow of water (*i.e.*, before water supply wells began pumping water from the ground to deliver to the WTPs). Then they modeled transient groundwater flow (*i.e.*, the subsurface flow of water during the time period when the water supply wells pumped water from the subsurface for delivery to the WTPs). Next they modeled the fate and transport (*i.e.*, movement) of contaminants like PCE and TCE in the groundwater. Finally, they modeled the mixing of the water from the various water supply wells (contaminated and non-contaminated) at the WTPs. Tarawa Terrace had 16 water supply wells whereas Hadnot Point/Holcomb Boulevard had nearly 100 water supply wells. *Id.* at 22, 24-25 (operational chronologies of wells).

The public domain code MODFLOW was used to model predevelopment and transient groundwater flow. *Id.* at 34, 37. The public domain code MT3DMS was used to model contaminant fate and transport. *Id.* Custom, or specialized, models were used to address particular modeling issues. For example, TechFlowMP was used to analyze the degradation of PCE into its byproducts

¹⁰ See DOJ Ex. 6, Maslia Rebuttal Report, at 48 (“A determination of health effects requires interpretation of the exposure and dose data by a health professional.”); DOJ Ex. 35, 9/26/24 Maslia Dep., 189:16-190:17 (purpose of models was to show mean monthly concentrations, not “an exposure assessment”); DOJ Ex. 22, 6/30/10 Maslia Dep., 38:19-23; 78:8-79:7 (same).

(TCE, 1,2-tDCE and VC), and PSOpS, a pumping schedule optimization tool, was developed to analyze the impact of uncertain historical pumping schedule variations of the water supply wells on the arrival of contaminants at the WTP. *Id.* at 34, 62.

A four-level calibration process was used, and modeled values were compared with field data at every step. *Id.* at 44. Calibration is a generally accepted modeling practice that involves adjusting model parameters to best achieve an acceptable match between measured and modeled values of groundwater elevation (for flow models) or contaminant concentrations (for fate and transport models). Ex. 3, Spiliotopoulos Dep., 90:15-91:7; Ex. 4, ASTM D5447-17, at 6.6. For the predevelopment (or steady-state) groundwater flow model, simulated and measured predevelopment water levels in monitor wells were compared. For the transient groundwater flow model, simulated and transient water levels in monitor and supply wells were compared. For the fate and transport model, simulated and measured contaminant concentrations in water-supply wells were compared. For the mixing model, computed and measured contaminant concentrations in finished water at the WTPs were compared. For the final stage (the mixing model), no adjustments were made to model parameters. Instead, this comparison was done to test the adequacy of the groundwater flow, contaminant fate and transport, and mixing models to predict contaminant concentrations in finished water. DOJ Ex. 5, Maslia Report, at 44.

For Tarawa Terrace, after model-specific parameters were calibrated at each stage, statistical and graphical analyses were conducted to determine whether the parameters met pre-determined calibration criteria targets. *Id.* at 47 (see Table 7.7). The groundwater flow model (predevelopment and transient) was successfully calibrated to produce modeled values in close agreement with measured values. *Id.* at 47-50. Notably, four decades of data were available for this calibration. *Id.* at 50; Ex. 3, Spiliotopoulos Dep., 267:8-23. The fate and transport model

tended to overestimate lower measured concentrations but underestimate the highest observed concentrations at the water supply wells, DOJ Ex. 5, Maslia Report, at 51; however, “73% of the sampling wells show reasonably and acceptably accurate simulation results.”¹¹ DOJ Ex. 15, Konikow Rebuttal Report, at 9. Importantly, the concentrations at the water treatment plant simulated by the model matched closely with measured values of water sampled at the WTP (within a factor of three), which provides confidence in the model as a whole. DOJ Ex. 5, Maslia Report, at 44; DOJ Ex. 12, Konikow Dep., 339:3-23.¹²

For Hadnot Point, the groundwater flow model (predevelopment and transient) was successfully calibrated to produce modeled values in good agreement with measured values. DOJ Ex. 5, Maslia Report, at 72-74. Notably, over 700 water level measured values were used for this calibration. *Id.* at 72. For the fate and transport model, there was reasonable agreement between the modeled and observed data, with the caveat that observation data in water supply wells were limited. *Id.* at 74-75 & 77. For this calibration, contaminant data from four remediation extraction wells installed over a decade after HP-651 (the most highly contaminated HP water supply well) was decommissioned were compared to modeled values and showed good agreement, which provided a longer-term basis for model calibration and increased confidence in model results. *Id.* at 77-78 & Figure 7.21. In addition, an alternative computational method, the Linear Control

¹¹ An additional assessment of the level 3 calibration was done comparing the mass of PCE remaining in the aquifer calculated from field observations to model computations; the results compared favorably, which is a confirmation of the concordance of model results with observed data. DOJ Ex. 5, Maslia Report, at 57-58; DOJ. Ex. 14, Maslia Dep., 284:3-12.

¹² ATSDR modeled Tarawa Terrace using a second, alternative model, TechFlowMP. TechFlowMP takes into account degradation of PCE into TCE, 1,2-tDCE and VC and the loss of PCE due to volatilization. As expected, the modeled concentrations of PCE are slightly lower for TechFlowMP due to degradation and volatilization. PCE monthly concentrations reconstructed using MT3DMS are in very close agreement to the summed value of PCE and its degradation products reconstructed from TechFlowMP. “This very close agreement between two different contaminant fate and transport models, solving two different transport equations . . . provides additional evidence and confidence that the reconstructed concentrations at the TTWTP represent ‘real world’ conditions.” DOJ Ex. 6, Maslia Rebuttal Report, at 61.

Model (LCM), was used to model contaminant levels at HP-651. There was very good agreement between the LCM results, the MT3MDS results and observation data for water supply well HP-651, which provides increased confidence in results derived from the MT3DMS simulations. *Id.* at 82-83. Importantly, the concentrations at the water treatment plant simulated by the model matched within reasonable agreement (within a factor of ten) with measured values, which is acceptable for the complexity of the site and “supports the collective ability of the four-level modeling and calibration process to capture the HP-HB behavior with acceptable accuracy.” *Id.* at 84-86.

All groundwater models include assumptions and have limitations. Ex. 3, Spiliotopoulos Dep., 95:5-13.¹³ To determine the effect of the assumptions and limitations on the output of the model (here, the mean monthly contaminant concentrations), sensitivity and uncertainty analyses were conducted. DOJ Ex. 5, Maslia Report, at 35, 41, 44, 61-68. A probabilistic analysis using Monte Carlo simulation (MCS) with and without pumping schedule uncertainty was conducted for Tarawa Terrace, which simulated a range of mean monthly concentrations, establishing a lower confidence level and an upper confidence level, which are represented by the 2.5 percentile and 97.5 percentile of Monte Carlo simulations. DOJ Ex. 5, Maslia Report, at 66-67.¹⁴ For Hadnot Point, the effects of parameter uncertainty and variability were analyzed using sensitivity analysis and probabilistic analysis (Latin Hypercube Sampling or LHS). *Id.* at 88-91. LHS was used to

¹³ “Every model is a simplification of complex reality. It involves approximation, assumptions, and averaging. So yes, there’s always uncertainty and certainly errors in every model, and what you try to do in standard practice is assess how serious those errors might be, how they might affect the results. You do sensitivity tests and uncertainty analysis to help assess what confidence you should have in the model because we recognize that the model is not the reality.” DOJ Ex. 12, Konikow Dep., 228:21-229:11.

¹⁴ Appendix H2 to the Maslia Report provides mean monthly contaminant concentrations for Tarawa Terrace with the range of concentrations derived from MCS. DOJ Ex. 5, Maslia Report, at 198-207. ATSDR selected the most sensitive and uncertain parameters to use in its MCS using the results from its sensitivity analyses. Ex. 5, TT Ch. I, at I31. Probability density functions (PDFs) for model input parameters for the MCS were derived from the use of an algorithm (PRNG, or Pseudo-Random Number Generator).

demonstrate the effect of uncertainty in the pumping schedules of water supply wells.¹⁵ *Id.* at 90. “Individually and combined, these analyses demonstrate the high reliability of and confidence in results determined using the calibrated MODFLOW and MT3DMS models.” *Id.*

A post-audit was conducted by Dr. Norman Jones and R. Jeffrey Davis using data collected from 1995 to 2008 as part of remediation efforts.¹⁶ Consistent with standard methodology, the post-audit used ATSDR’s Tarawa Terrace models with the same parameter values and compared the modeled values to the remediation data. The results of the post-audit demonstrate that the ATSDR’s Tarawa Terrace models “were developed using sound methodology” and provide additional confirmation that the models predict contaminant concentrations with reasonable accuracy.¹⁷ DOJ Ex. 16, Davis/Jones Report, at vi-vii.

The ATSDR’s modeling efforts have been extensively documented in individual chapter reports, which are available to the public on ATSDR’s Camp Lejeune website. DOJ Ex. 5, Maslia Report, at 45-46 (listing reports). Multiple papers have been published by ATSDR staff in the peer-reviewed literature regarding its modeling methodology. *See* § C.2 *infra*. The Government makes much of the NRC report and an article published by Dr. Clement. Notably, only one person (Dr. Clement) had a background in groundwater modeling or hydrogeology on the NRC panel;¹⁸ he is

¹⁵ As the Government points out, LHS was chosen for HP/HB because Monte Carlo analysis was “computationally prohibitive.” DOJ Ex. 28, HP/HB Ch. A Supp. 6, at S6.45. Such compromises are appropriate in groundwater modeling and do not justify exclusion. *Orange County Water Dist. v. Unocal Corp.*, No. SACV 03-01742-CJC(ANx), 2017 WL 11626204, *18 (C.D. Cal. Jan. 31, 2017) (“The question of whether a model is admissible turns on whether its simplifications are reasonable and justifiable *given* the limits of computing power.”) (emphasis in original).

¹⁶ “In cases where the groundwater flow model has been used for predictive purposes, a post-audit may be performed to determine the accuracy of the predictions. ... the post-audit tests whether the model can predict future system behavior.” Ex. 4, ASTM D5447-17, at 6.9.

¹⁷ *See* PLG’s Opposition to Motion to Exclude the Opinion Testimony of Mr. R. Jeffrey Davis and Dr. Norman L. Jones, filed simultaneously with this opposition, for additional discussion of the methodology and results of the post-audit.

¹⁸ The other members were experts in health-related fields, such as epidemiology. This is to be expected because the NRC’s primary charge was “to assess the strength of evidence in establishing a link or

the only person who has published a critique of ATSDR's Camp Lejeune models. Ex. 3, Spiliotopoulos Dep., 145:13-24; 146:18-21. The scope of the NRC Report is confined to an incomplete review of the modeling work limited to Tarawa Terrace,¹⁹ and it contains many errors and inaccuracies regarding the hydrogeology of Camp Lejeune and the specifics of ATSDR's modeling work. DOJ Ex. 5, Maslia Report, at 101-02 & App. M (ATSDR Response to NRC Report). For example, Dr. Clement did not review Chapter I regarding sensitivity and uncertainty analyses performed for Tarawa Terrace before releasing the NRC Report.²⁰ With regard to his article, which was published in 2010 years before the Hadnot Point modeling was complete, Dr. Clement appeared to back off of his criticisms in his published reply to ATSDR's comments: "The goal of my article was *not* to review the Camp Lejeune modeling studies." Ex. 6, Clement reply, at 16 (emphasis added). *See also* Ex. 7, 2/21/08 Clement email to Maslia (characterizing ATSDR modeling work as "thoughtfully organized" and "the best possible job a modeler can [do]"). Consequently, his paper should not be taken as a technical review of the modeling or its reliability.

The Government repeatedly points to questions and concerns raised by Dr. Konikow as a member of the Expert Peer Review Panels in 2005 and 2009. It is the job of the peer review panel to ask difficult questions and to probe for weaknesses in the model development. DOJ Ex 12, Konikow Dep., at 92:3-7; 173:9-13. These concerns were all raised prior to and during the meetings of the peer review panels—not after ATSDR responded to the concerns and not after the completion of the model studies. *Id.* at 208:20-209:8; 216:4-14. After the questions and concerns were raised, ATSDR provided satisfactory answers to the questions and specifically addressed

association between exposure to TCE, PCE, and other drinking-water contaminants and each adverse health effect suspected to be associated with such exposure." DOJ Ex. 29, NRC Report, at 25.

¹⁹ Ex 8, 2/18/2009 Clement email to Maslia, at 1; Ex. 3, Spiliotopoulos Dep., 146:22-24.

²⁰ Ex 8, 2/18/2009 Clement email to Maslia, at 1. Chapter I is not cited or discussed in the NRC report (*e.g.*, the uncertainty analysis using Monte Carlo simulations is not mentioned).

concerns raised by Dr. Konikow and others about such issues as numerical dispersion and grid spacing. *Id.* at 92:3-15; 217:5-218:15; 219:17-221:17; 311:20-312:1. ATSDR ran specific tests to evaluate these concerns and demonstrated that they were not meaningful problems. *Id.* This is all consistent with standard scientific practices and peer review. Comments and questions made during the Expert Panel sessions, several years before the final models and final reports were produced, do not constitute criticisms of the final models.²¹

Moreover, the reality is that Dr. Konikow and the peer review panels as a whole endorsed ATSDR's methodology. On the final day of the 2009 panel meeting, 15 years prior to Dr. Konikow becoming a litigation expert, Dr. Konikow stated: "But the other kind of big picture things I see here is that you've essentially completed the work at Tarawa Terrace, and I could nit pick a lot of little things in there, but basically, I think that was a successful effort. You did a good job there within its own right was a very complicated problem." DOJ Ex. 10, 2009 Expert Panel (Day 2), at 257:18-25. Near the end of the second day of deliberations of the 2005 Expert Panel, another panel member (Dr. Singh) said "I would like to take this opportunity to state on the record that the ATSDR group, especially Morris Maslia and his group, have done really an outstanding job, and I have nothing but admiration for their work, both quality-wise as well as scientific rigor-wise." DOJ Ex. 8, 2005 Expert Panel (Day 2), at 189:19-24. No one on the panel disagreed with this assessment. *See also* DOJ Ex 12, Konikow Dep., at 91:18-21 ("the consensus of the expert peer review panel was that the work being done by ATSDR for groundwater modeling flow and transport was state of the art and excellent work, reliable work.").

²¹ Similarly, the Government erroneously relies on an email from Robert Faye, a contract engineer for ATSDR. D.E. 368 at 28. Mr. Faye expressed frustration regarding an interim, mid-project professional disagreement about the biodegradation rate. This disagreement was eventually resolved and is not reflected in the final ATSDR reports. DOJ Ex. 35, 9/26/24 Maslia Dep., 278:1-15; 280:11-281:6; 282:2-22.

IV. ARGUMENT

The Government concedes that ATSDR's modeling methodology is reliable, at least for the purpose of calculating "relative" exposure levels: "The United States does not dispute the soundness of ATSDR's methodology in simulating average monthly contaminant concentrations in drinking water for the purpose that ATSDR intended—to provide relative exposure level estimates to inform ATSDR's epidemiological studies." D.E. 357 at 1. But the Government has not identified any step in ATSDR's modeling methodology that should have been conducted differently to determine mean monthly concentrations for individual (as opposed to "relative") exposure determinations.²² That is because there are none – ATSDR's methodology is independent of how the data it generated is used by others; the modeling methodology does not change if the mean monthly levels are used to establish exposure-response relationships for a causation analysis or to calculate an individual's exposure. If the methodology is appropriate for determining mean monthly concentrations, as the Government concedes, how the results are used by others does not change that assessment.²³

DOJ argues that "the Court should exclude the broad and sweeping opinions of PLG's Phase I experts about the correctness, accuracy, reliability, and soundness of ATSDR's water

²² In fact, DOJ expert Dr. Remy Hennes relies on the "same layers, the same thickness of each layer, the same permeability in each layer and such" and "used parameters that were the same as in the Hadnot Point model" for the calculations that the DOJ offers to this Court "on what can reliably be said about the extent and timing of water contamination at Camp Lejeune to determine whether a plaintiff was 'substantially exposed' to contaminated water at Camp Lejeune." Ex. 9, Hennes Dep., 267:8-14; 267:24-25; 269:3-7; D.E. 368 at 30. The Government does not explain why it contends that these parameters are reliable for Dr. Hennes's use in calculating exposure levels for individual plaintiffs but not for the PLG experts' use.

²³ Although the Government maintains that ATSDR's water models cannot be used to determine exposure levels for individual plaintiffs, the Government's only expert who prepared exposure summaries for individual plaintiffs (Dr. Judy Lakind) relied – at DOJ's request – on "ATSDR's mean monthly chemical concentration data for estimating exposures at Camp Lejeune." *E.g.*, Ex. 10, Lakind Report for Mr. Mousser, at 11. The Government suggests that exclusion of the ATSDR's water models will not preclude this litigation from moving forward because Dr. Hennes has allegedly offered testimony about plaintiffs' substantial exposures, D.E. 368 at 30, but no DOJ or PLG expert has relied on Dr. Hennes's opinion. Thus, should the Government's motion be granted, another round of expert discovery will likely be required.

models ...” D.E. 368 at 2. However, as is evident from review of their reports, these experts judged the correctness, accuracy, reliability, and soundness of the water models on the basis of hydrologic, hydrogeologic, numerical, physical, and chemical factors in light of the stated purpose of the models, and all delved in depth into the water model design, calibrations, sensitivity and uncertainty analyses and results to come to their conclusions.

As set forth herein, the PLG’s Phase I experts are qualified to opine regarding ATSDR’s water models, their opinions regarding the models are relevant and will be helpful to this Court as the trier of fact, and analysis of the *Daubert* factors demonstrates that the ATSDR’s methodology, and the PLG Expert’s opinions relying upon same, are reliable.

A. The PLG’s Phase I Experts are Qualified to Opine on the ATSDR’s Water Models.

An expert may be qualified based on “knowledge, skill, experience, training, or education.” Fed. R. Evid. 702. “A court assesses qualifications in reference to the matter to which the witness seeks to testify. The witness need not be the most well-known or well-qualified witness.” *Dew v. E.I. du Pont de Nemours & Co.*, 2024 WL 4349883, at *3 (E.D.N.C. Sept. 30, 2024) (citations omitted). The PLG’s Phase I experts are preeminently qualified to opine on the ATSDR’s water models. Because the United States does not appear to contest this, D.E. 368 at 3-4, the PLG provides only a brief summary of its witness’s qualifications.²⁴

Morris Maslia, P.E., a licensed professional engineer, worked for the U.S. Geological Survey as a Research Hydrologist for nine years and for the ATSDR as an Environmental Engineer for 25 years. DOJ Ex. 5, Maslia Report, at 9, 120-143 (App. A, CV). He was the Technical/Scientific Project Officer at ATSDR for the water models that are the subject of this

²⁴ The qualifications of PLG Phase I experts Dr. Mustafa M. Aral, Dr. Norman L. Jones and R. Jeffrey Davis are detailed in the responses to the motions to exclude their specific testimony, which are being filed simultaneously with this response.

motion. Mr. Maslia is the co-author of the ATSDR's comprehensive plan for its Exposure Dose Reconstruction Program (EDRP), which presents science-based methods to characterize exposure and dose (with emphasis on characterizing past exposures) from hazardous substances at Superfund sites to support health assessments, health studies and exposure registries. *Id.* at 12-13, 147-158 (App. C). In addition to Camp Lejeune, Mr. Maslia and his EDRP team used computational models to reconstruct exposure to contaminants at numerous other sites around the country. *Id.* at 13-16. Mr. Maslia has published 36 articles in peer-reviewed journals, the vast majority of which concern using models for exposure assessment. *Id.* at 130-33. He has received 12 awards from the scientific community for his exposure dose reconstruction work. *Id.* at 127-28.

Dr. Leonard F. Konikow has a Ph.D. in Geosciences and worked as a research hydrologist for the U.S. Geological Survey for over 40 years, where he was “mostly involved in the development, documentation, and application of groundwater flow models and groundwater solute-transport models.” DOJ Ex. 15, Konikow Rebuttal Report, at 1.²⁵ He has developed half a dozen comprehensive models and has evaluated more than 100 others. DOJ Ex. 12, Konikow Dep., 236:21-237:6. He was the Editor-in-Chief of the peer-reviewed journal *Groundwater* from 2020-2023, was elected to the National Academy of Engineering in 2015, and is a Fellow of the American Geophysical Union and the Geological Society of America, which presented him with an award for publications that have significantly advanced the science of hydrogeology. DOJ Ex. 15, Konikow Rebuttal Report, at 1. He served on the Expert Peer Review Panels for ATSDR's Camp Lejeune groundwater models in 2005 and 2009. *Id.*

²⁵ See also Ex. 11, Konikow CV; Ex. 12, Konikow publication list; Ex. 3, Spiliotopoulos Dep., 17:8-11 (DOJ expert agreeing that Dr. Konikow is well respected in the field of groundwater hydrogeology).

B. ATSDR’S Water Models Fit this Case and Will Be Helpful to this Court as the Trier of Fact.

ATSDR’s water models and the Phase I PLG Expert’s opinions about same have a “valid scientific connection to the pertinent inquiry” before this Court. *Daubert*, 509 U.S. at 591-92. The five questions that the ATSDR modelers set out to answer are the very questions that this Court identified as pertinent to Phase I. *Compare* DOJ Ex. 5, Maslia Report, at 26-27 (listing model objectives of identification of contaminants, arrival dates, mean monthly drinking-water concentrations, and ranges of same) *with* D.E. 247 at 2 (directing Plaintiffs to establish which chemicals were in the water and the levels of the chemicals over time).

The United States starts its motion with the proposition that “scientific validity for one purpose is not necessarily scientific validity for other, unrelated purposes,” quoting *Daubert*, 509 U.S. at 591. But the purpose for which the ATSDR conducted its modeling – to answer the five questions raised by the epidemiologists, including estimation of the mean monthly drinking-water concentrations – is related to, if not exactly identical to, the questions before this Court. *See* D.E. 247 (“The court must understand the chemicals in the water at Camp Lejeune during the operative period.”). The illustrative example provided by the Supreme Court for the above proposition – that “[t]he study of the phases of the moon ... may provide valid scientific ‘knowledge’ about whether a certain night was dark,” but “will not assist the trier of fact in determining whether an individual was unusually likely to have behaved irrationally on that night”²⁶ – is a far cry from the situation before this Court. The ATSDR developed its models to provide epidemiologists with the mean monthly drinking-water concentrations, and the epidemiologists used those model results for a variety of purposes. The fact that one such use was to group exposed individuals in order to perform epidemiological analyses does not limit the model results to that use alone. DOJ Ex. 14,

²⁶ *Daubert*, 509 U.S. at 591.

Maslia Dep., 47:22-48:11; 168:17-169:18. Moreover, whether the mean monthly concentrations were to be used for “relative” or “absolute” purposes has (and would have) no effect on how the ATSDR groundwater flow and transport models were designed and developed. DOJ Ex. 12, Konikow Dep., 142:5-8; 149:23-150:9; 355:17-357:1; DOJ Ex. 13, Jones Dep., 280:22-281:25. Put concretely: The purpose of the ATSDR’s modeling was to determine the levels. The levels are the levels. How the levels are ultimately used in no way affects how the levels were calculated or what the levels actually *are*.

Precisely for the above reasons, the PLG’s Phase I engineering and hydrogeology experts appropriately declined to offer opinions regarding how epidemiologists or medical doctors could or should use the modeled concentration levels in estimating individual exposures, and the Government’s erroneous insistence that these experts testify outside of their expertise falls flat. *See* D.E. 368 at 12-15. Phase I experts need not testify on Phase III issues. Plaintiffs incorporate by reference their opposition to the Government’s motion to exclude Dr. Aral, which presents case law from around the country in which courts have soundly rejected the argument that a witness must be an expert in every discipline or must prove a party’s entire case. *See* Pls.’ Opp. To Mot. to Exclude Expert Testimony of Mustafa Aral, at § II.

The United States’ reliance on *Coleman v. Union Carbide Corp.*, No. 2:11-0366, 2013 WL 5461855 (S.D. W.Va. Sept. 20, 2013) and *Sommerville v. Union Carbide Corp.*, No. 2:19-cv-00878, 2024 WL 1204094 (S.D. W.Va. Mar. 20, 2024) is inapposite. The modeler in *Coleman* used a regulatory-based model to produce a “worst case scenario” using the “highest emission rates” he could find “without regard to what is actually being emitted.” *Coleman*, 2013 WL 5461855, at *24. Similarly, the modeler in *Sommerville* relied on regulatory “worst-case emissions rates” had been “drastically overstated,” and then assumed without citation to data that those values

were underestimated. *Sommerville*, 2024 WL 1204094 at *12-*13. As set forth below, the ATSDR took no such approach.²⁷ DOJ Ex. 12, Konikow Dep., 191:10-193:1. *See also Hartle v. Firstenergy Generation Corp.*, 7 F.Supp.3d 510, 520-21 (W.D. Pa. Mar. 17, 2014) (distinguishing *Coleman* because expert did not make worst case assumptions).

The Government incorrectly claims that ATSDR made “health protective” or “worst case scenario” assumptions regarding the start date and rate of PCE that entered the aquifer from ABC One-Hour Cleaners (“ABC”). D.E. 368 at 22-24. In fact, ATSDR determined the start date of ABC based on the sworn testimony of its owner. DOJ Ex. 35, 9/26/24 Maslia Dep., 234:21-236:22; DOJ Ex. 6, Maslia Rebuttal Report, at 9. Regarding the rate of PCE disposed of by ABC, ATSDR reviewed all available field data to estimate a *minimum* mass loading rate, which is what it used to begin its model calibrations. DOJ Ex. 14, Maslia Dep., 284:2-25; DOJ Ex. 35, 9/26/24 Maslia Dep., 218:5-14. Consistent with standard modeling practice, ATSDR adjusted the mass loading rate during its calibration process in order to obtain the best fit with real world data. DOJ Ex. 14, Maslia Dep., 285:5-15. Also consistent with accepted modeling practice, ATSDR assumed a constant mass loading rate because it did not have data that would allow it to vary the rate. *Id.* at 287:23-288:11.²⁸ All of ATSDR’s assumptions were based on reasonable explanations and made in an attempt to model the real world as closely as possible. Unlike *Coleman* and *Sommerville*,

²⁷ The Government references Mr. Maslia using the phrase “from a standpoint of being conservative, from a public health standpoint” once in a question to the expert panel during the four days of Expert Peer Review Panel meetings. D.E. 368 at 21. That question has no relevance to the ATSDR making any health-protective assumption or modeling decision or assuming a worst case scenario. In fact, Mr. Maslia expressly denied making conservative, health-protective assumptions, explaining: “We took an objective scientific approach that could be defended ... by the scientific community, as to the approach we did for modeling.” DOJ Ex. 35, 9/26/24 Maslia Dep., 223:22-234:12.

²⁸ “[W]hat ATSDR did was apply an average rate over the critical time period because there was no basis for differentiating how the loading might have varied over time. In my opinion, this was a reasonable approach. Furthermore, the constant source resulted in a reasonable model calibration, and so there was no reason to incorporate a variable source in the absence of data on transient source characteristics.” DOJ Ex. 15, Konikow Rebuttal Report, at 21.

“worst case scenario” and “health protective assumptions” were not made. In any event, a sensitivity analysis confirmed that a start time as late as 1955 would not have resulted in any appreciable changes to arrival time or concentration levels of contaminants;²⁹ therefore, the 1953 start date was immaterial to the ultimate levels and was not a health-protective decision.

In an unsuccessful attempt to show that ATSDR made unsupported assumptions, D.E. at 22, the Government mischaracterizes statements and testimony from Dr. Konikow and Morris Maslia regarding PCE travel time from ABC. Contrary to the Government’s assertions, Dr. Konikow never opined that it would take up to 14 years for PCE to reach the aquifer. When questioned about the very same testimony relied on by the Government in its motion, Dr. Konikow explained: “I did not mean that it would take 12 years to reach the water table. ... I meant that it would reach the water table, and then it had 12 years to spread. Until that, you know, 1968 time.” DOJ Ex. 12, Konikow Dep., 267:19-24. Similarly, Morris Maslia testified that it would take several years for contaminants to reach the water supply wells – not the aquifer, DOJ Ex. 14, Maslia Dep., 287:3-13,³⁰ which is consistent with the model results. DOJ Ex. 5, Maslia Report at 199 (App. H2) (earliest time that contamination reached any supply well was April 1955).

ATSDR and the PLG Phase I experts appropriately assessed volatilization losses; their treatment of this issue does not constitute reliance on a “conservative, health-protective assumption.” ATSDR assessed the potential for volatilization at the WTPs via the report of AH Environmental Consultants, Inc. (“AH”) and input at the Expert Panel meetings. AH interviewed base personnel, conducted site visits, examined design drawings, and issued a report in December

²⁹ DOJ Ex. 9, 2009 Expert Panel (Day 1), 89:7-89:21 (quoted by DOJ at D.E. 368 at 23); DOJ Ex. 6, Maslia Rebuttal Report, at 9-12 (sensitivity analysis confirmed that start dates ranging from Jan. 1953 to Jan. 1955 made a negligible difference in PCE concentrations and the timing and duration of exceedance of the MCL at TT-26 and the WTP).

³⁰ DOJ cites testimony (D.E. 368 at 22) regarding it taking a couple of years to reach the aquifer, but Mr. Maslia clarified that he meant supply wells in his very next answer.

2004 in which it concluded that “the only significant VOC [volatile organic compound] removals must have occurred at the spirator effluent pipe” and that “the removals for TCE and PCE were likely to be less than 15%.” Ex. 13, AH report, at 2-5; 4-1; 5-1. During the 2005 Expert Panel meeting, Navy consultant Dr. Peter Pommerenk opined that “removal due to volatilization was negligible,” – at most 10%.³¹ DOJ Ex. 7, 2005 Expert Panel (Day 1), 56:2-57:14. Based on the panel’s input, ATSDR made a “pragmatic engineering approximation” to treat volatilization as negligible;³² however, PLG Phase I expert Dr. David Sabatini issued a rebuttal report in which he calculated potential volatilization losses at the WTP. Ex. 16, Sabatini Rep., at 14 (Table 5.4)³³; *see also* DOJ Ex. 6, Maslia Rebuttal Report, at 27-31 (discussing volatilization). Thus, the PLG Phase I experts have taken volatilization into account via Dr. Sabatini’s and Mr. Maslia’s reports.

C. ATSDR’s Water Models are Reliable for Estimating Mean Monthly Contaminant Levels

1. The ATSDR’s modeling methodology was developed independent of litigation.

For a decade, from 2003 until 2013, Morris Maslia and his team of twenty engineers and scientists both within and outside of ATSDR worked diligently to design, develop and run water models to determine the mean monthly concentrations of contaminants at Camp Lejeune. DOJ Ex. 5, Maslia Report, at 10, 20, 145 (App. B). This tremendous effort was conducted entirely independent of any litigation. Research conducted independent of litigation “carries its own indicia

³¹ Dr. Peter Pommerenk, an AH engineer, was a consultant for the Navy regarding Camp Lejeune. Ex. 14, Waddill Dep., 43:10-22; 100:11-101:10; 113:5-23. The Navy nominated him to be on the ATSDR’s 2009 Expert Peer Review Panel. Ex. 15, 11/24/2008 letter, at 2.

³² DOJ Ex. 14, Maslia Dep., 156:2-16; 165:4-166:3; 188:18-189:15; 192:15-17; 197:10-19; DOJ Ex. 6, Maslia Rebuttal Report, at 31. Mr. Maslia explained: “the representative of AH Consulting Dr. Pommernek, who was also representing the Department of Navy, U.S. Marine Corps on the expert panel ... said ... there’s a 90 percent passthrough, so that’s 10 percent. And then we also had other water distribution system experts on there – like Dr. Walski, Dr. Grayman, Dr. Clark, and they indicated in their experience that there would be even less than 10 percent negligible.” DOJ Ex. 14, Maslia Dep., 190:14-191:3.

³³ The Government did not file a *Daubert* motion challenging Dr. Sabatini’s opinions.

of reliability” because it provides “important, objective proof that the research comports with the dictates of good science.” *Daubert*, 43 F.3d at 1317. Experts whose research is conducted outside of litigation “are less likely to have been biased toward a particular conclusion by the promise of remuneration...”. *Id.* “That the testimony proffered by an expert is based directly on legitimate, preexisting research unrelated to the litigation provides the most persuasive basis for concluding that the opinions he expresses were ‘derived by the scientific method.’” *Id.*

2. The ATSDR’s modeling methodology can be (or has been) tested.

In determining whether a water model meets *Daubert*’s testability factor, “the primary requirement is that ‘[s]omeone else using the same data and methods ... be able to replicate the results[s].’ Testability ‘assures the opponent of proffered evidence the possibility of meaningful cross-examination (should he or someone else undertake the testing).’” *Orange County Water Dist. v. Unocal Corp.*, No. SACV 03-01742-CJC(ANx), 2017 WL 11626204, *13 (C.D. Cal. Jan. 31, 2017). Like the modeling expert in *Orange County*, ATSDR’s models satisfy the testability factor because the methodology is encapsulated in its data files and model code, which allows for third party verification and objective challenge. As in *Orange County*, these materials were provided to the Government, whose experts used them to run the model for analysis. Ex. 3, Spiliotopoulos Dep., 141:18-142:9; 164:1-4; 182:22-24; Ex. 9, Hennes Dep., 59:11-60:17 (“Dr. Spiliotopoulos has basically run the ATSDR model as part of his evaluation of the models. ... He did that.”). The United States does not challenge the replicability or testability of ATSDR’s models.

3. The ATSDR’s modeling methodology has been subjected to peer review and publication.

Morris Maslia and his colleagues published detailed articles about the methodology (including model development, calibration, sensitivity and uncertainty) and results of both the

Tarawa Terrace and Hadnot Point/Holcomb Boulevard water models in peer-reviewed journals.³⁴ Further peer review was accomplished in that every chapter of the ATSDR modeling effort for Tarawa Terrace and Hadnot Point/Holcomb Boulevard was peer reviewed by independent, outside subject matter experts before finalization and publication on the ATSDR's Camp Lejeune website, consistent with the agency's peer review process.³⁵ DOJ Ex. 5, Maslia Report, at 99. "Review comments provided by external peer reviewers were used to address technical issues and to improve the scientific credibility of all final reports." *Id.* Morris Maslia and his peers also presented their Camp Lejeune water modeling work at multiple professional conferences, which is another form of industry-level peer review.³⁶ Ex. 3, Spiliotopoulos Dep., 24:1-8; 180:19-182:1.

In addition, ATSDR conducted two-day Expert Peer Review Panels in 2005 and 2009 which gathered 10 (in 2005) and 13 (in 2009) nationally and internationally recognized experts from government, academia and the private sector to provide expert guidance and feedback

³⁴ Ex. 17, Maslia, *et al.*, "Reconstructing Historical Exposures to Volatile Organic Compound-Contaminated Drinking Water at a U.S. Military Base," *Journal of Water Quality Exposure & Health* (2009); Ex. 18, Maslia, *et al.*, "Reconstructing Historical VOC Concentrations in Drinking Water for Epidemiological Studies at a U.S. Military Base: Summary of Results" *Water* (2016).

³⁵ DOJ Ex. 31, ATSDR Response to Clement, at 14 ("every chapter report published in the Tarawa Terrace historical reconstruction report series ... underwent extensive external peer review ... Authors completely addressed all external peer review comments; the majority of which were accepted by the authors and included in the final published reports."); DOJ Ex. 35, 9/26/24 Maslia Dep., 191:18-194:20.

³⁶ *E.g.*, Ex. 19, Suarez-Soto, *et al.*, "Using Uncertainty Analysis to Reconstruct Historical Tetrachloroethylene (PCE) Exposure for an Epidemiological Study," ASCE World Environmental and Water Resources Congress (2007) (discussing uncertainty analysis using Monte Carlo simulation); Ex. 20, Guan, *et al.*, "Historical Reconstruction of Groundwater Contamination at Contaminated Sites and Uncertainty Analysis," ASCE World Environmental and Water Resources Congress (2010) (discussing use of linear control model for Tarawa Terrace); Ex. 21, Guan, *et al.*, "A Methodology to Reconstruct Groundwater Contamination History with Limited Field Data," ASCE World Environmental and Water Resources Congress (2009) (discussing linear control model); Ex. 22, Wang, *et al.*, "Tetrachloroethylene (PCE) Exposure Reconstruction for an Epidemiological Study: The Effect of Historical Supply-Well Schedule Variation on Arrival Time," Proceedings of the World Environmental & Water Resources Congress (2007) (discussing use of PSOpS to evaluate the uncertainty of contaminant arrival caused by variations in pumping schedules).

regarding the water models' methodology while they were still being constructed.³⁷ Ex. 3, Spiliotopoulos Dep., 165:1-166:6. The areas of expertise of panel members included numerical model development and simulation, groundwater-flow and contaminant fate and transport analyses and model calibration, hydraulic and water-quality analysis of water-distribution systems, epidemiology, and public health. DOJ Ex. 5, Maslia Report, at 99. After reviewing data and initial approaches and analyses provided by ATSDR, panel members made recommendations that ATSDR addressed. *See generally* Ex. 23, Final Report of 2005 Expert Peer Review Panel; Ex. 24, Final Report of 2009 Expert Peer Review Panel; DOJ Exs. 7-10, Expert Panel Transcripts. ATSDR's use of expert peer review panels is consistent with guidance from U.S. EPA on conducting external peer review of environmental models, which "not only enriches the quality of work products but also adds a degree of credibility that cannot be achieved in other way[s]."³⁸

Publication in a peer-reviewed journal is a relevant consideration in assessing the scientific validity of a particular methodology on which an opinion is premised. *Daubert*, 509 U.S. at 594. "[S]ubmission to the scrutiny of the scientific community is a component of 'good science,' in part because it increases the likelihood that substantive flaws in methodology will be detected." *Id.* at 593. The ATSDR models more than satisfy this *Daubert* factor based on publication in traditional peer-reviewed journals, outside peer review of each model chapter prior to publication on the ATSDR Camp Lejeune website, presentations at professional conferences, and Expert Peer Review Panel meetings.

³⁷ Lists of the Panel Members and each of their curriculum vitae are provided in Appendices B and C to Ex. 23, Final Report of the 2005 Expert Peer Review Panel and in Appendices B and F to Ex. 24, Final Report of the 2009 Expert Peer Review Panel. Transcripts of the four days of meetings are DOJ Exs. 7-10.

³⁸ Ex. 25, U.S. Environmental Protection Agency (USEPA), 1994, Guidance for Conducting External Peer Review of Environmental Regulatory Modeling, at 5. EPA Report 100-B-94-001, July 1994.

4. The ATSDR's modeling methodology has an acceptable rate of error.

The overall quality and accuracy of ATSDR's models is demonstrated via quantitative and qualitative error analyses (comparing model responses with corresponding observations), sensitivity analyses, and uncertainty analyses. After calibration of its groundwater flow and fate and transport models, the ATSDR compared the modeled concentrations at the water treatment plants with measured concentrations. This provided an opportunity to compare the models' results to real world data, and the results were in good agreement. *See* discussion *supra* pp. 11-12. Calculated geometric model biases of 1.5 and 2.3 respectively for Tarawa Terrace and Hadnot Point WTP results provide confidence that model results "provide reasonable accuracy and concordance with system behavior."³⁹ DOJ Ex. 6, Maslia Rebuttal Report, at 49; *see also* DOJ Ex. 19, TT Ch. A, at Table A8. Both the results and the methodology used by ATSDR in making these comparisons weigh in favor of rejecting the Government's motion. *See Orange County*, 2017 WL 11626204, at *n.7 (holding that the "'known or potential rate of error' [is] inapplicable to ... groundwater modeling more generally" because "[c]onstructing models and evaluating results is a process that inherently includes expert judgment; it is impossible to quantify a known rate of error for such work"; however, "the predictive power of models (*i.e.* model errors) is often easily ascertained by comparing predictions to actual outcomes."); *Hartle v. Firstenergy Generation Corp.*, 7 F.Supp.3d 510, 519 (W.D. Pa. Mar. 17, 2014) (allowing expert to testify because he compared his results to field observations; "[t]o the extent that the other field observations are

³⁹ An updated version of this analysis for TT that takes into account duplicates and non-detects resulted in an even lower geometric bias (ranging from 0.84 to 1.4). Ex. 26, Assessing Model Fit with Sampling Data at TT Water-Supply Wells and the WTP, at 3-4. With regard to "how to determine what is good enough," USGS modelers opine that "the evaluation of the adequacy of the calibration of a model should be based more on the insight of the investigators and the appropriateness of the conceptual model rather than the exact value of the various measures of goodness of fit." Ex. 27, Reilly & Harbaugh, Guidelines for Evaluating Ground-Water Flow Models (2004), at 23.

inconsistent with [expert's] predictions, that evidence goes to weight, not admissibility.”).

Additional assessments of the quality and accuracy of ATSDR's models are contained in the chapter reports. For example, ATSDR qualitatively assessed the correspondence between simulated and observed values through graphs and scatterplots for each site. *See, e.g.*, Ex. 28, TT Ch. C, at Figures C9 (at C28) and C20 (at C36) (showing observed versus simulated water level for the TT groundwater-flow model for both pre-development (steady state) and transient conditions); *id.* at Figures C10–C17 (at C30–C31) (graphs of simulated and observed water levels as a time-series plots); Ex. 29, HP/HB Ch. A-Supp. 4, at Figure S4.11 (at S4.22) (plotting observed versus simulated water levels); *id.* at Figure S4.12 (at S4.23) (showing a distribution of residuals for the HP/HB groundwater-flow model). With these graphical analyses of model bias as one measure of “goodness of fit,” ATSDR has demonstrated that its calibrated models provide a good concordance between observed data and simulation results.

ATSDR also applied sensitivity and uncertainty analyses to both the TT and HP/HB models. For the TT model ATSDR published a very detailed analysis as the TT Chapter I report that explained the development and application of sensitivity and uncertainty analyses using the well accepted probabilistic approach of Monte Carlo simulation. Ex. 5, TT Ch. I. ATSDR also conducted sensitivity and uncertainty analyses for the HP/HB model including (1) using a Monte Carlo simulation and the linear control model methodology (LCM), and (2) applying the Latin Hypercube Sampling (LHS) methodology for uncertainty analyses, both of which reduced the computational burden as compared to the MCS done for TT, which was not computationally feasible for HP/HB. DOJ Ex. 25, HP/HB Ch. A, at A92–A94; A70–A91 (sensitivity analyses); DOJ Ex. 28, HP/HB Ch. A Supp. 6, at S6.45 (explaining that MCS for HP/HB would have required thousands of realizations at 6 to 8 hours each, which made “a comprehensive uncertainty analysis

computationally prohibitive based on available resources and time limitations.”). Use of a different modeling methodology based on computing power limits is permissible under *Daubert*. See *Orange County*, 2017 WL 11626204, at *18 (holding such compromises are a matter for cross-examination, not exclusion). The ATSDR’s sensitivity and uncertainty analyses increase confidence in the model results. See DOJ Ex. 15, Konikow Rebuttal Report, at 26-28; see also discussion *supra* pp. 12-13.

The Government’s allegation that ATSDR’s sensitivity and uncertainty analyses were incomplete should be rejected because “how much verification and sensitivity analysis is necessary” is a matter of professional judgment. *Orange County*, 2017 WL 11626204, at *21. See also Ex. 3, Spiliotopoulos Dep., 98:16-21; 99:13-19. Here a variety of methods were employed by ATSDR and the PLG’s Phase I experts to test the model, including comparison of WTP data to modeled values; qualitative assessments of the correspondence between simulated and observed values through graphs and scatterplots; and sensitivity and uncertainty analyses. Each of these methods increase confidence in the model results and demonstrate that ATSDR’s modeling has an acceptable rate of error.

5. The ATSDR’s modeling methodology is consistent with industry standards.

ATSDR’s groundwater models were developed, assessed, and documented following standardized practices and published guidelines by ASTM and USGS. These organizations have published guidelines suggesting best practices and approaches, acknowledging that no single standard fits all situations. See Ex. 3, Spiliotopoulos Dep., 46:18-47:8; 242:10-13. The Government’s modeling witness Dr. Spiliotopoulos opines, for example, that there is no set standard or formula for the amount of data that are necessary for a reliable calibration or uncertainty analysis; rather, this is a matter of professional judgment and experience. Ex. 3,

Spiliotopoulos Dep., 244:3-17; 248:4-9.

Both ASTM and the USGS have standards (as guidelines) regarding the appropriate steps to achieve acceptable representation of a physical hydrogeological system and the documentation of same so that other scientists understand the work that has been done and can duplicate the results.⁴⁰ The ATSDR met or exceeded these standards:

The documentation for the ATSDR model studies at Tarawa Terrace and HPHB study areas are detailed, comprehensive, and clear, and meet or exceed these guidelines, as evidenced by the series of model documentation reports that include 11 separate book chapters for Tarawa Terrace and 4 separate book chapters and 8 supplemental volumes for HPHB. Careful review of this comprehensive documentation indicates that ATSDR used scientifically acceptable tools and followed correct scientific methodology in performing its historical reconstruction ...

DOJ Ex. 15, Konikow Rebuttal Report, at 5-6. *See also* DOJ Ex. 35, 9/26/24 Maslia Dep., 211:22-212:17. ATSDR has satisfied this *Daubert* factor.

6. The ATSDR's modeling methodology is generally accepted within the relevant scientific community.

ATSDR's models "are based on a mathematical representation of the processes that govern fluid flow in porous media and the movement of dissolved chemicals. These equations are well accepted throughout the scientific and engineering worlds." DOJ Ex. 12, Konikow Dep., 240:24-241:23. *See also Orange County*, 2017 WL 11626204, at *14 ("Predictive groundwater and contaminant modeling is inherently uncertain, but the field is sufficiently robust for this Court to give weight to its collective acceptance of given techniques and methodologies."); Ex. 3, Spiliotopoulos Dep., 40:15-20. ATSDR used those equations to perform a historical reconstruction, or hindcasting, which "seeks to provide estimates of contaminant concentrations

⁴⁰ Ex. 4, ASTM D5447-17, at 4; Ex. 27, Reilly & Harbaugh, Guidelines for Evaluating Ground-Water Flow Models (2004), at 26.

in drinking water (or other environmental media) when direct, past knowledge of contaminant concentrations is limited or unavailable.” DOJ Ex. 31, ATSDR Response to Clement, at 11. Whether a model simulates past events (hindcasting) or future events (forecasting), the same fundamental equations are employed, and model development, calibration and analyses of uncertainty are similar. *Id.* Hindcasting is generally accepted in the hydrogeologic and modeling community. *See id.*; DOJ Ex. 6, Maslia Rebuttal Report, at 8, 49; DOJ Ex. 15, Konikow Rebuttal Report, at 2-3; Ex. 3, Spiliotopoulos Dep., 52:13-53:7; 287:6-13.

MODFLOW and MT3MDS, the models used and applied by ATSDR to model groundwater flow and contaminant fate and transport, are widely used, well-tested, have been thoroughly peer reviewed, and are generally accepted in the hydrogeologic community. Ex. 3, Spiliotopoulos Dep., 41:24-42:6; 42:24-43:5; 43:10-16; 44:11-16; *Orange County*, 2017 WL 11626204, at *5 & 14 (MODFLOW and MT3DMS are widely used, accepted and peer-reviewed); *Aero-Motive Co. v. Becker*, No. 1:99-CV-384, 2001 WL 1698998, at *3 (W.D. Mich. Dec. 6, 2001) (MODFLOW is generally accepted).⁴¹

The ATSDR also used specialized models to address specific issues unique to the Camp Lejeune site conditions that existing codes such as MODFLOW/MT3DMS cannot address. This is a generally accepted practice.⁴² The Government contends that one such model, TechFlowMP,

⁴¹ Ex. 30, Kumar, “An Overview of Commonly Used Groundwater Modelling Software,” *Int’l Journal of Advanced Research in Science, Engineering and Technology* (2019) at 7856 (“MODFLOW is considered an international standard for simulating and predicting groundwater conditions and groundwater/surface-water interactions.”); Ex. 31, Pietrzak, “Modeling migration of organic pollutants in groundwater — Review of available software,” *Environmental Modelling & Software* (2021) at 9 (systematic review of software for modeling migration of organic pollutants in groundwater: “MODFLOW and MT3D/MT3DMS models are commonly used to simulate groundwater flow, fate and transport of organic pollutants.”); Ex. 32, U.S. EPA, Science Inventory (“MT3D has been widely accepted by practitioners and researchers alike and applied in numerous field-scale modeling studies in the United States and throughout the world.”).

⁴² *See* Ex. 33, U.S. EPA, “Guidance on the Development, Evaluation, and Application of Environmental Models” (2009) at 31 (“the Agency acknowledges there will be times when the use of proprietary models provide the most reliable and best-accepted characterization of a system.”); *Alexander v. Halliburton*

is “untested,” based on the testimony of one of the post-audit modelers. D.E. 368 at 29. That one expert is not familiar with a model is not proof that it has not been published or tested nor does that logically lead to the conclusion that ATSDR’s water models are unreliable. In fact, there are several publications in the peer-reviewed literature describing use of TechFlowMP, including documentation that it has been tested and verified.⁴³

The selection of model input parameters by ATSDR was made based on review of site-specific data and literature with adjustment via the calibration process; contrary to the Government’s assertion, the selection was not “arbitrary.” DOJ Ex. 6, Maslia Rebuttal Report, at 49-50. ATSDR considered an enormous amount of site-specific data to parametrize its models, including water-quality laboratory analyses, CERCLA Administrative Record files, solid waste management unit reports, and hundreds of consulting reports providing site-specific data. *Id.* at 46; DOJ Ex. 25, HP/HB Ch. A, at Appendix A2. As an example, the biodegradation rate was initially determined with field data and then adjusted via the calibration process. DOJ Ex. 14, Maslia Dep., 281:15-282:1. This yielded two biodegradation rate parameter values from two different models; professional judgment was used to select a value between the two modeled values. Sensitivity analysis demonstrated that the selected value was appropriate because the

Energy Services, Inc., No. CIV-11-1343-M, 2016 WL 2859630, at *3-4 (W.D. Okla. May 16, 2016) (allowing expert to testify based on a proprietary model).

⁴³ *E.g.*, Ex. 34, Jang and Aral, “Density-Driven Transport of Volatile Organic Compounds and Its impact on Contaminated Groundwater Plume Evolution,” *Journal of Transport in Porous Media* (2007), pp. 353-374; Ex. 35, Jang and Aral, “Effect of Biotransformation on Multi-species Plume Evolution and Natural Attenuation,” *Int’l Journal on Transport in Porous Media* (2008) pp. 207-226; Ex. 36, Jang and Aral, “Multiphase Flow Fields in In-Situ Air Sparging and Its Effect on Remediation,” *Int’l Journal on Transport in Porous Media* (2009) pp. 99-119; Ex. 37, Jang and Aral, “In-Situ Air Sparging and Thermal Venting in Ground Water Remediation,” Chapter 11 in Groundwater Quality and Quantity Management (2011) pp. 430-475. TechFlowMP is a public domain code that can be accessed from the Georgia Tech website for individual use (<http://mesl.ce.gatech.edu/>, MESL 2017). *See also* Ex. 38, Jang and Aral. 2005, “Three-Dimensional Multiphase Flow and Multispecies Transport Model TechFlowMP,” Georgia Institute of Technology, Multimedia Environmental Simulations Laboratory, Report MESL-02-05, Sept. 2005 (the original Ga Tech-MESL report developing, documenting, and testing TechFlowMP).

model was not sensitive to the range of values at issue (*i.e.*, choosing the higher or lower value as opposed to the midpoint would not have made a difference). DOJ Ex. 13, Jones Dep., 108:3-109:13; 150:11-151:16; 154:16-155:21. Estimation of parameter values via model calibration and professional judgment is a generally accepted methodology and far from arbitrary. DOJ Ex. 18, *The Handbook of Groundwater Engineering*, Chap. 20, Groundwater Modeling, at 20-21 (“However, even with regression [parameter estimation] modeling, the hydrologic experience and judgment of the modeler continues to be a major factor in calibrating a model both accurately and efficiently.”); Ex. 4, ASTM D5447-17, at 6.6 & 6.6.1; Ex. 3, Spiliotopoulos Dep., 277:8-20; *see also Orange County*, 2017 WL 11626204, at *19 (“professional judgment is an inherent component of modeling”); *Aero-Motive*, 2001 WL 1698998, at *3-4 (engineering reports, geologic histories, maps, and surveys of the water and soil are reasonably relied upon and disagreement among scientists about input values does not render modeling technique unreliable).

The Government also criticizes the mass loading inputs to the TT and HP/HB models. As explained *supra* pp. 21-22, the minimum mass of PCE input into the TT model was initially determined based on field data and then adjusted via the modeling calibration process. For HP/HB, the contaminant sources are well-documented based on ATSDR’s comprehensive, detailed source characterization analyses. DOJ Ex. 25, HP/HB Ch. A, at A23-A28 & Appendix A2 (listing information sources used to extract model-specific data).⁴⁴ Given the absence of site-specific leak data, ATSDR reasonably relied on the installation dates of underground storage tank (UST) systems and the median time frame for leak development in those systems determined in a study

⁴⁴ Table A7 provides an inventory of potential contaminant-source areas in the vicinity of contaminated water-supply wells; Table A8 identifies documented source areas, timelines, primary contaminants and location of major sources of groundwater contamination in the HP industrial and landfill areas; Table A13 lists the contaminant sources used for the HP/HB historical reconstruction, and Figures A9 and A10 show the extent of groundwater contamination in the vicinity of the HP Industrial Area and landfill. DOJ Ex. 25, HP/HB Ch. A, at A19, A20, A26, A27 & A45.

conducted by the U.S. EPA of more than 12,000 leak incidents to estimate the timing of the leaking of USTs,⁴⁵ and then made adjustments during the calibration process. DOJ Ex. 28, HP/HB Ch. A Supp. 6, at S6.16; DOJ Ex. 14, Maslia Dep., 219:22-220:13; 221:5-222:16; 224:15-225:10. Similarly, a source release time frame of seven years was assumed for the landfill because it was unlined and wastes were unlikely to have been disposed of in tanks or secured containers; adjustments were subsequently made during the calibration process. DOJ Ex. 28, HP/HB Ch. A Supp. 6, at S6.42; DOJ Ex. 14, Maslia Dep., at 222:17-223:2; 224:2-19. Importantly, a sensitivity analysis demonstrated that uncertainty in the start release dates had little effect on TCE concentrations for most of time frame at issue. DOJ Ex. 15, Konikow Rebuttal Report, at 26.

“The variation in the exact location, timing, and strength of sources is rarely known, and adjustment of source properties is a commonly-accepted part of calibrating a flow and transport model.” *Id.* at 21 & 25. Moreover, *Daubert* does not require the use of the “best” modeling methodology or data; rather, the choice of methodology or data must be based on good grounds, based on what is known. *See Hartle*, 7 F.Supp.3d at 522-23, 525 (allowing modeler to testify because he had good ground for selecting and applying the model and considered the model’s limitations); *Daubert*, 509 U.S. at 590; *Westberry*, 178 F.3d at 261. ATSDR met that standard by employing the site-specific data at hand and then relying on publications, calibration and professional judgment to determine source inputs.

The Government’s questioning of the constant mass loading rate (and other parameter

⁴⁵ Ex. 39, Gangadharan, AC, *et al.*, Leak Prevention in Underground Storage Tanks: A State-of-the-Art Survey, at 23, U.S. Environmental Protection Agency, 1987, Report No. EPA-600/2-87/018. Mr. Maslia explained that “the actual tank did not necessarily leak, but it was at the pipe joints because of the construction methods back then in the ’40s and ’50s and ’60s, unlike today where you have to have a concrete pad, solid, and then you put the tank on. They just dug the hole, put the tank on, . . . and connected the pipes. And when the tank filled up, then the pipes flexed, and that’s where you got the leakage.” DOJ Ex. 14, Maslia Dep., 221:17-222:2.

values) is similar to the second-guessing of the defendant in *Orange County*. Noting that professional judgment is an “inherent component of modeling,” the *Orange County* court found that where, as here, the modeler made a choice, clearly documented the choice, and applied it consistently, that weighed heavily in favor of admissibility. 2017 WL 11626204, at *19. Like the *Orange County* modeler, the ATSDR modelers did not assume a varying mass input because that would involve taking “a much heavier hand in curating” the mass loading, which “would have introduced inconsistency and significant subjectivity” where there is no data to support such variation.⁴⁶ *Id.* “Scientific models are reliable when they consist of consistently-applied, reasonable, and understandable decisions.” *Id.* Both the Orange County modeler and the ATSDR pass that threshold.

The Government claims the ATSDR water models are based on insufficient concentration data, relying almost exclusively on PLG’s experts Morris Maslia and Dr. Konikow, both of whom adamantly disagree with the Government on this point.⁴⁷ The gap in data is the reason that models are needed – they are used to fill in that gap in a way that is consistent with physical, hydrological, and geochemical principles and processes. DOJ Ex. 6, Maslia Rebuttal Report, at 8, 36; DOJ Ex. 15, Konikow Rebuttal Report, at 6-7. The concentrations are known to be zero before the sources of contamination started operating and are known at water supply wells and WTPs after sampling started in the early 1980s. The groundwater models solve the equations governing groundwater flow and contaminant fate and transport in a way that is consistent with scientific knowledge about how groundwater flows and contaminants migrate in the subsurface environment. DOJ Ex. 15,

⁴⁶ DOJ Ex. 6, Maslia Rebuttal Report, at 14; DOJ Ex. 14, Maslia Dep., 287:23-288:11; DOJ Ex. 15, Konikow Rebuttal Report, at 21.

⁴⁷ The Government also cites a phrase from Dr. Clement’s published paper, which constitutes at most a limited review of Tarawa Terrace only, and a Navy Letter which advises against reporting results without error bounds. D.E. 368 at 20. The Government has not provided this Court with the opinion of any expert that the data were insufficient for calculating mean monthly levels.

Konikow Rebuttal Report, at 6-7. These tools thus provide a scientifically valid method to interpolate (and estimate) the concentration changes in time and space between those two knowns. *Id.* at 15. The results contain uncertainty, and that uncertainty is recognized, evaluated, and documented in the ATSDR reports. This gap does not make the models scientifically invalid.

The Government says the models do not reflect real-world conditions, which seems at odds with its concession that the models are reliable for purposes of epidemiological analysis. In any event, the groundwater models are based on a multitude of hydrogeologic studies and measurements of aquifer properties (*e.g.*, hydraulic conductivity, hydraulic head, and porosity) that control groundwater flow directions and paths of contaminant migration. ATSDR extracted and reviewed more than twenty-eight thousand data values (including groundwater samples and water-level measurements) for its historical reconstruction analyses. DOJ Ex. 25, HP/HB Ch. A, at A10; Ex. 3, Spiliotopoulos Dep., 256:21-258:18. And ATSDR compared its model results against real-world sampling data at the water supply wells and the water treatment plants. *See supra* pp. 11-12. These are real-world conditions and real-world data.

In conclusion, acceptance of ATSDR's modeling methodology in the hydrogeologic and groundwater modeling communities is evident from multiple publications in peer-reviewed journals and at professional conferences, *see* § C.2 *supra*, and from the modeling team's receipt of the Excellence in Environmental Engineering Award, Grand Prize, Research Category by the American Academy of Environmental Engineers and Scientists in 2015. DOJ Ex. 5, Maslia Report, at 99.

7. The Government's Own Failure to Maintain Complete Water Data Cannot Be Held Against Plaintiffs, and Does Not Render PLG's Experts' Testimony Unreliable.

The United States' argument about missing pumping data ignores that extrapolation is

permissible and consistent with acceptable methods for scientific and engineering analyses, especially to account for information the opposing party destroyed. Courts regularly admit expert opinions that “extrapolate . . . data because actual . . . information was unavailable.” *Brown v. Nucor Corp.*, 785 F.3d 895, 904 (4th Cir. 2015); *see also Rhyne v. United States Steel Corp.*, 474 F. Supp. 3d 733, 751 (W.D.N.C. 2020) (admitting expert opinion that benzene exposure at lower doses can cause leukemia that extrapolated from studies on higher doses, despite “lack of good exposure estimates as a major limitation”); *Westberry*, 178 F.3d at 264 (“precise information” is “not always available, or necessary” for causation opinion). “[M]issing data . . . goes squarely to weight and not to admissibility,” and is “a common subject of expert cross-examination.” *BlueRadios, Inc. v. Kopin Corp.*, No. 16-CV-02052-JLK, 2023 WL 9104818, at *12 (D. Colo. Dec. 27, 2023). “The critical question is thus not whether the data used is perfect but instead whether it is reliable and probative” *Brown*, 785 F.3d at 904.

Extrapolation and alternative data sources are especially appropriate when the opposing party is responsible for the missing data. *See id.* (“plaintiffs may rely on other reliable data sources and estimates when a company has destroyed or discarded the primary evidence”) (citing Fourth Circuit cases); *Tyson Foods, Inc. v. Bouaphakeo*, 577 U.S. 442, 456 (2016) (permitting “representative sample to fill an evidentiary gap created by the employer’s failure to keep adequate records”). Here, the Government apparently destroyed evidence it had on water contamination at Camp Lejeune, including daily well logbooks and water treatment plant logs. Ex. 40, Apr. 29, 2010 Camp Lejeune Community Assistance Panel Meeting, at 96-99. The ATSDR requested such records to use in its assessment, but the Government could not produce them. *Id.* The Government cannot hold its own failure to preserve data against Plaintiffs.⁴⁸

⁴⁸ The Government had a duty to preserve once it knew or should have known this evidence might be

Consistent with professional engineering practice, ATSDR used statistical and modeling tools to reconstruct pumping history and to assess uncertainty related to pumping schedule variation. Such an approach is not unique to Camp Lejeune.⁴⁹ ATSDR employed a documented process that used all available pumping data to reconstruct missing data. DOJ Ex. 14, Maslia Dep., 212:1-214:11; Ex. 3, Spiliotopoulos Dep., 283:5-8 (confirming ATSDR used all available pumping data). ATSDR dealt with the pumping scheduling in a reasonable manner consistent with standard practices in groundwater modelling and carefully documented what they had done, what they had assumed, and what approximations they made. Ex. 41, HP/HB Ch. A Supp. 2 (entire report describing methodology to reconstruct water-supply well pumping operations); DOJ Ex. 6, Maslia Rebuttal Report, at 18-19; DOJ Ex. 15, Konikow Rebuttal Report, at 20; DOJ Ex. 35, 9/26/24 Maslia Dep., 204:7-17. Lack of pumping data can contribute to the uncertainty in the final results, but ATSDR carefully assessed and documented this potential uncertainty, which is minimal for the vast majority of the time frame at issue. *See* DOJ Ex. 5, Maslia Report, at 62; DOJ Ex. 14, Maslia Dep., 268:15-269:17; 270:17-271:25; 272:21-273:9 (LHS provided satisfactory quantitative and qualitative uncertainty analysis).

relevant to future litigation. *Powell v. Town of Sharpsburg*, 591 F. Supp. 2d 814, 818 (E.D.N.C. 2008) (granting adverse inference for records destroyed pursuant to document retention policy). At the latest, the Government was required to retain for 50 years any relevant records it still possessed when Camp Lejeune was designated a Superfund site on October 4, 1989. *See* 42 U.S.C. § 9603(d).

⁴⁹ DOJ Ex. 12, Konikow Dep., 276:2-11 (“it’s almost in every case the models have to reconstruct the pumping history and make estimates of it. ... It is rare that over a historical period you would have very precise records of pumpage.”); Ex. 42, Brookfield, *et al.*, “Estimating Groundwater Pumping for Irrigation: A Method Comparison,” *Groundwater*, at 15 (2024) (“Effective groundwater management is critical to future environmental, ecological, and social sustainability and requires accurate estimates of groundwater withdrawals. Unfortunately, these estimates are not readily available in most areas due to physical, regulatory, and social challenges.”).

V. CONCLUSION

Contrary to the Government's central contention, neither the PLG experts nor the ATSDR are required to prove the levels of contaminants in the water to an absolute certainty; perfection is not the standard. The Government concedes that the ATSDR's models are reliable for purposes of assessing exposure levels for epidemiology studies; the models are likewise reliable for assisting the PLG's specific causation experts and this Court in determining exposure levels of individual plaintiffs. The ATSDR used the modeled mean monthly levels in its Public Health Assessment to determine whether and to what extent the water at Camp Lejeune is harmful to pregnant women, children and others; here the PLG Phase III experts likewise will use the modeled mean monthly levels to determine whether the water at Camp Lejeune as likely as not caused harm to individual plaintiffs.

The Government's motion should be denied because the PLG's Phase I experts are qualified to offer opinions regarding the ATSDR's water models, and their opinions will assist this Court in addressing the levels of contaminants in the water at Camp Lejeune (*i.e.*, they are relevant). The ATSDR models and the PLG experts' opinions regarding same satisfy the *Daubert* factors and therefore are reliable. Specifically, the models were not created for litigation; they are testable and have been tested by the Government's experts; they have been subject to peer review; they have an acceptable rate of error; and the methodology is consistent with industry guidelines and generally accepted in the hydrogeology and modeling community.

For the foregoing reasons, the PLG respectfully requests the Court to deny the Government's motion.

DATED this 4th day of June 2025.

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CERTIFICATE OF COMPLIANCE

I, J. Edward Bell, III, hereby certify that this document complies with the Court's order dated June 2, 2025 (DE 392) regarding the applicable word and page limit. Not counting front or back matter, this document is 39 pages and has 13,871 words [limit: 14,000], as calculated by Microsoft Word.

This the 4th day of June 2025.

/s/ J. Edward Bell, III_____

J. Edward Bell, III

CERTIFICATE OF SERVICE

I, J. Edward Bell, III, hereby certify that the foregoing document was electronically filed on the Court's CM/ECF system on this date, and that all counsel of record will be served with notice of the said filing via the CM/ECF system.

This the 4th day of June 2025.

/s/ J. Edward Bell, III_____

J. Edward Bell, III