

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TENNESSEE
AT KNOXVILLE

IN RE:) 3:09-CV-009 3:09-CV-568 3:09-CV-605
) 3:09-CV-014 3:09-CV-569 3:10-CV-191
) 3:09-CV-048 3:09-CV-570 3:11-CV-217
TENNESSEE VALLEY AUTHORITY) 3:09-CV-054 3:09-CV-571 3:11-CV-574
ASH SPILL LITIGATION) 3:09-CV-064 3:09-CV-572 3:11-CV-575
) 3:09-CV-114 3:09-CV-578 3:11-CV-581
) 3:09-CV-491 3:09-CV-579 3:11-CV-582
) 3:09-CV-495 3:09-CV-582 3:11-CV-588
) 3:09-CV-496 3:09-CV-583 3:11-CV-589
) 3:09-CV-497 3:09-CV-584 3:11-CV-590
) 3:09-CV-504 3:09-CV-589 3:11-CV-591
) 3:09-CV-517 3:09-CV-590 3:11-CV-596
) 3:09-CV-529 3:09-CV-591 3:11-CV-603
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) 3:09-CV-563 3:09-CV-597 3:11-CV-612
) 3:09-CV-564 3:09-CV-602 3:11-CV-613
) 3:09-CV-565 3:09-CV-603
) 3:09-CV-566 3:09-CV-604
) (VARLAN/GUYTON)

MEMORANDUM OPINION AND ORDER

I. INTRODUCTION

The above-captioned actions are a part of the Tennessee Valley Authority (“TVA”) Ash Spill Litigation which arose following the failure of a coal ash containment dike at TVA’s Kingston Fossil plant (the “KIF plant”) on December 22, 2008. The entire TVA Ash

Spill Litigation currently encompasses more than 60 cases pending before the undersigned and involves more than 800 plaintiffs.¹

In general, plaintiffs claim that the failure of the coal ash containment dike at the KIF plant and the resulting spill of coal ash sludge from the plant's coal ash storage area was caused by TVA's negligent conduct with respect to the design, construction, implementation, operation, maintenance, and inspection of the plant's coal ash storage and disposal facilities. Plaintiffs allege that they reside and/or own property and/or businesses within the vicinity of the KIF plant and that they suffered injuries and damages as a result of the spill. Plaintiffs' initial complaints against TVA alleged causes of action for personal injury and property damage under tort law theories of negligence, negligence per se, gross negligence, trespass, nuisance, strict liability, and inverse condemnation.

The Court has previously issued written opinions on dispositive and non-dispositive motions in which TVA sought dismissal and/or limitation of plaintiffs' claims. In *Mays v. TVA* ("*Mays*"), 699 F. Supp. 2d 991 (E.D. Tenn. 2010), the Court held that TVA may be liable to plaintiffs in tort through the "sue and be sued" clause of the Tennessee Valley Authority Act of 1933 ("TVA Act"), 16 U.S.C. §§ 831, *et seq.*, subject to the immunity from liability provided by the discretionary function doctrine. *See* 16 U.S.C. § 831c(b) (providing that TVA "[m]ay sue or be sued in its corporate name"); *Mays*, 699 F. Supp. 2d at 1004-11. The Court found that the discretionary function doctrine insulates TVA from liability if the

¹Unless otherwise specified, all docket entry notations contained herein are numbered according to the docket entry sheet in *Chesney, et al. v. TVA, et al.*, Case No. 3:09-CV-09.

conduct challenged by plaintiffs was discretionary conduct grounded in considerations of public policy and involved the permissible exercise of policy judgment. *Mays*, 699 F. Supp. 2d at 1004-11, 1016, 1019, 1022 (discussing the application of the discretionary function doctrine to the TVA Ash Spill Litigation); *United States v. Smith*, 499 U.S. 160, 168-69 (1991) (citing *Peoples Nat. Bank of Huntsville, Ala. v. Meredith*, 812 F.2d 682, 684-85 (11th Cir. 1987)); *Queen v. TVA*, 689 F.2d 80, 85 (6th Cir. 1982), *cert. denied*, 460 U.S. 1082 (1983).² The Court also found that the discretionary function doctrine does not protect TVA from liability for nondiscretionary conduct not grounded in policy considerations and not involving the permissible exercise of policy judgment. *Mays*, 699 F. Supp. 2d at 1016, 1021-22 (discussing the application of the discretionary function doctrine to the TVA Ash Spill Litigation). Also in *Mays*, the Court granted TVA's request to dismiss plaintiffs' claims for punitive damages and granted TVA's request to strike plaintiffs' requests for a jury trial. *Id.*, 699 F. Supp. 2d at 1033.

²As noted in *Mays*, the discretionary function doctrine generally arises in the context of the Federal Tort Claims Act ("FTCA"), 28 U.S.C. § 2680(a), which states that the United States' waiver of sovereign immunity does not extend to:

Any claim . . . based upon the exercise or performance or the failure to exercise or perform a discretionary function or duty on the part of a federal agency or an employee of the Government, whether or not the discretion involved be abused.

28 U.S.C. § 2680(a); *Mays*, 699 F. Supp. 2d at 1006. TVA does not benefit from the discretionary function doctrine as it is embodied in the FTCA. *Mays*, 699 F. Supp. 2d at 1006. TVA's waiver of sovereign immunity is through the "sue and be sued" clause of TVA's enabling legislation, the TVA Act. *Id.*

In re TVA Ash Spill Litig., 787 F. Supp. 2d 703 (E.D. Tenn. 2011) (“*TVA Ash Spill Litig. I*”), considered motions by TVA seeking summary judgment on plaintiffs’ tort claims on grounds that plaintiffs had not shown that nondiscretionary conduct by TVA caused the dike failure and resulting coal ash spill. *Id.*, 787 F. Supp. 2d at 706. In *TVA Ash Spill Litig. I*, the Court agreed with TVA’s articulation of what plaintiffs must do in order to establish liability on the part of TVA for the failure of the containment dike at the KIF plant:

[I]dentify a specific decision or conduct on the part of TVA and show it to be within the Court’s determination of what may constitute a nondiscretionary act for which TVA may be liable[,] and . . . explain how that decision or conduct caused the dike failure.

Id. at 716 (quoting TVA’s brief and omitting internal quotation marks). Using this roadmap, the Court found that TVA cannot be held liable for plaintiffs’ allegations relating to TVA’s decisions and conduct regarding the design and construction of the KIF plant; TVA’s decisions to keep the KIF plant’s wet coal ash storage and disposal system in operation; TVA’s clean-up, removal, and remediation of the surrounding area following the ash spill; the substance of TVA’s policies and procedures for coal ash operations and management; and TVA’s decisions regarding modifications, repairs, and changes to the KIF plant. *Mays*, 699 F. Supp. 2d at 1004-11; *TVA Ash Spill Litig. I*, 787 F. Supp. 2d at 725. The Court found that TVA could be liable:

[N]egligent failure to inform or train TVA personnel in the applicable policies and procedures for coal ash operations and management; negligent or inadequate performance by TVA personnel of TVA’s policies and procedures; negligence in the construction and implementation of approved design and construction plans; and negligent maintenance.

TVA Ash Spill Litig. I, 787 F. Supp. 2d at 725.³ Additionally, in May 2011, over plaintiffs' objections, the Court upheld a report and recommendation denying plaintiffs' motions for class certification. *See Mays v. TVA*, 274 F.R.D. 614 (E.D. Tenn. 2011).

In re TVA Ash Spill Litig., 805 F. Supp. 2d 468 (E. D. Tenn. 2011) (“*TVA Ash Spill Litig. II*”), considered motions by TVA seeking summary judgment on plaintiffs' tort and inverse condemnation claims on grounds of no causation. In *TVA Ash Spill Litig. II*, the Court granted summary judgment in favor of TVA on plaintiffs' personal injury, emotional distress, and inverse condemnation claims, and denied TVA's request for summary judgment on plaintiffs' property damage, trespass, and nuisance claims. *Id.*, 805 F. Supp. 2d at 479-82, 886-95. Plaintiffs' remaining claims against TVA following *TVA Ash Spill Litig. II* therefore included claims of negligence, negligence per se, recklessness, strict liability, trespass, private nuisance, and public nuisance [Doc. 419, pp. 2-9].

In August 2011, the Court granted motions by both plaintiffs and TVA to consolidate and bifurcate the trials in this litigation into two separate phases [Doc. 407]. The Court ordered that Phase I would involve a single trial on issues and evidence relating to duty, breach, and dike failure causation, and that the issues determined in Phase I would be binding on all parties to the litigation [*Id.*, p. 6]. Depending on the disposition of the issues reached in Phase I, the Court ordered that Phase II would include individualized evidentiary hearings

³The Court has issued several opinions involving the application of the discretionary function doctrine to this litigation. However, until Phase I, the Court had not considered the issue of whether alleged nondiscretionary conduct by TVA was negligent.

or proceedings to determine issues such as tract-specific causation and whether and to what extent each plaintiff is entitled to damages [*Id.*, pp. 6-7]. Because of the individualized nature of the issues to be resolved in Phase II, the Court ordered that no Phase II proceeding would be binding on all parties and that the method of conducting the Phase II proceedings would be determined after the Court's disposition of the issues involved in Phase I [*Id.*, p. 7].⁴

The undersigned held a bench trial for Phase I in the actions of *Chesney, et al. v. TVA*, Case No. 3:09-CV-09, *Raymond, et al. v. TVA*, Case No. 3:09-CV-48, *Auchard, et al. v. TVA, et al. v. TVA*, Case No. 3:09-CV-54, *Scotfield, et al. v. TVA*, Case No. 3:09-CV-64, and *Campbell, et al. v. TVA*, Case No. 3:09-CV-517. During the approximately three-week long bench trial, the Court heard and considered testimony and evidence regarding, *inter alia*, issues of duty, breach, causation, and whether nondiscretionary conduct by TVA caused the dike failure and coal ash spill [Doc. 407, pp. 6-7]. The Court did not consider testimony or evidence on property-specific causation and damages because these issues would be considered and resolved, if necessary, in Phase II proceedings [*Id.*].

Following Phase I, the parties submitted closing argument briefs, proposed findings of fact and conclusions of law, and summaries of each witness's testimony, whether that

⁴By stipulation of all parties and with approval of the Court, the record from Phase I was adopted as the record for Phase I in all of the above-captioned cases [*See, e.g., Armes, et al. v. TVA*, Case No. 3:09-CV-491, Doc. 100]. By agreement of the parties, this record has also been adopted by the parties in all cases related to the TVA Ash Spill Litigation filed in this Court [*See, e.g., Rivers v. TVA*, Case No. 3:11-CV-604, Doc. 10]. The Court also issued a partial stay of discovery in the later-filed actions pending issuance of this opinion [*See id.*]

testimony was given at trial or by deposition.⁵ In plaintiffs' post-trial submissions, plaintiffs did not include arguments or proposed findings of fact and conclusions of law regarding their claims that TVA is liable under theories of recklessness, strict liability, and public nuisance [Doc. 495; Doc. 496, pp. 89-102; *Armes, et al. v. TVA*, Case No. 3:09-CV-491, Doc. 105; *Turner, et at. v. TVA*, Case No. 3:09-CV-495, Docs. 110, 111]. The Court therefore concludes that plaintiffs have abandoned these theories and the Court will not consider or address these theories in this opinion. See *Harbison v. Little*, 723 F. Supp. 2d 1032, 1038 (M.D. Tenn. 2010) (declining to address a claim and noting that if "a plaintiff fails to include arguments regarding a claim in a post-trial brief, the court is justified in finding that the plaintiff has abandoned that claim"); *Coston v. Petro*, 398 F. Supp. 2d 878, 880-81 (S.D. Ohio 2005) ("[I]n their post-trial brief, Plaintiffs did not submit proposed findings of fact and conclusions of law for the claims asserted [various counts] of the complaint. Accordingly, the Court concludes that Plaintiffs have abandoned these claims."); see also *Black Law Enforcement Officers Ass'n v. City of Akron*, No. 89-3743, 1990 WL 198934, at *4 (6th Cir. Dec. 11, 1990) (affirming a district court's determination "that the appellants had abandoned [certain] claims because they did not address them in their post-trial brief").

The Court therefore only addresses herein plaintiffs' tort claims under theories of negligence, negligence per se, trespass, and private nuisance. As previously determined by

⁵Several plaintiffs who did not participate in Phase I but who stipulated and adopted that trial record also filed post-trial submissions. The Court has considered all of these submissions in making its proposed findings of fact and conclusions of law. See *Chesney, et al. v. TVA*, Case No. 3:09-CV-09, Docs. 491, 492, 493, 494, 495, 496; *Armes, et al. v. TVA*, Case No. 3:09-CV-491, Doc. 105; *Turner, et at. v. TVA*, Case No. 3:09-CV-495, Docs. 110, 111.

the Court, the discretionary function doctrine applies to these claims and forecloses relief to the extent the claims are barred by the discretionary function doctrine. *See Mays*, 699 F. Supp. 2d at 1009-10, 1033; *see also TVA Ash Spill Litig. I*, 787 F. Supp. 2d at 724. As set forth in more detail in the findings of fact and conclusions of law that follow, the Court concludes that the failure of North Dike, the coal ash containment dike at the KIF plant that failed on December 22, 2008 and spilled more than 5 million cubic yards of coal ash sludge over approximately 300 acres, was caused by TVA's placement of North Dike over the Swan Pond slack water embayment, TVA's design of North Dike, TVA's decision to continue operating the KIF plant as a wet coal ash storage and disposal facility, and TVA's decision to continue building up its wet coal ash stack. This conduct, in conjunction with the geological conditions of the Swan Pond slack water embayment, gave rise to the slimes layer, a unique subsurface layer of materials located near the foundation of North Dike that was weak, high in water content, and susceptible to a complete loss of strength when overstressed. The Court concludes that but for the confluence of these physical and geological factors and the movement of the slimes layer which triggered the dike failure sequence, the coal ash spill that is the subject of this litigation would not have occurred.

The Court concludes that one "but for" cause of the failure of North Dike on December 22, 2008, cannot be isolated from the physical factors and geological conditions that are the most probable causes of the dike failure, as determined by AECOM, the Tennessee Department of Environment and Conservation ("TDEC"), the Office of the Inspector General for TVA ("OIG"), Marshall Miller & Associates ("MM&A"), and

McKenna Long & Aldridge LLP (“MLA”), and described at Phase I by expert witnesses for both plaintiffs and TVA, because but for each of these factors and the geological conditions of the site, the failure would not have occurred. The Court also concludes that the creation of the slimes layer cannot simply be attributed to only discretionary conduct for which TVA cannot be liable under the discretionary function doctrine. This is because TVA’s location of North Dike over the Swan Pond slack water embayment was a result of TVA’s improper construction of perimeter Dike C, conduct which ultimately resulted in TVA placing North Dike over the unstable conditions and materials of the Swan Pond slack water embayment. As this Court has held throughout this litigation, negligent implementation of discretionary decisions to design, locate, and construct, a wet coal ash facility do not involve the policy judgments and considerations the discretionary function doctrine is intended to shield. To hold otherwise would preclude and foreclose liability for negligence upon the single assertion that choices or a decision was made subsequent to negligent conduct. The Court declines to construe the discretionary function doctrine so broadly and therefore finds TVA is liable for the ultimate failure of North Dike which flowed, in part, from TVA’s negligent nondiscretionary conduct

The Court also concludes that TVA’s failure to inform and train TVA personnel in TVA’s mandatory policies, procedures, and practices for coal ash management, and TVA personnel’s negligent performance of the same—specifically, TVA’s policy, procedure, and practice of conducting annual dike stability inspections and TVA’s undertaking of ongoing maintenance of North Dike—were also substantial contributing causes of the failure of North

Dike. More specifically, plaintiffs have proved, by a preponderance of the evidence, that TVA's conduct in regard to its mandatory policies, procedures, and practices for coal ash management compounded the location, design, and operation causes discussed above that were the but for causes of the failure, and had TVA followed its own mandatory policies, procedures, and practices, the subsurface issues underlying the failure of North Dike would have been investigated, addressed, and potentially remedied before the catastrophic failure of December 22, 2008.

Furthermore, while acknowledging that the substance of TVA's coal ash management policies, procedures, and practices at the KIF plant are based on discretionary conduct for which TVA cannot be liable under the discretionary function doctrine, the Court concludes that TVA's failure to inform TVA personnel—its own inspectors and coal ash managers—of the substance of these policies, procedures, and practices, and their negligent performance of the same, is nondiscretionary conduct for which TVA is liable. The Court does not find this failure to inform or this negligent implementation of coal ash management policies, procedures, and practices, adopted and viewed as mandatory by TVA, to be conduct or decisions grounded in policy considerations of social, economic, and political factors, or policy or planning decisions which regularly require judgment as to which permissible course is the wisest. Rather, the Court finds this conduct to be the type of decisions and conduct that the discretionary function doctrine is not intended to shield—decisions and conduct involving negligence and a lack of due care.

However, having found that found TVA is not wholly protected from liability by the discretionary function doctrine, the Court also finds, as explained herein, that plaintiffs' claims of negligence, trespass, and private nuisance will proceed to Phase II proceedings but that plaintiffs' claims of negligence per se will not and will be dismissed. The Court also notes that each plaintiff in the TVA Ash Spill Litigation now faces an individualized burden in the Phase II proceedings. In Phase II, each plaintiff must prove the elements of his or her respective negligence, trespass, and/or private nuisance claims by a preponderance of the evidence. The Court has noted since the inception of this litigation that while these cases involve common questions of general causation, these common issues do not predominate over individual questions of causation. While up until this point, common issues of causation—such as whether nondiscretionary conduct by TVA caused the dike failure—have dominated, from this point forward the common issues will not predominate over individualized issues including: whether coal ash is or was present on each plaintiff's specific property; whether the presence of the coal ash on the specific property can be traced to TVA's nondiscretionary conduct; whether the coal ash has damaged each specific property; whether and how the coal ash affects each plaintiff's use and enjoyment of said property; and the amount of damage, if any, to each property and to each plaintiff.

Thus, after this brief summary, and after considering all testimony and evidence presented at Phase I, along with the submitted deposition testimony, the exhibits and the post-trial submissions, and the relevant and controlling law, the Court is prepared to rule as follows and issue its findings of fact and conclusions of law pursuant to Federal Rule of Civil

Procedure 52(a), which requires the Court, “in an action tried on the facts without a jury . . . [to] find the facts specially and state its conclusion of law separately.” Fed. R. Civ. P. 52(a)(1). Because of the interrelatedness of the findings of fact and conclusions of law in this case, to the extent a finding of fact constitutes a conclusion of law, the Court adopts it as such, and, to the extent a conclusion of law constitutes a finding of fact, the Court adopts it as such.

II. FINDINGS OF FACT⁶

A. The Buildup of the KIF Plant and the Failure of North Dike

1. The KIF plant is a coal-fired electricity generation plant owned and operated by TVA. *Mays*, 699 F. Supp. 2d at 1004-11.

2. It is located on a peninsula at the confluence of the Clinch and Emory River embayments of the Watts Bar Reservoir, a Reservoir owned by TVA which includes Swan Pond, the Swan Pond shoreline strip, and a shallow area of the Reservoir known as the Swan Pond slack water embayment. *Id.*

3. TVA began construction of the KIF plant in 1951 and the first unit went on-line in February 1954. *Id.*

4. Coal ash, a byproduct of when coal is burned for electricity generation, has been produced, disposed of, and stored at the KIF plant since 1954. *Id.*

⁶The Court’s findings of fact include undisputed background facts which have been found by the Court in prior opinions, in addition to facts determined by the Court from the evidence presented and considered during Phase I.

5. The coal ash disposal and storage process at the KIF plant involved transporting coal ash and slurry⁷ to disposal and storage facilities, including a stilling pond, a coal ash collection pond, and a coal ash storage area. *Id.*

6. The coal ash storage area included a dredge cell area where coal ash from the collection pond was dredged, deposited for permanent storage, and used for dike construction. *Id.*

7. Prior to 1954, the Swan Pond slack water embayment collected natural silt and clay bottom sediments from the Watts Bar Reservoir [Tr. XII at 222-39, 252-55; Pls. Ex. 6047 at 3739; Def. Ex. 154 at 2-9]. *Id.*

8. From about 1954 through about 1958, coal ash and slurry was discharged to the north of the plant into the coal ash storage area, part of which was located directly over the Swan Pond slack water embayment [Tr. XII at 222-39, 252-55; Pls. Ex. 6047 at 3739; Def. Ex. 154 at 2-9]. *Id.*

9. This initial coal ash storage area consisted of a 59-acre gap between two dikes which allowed the coal ash to commingle with waters from the Watts Bar Reservoir [Pls. Exs. 48, 148; Tr. VII at 11-17; Def. Ex. 154 at 2-9].

10. Around 1956, TVA began construction of perimeter Dike C, a container dike designed to be constructed of clay and located along the north perimeter of the coal ash storage area [Def. Ex. 154 at 2-9; Pls. Exs. 5412, 266C].

⁷Slurry is a term for when coal ash is commingled with water. *Mays*, 699 F. Supp. 2d at 996.

11. The foundation of perimeter Dike C was located around the original lake bottom of the Swan Pond embayment, at elevation 770, and the dike initially extended upward 40 feet from its foundation [Def. Ex. 157 at 16; Def. Ex. 154 at 2-9].⁸

12. Instead of being constructed of clay only, perimeter Dike C was constructed of a mixture of clay residuum and coal ash [Pls. Exs. 5412, 266C, 603 at Depo. Ex. 461, 467; Tr. VII at 18-31; Def. Ex. 154 at 2-9].

13. Perimeter Dike C was completed in 1958, expanding the initial 59-acre coal ash storage area to 275 acres [Pls. Exs. 5412, 266C; Tr. VII at 18-23; Def. Ex. 154 at 2-9].

14. The initial 59-acre coal ash storage area filled in around 1965 [Def. Ex. 154 at 2-9].

15. The expanded 275-acre coal ash storage area was divided by internal dikes into dredge cells [*Id.*]. *Id.*

16. From about 1958, through about 1977, coal ash and slurry contained in the coal ash storage area were released back to the Watts Bar Reservoir through two sluice channels [*Id.*; Pls. Ex. 266D]. *Id.*

17. The sluice channels formed a spillway system which operated at the north end of the coal ash storage area near the Swan Pond slack water embayment [Def. Ex. 154 at 2-9; Pls. Exs. 266D]. *Id.*

⁸Consistent with the parties' presentation of the evidence, all elevations and measurements given herein are approximate.

18. As the coal ash and slurry flowed through the sluice channels, the coarser bottom ash settled to the bottom where it was removed by mechanical means and used for dike construction [Def. Ex. 154 at 2-9; Pls. Ex. 266D]. *Id.*

19. The weaker, finer fly ash, which is more difficult to compact, flowed through the sluice channels and into the coal ash collection pond, where it was dredged by hydraulic means and deposited into the dredge cell area [Def. Ex. 154 at 2-9; Pls. Ex. 266D]. *Id.*

20. Excess water in the coal ash storage area drained to the coal ash collection pond and to the stilling pond, after which it flowed through a discharge channel, into a water intake channel, and into the Watts Bar Reservoir [Def. Ex. 154 at 2-9; Pls. Ex. 266D]. *Id.*

21. Excess water seeped down through the finer fly ash in the coal ash storage area and into the groundwater, where it was discharged into the Watts Bar Reservoir [Def. Ex. 154 at 2-9; Pls. Ex. 266D]. *Id.*

22. Beginning in 1967, TVA began performing annual dike stability inspections of the facilities at the KIF plant [Pls. Ex. 603; Tr. I at 57-58, 73; Tr. II at 237; Tr. VII at 24-25; Pls. Ex. 191]. *Id.* at 996.

23. These annual dike stability inspections continued up through October 20, 2008 [Pls. Ex. 603; Tr. I at 57-58, 73; Tr. II at 237; Tr. VII at 24-25; Pls. Ex. 191]. *Id.*

24. After the completion of perimeter Dike C, TVA continued to raise the elevation of the perimeter dike to increase the storage capacity of the coal ash disposal area [Pls. Ex. 603 at Depo. Ex. 461, 467; Tr. VII at 23-37; Pls. Ex. 51 at Depo. Ex. 8, 10; Def. Ex. 154 at 2-9].

25. An annual dike stability inspection report from 1971 confirms that a mixture of clay and coal ash was used to raise and construct perimeter Dike C [Pls. Exs. 603 at Depo. Ex. 461, 467; Tr. VII at 23-31].

26. Around 1975, TVA issued Engineering Procedure ENDES-EP 1.09 for Inspection and Maintenance of Ash Disposal Areas (“Engineering Procedure 1.09”), a mandatory engineering procedure that has not been rescinded [Pls. Ex. 538;].⁹

27. Section 2.0 of Engineering Procedure 1.09 requires that:

Ash disposal areas shall have periodic inspections and maintenance to ensure that the operation of the dikes is in accordance with designs, that the retaining dikes are in stable condition, that ash does not escape from the areas, and that areas are left in an acceptable condition when they are abandoned.

[*Id.*].

28. Section 8.0 of Engineering Procedure 1.09 sets out detailed requirements for inspection, maintenance, and operation of ash disposal areas at the KIF plant, including the following:

b. Top of Dikes

(1) The top of dikes shall have a minimum width of 16 feet.

(2) The top of dikes shall be maintained with a smooth surface sloping to the inside on a 5% minimum slope.

.....

⁹Engineering Procedure 1.09 was revised in July 1978 [Pls. Ex. 538].

(5) The top of dikes shall not be raised above the ultimate design elevation as shown on issued construction drawings. Dikes shall not be raised by P PROD unless approved by EN DES.

c. Side Slopes of Dikes

(1) The slide slopes of dikes shall be no steeper than shown on design drawings. If existing slopes are steeper than shown on design drawings, establish the theoretical design slope from outside toe of dike to the existing top of dike, add a 10-foot-minimum berm, and all future raising shall begin at this point on the design slope. Future raising by P PROD shall only be done when approved by EN DES.

(2) All berms along the slopes shall be maintained. Drainage may collect along these berms, and it is important to provide some type of positive means of releasing this water such as pipes, gutters, etc. Do not allow this release to erode the slopes.

(3) All slopes shall maintain a good vegetative cover. This may require seeding, reseeding, fertilizing, liming, mulching, etc. EN DES will provide grassing requirements when requested.

(4) All erosion on side slopes shall be corrected at once by filling and grassing.

(5) Side slopes shall be kept cleared of logs, scraps, and other debris. Trees shall not be permitted on the side slopes, but should be encouraged along the outside toe of the dike.

.....

(7) Any seepage, erosion, holes, or movement along the slopes shall be reported to EN DES.

(8) No pipes shall be placed in or along the dikes without approval from EN DES. EN DES should be notified of any existing pipes.

d. Pond

(1) The water levels in ponds shall be maintained at an absolute minimum.

(2) Four feet of freeboard shall be maintained at all times.

e. Daily Inspection (Once each shift)

(1) Drive entire dike.

(2) Check for the following:

(a) Settlement, rutting, or cracks along top of dikes.

(b) Water trapped on top of dikes.

(c) Abnormal rise or drop in pond level.

(d) Four-foot-minimum freeboard.

(3) Report all abnormal findings to EN DES.

f. Periodic Inspections (Monthly)

(1) Walk entire dike.

(2) Check the following:

.....

(b) Top of Dikes

-- The top of dikes should have a smooth surface sloping to the inside on a 5 percent-minimum slope.

-- The top of dikes should have an all-weather surface and not be rutted.

-- Any settlement or large cracks on the top of dikes should be reported to EN DES.

(c) Side Slopes of Dikes

- Water should not be standing along berms.
- All slopes should have a good vegetative cover.
- Side slopes shall be kept cleared of logs, scraps, and other debris. Trees shall not be permitted on the side slopes, but should be encouraged along the outside toe of the dike.
- Any seepage, erosion, holes, or movement along the slopes shall be reported to EN DES.

(d) Pond

- The water levels in ponds shall be maintained at an absolute minimum. Abnormal rise or drop should be reported.
- There should be 4 feet of freeboard.

(3) Report all abnormal findings to EN DES.

[*Id.*].

29. In 1975, in conjunction with TVA's plans to increase the coal ash storage capacity of the KIF plant, TVA's in-house lab, Singleton Laboratories, drilled boreholes into perimeter Dike C to perform sampling and tests to determine the soil and ash conditions under and behind the perimeter dike [Pls. Ex. 755; Tr. VII at 38-43].

30. This sampling and testing confirmed that perimeter Dike C was not constructed in accordance with TVA's design and construction plans, that there were weaknesses in several of the boring samples, that some of the ash-soil mixtures had low strength, and that

the weight of the upper ash in the perimeter dike was not adequately consolidating the finer lower ash under the submerged conditions [Tr. VII at 36-43; Pls. Ex. 755].

31. A non-routine inspection report from August 1976 noted that:

The foundation for the pondward portion of the spillways is in light ash. It has not been possible to excavate to firm ground for structure foundations because of water and ash inflow into the excavations. Construction by attempting to firm up the soft ash with earthfill has been unsuccessful, and settlements have occurred on the partially installed structures.

[Pls. Ex. 603 at Depo. Ex 481].

32. In April 1978, TVA issued a design guide entitled Civil Design Guide DG-C1.4.2. Slope Stability Analysis (“CDG”) [Pls. Ex. 467].

33. The CDG set forth engineering guidelines covering areas such as field and laboratory testing, evaluating soil characteristics, required factors of safety for holding ponds (including ash ponds), methods of analysis and slope stabilization techniques, and provides that at the end of construction, the required factor of safety for holding ponds with a raised dike and pool should be 1.5 [*Id.*].

34. Similar design guidelines provide that 1.5 is an acceptable minimum factor of safety under the engineering standard of care for the design of earthen dams, dikes, and levees under long-term, steady-state seepage conditions [Tr. VII at 49; Tr. XIII at 85].

35. The CDG was revised in 1981 and was reportedly in use for coal ash dikes at least through the 1980s [Pls. Ex. 88].

36. TVA did not update the CDG and there was no evidence it issued a similar design guide in regard to the KIF plant [Pls. Ex. 485 at 16; Tr. XIII at 83-84].

37. Policies, procedures, and practices, such as Engineering Procedure 1.09 and the CDG, are meant to embody standard engineering practice as developed through the years by state, federal, and private engineering organizations [Tr. VII at 49; Tr. XIII at 85].

38. In 1982, TVA began construction of an interior north-south divider dike between the KIF plant's coal ash collection pond and the stilling pond [Pls. Exs. 485, p. 9, 603 at Depo. Ex. 532-34].

39. This interior north-south divider dike failed in 1984, causing the release of stored dredged coal ash which overtopped the interior divider dike and flowed east [Pls. Exs. 485 at 9, 603 at Depo. Ex. 532-34; Def. Ex. 154 at 2-9].

40. After the 1984 failure, an engineer performing an annual dike stability inspection noted that "[t]he exterior dikes were not designed for additional interior loads which may occur as a result of this dredging future stacking operation," and "engineered interior dikes could reduce the risks of their failure." [Pls. Ex. 485 at 9; Pls. Ex. 603 at 532-34].

41. Following the 1984 failure, TVA continued to raise the elevation of perimeter Dike C and began construction of new interior divider dikes within the coal ash storage area [Def. Ex. 154 at 2-9; Pls. Ex. 485 at 9; Pls. Ex. 603 at Depo. Ex. 532-34].

42. To provide for additional storage of dredged coal ash after the 1984 failure, TVA began to construct new interior dikes which would eventually serve as the foundations of Dredge Cell 1 and Dredge Cell 2 [Pls. Exs. 485 at 9, 603 at 532-34; Pls. Ex. 80].

43. These new interior dikes formed dredge cells which were intended to allow fly ash that had settled in the ash pond to be continuously removed by sluicing and pumping it behind the dikes and placing it in vertical lifts to increase the capacity of the ash pond to settle out more fly ash [Tr. VII at 46-47].

44. In 1985, TVA evaluated the stability of perimeter Dike C for the purpose of raising new dikes and dredge cells upstream of perimeter Dike C [Pls. Ex. 80].

45. A memorandum by the director of engineering projects at TVA in April 1985, R. G. Domer (the "Domer memo"), analyzed the stability of perimeter Dike C and the new dredge cell dikes being constructed [Pls. Ex. 80, 81; Tr. VII at 47-48; Pls. Ex. 467 at 13].

46. The Domer memo concluded that perimeter Dike C, as built, was not constructed according to TVA's design drawings [Pls. Ex. 80, 81; Tr. VII at 47-48; Pls. Ex. 467 at 13].

47. The Domer memo provides that a layer of ash extended to within a few feet of the exterior of the perimeter Dike C and that the minimum, as-built factor of safety for the perimeter dike was 1.2 [Pls. Ex. 80; Tr. VII at 47-48; Pls. Ex. 467 at 13].¹⁰

¹⁰As noted previously, the CGD required a factor of safety of at least 1.5 [Pls. Ex. 467 at 13].

48. The Domer memo states that the construction of an “engineered dredge pond dike adjacent to [perimeter Dike C] will not increase the probability of a slide failure of [perimeter Dike C]; however, the dredge pond would increase the risk of seepage through [perimeter Dike C]. [Accordingly, t]he new dredge dike must be constructed in accordance with attachment C[,]” a design drawing attached to the Domer memo [Pls. Ex. 80; Pls. Ex. 603 at Depo. Ex. 576; Pls. Ex. 266E, 6059; Tr. VII at 63-65].

49. The Domer memo also recommended that plant personnel perform daily inspections of perimeter Dike C [Pls. Ex. 80].

50. Attachment C shows a dredge cell dike with a 60-foot wide top, a 17-foot vertical rise over a course of 90 horizontal feet, and a maximum height of 778 feet, built of compacted bottom ash starting at elevation 750 and stacked on top of a layer of fly ash with foundation soil located at elevation 700 [Pls. Ex. 80 at 5; Tr. VII at 53].

51. TVA continued to build up the storage capacity of the coal ash storage area and build up and extend the new dredge cell dikes by constructing new dredge cells and dikes to contain the stored coal ash and sludge at the KIF plant [Tr. VII at 63-65].

52. The first new dredge cell dike of Dredge Cell 2, completed in 1988, was not built in accordance with attachment C because it was partially constructed of fly ash with a 30-foot top width [Tr. VII at 53-54, 63-65].

53. While TVA's original design and construction drawings called for the dredge cell dikes to be constructed of clay or bottom ash, the dikes did not conform to this intended construction; rather, the dredge cell dikes were constructed of a mixture of clay and weaker fly ash [Tr. XI at 59, 74, 83; Tr. XII at 99-100].

54. TVA's annual dike stability inspection report from April 1986 noted that the internal dredge pond dikes were being raised several feet in preparation for future storage, and concluded that "while the raising of internal dikes may be essential for the storage of ash due to ever decreasing available space, these dikes should be analyzed for structural stability." [Pls. Ex. 485 at 9; Pls. Ex. 603 at Depo Ex. 557-558].

55. The April 1986 report also recommended that "the lower exterior berm should be mowed to enhance a more effective visual inspection. All undersireable (sic) vegetation should be removed by use of chain or cable so as to pull the root system from the earth." [Pls. Ex. 603 at Depo. Ex. 558].

56. A memo from 1986 by Mr. William Bivens, who worked in various capacities at TVA, including in design engineering and management, warns against long-term ponding, or allowing prolonged freestanding water on the dikes [Pls. Ex. 82].

57. An annual dike stability inspection report from 1987 noted that TVA failed to follow the directive made in the April 1986 annual dike stability inspection report that "the lower exterior berm should be mowed to enhance a more effective visual inspection" and the 1987 report reiterated this recommendation [Pls. Ex. 603 at Depo. Ex. 567].

58. Because of the failure to construct perimeter Dike C and the first Dredge Cell 2 dike according to the design and construction plans, TVA located and configured the next dike of Dredge Cell 2, what would become North Dike, approximately 200 feet south of perimeter Dike C to avoid placing additional load on perimeter Dike C and improve the stability of the dredge cells [Tr. VII at 63-65; Tr. X at 62].

59. This location of North Dike, 200 feet out from perimeter Dike C, placed the foundation of North Dike within Dredge Cell 2 and around the area of the Swan Pond slack water embayment, with its unique subsurface conditions and materials [Tr. VII at 151-53; Tr. X at 56-60].

60. By 1988, the dredge cell area within the coal ash storage area was divided by internal dikes into three distinct areas—Dredge Cell 1, Dredge Cell 2, and Dredge Cell 3—and bounded on four sides by exterior perimeter dikes—North Dike, West Dike, South Dike, and East Dike [Def. Ex. 154 at 2-9; Pls. Ex. 51; Pls. Ex. 603 at Depo. Ex. 576; Pls. Ex. 266E; Tr. VII at 63-65].

61. By 1995, perimeter Dike C had been raised to elevation 795 and coal ash material was being actively sluiced into Dredge Cell 1, Dredge Cell 2, and Dredge Cell 3 [Def. Ex. 154 at 2-9; Pls. Ex. 603 at Depo. Exs. 582, 596, 606, 622].

62. In 1995, TVA applied for a permit with the Division of Solid Waste Management of the Tennessee Department of Environment and Conservation (“TDEC”) to operate the KIF plant as a landfill structure under the Tennessee Solid Waste regulations [Tr. VIII at 30, 45-47; Pls. Ex. 878].

63. TVA's amended TDEC application, submitted in 1998, stated that three dredge cells, Dredge Cells 1, 2, and 3, would be constructed of a mixture of compacted bottom ash material and would operate through closure year 2015 with a proposed vertical expansion of the dredge cells from elevation 770 up to elevation of 866, and with an average of 285,000 cubic yards of fly ash and bottom ash being deposited per year into the dredge cells [Pls. Ex. 878 at 3-4; Tr. VIII at 53-54].¹¹

64. TVA represented to TDEC in the application that ash would be sluiced wet into the three dredge cells, but that all the water would settle out and the ash stack would consolidate and dry into a relatively inert structurally stable material and become stable [Tr. VIII at 31, 45, 48-51, 59].

65. TVA submitted an operations manual to TDEC as part of its application [Pls. Ex. 836].

66. TDEC granted TVA's application in September 2000 and issued TVA a Class II Landfill Permit, No. IDL 73-0094, for the continued deposit and storage of coal ash at the plant (the "2000 Landfill Permit") [Doc. 49-1 at 105, 140, 242; Def. Ex. 154 at 2-9]. *Mays*, 699 F. Supp. 2d at 996-97.

67. The operations manual became a part of the 2000 Landfill Permit [Tr. VIII at 50-51].

¹¹The expansion plan was referred to during Phase I as the Closure/Post-Closure Plan [Tr. VIII at 53-54].

68. The 2000 Landfill Permit required TVA to “at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit.” [Pls. Ex. 552 at Depo. Ex. 247].

69. The 2000 Landfill Permit required TVA to give notice to TDEC of any “planned physical alterations or additions to the permitted facility” [Pls. Ex. 552 at Depo. Ex. 248], required compliance with all applicable TDEC solid waste regulations, and required TVA to construct and operate the facility in accordance with approved engineering plans and operations plans, which became conditions of the permit [Pls. Ex. 552 at Depo. Ex. 250-51].

70. TDEC began regular inspections of the facilities at the KIF plant in 2000 [Def. Ex. 153; Def. Ex. 52].¹² *Mays*, 699 F. Supp. 2d at 997.

71. By early 2000, TVA stopped increasing the height of the interior dike between Dredge Cell 2 and Dredge Cell 3 and covered over the interior dike between Dredge Cell 2 and Dredge Cell 3 with sluiced coal ash, thus eliminating one dredge cell and combining Dredge Cells 2 and 3 into one cell [Pls. Ex. 603 at Depo. Ex. 671; Tr. VIII at 55-56].

72. TVA did not give notice or obtain prior approval from TDEC before making this alteration of the physical structures at the KIF plant [Pls. Ex. 552, ¶ 11; Tr. V at 107; Tr. VIII at 83-84, 142-43].

¹²TDEC’s last inspection of the facilities at the KIF plant was on August 20, 2008 [Def. Ex. 153].

73. On November 6, 2003, a blowout occurred at elevation 780 of West Dike, one of the exterior perimeter dike which bound the west side of Dredge Cell 2 (“2003 blowout”) [Def. Ex. 154 at 2-9]. *Mays*, 699 F. Supp. 2d at 997.¹³

74. The 2003 blowout resulted in the release of fly ash adjacent to and across Swan Pond Road, a road which ran alongside West Dike [Def. Ex. 154 at 2-9].¹⁴

75. Following the 2003 blowout, TVA stopped dredging coal ash into Dredge Cell 1 and Dredge Cell 2 [*Id.*].

76. While TVA made repairs to West Dike, TVA constructed the Emergency Dredge Cell to the east of Dredge Cells 1 and 2 in order to continue hydraulically depositing coal ash into the dredge cell area [*Id.*].

77. TVA began dredging into the Emergency Dredge Cell in March 2004 [*Id.*].

78. In early 2004, TVA retained Parsons Energy & Chemicals Group, Inc. (“WorleyParsons”), a third-party contractor engineering firm, to investigate the causes of the 2003 blowout, to evaluate long-term alternatives for the continued storage and disposal of coal ash at the KIF plant, to determine whether Dredge Cell 2 could continue to operate at

¹³A term used by the parties throughout this litigation, a “blowout” describes excessive seepage and ground movement events on a dike. Dr. Gary Brown, a licensed environmental engineer retained by plaintiffs as an expert, testified that a blowout occurs when water runs so fast that the soil starts to move with the water [Tr. VIII at 87-89]. To relieve the resulting water pressure, the soil or coal ash shifts, creating a semi-circular hole where the soil or ash washes out of the dike [*Id.*]. Dr. Brown testified that the term blowout “over-accentuates” what actually happens when the soil or ash washes out [*Id.*].

¹⁴The 2003 blowout created a hole of approximately 12-to 18-inches in diameter in West Dike through which loosened ash and water flowed through and covered a 5-by-10 foot swath of Swan Pond Road [Pls. Ex. 435 at 11].

the existing elevation of 810, and whether it could be raised to operate at a higher elevation [*Id.*; Pls. Ex. 618; Def. Ex. 4 at 6; Pls. Ex. 136, Ap. C at 15-16; Def. Ex. 4 at 7-9]. *Mays*, 699 F. Supp. 2d at 996-98.¹⁵

79. WorleyParsons also performed an engineering stability analysis of the dredge cell area and the adjoining coal ash collection pond and was directed by TVA to:

[C]onsider two failure modes: One due to slope instability and the other due to seepage or piping. Based on this analysis, it will be determined whether the dredge cell can continue to be utilized as presently constructed, or whether modifications or measure(s) for its mitigation will be required in order to allow the dredge cell to continue to be operated beyond its existing height.

[Def. Ex. 4 at 6-9].

80. WorleyParsons completed the stability analysis report in May 2004 and reported to TVA that Dredge Cell 2 could safely be raised 58 feet to elevation 868, that the increased height of the ash stack should consist of wet-placed ash up to elevation 844 and dry-placed ash up to elevation 868, and that a combination of coal ash and gypsum could be stacked up to elevation 970 in a new gypsum-ash stack adjacent to the coal ash collection pond [Pls. Ex. 836, at 559-63; Tr. VIII at 60, 133].

¹⁵WorleyParsons was initially a defendant in several of the cases in this litigation. On March 22, 2011, upon motion by WorleyParsons and another third-party contractor engineering firm, Geosyntec Consultants, Inc. (“Geosyntec”), the Court found that WorleyParsons and Geosyntec were entitled to derivative sovereign immunity and dismissed those entities from this litigation. *See Chesney v. TVA*, 782 F. Supp. 2d 570 (E.D. Tenn. 2011).

81. WorleyParsons also reported that:

The proposed raised Cell Area ash stack . . . and gypsum-ash stack . . . are likely to be stable during any stage of construction and after completion of construction including during the occurrence of the design seismic event.

[Pls. Ex. 836 at 583].

82. WorleyParsons' report also noted that the sluiced fly ash in West Dike had not been consolidating and that it was subject to liquefaction:

Reviewing all the subsurface data, . . . it is apparent that several feet of ash overlying the natural clay layer (top approximately at Elev. 730) has remained apparently loose despite years of being under the existing ash overburden. . . . This means that the ash has not been consolidating or that it may undergo significant strength loss when disturbed or shaken. Interestingly, John Boschuk of JTL laboratories also observed that the fly ash "liquefies under even slight vibrations[.]"

[*Id.*; Tr. VIII at 60], but that the ash stack of Dredge Cell 2 was "likely to be stable during any stage of construction and after completion of construction including during the occurrence of the design seismic event." [Pls. Ex. 836 at 583].

83. WorleyParsons also recommended alternatives to TVA regarding the repair of West Dike, including the recommendation that drainage in the ash ponds could be improved by installing blanket drains in the proposed gypsum-ash stack [Tr. IV at 109-110; Def. Ex. 154 at 2-9].¹⁶

¹⁶TVA began construction of the proposed gypsum-ash stack in December 2008, but had not yet installed the recommended blanket drains at the time of the failure [Tr. V at 61-62].

84. In August 2004, TVA retained Geosyntec Consultants (“Geosyntec”),¹⁷ also a third-party contractor engineering firm, to conduct a peer review of WorleyParsons’ report [Pls. Exs. 136 at 20-21, 214-15].

85. Geosyntec issued its own report and recommendations in November 2004 [*Id.*].

86. In that report, Geosyntec noted the necessity of analyzing additional dike sections for slope stability and performing additional analysis of ash materials to determine material strength [Pls. Ex. 214].

87. WorleyParsons issued a second report in December 2004 in response to Geosyntec’s report [Def. Ex. 8; Tr. IV at 102].

88. In 2004, an ash recovery team consisting of consultant engineers, TVA personnel, and TVA engineers conducted inspections of TVA’s coal ash facilities, including the KIF plant [Pls. Ex. 618].

89. The ash recovery team reviewed data, performed site investigations and parallel seepage calculations, and ran seepage calculation models on the dredge cells before presenting its findings to TVA in a January 23, 2004 presentation [*Id.*].

90. The ash recovery team’s findings included problems the team had observed with the coal ash facilities, including saturated dikes, localized sloughing, displaced rip rap,

¹⁷The lead engineer for Geosyntec was Mr. Neil Davis, who also testified at trial as a witness for plaintiffs. Mr. Robert Bachus was also an engineer employed by Geosyntec who participated in Geosyntec’s peer review of WorleyParsons’ 2004 work. Mr. Bachus’s testimony was presented by deposition testimony [Pls. Ex. 6127].

plugged underdrains, standing water on berms, red water seeps, holes on sides of cells in localized areas, and potential leakage in an abandoned ash pond spillway [*Id.*].

91. The team also related its observations on short and long term concerns for the coal ash facilities and recommended various actions plans to address those concerns [*Id.*].

92. Using the reports from WorleyParsons and Geosyntec, TVA applied for a modification of its 2000 Landfill Permit to allow it to further laterally expand the dredge cells and further increase the coal ash storage capacity of the plant [Pls. Exs. 557, 568, 836, 836A, 836B, 836C; Doc. 48, ¶ 5; Tr. VII at 155-57].

93. As part of its application, TVA submitted an amended operations manual [Tr. VII at 113-14, 128; Pls. Ex. 556].

94. While TVA's application regarding the lateral expansion of the dredge cells was pending with TDEC, TVA submitted a minor modification in April 2005 to TDEC of the 2000 Landfill Permit [Pls. Ex. 562 at Depo. Ex. 424].

95. TDEC approved the minor modification in May 2005 (the "Modified 2005 Landfill Permit") [Pls. Ex. 562 at Depo. Ex. 424; Doc. 48, ¶ 5].

96. A letter from TDEC to TVA regarding the Modified 2005 Landfill Permit stated that TDEC was approving leachate collection trench drains, a toe drain and improved drainage ditch, a new collection/retention pond, and the installation of geonet at the toe in the vicinity of the original blowout [Tr. VII at 130-31; Pls. Ex. 564 at 1].

97. Correspondence from TDEC to TVA regarding the Modified 2005 Landfill Permit included a document entitled Proposed Dredge Cell Repair Supporting Information,

which stated that TVA would install piezometers on the north, south and western faces of the dredge cell dikes “[t]o insure that the proposed fix is successful.” [Tr. VII at 94, Pls. Ex. 562; Pls. Ex. 562 at Depo. Ex. 431; Tr. II at 17-18, 21-22; Pls. Ex. 562 at TVK].¹⁸

98. Around 2005, TVA began installing piezometers and monitoring wells in the dikes at the KIF plant, including piezometers installed in West Dike and monitoring wells in North Dike [Pls. Ex. 562 at Depo. Ex. 431; Tr. II at 17-22, 128-30; Pls. Ex. 562 at TVK-40057; Pls. Ex. 596 at 3].

99. The monitoring wells in North Dike included three, MW-13, MW-14, and MW-15, installed in September 2005 and located at least 30 feet below the surface of the north face of North Dike [Pls. Ex. 562 at Depo. Ex. 431; Tr. II at 17-22, 128-30; Pls. Ex. 562 at TVK-40057; Pls. Ex. 596 at 3].

100. In September 2006, TDEC approved TVA’s application for a modification of the 2000 Landfill Permit (the “2006 Landfill Permit”), including the amended operations manual and approved engineering plans [Tr. VII at 116; Pls. Ex. 568; Doc. 48, ¶ 5].

101. The permit terms and conditions attached to the 2006 Landfill Permit state that:

[T]he permittee shall construct and operate in accordance with the approved engineering plans and operations manual, which becomes a condition of this permit.

[Pls. Ex. 568 at 5].

¹⁸Generally, piezometers are pipes installed for monitoring water levels at a discrete vertical intervals beneath the ground [Tr. II at 12]. Monitoring wells are similar in construction to piezometers, but may be used for multiple purposes [*Id.* at 13]. Water levels are measured by determining the distance to water from the top of the casing of the piezometer or monitoring well, and the difference between the measurement and the top of the casing, taking into account its elevation above the ground surface, is the depth of the water below the ground surface [*Id.* at 34-35].

102. The amended operations manual incorporated into the 2006 Landfill Permit permitted TVA to vertically expand the existing dredge cells by hydraulically stacking the coal ash up to elevation 844, followed by the placement of dry ash up to a final elevation of 868, and authorized the creation of new dredge cells in the coal ash collection pond up to elevation 930 [Pls. Ex. 836 at 11, 559; Pls. Exs. 557, 568, 836A, 836B, 836C; Tr. VII at 115-16; Tr. VIII at 132].

103. Between June and September 2005, TVA made repairs to West Dike in the area of the 2003 blowout, including placing riprap over the blowout and slide areas, installing underdrains, and installing an additional trench drainage system [Def. Ex. 154 at 2-9; Pls. Ex. 618 at 13-15; Tr. XI at 11; Pls. Ex. 6126, Depo. Tr. 73; Pls. Ex. 136, App. C at 15-16].

104. TVA resumed normal dredging operations into the dredge cell area in November 2005. *Mays*, 699 F. Supp. 2d at 996-1000.

105. On November 1, 2006, a second blowout occurred in West Dike of Dredge Cell 2 (“2006 blowout”), north of the 2003 blowout location [Def. Ex. 154 at 2-9; Tr. VII at 158-59, Pls. Ex. 270 at 4].¹⁹

106. In response to the 2006 blowout, TVA stopped dredging into Dredge Cells 1 and 2 and dredged only into the Emergency Dredge Cell [Def. Ex. 154 at 2-9; Pls. Exs. 218, 270; Tr. X at 101].

¹⁹The 2006 blowout created a hole in West Dike similar to the hole created by the 2003 blowout, but with a smaller amount of discharged material [Pls. Ex. 435 at 11].

107. TVA also lowered the water levels in the ash collection pond, installed a temporary patch in West Dike, and conducted a dye trace study to determine the source of the water released in the blowout [Def. Ex. 154 at 2-9; Pls. Exs. 218, 270; Tr. X at 101].

108. Following the 2006 blowout, TVA retained Geosyntec to investigate the causes of the blowout and to develop alternatives for addressing the blowout and the continued storage and disposal of coal ash, including the possibility of converting the facilities from a wet to a dry coal ash disposal system [Doc. 48, ¶ 6]. *Mays*, 699 F. Supp. 2d at 996-1000.

109. Geosyntec determined that the 2003 and 2006 blowouts in West Dike were localized anomalies which involved excessive seepage and the proximity of water to the surface of West Dike [Pls. Ex. 6127 at 87, 136, 163-170, 190-91, 203-04, 6124 at 100-103, 242-44].

110. As a result of these blowouts, TVA implemented localized toe drain improvements with additional groundwater monitoring, maintenance, and surface water improvements, including the installation of two new sets of piezometers in West Dike [Pls. Exs. 285, 6127 at 80, 136-42, 163, 6124 at 195-96, 244, 260, 266-67, 275-77, 59A; Tr. II at 70-71; Doc. 48, ¶ 6; Doc. 49-2].

111. The piezometers installed in 2005 and the additional piezometers installed in 2006 became part of a groundwater monitoring system, which would eventually include the installation of over 50 piezometers or monitoring wells [Tr. II at 70-71, 133; Pls. Exs. 285, 606, 6124 at 175-76, 181-87].

112. Geosyntec performed the initial monitoring of the piezometers and set up a program to track the water levels in the piezometers [Tr. I at 141-49; Tr. II at 147-48].

113. This program involved inputting water level data taken from the piezometers into a spreadsheet which produced a color-coded chart and tracked the phreatic surface, or ground water level, of the piezometers [Tr. I at 141-49; Tr. II at 147-48].²⁰

114. When the water level data showed the phreatic surface in the piezometers close to the grounds surface, the color-coded chart located those levels in a red zone which served as an action alert to whomever was monitoring the levels [Tr. I at 150; Pls. Ex. 606].

115. If the piezometers were in the red zone, TVA personnel were instructed to take action [Tr. I at 150; Pls. Ex. 1552].

116. Because the piezometers were only a few feet deep, if a piezometer indicated a water level above the ground surface, this meant that water was flowing from the surface of the dike [Tr. I at 152-53].

117. The red zone alert only applied to piezometer readings, not to readings for the monitoring wells or well points (dewatering wells) [Tr. I at 151-53; Tr. V at 184, 197-208; Tr. IV at 181; Pls. Ex. 812 at 7, 11, 38; Pls. Exs. 606, 1212].

118. This is because the monitoring wells and well points were located much deeper in the dikes, around 20-feet deep, while piezometers ranged from 2- to 10-feet in depth [Tr.

²⁰Phreatic surface is the top of the water table [Tr. II at 27; Pls. Ex. 606 (noting at the bottom of each page that the readings for the shallow-screen piezometers represent the location of the water table)].

I at 151-53; Tr. IV at 181; Tr. V at 184, 197-208; Pls. Ex. 812 at 7, 11, 38; Pls. Exs. 606, 1212].

119. Monitoring wells and well points were used to show water pressures at depth, to dewater the dikes, for secondary monitoring purposes, and to draw down water levels in the dikes in order to make repairs [Tr. I at 151-53; Tr. IV at 181; Tr. V at 184, 197-208; Pls. Ex. 812 at 7, 11, 38; Pls. Exs. 606, 1212].

120. TVA did not use the monitoring wells and well points to measure dike stability, water levels, or show whether the phreatic surface was close to the ground surface [Tr. I at 151-53; Tr. IV at 181; Tr. V at 184, 197-208; Pls. Ex. 812 at 7, 11, 38; Pls. Exs. 606, 1212].

121. It does not appear that TVA installed piezometers in North Dike.

122. After Geosyntec created the water level monitoring program, Geosyntec transferred the responsibility of monitoring the water level data to Mr. Matt Williams of TVA's environmental services division [Tr. II at 11-30].

123. Mr. Williams recorded the water level readings for the piezometers, created the graphs, and sent the results to Mr. Harold Lynn Petty of TVA's fossil engineering department [Tr. II at 26-29, 35; Pls. Ex. 919].

124. At various times, Mr. Williams was frustrated with the ash handlers' lack of care for the groundwater monitoring system [Tr. II at 53-54].

125. For instance, in November 2005, a piezometer was destroyed by earth moving equipment, and two were found to be submerged [*Id.* at 37-39; Pls. Ex. 1233].

126. In December 2005, another piezometer was found buried, three more were found with ash slurry in the pipes, and another was found to be under water [Tr. II at 39-42; Pls. Exs. 1232, 1230].

127. In April 2006, another piezometer was run over by heavy equipment [Pls. Ex. 2036; Tr. II at 50].

128. MW-13, MW-14, and MW-15, the monitoring wells in North Dike, were not a part of the groundwater monitoring system or Geosyntec's program, and were not involved in the red zone alert system [Tr. I at 144-47, 154-55, 185-87; Tr. II at 146; Pls. Exs. 186, 606].

129. Mr. Williams did, however, record the water level readings from the monitoring wells in North Dike in a separate spreadsheet which included graphs tracking the water pressure [Tr. II at 26-29; Pls. Ex. 919].

130. Mr. Williams sent the readings for these monitoring wells to Mr. Petty [Tr. II at 26-29; Pls. Ex. 919].

131. While Mr. Williams kept track of the data from MW-13, MW-14, and MW-15, and sent the data to Mr. Petty, because these monitoring wells were not a part of the groundwater monitoring program, the data from these monitoring wells was not being processed, reviewed, or evaluated by TVA [Tr. IV at 167-79, 194-96].

132. A spreadsheet shows the September 1, 2006 water level readings for the three monitoring wells in North Dike increased by a few inches [Tr. II at 55-58; Pls. Exs. 1234, 919 at 5], and during the time period in which Mr. Williams monitored the water level readings for MW-15, he reported water seepage from North Dike on several occasions and

noted that the water levels for this monitoring well were sometimes above ground level, a condition Mr. Williams referred to as artesian [Tr. II at 47-55, 69; Pls. Exs. 919, 1251;].

133. For instance, in January 2006, Mr. Williams reported to TVA's fossil engineering department that he and his crew had noticed "some seepage coming out of the side of the dredge cell in a couple of spots, about 15 feet south of MW-15. The ground around the well was a gray ash mud." [Pls. Ex. 1251; Tr. II at 44-45].

134. In April 2006, Mr. Williams noticed further seepage points along the northern side of the dredge cells [Tr. II at 50; Pls. Ex. 2306].

135. Because dredging had been suspended after the 2006 blowout, in March 2007, Geosyntec recommended that normal dredging into the dredge cells could be resumed, subject to implementation of a more structured monitoring and maintenance program [Pls. Ex. 269 at 40, 337 at 10].

136. A May 2007 presentation by Geosyntec to TVA management at the KIF plant noted that a water level monitoring program was necessary as an early warning system for drainage problems and other structural changes, and that drainage problems left unaddressed in the dikes could quickly led to stability problems [Pls. Ex. 337 at 10].

137. In May 21, 2007, a Geosyntec employee suggested that MW-13, MW-14, and MW-15 be added to the groundwater monitoring system because he had observed a relatively high flow seepage problem in this area at a time when TVA was not sluicing wet ash into the dredge cells [Pls. Ex. 6124, Depo. Tr. at 303-04; Pls. Ex. 226].

138. TVA did not implement this recommendation and did not extend the groundwater monitoring program to the monitoring wells in North Dike.

139. In early 2008, Mr. Petty turned over responsibility for receiving and processing the water level data to Mr. Christopher Hensley, a technician in TVA's engineering design services [Tr. II at 98; Pls. Ex. 2833; *see, e.g.*, Pls. Exs. 1185].²¹

140. Geosyntec recommended to TVA that dredging be suspended during the winter of 2007-2008 due to the potential for high precipitation and because repairs done in response to the 2006 blowout were not yet complete [Tr. XII at 65-66].

141. TVA suspended dredging during the winter of 2007-2008 [Pls. Ex. 188 at 5].

142. The annual dike stability inspection report from 2008 noted that a seep was observed on the northeastern corner of Dredge Cell 2 on December 4, 2007 [Pls. Ex. 602 at 6].

143. According to Mr. Settles, a rim ditching system was implemented at the KIF plant in the fall of 2008 at the direction of a supervisor [Tr. XI at 61, 137-38; Tr. XII at 80-81].

144. Mr. Settles testified that this system, which permitted a certain amount of freestanding water on the dikes, was intended to control excessive surface water, trap coal ash, and keep the coal ash level by letting excessive surface water flow out of the dredge cell

²¹TVA's engineering design services division provided engineering services for the ash storage and disposal facilities at the KIF plant and/or contracted for those services [Tr. IV at 148-49].

and back to the collection pond through the plant's spillway and piping system [Tr. XI at 61, 137-38; Tr. XII at 80-81].²²

145. The rim ditching system continued to be in use at the KIF plant through December 2008 [Tr. XI at 61, 137-38; Tr. XII at 80-81].

146. There is no technical document, manual, drawing, or instruction directing that the rim ditching system be implemented or showing how it was to be implemented [Tr. XI at 61, 137-38; Tr. XII at 80-81].

147. The rim ditching system seems to contradict the memo issued in 1986 by Mr. Bivens advising against long-term ponding and also seems to contradict Engineering Procedure 1.09, which requires that water levels in the dikes be maintained at an absolute minimum and that water should not be left standing along berms [Pls. Exs. 82, 538].

148. Repair work to West Dike was completed in early 2008 and normal dredging and sluicing into the dredge cell area resumed in March 2008 [Tr. V at 56-57; Pls. Exs. 485 at 22, 856; Def. Ex. 154 at 2-9; Doc. 48, ¶¶ 6, 7; Doc. 49-2, p. 19].

149. In June 2008, Mr. Hensley passed the task of monitoring the water levels to Mr. Jamey Dotson of TVA's engineering design services [Tr. II at 99; Pls. Ex. 2833].

²²It has not been argued that water was absent from the dredge cells, as by its very nature, hydraulic dredging of coal ash involves adding water to the dredge cells, in addition to water added by rainfall and dust suppression measures [Tr. XI at 108, 136-37, 141; Tr. XII at 43, 64-65, 81; Pls. Ex. 6125 at 235-36].

150. In August 2008, Mr. Chris Buttram, a civil engineer in TVA's fossil power engineering group, became the recipient of the water level data and inputted that data into the program [Tr. I at 55-56, 141-49; Tr. II at 99-100; Pls. Ex. 2833; Def. Ex. 149].

151. During the time Mr. Buttram was responsible for processing the water level data for the piezometers, the levels were never in the red zone [Tr. I at 160; Pls. Ex. 606].

152. On November 19, 2008, there was a definite upward movement in the water level measurements for MW-13, MW-14, and MW-15 [Tr. II at 115-22; Pls. Ex. 919].

153. These levels were, however, within historical ranges [Tr. II at 115-22; Pls. Ex. 919].

154. There was a seasonal trend of higher water levels in the wetter months of October through March [Tr. II at 57-58].

155. As of December 2008, the height of Dredge Cell 2 had increased from the 2004 elevation of 810 to elevation 820, approximately 90 feet from the underwater ground surface of the original Swan Pond slack water embayment [Doc. 502, p. 8; Tr. VIII at 135; Pls. Ex. 836 at 559]. *Mays*, 699 F. Supp. 2d at 998.²³

156. By December 2008, the coal ash storage and disposal area at the KIF plant consisted of the 275-acre coal ash collection pond, a stilling pond, and a 84-acre coal ash

²³As of December 2008, Dredge Cell 2 had not yet reached elevation 844, the elevation determined by WorleyParsons to be the elevation to which wet coal ash could be safely stacked [Tr. V at 56-57; Pls. Ex. 836].

storage area divided by internal dikes into three distinct areas, Dredge Cell 1, Dredge Cell 2, and an Emergency Dredge Cell [Doc. 502 at 7].

157. Dredge Cell 2 was bounded on the north by North Dike, on the west by West Dike, on the south by Dredge Cell 1, and on the east by the Emergency Dredge Cell [*Id.*]

158. North Dike was setback 200 feet from perimeter Dike C, formed the northern boundary of Dredge Cell 2, was constructed on stored sluiced coal ash contained by perimeter Dike C, and extended upward in stages from elevation 770 to elevation 820 [Doc. 502, p. 8; Tr. VIII at 135; Pls. Ex. 836 at 559].

159. On October 20, 2008, Mr. Buttram, Mr. Dotson, and Mr. John Albright, inspectors with TVA, conducted the 2008 annual dike stability inspection (“October 2008 Inspection”) [Tr. I at 57-58, 64].

160. While all three inspectors were of the same rank, Mr. Buttram was the only professional engineer [Tr. I at 63, 73].

161. Mr. Albright was the lead inspector who provided training during the inspection to Mr. Buttram, who had not previously performed an annual dike stability inspection and who was charged with drafting the final inspection report from the October 2008 Inspection (the “October 2008 Inspection Report”) [*Id.*; Tr. III at 86, 119-20].

162. During the October 2008 Inspection, the inspectors walked around the facilities, took photographs of the dikes and ash pond, noted the positions of global position system waypoints on the dikes, and took photographs to correspond to those positions [Tr. II at 224-25; Tr. III at 113-14; Tr. V at 88-89].

163. On December 18, 2008, following the October 2008 Inspection, Mr. Williams forwarded Mr. Buttram the November 2008 water level readings for the piezometers that were a part of the groundwater monitoring system [Tr. I at 158; Pls. Exs. 3609, 3610, 3611].²⁴

164. Mr. Settles, an ash handling foreman for TVA from 1998 through 2009, was responsible for performing daily and weekly visual inspections of the coal ash storage and disposal site at the KIF plant [Tr. XI at 33-34].

165. A typical week of visual inspections for Mr. Settles included a visual inspection of the facilities from his vehicle on Mondays and Thursdays, during which Mr. Settles would drive along the top of the dredge cell area and perimeter Dike C and walk the benches on West Dike and North Dike looking for noticeable seepage and erosion features [Tr. XI at 93-94].²⁵

166. Mr. Settles performed similar visual inspections on Tuesdays and Wednesdays, except that he drove his vehicle along the bench on North Dike instead of walking [*Id.*].

167. Mr. Settles also performed visual inspections of the dikes and ash pond within 24 hours of rainfalls of more than one-half inch [*Id.*].

²⁴These were the last water level readings taken before the December 22, 2008 failure of North Dike.

²⁵Mr. Settles testified at his deposition that his daily visual inspections lasted 30 to 40 minutes [Tr. XI at 18, 116]. He testified at Phase I, however, that his daily visual inspections lasted two to three hours [Tr. XI at 91-92, 111, 114].

168. Mr. Settles recorded his observations in daily monitoring logs in a spreadsheet created by Geosyt nec and prepared daily progress reports summarizing his crew's work [*Id.*; Tr. XII, 21-22; Def. Ex. 128].

169. Mr. Settles did not typically record routine maintenance activities such as erosion control and repair in his daily progress reports [Tr. XI at 177, 182; Tr. XII at 88].

170. Mr. Settles visually inspected the dredge cell area five times during the week of December 15 through December 19, 2008, including two inspections in which he walked along the benches on North Dike [Tr. XI at 90-93].

171. Because it rained in excess of one-half inch on December 20, 2008, on December 21, 2008, Mr. Settles inspected the dredge cell area around 12:19 P.M. [*Id.* at 101-02].

172. A little after midnight, on December 22, 2008, North Dike failed. *Mays*, 699 F. Supp. 2d at 998.

173. As a result of the dike failure, approximately 5.4 million cubic yards of stored coal ash spilled from the coal ash storage area to an adjacent area of about 300 acres, consisting of primarily the Watts Bar Reservoir, the Clinch and Emory Rivers, and government and privately-owned shoreline properties. *Id.*

174. Mr. Buttram, who drafted the October 2008 Final Inspection Report, did not complete the final version of the report until nearly a month after the failure and more than two months after the October 2008 Inspection [Tr. I at 88, 91-92; Tr. III at 121; Tr. VI at 124-25].

175. Mr. Albright assisted Mr. Buttram with the final report by providing him his notes, reviewing the final draft, making suggested revisions, and drafting the executive summary [Tr. III at 88-89].

176. In early January 2009, TVA hired engineering firm AECOM, an engineering firm, under the direction of William Walton, the principal engineer, to perform a root cause analysis to determine the geotechnical root causes, or physical mechanics, of the failure of North Dike [Tr. III at 76; Tr. XII at 114-19, 129; Tr. XIII at 53-54].

177. On June 25, 2009, AECOM issued a report on its investigation, the Root Cause Analysis of TVA Kingston Dredge Pond Failure on December 22, 2008 (“AECOM Report”) [Def. Ex. 154].

178. Marshall Miller & Associates (“MM&A”), a professional engineering firm, was retained by TVA’s Office of the Inspector General (“OIG”) to peer review the AECOM Report; incorporating and relying upon MM&A’s findings, the OIG issued its own report, the OIG’s Review of the Kingston Fossil Plant Ash Spill Root Cause Study and Observations About Management (“OIG Report”) [Tr. IV at 11, 16; Pls. Ex. 136].

179. In July 2009, MM&A issued its own peer review of the AECOM Report (“MM&A Report”) [Tr. IV at 16; Pls. Ex. 136].

180. In February 2009 the TVA Board of Directors retained the law firm of McKenna Long & Aldridge LLP (“MLA”) to perform an evaluation of TVA’s management practices related to the KIF plant and TVA’s coal ash disposal and storage practices and facilities [Def. Ex. 221].

181. MLA performed the evaluation and issued a report (“MLA Report”) [Pls. Ex. 485].

182. In February 2009, TDEC charged the TDEC Advisory Board with assessing the scope and methodology of TVA’s investigations of the dike failure, including scrutinizing the AECOM Report; this assessment did not include an analysis of the causes of the dike failure [Tr. III at 169-72, 195-98; Pls. Ex. 486 at 2-5, 13-15].

183. On November 30, 2009, the TDEC Advisory Board issued a report entitled Lessons Learned from the TVA Kingston Dredge Cell Containment Facility Failure, TDEC Advisory Board Recommendations for Safe Performance (“TDEC Report”) [Tr. III at 170; Pls. Ex. 486].

B. Summaries of Relevant Testimony and Reports Presented at Phase I

184. Dr. Walton, a professional civil engineer who specializes in geotechnical work, was retained as an expert by TVA and testified at Phase I as an expert witness [Tr. XII-Tr. XIII].

185. Dr. Walton’s testimony focused on AECOM’s investigation into the dike failure and the findings of the AECOM Report regarding the geotechnical root causes of the dike failure [*Id.*].

186. Dr. Walton testified that in addition to himself, the AECOM team included professional engineers specializing in hydrology, engineering geology, and embankment engineering [*Id.*].

187. Dr. Walton testified about his peer review and opinions on plaintiffs' theory of dike failure causation and the investigation, findings, and data relied upon by plaintiffs' expert witnesses [*Id.*].

188. According to Dr. Walton, AECOM performed investigative site work at the KIF plant, including: touring the spill site in early January 2009; performing subsurface investigations using drill rigs; taking drill borings; installing inclinometers; collecting insitu tube samples; employing cone penetrometer tests to measure the shear strength of the soil and the effect of pore water pressure on failed and unfailed ash; conducting laboratory work on ash, weak ash slime, and foundation clay samples from the site; excavating test trenches to investigate the coal ash materials and the presence of a drainage system; conducting density, water content, permeability, shear strength, and consolidation tests; and conducting seepage and stability analyses and investigations of relic materials [*Id.*; Def. Ex. 218; Def. Ex. 154 at 40-69].

189. Dr. Walton testified that AECOM considered twelve potential causes of the dike failure, including seismic events, excessive rainfall, reservoir drawdown, limestone sinkholes, groundwater instability, intermediate depth stability, and the possibility of an above-ground sidewall failure due to excessive water pressure and seepage [Def. Ex. 154 at 69-80; Tr. XII at 206-12].

190. Throughout AECOM's investigation, AECOM held workshops²⁶ on the status of its investigation which were attended by representatives of the OIG, MM&A, and the TDEC Advisory Board²⁷ [Tr. III at 170-72, 203-05; Tr. XII at 197-99].

191. The AECOM Report was the result of this investigation [Def. Ex. 154].

192. The AECOM Report identifies four concurrent physical factors as the most probable root causes of the dike failure: increased load due to the higher elevation of the ash stack resulting from the continued deposit of ash; the setback of North Dike from perimeter Dike C which placed North Dike over a sluiced wet ash foundation; an unusually weak silt/ash "slimes" layer at the bottom of North Dike's sluiced wet ash foundation, and a lack of consolidation of the wet ash underlying North Dike leading to the potential for static liquefaction of the unconsolidated coal ash contained in Dredge Cell 2 and North Dike [Tr. XII at 210-39, 280-90; Tr. XIII at 161-63, 193-94; Def. Ex. 154 at 81; Def. Ex. 157 at 5].

193. Of these four factors, AECOM determined that the slimes layer at the bottom of the sluiced wet ash foundation of North Dike was the most probable root cause of the failure:

²⁶At the first AECOM workshop in 2009, Dr. Bruce Tschantz, one of six professional engineers on the TDEC Advisory Board who also testified at trial on behalf of plaintiffs as a non-retained expert, pointed out that AECOM was only focusing on the physical mechanics of the dike failure and observed that there should also be an evaluation of TVA's management practices in relation to the dike failure [Tr. III at 204-05].

²⁷The TDEC Advisory Board consisted of seven individuals—including six professional engineers—appointed in February 2009 to assist TDEC in conducting a review of the scope and methodology of AECOM's and TVA's investigations of the dike failure [Doc. 502, p. 6; Pls. Ex. 486 at 17].

The north end of Dredge Cell 2 was on the verge of failure due to the high stresses and creep in the loose wet layer of weak slimes. The deformation of the slimes in turn caused the overlying collapsible wet ash to liquefy. . . . Failure of the. . . dredge cells was sudden and complex in nature due [to] its geographic setting and being built within the Watts Bar Reservoir after the lake was formed. It took a forensic type study to determine the propensity of the ash to liquefy at low strain levels when the material cannot drain and thus becomes undrained, and to locate the slide plane in the unusual, creep susceptible, low undrained shear strength slime layer that underlies [Dredge Cell 2]. In AECOM's opinion, subsurface conditions at the dredge cells were unusual and rarely found. The consequence of failure in the slimes led to the collapse of the dredge cell and loss of the saturated contents of the ash landfill due to the breach of perimeter Dike C.

[Tr. XII at 214; Def. Ex. 157 at 5].

194. The AECOM Report concluded that a shallow slope sidewall failure was not the type of failure that occurred on December 22, 2008, because there would not have been sufficient energy in a release from a small upper slope surface slump of North Dike to cut back progressively through the entire dike to create an uncontrolled release [Tr. XII at 193, 210-11; Tr. XIII at 161-63; Pls. Ex. 6124 at 239-40, 244; Pls. Ex. 6127 at 83, 192, 197-98; Tr. VI at 105-06; Tr. IX at 95-96].

195. The AECOM Report was peer reviewed by Dr. Gonzalo Castro, a professional engineer, who concluded as follows:

After careful consideration of the available information, I agree that the failure mechanism described in the AECOM report is the most probable. The mechanism consists of an initial failure at the NW corner through the slimes layer, which triggered static liquefaction of the ash. . . . The height of the impoundment reached a critical height in December of 2008 that, given the overall configuration of the containment dikes, their slopes and setback from [perimeter] Dike C,

lead to sufficient sliding on the slimes layer to induce the consequential liquefaction of the ash.

[Def. Ex. 155 at 6].

196. The TVA OIG also peer reviewed the AECOM Report in the OIG Report [Pls. Ex. 136].

197. TVA Inspector General Richard Moore (“IG Moore”) testified on behalf of plaintiffs during Phase I regarding the findings of the OIG Report and the MM&A Report [Tr. IV].²⁸

198. The OIG had retained a team of six engineers from MM&A to assist with the report, primarily on issues pertaining to the dike failure, and the OIG Report incorporated and relied upon MM&A’s findings, in addition to including MM&A’s peer review of the AECOM Report as part of the final OIG Report [Tr. IV at 11, 16; Pls. Ex. 136].

199. The OIG Report concurred with the AECOM Report’s conclusions regarding the four concurrent physical factors as the most probable root causes of the dike failure [Pls. Ex. 136 at 5].

200. The OIG Report also found that TVA had limited AECOM’s scope of work to a root cause analysis, and references what it refers to as the failure of TVA and of the

²⁸IG Moore, appointed Inspector General of TVA pursuant to the Inspector General Act of 1978, *as amended* 5 U.S.C. § App. 3 (“IG Act”), testified that the OIG’s work conduct and responsibilities are outlined in the IG Act and that the OIG follows guidelines promulgated by the Counsel of Inspectors General for Integrity and Efficiency [Tr. IV at 6, 12-13]. IG Moore testified that the OIG is separate from TVA and that the inspector general reports to Congress and TVA’s Board of Directors [*Id.* at 6, 9]. IG Moore testified that his duties include drafting reports on the conduct and management of TVA [*Id.* at 5, 6, 9].

AECOM Report to acknowledge or report on TVA's management practices at the KIF plant that may have contributed to the dike failure:

[T]he root cause analysis commissioned by TVA did not investigate what management practices or policies and procedures allowed conditions to advance to the critical stage that precipitated the spill.

[Pls. Ex. 136 at 5, 8-9].

201. The OIG Report also found that the AECOM Report overemphasized and focused disproportionately on the slimes layer as the most probable root cause of the dike failure [Pl. Ex. 136, at 5], and IG Moore testified that this overemphasis on the slimes layer was "convenient," because it enabled TVA to report a cause of the failure that would not place any blame on TVA [Tr. IV at 58].

202. The OIG Report also addressed coal ash management at TVA and found that the risk management program for coal ash at TVA was not robust [*Id.* at 19].

203. IG Moore testified at Phase I that there was a lack of maintenance of the dikes at the KIF plant, overall poor communication between organizations within TVA, a lack of any formalized training of TVA personnel for daily and annual dike stability inspections, a failure to follow engineering best practices, and "legacy problems" which the OIG Report characterized as failures to address re-occurring maintenance issues [*Id.* at 48-54].

204. The OIG Report lists the following examples of legacy problems: erosion, seepage, overgrown vegetation, sparse vegetation, standing water, tree growth on the dikes, and piping issues [*Id.* at 48-51].

205. IG Moore also testified that the OIG Report was critical of the AECOM Report because, according to IG Moore, Dr. Walton was told not to look at policy or design problems, told not to look at system deficiencies, told not to judge TVA employees or contractors, told not to place blame for the failure or address maintenance, training, and repair work that took place or failed to take place, told not to discuss how the dikes were built or whether plans for building the dikes were followed, and finally, told not to discuss the training of inspectors and personnel in regard to recognizing stability and maintenance issues [*Id.* at 23-29, 59].

206. The MM&A Report concluded that the AECOM Report's root cause analysis was sufficiently thorough and that AECOM applied appropriate investigative methods:

[T]he fundamental conclusions of [the AECOM Report's root cause analysis] with regard to the four most probable root causes or factors contributing to the [dike failure] are technically plausible and reasonably supported by the study data [and] MM&A concurs with AECOM that some or all of these four factors . . . contributed significantly to the failure.

[Pls. Ex. 136, App. B; Tr. IV at 11; Tr. XIII at 38].

207. While agreeing that the slimes layer was a substantial contributing physical factor to the dike failure, MM&A found that the other physical factors identified in the AECOM Report were equally important contributing factors to the dike failure, noting that:

The characteristics of the loose, wet ash (hydraulically placed/sluciced ash), such as the rounded particle shape, weakly fused and loose particle structure, sensitivity, consistently high void ratios with increasing depth (lack of consolidation behavior), along with the contractive undrained behavior and very low undrained steady-state shear strength evidenced in the laboratory tests, pose the wet ash as a

probable root cause of equal or greater significance to the [slimes layer].

[Pls. Ex. 136, App. B; Tr. IV at 11, 35; Tr. XIII at 38].

208. The MLA Report, which was commissioned by the TVA Board of Directors to perform an evaluation of TVA's management practices and coal ash disposal and storage practices and facilities [Def. Ex. 221], found that TVA "engineers conducted annual inspections, but did not follow-up on the recommendations until the next annual inspection, often repeating the same recommendations year after year. In practice, there was no ultimate authority in charge of the byproducts ponds until remediation was commenced after the [KIF plant] spill." [Tr. III at 44; Pls. Ex. 485].

209. The MLA Report also found that TVA did not conduct standardized training for the TVA engineers and personnel who performed the annual inspections and daily inspections at the KIF plant [Tr. III at 44-45; Pls. Ex. 485].

210. The TDEC Report was intended to assess the scope and methodology of TVA's investigations of the dike failure, including scrutinizing the AECOM Report [Tr. III at 169-72, 195-98; Pls. Ex. 486 at 2-5, 13-15].

211. Dr. Tschantz was one of six professional engineers on the TDEC Advisory Board, he also testified at Phase I on behalf of plaintiffs as a non-retained expert with regard to his opinions on the dike failure and the findings of the TDEC Advisory Board [Tr. III; Pls. Ex. 486 at 17].

212. Dr. Tschantz testified that the TDEC Advisory Board participated in at least a dozen meetings with AECOM and Dr. Walton [Tr. III at 170-72, 203-05], that the Board made several visits to the site of the failure, met with TVA officials, attended meetings with the OIG, attended AECOM's presentations and workshops, and reviewed TDEC's documents on the KIF plant [*Id.* at 170-72, 203, 205-06; Pls. Ex. 486 at 3-4].

213. Dr. Tschantz testified that the TDEC Report concluded that "AECOM performed an extremely thorough and qualified technical review of the Kingston failure . . . [and] [T]he Advisory Board concurs that the weak foundation interface layer likely did contribute to the failure that occurred[.]" [Pls. Ex. 486 at 14].

214. Dr. Tschantz noted, however, that while the slimes layer was certainly a substantial contributing physical factors in the cause of the failure, it was the opinion of the TDEC Advisory Board that it was not the sole contributing cause [Tr. III at 198-200, 207-10; Pls. Ex. 486 at 14-15].

215. Dr. Tschantz testified that the TDEC Report concluded that "the quality of engineering design, construction, inspection and maintenance provided throughout the life of the [KIF plant] did not incorporate the standard of care and the understanding required for this type of structure" [Pls. Ex. 486 at 7; Tr. III at 188-89], that TVA's conduct relative to the design, operation, and construction evolution of the dredge cells resulted in "the stability of the . . . dredge cells" being "at a critical state of failure regardless of the presence of the emphasized layer of weak foundation material" [Tr. III at 195-98, 208; Pls. Ex. 486 at 14-15], and that TVA's annual inspections, including the October 2008 Inspection and the

October 2008 Inspection Report, did not meet the standard of care [Tr. III at 175, 188-89; Pls. Ex. 486 at 7-9].

216. Belve D. Marks, a professional civil engineer specializing in geotechnical engineering, was retained as an expert by plaintiffs and testified at Phase I as an expert witness [Tr. VI, VII, IX, X].

217. Dr. Marks testified that his investigation of the dike failure included two visits to the site of the failure and a review of documents and reports from TVA and other agencies and entities relative to the KIF plant [Tr. IX at 8-10; Tr. VI at 100-01; Tr. VII at 173-74].

218. The documents and reports reviewed by Dr. Marks included TVA's design and construction drawings, engineering analyses and studies from TVA and its contractors, memorandums and notes from TVA engineers and personnel throughout the history of the plant, documents relative to TVA's TDEC permits, the AECOM Report and the underlying data supporting the report, photographs of the facilities at the plant both pre- and post-failure, and various depositions, including those of TVA employees, Dr. Walton, and contractors [Tr. IX at 8-10; Tr. VI at 100-01; Tr. VII at 173-74].

219. Dr. Marks testified that he performed seepage calculations and slope stability analyses based on TVA's design and construction plans for the facilities based on pre- and post-failure data gathered by TVA and AECOM [Tr. X at 27-31; Pls. Ex. 471 at 16-19].

220. Based on his investigation and analyses, Dr. Marks testified that it was his conclusion that the mechanism and mode of the failure of North Dike began with rapid and dramatic increases in water levels in the dike between October 2008 and November 2008,

and that these increased water levels resulted in excessive water pressure and internal erosion which caused a shallow slope failure of the lower dredge cell embankment near the northwest corner of North Dike [Tr. VII at 160-77; Tr. VI at 103-04; Tr. X at 31-34].

221. Dr. Marks testified that these conditions led to a progression of slopes failures in North Dike and the liquefaction of the mass of saturated coal ash contained in Dredge Cell 2 which, upon release, flowed into perimeter Dike C, pushing it open at its northwest corner [Tr. VII at 160-77; Tr. VI at 103-04; Tr. X at 31-34].

222. Dr. Marks testified that the construction of perimeter Dike C was a significant contributing factor to the failure of North Dike because it brought on the whole issue of the 200-foot setback in constructing the rest of Dredge Cell 2 [Tr. X at 61-62].

223. Dr. Marks testified that given his knowledge and experience regarding the applicable engineering standard of care for inspections of coal ash dikes, throughout the history of the KIF plant, TVA failed to inform or train TVA personnel in the applicable policies and procedures for inspections and it was his opinion that experienced inspectors would have recognized significant problems during the October 2008 Inspection [Tr. IX at 138-39].

224. Dr. Marks testified that the water levels in North Dike, as measured by the monitoring wells, were elevated most of the time after their installation and that while MW-15 exhibited artesian conditions, TVA personnel took no notice or action regarding the elevated levels [Tr. VI at 171-97; Tr. X at 72-74].

225. Dr. Marks also testified that from October to November 2008, when there was a high rate of dredging in Dredge Cell 2, the water levels in North Dike spiked, but that those water levels were not sent to an engineer for review until four days before the failure of the dredge cells, without any alert that the readings had increased, and that had TVA sent this data to TVA management before this date, the dike failure might have been prevented [Tr. VI at 171-90].

226. Dr. Marks testified that TVA had no comprehensive annual inspection procedures for the KIF plant, that TVA failed to perform its annual dike stability inspections in accordance with the applicable standard of care, that the October 2008 Inspection was not comprehensive and too short, and that the October 2008 Inspection Report should have been written immediately after the dike failure [Tr. VI at 111-17].

227. Dr. Marks testified that the following were substantial contributing causes of the increased water levels in North Dike and the ultimate dike failure: TVA's failure to inform and train TVA personnel and inspectors in the applicable policies and procedures for coal ash management; TVA's negligent performance of those policies and procedures; TVA's failure to perform required procedures for the monitoring of water levels in the dredge cell dikes, including the requirements of its TDEC permits and TVA's own groundwater monitoring system; TVA's failure to construct the coal ash dikes according to TVA's approved design and construction plans; and TVA's failure to properly maintain the coal ash storage and disposal facilities [Tr. VI at 103-06].

228. Dr. Marks's work was peer reviewed by Dr. Walton, who testified at trial that he disagreed with a number of the analyses and mathematical calculations performed by Dr. Marks, along with a number of his findings [*See generally* Tr. XIII at 3-25; Tr. VII at 164; Tr. XIV at 60-70].

229. Gary Brown, a licensed engineer who specializes in environmental engineering, was also retained as an expert by plaintiffs and testified at Phase I as an expert witness [Tr. VIII].

230. Dr. Brown testified that his investigation of the dike failure involved visiting the site of the failure, reviewing documents, materials, and records from TVA, TDEC, WorleyParsons, and Geosyntec, reviewing the OIG Report, the MLA Report, the MM&A Report, and the AECOM Report, along with depositions and associated exhibits [Tr. VIII at 23-26].

231. Dr. Brown testified regarding the engineering standard of care for the design, construction, maintenance, operation, and inspection of coal ash facilities, TVA's groundwater monitoring system, and TVA's TDEC permits and permitting requirements [Tr. VIII at 21, 27-30, 46-55, 83-100, 143, 166-71].

232. Dr. Brown testified that based on his investigation, he concluded that TVA violated the applicable engineering standard of care with regard to the KIF plant's design, construction, maintenance, operation, and inspections, and that TVA violated the standard of care in failing to follow the requirements of its TDEC permits, including failing to have three distinct divider dikes in Dredge Cell 2, as initially required by the 2000 Landfill Permit,

and failing to monitor or negligently monitoring the water levels in the dikes, despite representing to TDEC that it would do so, and being required to do so by its TDEC permit and the groundwater monitoring system [Tr. VIII at 27-30, 46-55, 83-100, 143, 166-71].

233. Dr. Brown testified that TVA's failure to follow the engineering standard of care and TDEC permit requirements were substantial causes of the failure of North Dike [Tr. VIII at 28].

234. Dr. Brown testified that TVA's annual dike stability inspections of the KIF plant were substandard and "grossly deficient," that TVA did not inspect and monitor the dredge cells in accordance with its TDEC permits and the applicable standard of care, and that TVA personnel were not familiar with permitting requirements or regulations, nor did they understand the water levels within the dredge cells or how those water levels impacted dike stability [Tr. VIII at 41-43, 64-69, 178-183; Pls. Ex. 406].

235. Dr. Brown also testified that TVA did not have groundwater monitoring in place in accordance with the applicable standard of care and that TVA personnel were not familiar with TVA's policies and procedures on annual dike stability inspections [Tr. VIII at 69; Pls. Ex. 3080].

236. According to Dr. Brown, especially egregious was the lack of any inspection and appropriate monitoring of water levels as part of the inspection process, particularly the monitoring wells on North Dike, when a specific promise in that regard was made to TDEC as part of its approval of the 2005 permit modification [Tr. VIII at 43, 64-66, 79-80].

237. Dr. Brown testified that TVA could not know whether the dredge cells at the KIF plant were unstable because appropriate evaluations were not regularly performed, characterizing the failure to conduct such monitoring as a substandard practice [*Id.*].

238. Dr. Brown also testified that the TVA inspectors who conducted the October 2008 Inspection did not have the requisite training in regard to landfills, landfill permitting, or associated monitoring [*Id.* at 43-44].

239. In addition to testifying about the findings of the TDEC Report, Dr. Tschantz also testified at Phase I as a non-retained expert with regard to his opinions on the dike failure [Tr. III].

240. Dr. Tschantz is a licensed professional engineer, specializing in water resources engineering with a subset of dam safety, dam engineering, erosion sediment control, and hydraulic engineering [*Id.* at 155-59, 168].

241. Dr. Tschantz testified that TVA had no consistent method of design evaluation, documentation, and communication to manage the evolutionary process of constructing the KIF plant [Pls. Ex. 485 at 5, 14-15; Tr. III at 195-98, 208].

242. Dr. Tschantz testified that TVA did not keep documentation on the rate of loading on the dredge cells [Tr. III at 193], and, consequently, “throughout the life of the [KIF plant]” there was no continuity of documentation so that TVA engineers could understand the problems and materials of the structures at the KIF plant and no incorporation of the “standard of care and the understanding required” for the particular structures [*Id.* at 187-95].

243. Dr. Tschantz testified that TVA inadequately trained personnel to perform inspections of the facilities and that the October 2008 Inspection in particular was a “sham” in light of the inspectors’ inability to address erosion-related problems, that 80% of the report was “boilerplate,” cut and pasted from previous years’ inspection reports, that several important photographs showing erosion features on Dredge Cell 2, including depressions and subsidence, were not included in the final report, and that these features are “poster child” examples of conditions which should have required immediate investigation and inspection [*Id.* at 176-77, 181-86].

III. A PRELIMINARY MATTER

Before the Court discusses its conclusions of law, the Court turns to the records of interviews prepared by the OIG and whether these records are admissible as evidence in Phase I. The Court took this issue under advisement during Phase I and instructed the parties to brief the issue in the parties’ post-trial submissions.

The records of interviews consist of a total of fourteen documents, twelve documents labeled either “Interview” or “Record of Interview,” one handwritten document labeled “original interview notes,” and one handwritten document labeled “exit conference [*See* Pls. Exs. 397, 417, 491, 2551, 4494, 4518, 4521, 4558, 4560, 4563, 4582, 4587, 4835, 5435]. The records of interviews were prepared by OIG investigators following the investigators’ interviews of former and current TVA employees or agents and were used by the OIG to prepare the OIG Report [Pls. Ex. 136]. Generally, the records of interviews contain the name

of the OIG investigator who conducted the interview, the name of the interviewee, the date and time of the interview, and a summary of the interview, including purported quotes by the interviewee.

Plaintiffs presented the records of interviews as evidence at Phase I, asserting that the records are admissible hearsay because the business records exception to hearsay, Fed. R. Evid. 803(6), covers documents prepared in the regular course of the OIG's business. According to plaintiffs, the summaries of the interviews contained in the records are non-hearsay admissions by a party-opponent—employees and agents of TVA—who were authorized to speak to the OIG concerning the subject matters of the interviews. *See* Fed. R. Evid. 801(d)(2)(C), (d)(1). TVA asserted a continuing objection to the admission of the records of interviews, asserting that the records were not admissible on grounds of double-hearsay not covered by any exception. The Court allowed plaintiffs to submit the records of interviews as evidence and took TVA's objection under advisement.

TVA asserts that the business records exception to hearsay does not apply to the documents because “the source of information or the method or circumstances of preparation indicate a lack of untrustworthiness.” Fed. R. Evid. 803(6). TVA maintains that the circumstances surrounding the method and preparation of the records of interviews indicates a lack of trustworthiness because, according to TVA, the testimony of IG Moore at Phase I showed that portions of the OIG Report are unreliable and lacking in objectivity and fairness

[Doc. 492, ¶¶ 82-88].²⁹ TVA maintains that IG Moore’s testimony regarding the preparation of the report shows that it omitted facts favorable to TVA despite those facts being known or readily available to the OIG and directly relevant to the OIG criticisms of TVA. TVA also asserts that the interviews were not recorded or transcribed and therefore the records of interviews are not timely memorializations of the events and activities for which are being offered as substantive evidence by plaintiffs. According to TVA, the records of interviews indicate untrustworthiness because there is no way to verify what was stated in the interviews and because the interviewees were never given the opportunity to review the records for accuracy or adopt the statements attributed to them. TVA asserts further that the summaries of the interviews contained in the records are inadmissible hearsay because several interviewees, namely, James Baugh³⁰ and Mr. Walton, were not TVA employees or agents

²⁹For instance, TVA asserts that at least twelve of the records were prepared after IG Moore sent an email to his staff indicating the desired results of the investigation [*See, e.g.*, Def. Ex. 170 (Email sent on April 17, 2009 in which IG Moore informed his staff that his goal was to deliver a “lean power punch” and that “the reason [the OIG] hired [MM&A] was] to step out with some credibility and say that TVA is wrong”); Def. Ex. 174 (email from IG Moore to his staff in which IG Moore accused TVA management of “lying about stuff like the root case analysis” and stating that he wanted to “raise hell about it”); Def. Ex. 172 (email in which IG Moore directed an OIG investigator to interview TVA’s chief operating officer because he wanted “to be able to have an interview to quote at the [congressional] hearing saying that either [TVA’s general counsel] or [a TVA vice president] or Tom Kilgore or whoever it was coached them to not give the complete story”)].

³⁰Mr. Baugh is a former TVA manager at the KIF plant who retired from TVA approximately six months prior to his interview by the OIG investigator. Mr. Baugh was working as a TVA contractor at the time of the interview [Pls. Ex. 4560]. TVA asserts that the subject matter of Mr. Baugh’s interview related to his pre-spill employment at the KIF plant and his knowledge of coal ash disposal practices during the 1980s and contends that none of the questions Mr. Baugh was asked during the interview concerned matters within the scope of his agency or employment as a TVA contractor.

at the time of the interviews and their statements cannot be treated as non-hearsay [Pls. Exs. 4558, 4560, 4563, 5435].

It is undisputed that the records of interview are hearsay. “‘Hearsay’ is a statement, other than one made by the declarant while testifying at the trial or hearing, offered in evidence to prove the truth of the matter asserted.” Fed. R. Evid. 801. The business records exception to the hearsay rule, Rule 803(6), makes certain hearsay documents admissible if specific requirements are met, including: that the record was made at or near the time of the act or event and by someone with knowledge of the act or event; the record was kept in the course of a regularly conducted activity of a business; it was the regular practice of that business to make such a record, and neither the source of the information nor the method or circumstances of preparation indicate a lack of trustworthiness. Fed. R. Evid. 803(6). Rule 803(6) also requires the record to be presented through “the testimony of the custodian or other qualified witness[.]” Fed. R. Evid. 803(6). A “qualified witness” is a person familiar with the record-keeping procedures of the organization. *See Dyno Constr. Co. v. McWane, Inc.*, 198 F.3d 567, 575-76 (6th Cir. 1999). However, the person need not have control of the record or personal knowledge of its preparation. *Id.*

The Court agrees with plaintiffs that the documents containing the records of interviews fall within the business records exception. The Court has considered the authority and scope of responsibilities conferred generally by the IG Act upon offices of inspector generals, and specifically as to the inspector general of the TVA, and concludes that given the scope of responsibilities and authority conferred on that office, the preparation of

documents such as the records of interviews falls within the regular course of business of the OIG and its inspectors [Tr. XIV at 109-10, 142]. In addition, Inspector Gregory Stinson (“Inspector Stinson”), director of evaluations for the OIG and the lead inspector during the OIG’s investigation of the dike failure and ash spill, testified at Phase I regarding the OIG’s witness interview, evaluation, and record keeping procedures [*Id.*]. IG Moore also testified regarding the nature and scope of the authority and the responsibilities of the OIG, its oversight and investigatory power, and its issuance of formal reports following its investigations [Tr. IV at 5-7]. The Court finds the testimony of Inspector Stinson and IG Moore sufficient for purposes of the requirements of the business records exception that the record be kept in the course of a regularly conducted activity and presented by a person familiar with the record-keeping procedures.

While the Court has considered TVA’s argument that IG Moore’s testimony indicates unfairness and a lack of objectivity in the preparation of the records of interview documents, the Court does not find the statements of IG Moore to his staff regarding the preparation of the OIG’s Report on the dike failure and the OIG investigators’ interviews of TVA employees and agents renders the records of interviews inadmissible due to lack of trustworthiness. Pursuant to Federal Rule of Evidence 803(8), the OIG Report is admissible as a public record and report and counsel for TVA was able to conduct an extensive cross-examination of IG Moore and Inspector Stinson at trial concerning the investigation and preparation of the records of interviews and the OIG’s report [Tr. IV at 14-136]. The Court has carefully considered IG Moore’s testimony regarding the preparation of the OIG Report,

along with the trustworthiness and objectivity issues pointed out by TVA, and has been able to weigh the testimony and its relative trustworthiness and objectivity accordingly. The Court concludes that TVA's assertions regarding IG Moore's conduct in preparing and overseeing the OIG Report goes toward the Court's consideration of the OIG Report as a whole and not to the individual records of interviews. The Court is unpersuaded that the records of interviews documents, and the summaries of the interviews contained therein, involve sufficient indications of untrustworthiness of source or method and circumstance of preparation to be excluded for that reason.

As to whether the records of interviews are timely memorializations of the events and activities for which plaintiffs offered the records as substantive evidence, this requires a consideration of the admissibility of each individual record of interview. While the Court declines to order a blanket exclusion, the Court has considered each individual summary of interview contained in the records of interviews. As to those summaries, the Court agrees with plaintiffs that the summaries in the records of interviews of TVA employees and agents who testified at trial and were subject to cross-examination regarding the statements attributed to them are admissible as non-hearsay admissions of a party opponent, pursuant to Rule 801(d)(2)(D). While TVA argues that the summaries in the records of interviews are not trustworthy, counsel for TVA had the opportunity to question a number of the interviewees during Phase I regarding the contents of the records of interviews and whether those records were accurate portrayals of what was stated at the interviews. Some witnesses did not remember the interviews (*e.g.*, Mr. Albright), and some testified that the records were

not accurate summations (*e.g.*, Mr. Buttram, Mr. Dotson). Therefore, at Phase I and in its post-trial deliberations, the Court has been able to weigh and assess the relative trustworthiness of the summaries contained in the records.

In sum, to the extent the summaries in the records of interviews are being offered by plaintiffs as evidence against TVA, and the interviewees were employees or agents of TVA at the time of their statements and authorized by TVA to make the statements on matters within the scope of their relationship with TVA, those are admissible. *See* Fed. R. Evid. 801(d)(2)(D). To the extent the summaries in the records of interviews were by individuals who were not employees or agents of TVA at the time of their statements or the statements pertained to matters outside the scope of the interviewee's relationship with TVA, those summaries are inadmissible. *See id.* Applying the foregoing criteria, the Court concludes that the summaries in the records of interviews of Dr. Walton, Mr. Baugh, and Mr. Jones are not admissible because the interviewees were not employees or agents of TVA at the time of their statements and therefore the summaries are not timely memorializations of the events and activities for which they are being offered by plaintiffs as substantive evidence. The Court has therefore not considered these summaries.

IV. CONCLUSIONS OF LAW

A. Causation

1. The Tennessee Supreme Court requires a plaintiff to establish five elements for the tort claim of common law negligence: (1) a duty of care owed by the defendant to the plaintiff; (2) conduct falling below the applicable standard of care amounting to a breach of

that duty; (3) an injury or loss; (4) causation in fact; and (5) proximate, or legal cause. *TVA Ash Spill Litig. II*, 805 F. Supp. 2d at 476 (citing *Staples v. CBL & Ass., Inc.*, 15 S.W.3d 83, 89 (Tenn. 2000)); *see also* *McClenahan v. Cooley*, 806 S.W.2d 767, 774 (Tenn. 1991); *Mosley v. Metro. Gov't of Nashville & Davidson Cnty.*, 155 S.W.3d 119, 122 (Tenn. Ct. App. 2004).

2. Causation is thus a necessary threshold question to determining whether TVA may be liable to plaintiffs for their tort claims premised on negligence.

3. Cause in fact refers to the cause and effect relationship that must be established between a defendant's conduct and a plaintiff's loss or injury before liability for that particular loss will be imposed, *Waste Mgmt. of Tenn. v. S. Cent. Bell Tel. Co.*, 15 S.W.3d 425, 430-31 (Tenn. Ct. App. 1997), and means that the loss or injury would not have occurred "but for" the defendant's negligent conduct. *TVA Ash Spill Litig. II*, 805 F. Supp. 2d at 478 (citing *Kilpatrick v. Bryant*, 868 S.W.2d 594, 598 (Tenn. 1993)).

4. The Tennessee Court of Appeals has stated that under some circumstances, such as when two independent causes concur to produce an injury that either of them alone could have produced, the "but for" test is not as effective and the "substantial factor" test may be the most effective test to identify conduct that should be excluded as a cause in fact of an injury. *Waste Mgmt.*, 15 S.W.3d at 431 (stating that, "[i]n recent years, another test—the 'substantial factor' test—has taken its place beside the 'but for' test to address these circumstances").

5. The Tennessee Court of Appeals for the Middle Section of Tennessee discussed the most common formulation of the “substantial factor” test as follows:

The actor’s negligent conduct is a legal cause of harm to another if (a) his conduct is a substantial factor in bringing about the harm, and (b) there is no rule of law relieving the actor from liability because of the manner in which his negligence has resulted in harm.

Waste Mgmt., 15 S.W.3d at 431 (quoting the Restatement (Second) of Torts § 431 (1965)).

6. As pointed out by the Tennessee Court of Appeals, both the “but for” test and the “substantial factor” test recognize that a defendant’s conduct must be a “necessary antecedent” to an injury in order to be considered a cause in fact of the injury. *Waste Mgmt.*, 15 S.W.3d at 432.

7. Proximate, or legal cause, connotes a policy decision by the judiciary to deny liability for otherwise actionable conduct, *Bain v. Wells*, 936 S.W.2d 618, 625 (Tenn. 1997), and requires the courts to establish the boundary of legal liability, *Kilpatrick*, 868 S.W.2d at 598, using mixed considerations of logic, common sense, justice, policy, and precedent. *Smith v. Gore*, 728 S.W.2d 738, 749 (Tenn. 1987).

8. The Tennessee Supreme Court applies a three-pronged test for determining proximate cause: the tortfeasor’s conduct must have been a “substantial factor” in bringing about the harm being complained of; and there is no rule or policy that should relieve the wrongdoer from liability because of the manner in which the negligence has resulted in the harm; and the harm giving rise to the action could have reasonably been foreseen or anticipated by a person of ordinary intelligence and prudence. *McClenahan*, 806 S.W.2d at

774 (noting that “[o]ur opinions have recognized that proximate causation is the ‘ultimate issue’ in negligence cases.”).

B. The Failure of North Dike

9. Plaintiffs and TVA agree on several components of the “physical mechanics” of the failure of North Dike.

10. First, plaintiffs and TVA agree that the dike failure on December 22, 2008 involved two dikes, North Dike and perimeter Dike C [Tr. X, at 17-18, 26]; second, plaintiffs and TVA agree that the failure sequence began on or about the northwest corner of North Dike with the liquefaction of stored coal ash contained in Dredge Cell 2 [*Id.*]; third, plaintiffs and TVA agree that the liquefaction of the stored coal ash was followed by the failure of North Dike [*Id.*]; and fourth, plaintiffs and TVA agree that perimeter Dike C was a casualty and not a cause of the failure of North Dike [*Id.*].

11. Plaintiffs and TVA disagree on the ultimate cause or causes of the failure of North Dike.

12. Plaintiffs’ position is that there were multiple causes which substantially contributed to the dike failure, including: the four physical factors identified in the AECOM Report; the increased water levels in North Dike in the fall and winter of 2008; TVA’s failure to locate, configure, and construct perimeter Dike C and North Dike in accordance with TVA’s design and construction plans, including locating key structures involved in the failure over the Swan Pond slack water embayment; TVA’s failure to implement recommended fixes and repairs; TVA’s failure to respond appropriately to red flags and

warnings; TVA's failure to inform and train TVA personnel in the applicable policies and procedures for coal ash management; negligent performance by TVA personnel of applicable policies and procedures for coal ash management; TVA's violations of TDEC permit requirements and failure to comply with representations made to TDEC; and TVA's failure to properly maintain the facilities at the KIF plant.

13. Plaintiffs assert that these causes operated together and resulted in increased water levels in North Dike in addition to a North Dike composed of collapsible, unconsolidated wet ash subject to liquefaction and located over an unstable foundation.

14. Plaintiffs assert that these factors resulted in increased internal water pressure and erosion in North Dike which led to either an above-ground sidewall failure around elevation 805 or a failure around the foundation of North Dike near the slimes layer.

15. TVA's position is that the causes identified by plaintiffs were not factual causes of the failure of North Dike and that the failure of the dike would not have occurred but for the presence and movement of the slimes layer around elevation 730 to 735 of North Dike [Doc. 502, p. 9 n.3; Doc. 503, p. 8].

16. TVA asserts that the factual causes of the failure of North Dike are therefore TVA's design decisions for the KIF plant; specifically, its location and configuration, its design plan for constructing, or building up the ash stack; and its decision to keep operating the KIF facility as a wet coal ash storage facility [Doc. 502, p. 9 n.3; Doc. 503, p. 8].

17. After an exhaustive review of the evidence and testimony presented during Phase I and in the parties' post-trial submissions, the Court concludes that the evidence

shows that the factual causes of the failure of North Dike were TVA's negligent implementation of location and configuration decisions involving the location and configuration of perimeter Dike C and North Dike, conduct which placed North Dike over the Swan Pond slack water embayment, TVA's design of North Dike and the related structures at the KIF plant, TVA's decision to continue operating the KIF plant as a wet coal ash storage facility, and TVA's decision to continue building up the ash stack contained by North Dike [Def. Ex. 154; Tr. XII at 213-39, 255; Tr. X at 61-62].

18. The Court concludes that these factual causes, in confluence with other physical and geological factors, gave rise to the existence and ultimate movement of the slimes layer, a movement which triggered the dike failure sequence of North Dike on December 22, 2008 [Def. Ex. 154; Tr. XII at 213-39, 255].

19. The Court concludes that TVA's failure to inform and train TVA personnel in the applicable policies and procedures for coal ash management and TVA personnel's negligent performance of those policies and procedures were also substantial contributing causes of the failure of North Dike [Tr. III at 177-78, 187-200, 207-10, Tr. VIII at 27-28, 38-44, 64-67, 80-85, 95-98, 104-05; Pls. Ex. 486; Tr. VI at 103-04].

20. The Court concludes that while the evidence from Phase I shows that the water levels in North Dike may have been elevated in the months prior to the failure, the evidence does not show that increased water levels in North Dike, as measured by the monitoring wells, were factual causes of the failure [Tr. XIII at 8-13, 16-24; Tr. VII at 7-8; Tr. XIV at 65-67].

21. These conclusions are supported by the Court's review and consideration of the conclusions of the AECOM Report, the OIG Report, the MLA Report, the TDEC Report, the testimony of the expert witnesses, the testimony of the fact witnesses, the deposition testimony, the admitted exhibits, the parties' post-trial submissions and the arguments contained therein, and the relevant law.

1. Perimeter Dike C, North Dike, the Slimes Layer, and the Build Up of Dredge Cell 2

22. The findings of the AECOM Report regarding the existence of the slimes layer and its ultimate impact on the failure of North Dike were confirmed by the Court's consideration of the evidence presented at Phase I, including TVA's design and construction documents, AECOM's laboratory test results and field sampling, the photographic evidence, the OIG Report, the TDEC Report, and the extensive testimony by the expert witnesses and the fact witnesses during Phase I.

23. When fly ash was sluiced into the coal ash storage area during the 1950s and 1960s into the area which would become Dredge Cell 2, the larger ash particles settled to the bottom of the coal ash storage area while finer ash particles traveled to the northwest corner of the coal ash storage area over what would become the foundation of North Dike, an area located over the Swan Pond slack water embayment which contained unique subsurface materials consisting of silt and clay bottom sediments [Tr. XII at 223-39, 252-55; Def. Ex. 219, 154, 156].

24. The finer ash particles mixed with these silt and clay bottom sediments to form the slimes layer, an undulating band of subsurface materials that were weak, high in water content, and susceptible to a complete loss of strength when over-stressed [Tr. XII at 228-31; Def. Ex. 156 at 100-09].

25. These conditions remained underneath North Dike as TVA expanded the coal ash storage capacity of the KIF plant and constructed and built up the ash stack and additional dredge cells and dikes [Pls. Ex. 603 at Depo. Ex. 461, 467; Tr. VII at 23-37; Pls. Ex. 51 at Depo. Ex. 8, 10; Def. Ex. 154; Pls. Exs. 5412, 266C].

26. The physical structures of perimeter Dike C and the first new dredge cell dike built after perimeter Dike C were not constructed according to TVA's design and construction plans [Pls. Ex. 80; Tr. VII at 47-54; Pls. Ex. 467 at 13].

27. According to plaintiffs, the materials used to construct perimeter Dike C and the dredge cell dikes, including the first dredge cell dike and North Dike, were not the clay or stable compacted bottom ash called for in the original design and construction plans but were actually a mixture of clay and coal ash, including weaker fly ash [Pls. Ex. 5412, 603 at Depo. Ex. 461, 467; Tr. VII at 23-31; Def. Ex. 154 at 11].

28. Due to TVA's failure to construct perimeter Dike C and the first dredge cell dike according to the design and construction plans, TVA located North Dike 200 feet out from perimeter Dike C in order to avoid placing additional loading on the perimeter Dike C [Def. Ex. 154 at 3-6; Tr. VII at 63-65].

29. Locating North Dike in this manner placed the foundation of the dike within Dredge Cell 2 on top of previously sluiced wet coal ash and the original Swan Pond slack water embayment with its unique subsurface conditions [Def. Ex. 154 at 3-6; Tr. VII at 63-65].

30. The foundation of North Dike was undermined from this point forward.

31. While the AECOM Report discusses the slimes layer at length, including the properties of its materials and the geology of the site, it does not discuss TVA's role in the creation of the slimes layer.

32. After constructing North Dike, TVA continued to actively sluice into and build up the dredge cell area, including eliminating one of the initial three dredge cells that had been approved by the TDEC in conjunction with the issuance to TVA of the 2000 Landfill Permit [Pls. Ex. 603 at Depo. Ex. 582, 596, 606, 622; Def. Ex. 154, pp. 4-8; Pls. Ex. 603 at Depo. Ex. 671; Tr. VIII at 56, 83-83, 142-43].

33. TVA's physical alteration of the TDEC-approved plan for the dredge cell area was done without notice to TDEC, without obtaining prior approval, and without seeking a permit modification [Tr. VIII at 54-55, 80-85, 142-43, 160-66; Pls. Ex. 552 at ¶ 11].

34. According to Dr. Brown, altering the plan for the physical structures in the dredge cell area in this way—burying the divider dike between Dredge Cell 2 and Dredge Cell 3 and eliminating one dredge cell—was significant because this dramatically cut down the area for which the wet coal ash sluiced into the dredge cell area was able to dry out, causing the dredge cell to become wetter and ultimately placing more stresses on the dikes

which substantially contributed to the lack of consolidation of the wet coal ash and the ultimate failure of North Dike [Tr. VIII at 54-60, 140-45, 184-90; Pls. Exs. 538, 34 at 28].

35. There was no evidence presented to refute Dr. Brown's testimony that cutting the area in the dredge cells by which the wet ash was able to dry out increased the stresses on the dikes in Dredge Cell 2.

36. However, there was also no evidence presented that TDEC found the elimination of the dredge cells to be in violation of the 2000 Landfill Permit, and TDEC issued subsequent permits and permit modifications to TVA following this alteration.

37. While the AECOM Report discusses the elimination of this third dredge cell, it does not address what effect eliminating one dredge cell had on the dredge cell area.

38. Rather, the AECOM Report focuses solely on the slimes layer as the most probable cause of the dike failure [Tr. III at 198-200, 207-10; Tr. IV at 58; Pls. Ex. 486 at 14-15; Pls. Ex. 136 at 5, 8-9].

39. Due to TVA's continued buildup of the dredge cells and dikes, on December 22, 2008, the slimes layer was at or near the sluiced wet ash foundation of North Dike, about 85 feet below the top of the dike [Tr. XIV at 219-57; Def. Ex. 154; Pls. Ex. 6047 at 3739].

40. As described in the AECOM Report, by December 22, 2008, the increased load of the ash stack in Dredge Cell 2 exerted stresses on the sluiced wet foundation and unusually weak slimes layer at the bottom of the North Dike's sluiced wet ash foundation [Def. Ex. 154; Def. Ex. 157 at 5].

41. These stresses and the lack of consolidation of the wet ash resulted in static liquefaction of the ash followed by a failure of North Dike at and around the location of the slimes layer [Def. Ex. 154; Def. Ex. 157 at 5].

42. Physical evidence analyzed by AECOM confirms that the failure sequence of North Dike was initiated by this foundational failure around elevation 730 to 735 [Tr. XII at 260-61].

43. A chunk of cattails rooted in a bed of intact ground which had initially been located in the setback area between perimeter Dike C and North Dike [Tr. XII at 260-61; Def. Ex. 219 at 53] traveled over 3,000 feet into an adjacent slough during the failure and subsequent spill [Tr. XII at 260-61; Def. Ex. 219 at 53].

44. The location and condition of these cattails indicate that a deep foundational failure occurred during the failure which moved out all of the ground covering the setback area between North Dike and perimeter Dike C [Tr. XII at 260-61; Def. Ex. 219 at 53].

45. Had there been a shallow, above-ground sidewall failure, these cattails would have been completely overtopped with waves of coal ash and water [Tr. XII at 260-61; Def. Ex. 219 at 53].

46. In addition, a home which was originally located about 500 to 600 feet north of perimeter Dike C was moved across Swan Pond Circle during the failure and, following the spill, exhibited a high water mark on its side [Tr. XII at 261-62; Def. Ex. 154; Def. Ex. 219 at 57; Tr. IX at 25].

47. Because the high water mark did not contain coal ash, this indicated that a deep foundational failure had moved out all of the setback area between North Dike and perimeter Dike C [Tr. XII at 261-62; Def. Ex. 154; Def. Ex. 219 at 57].

48. Had there been a shallow, sidewall failure which overtopped and displaced perimeter Dike C, the high water mark would have contained coal ash [Tr. XII at 261-62; Def. Ex. 154; Def. Ex. 219 at 57].

49. Evidence of a foundational failure is also found in a photograph depicting ground movement at perimeter Dike C and showing that the shear plane was not at the bottom of the dike, as it would have been in the case of a shallow, sidewall failure, but that it extended more than 10-feet into the perimeter Dike C's clay foundation [Tr. XII at 261; Def. Ex. 156 at 70].

50. Data from inclinometers³¹ installed at the site shortly after the failure are also evidence that there was lateral movement of materials around the location of the slimes layer [Tr. XII at 264-67].

51. Furthermore, a comparison of boring samples taken by Singleton Laboratories from under perimeter Dike C in 1975 and boring samples taken from elevation 730 to 735 under North Dike after the failure show that the two samples contain different conditions [Tr. VII at 175-76; Tr. XII at 227-28].

³¹Inclinometers are used to measure ground movement [Tr. XII at 185-87; Tr. XII at 264-67].

52. The samples from under North Dike had a higher water content and a weaker strength envelope than the samples from under perimeter Dike C [Tr. VII at 175-76; Tr. XII at 227-28].³²

53. In addition, test borings and samples from underneath the Emergency Dredge Cell did not show similar conditions to those under North Dike [Tr. XII at 266-69; Tr. XIV at 75].

54. Investigation into the dike failure also showed that TVA constructed the dikes containing the Emergency Dredge Cell using methods similar to those TVA used to construct the dikes containing Dredge Cell 2, except with a steeper slope and higher rate of loading [Tr. XII at 266-69; Tr. XIV at 75].

55. However, despite this steeper slope and the higher rate of loading onto the dikes for the Emergency Dredge Cell, the dikes containing the Emergency Dredge Cell did not fail.

56. Given all of the above, the Court concludes that a preponderance of the evidence shows that the failure of North Dike was initiated by a foundational failure around elevation 730 to 735, the location of the slimes layer, and that this slimes layer was created by a confluence of factors, including the conditions of the Swan Pond slack water embayment, the location of North Dike over the Swan Pond slack water embayment, the

³²In 1975, Singleton Laboratories drilled boreholes into perimeter Dike C to take boring samples for under and behind the dike to determine soil and ash conditions for the purpose of raising perimeter Dike C [Pls. Ex. 755; Tr. VII at 38-43].

structure and materials of North Dike, and the nature and height of the ash stack contained by North Dike.

57. The Court concludes that the location and configuration of North Dike over the Swan Pond slack water embayment was a substantial cause and a necessary antecedent to the failure of North Dike on December 22, 2008 and that, but for locating North Dike over the Swan Pond slack water embayment, the failure would not have occurred.

58. While TVA asserts that the failure to construct perimeter Dike C and the first dredge cell dike was not a “but for” cause of the failure of North Dike, the Court finds this analysis too limited given the findings of the AECOM Report.

59. The AECOM Report lists four concurrent physical factors as the most probable causes of the dike failure: increased load due to the higher elevation of the ash stack resulting from the continued deposit of coal ash; the setback of North Dike from perimeter Dike C which placed North Dike over a sluiced wet ash foundation; an unusually weak slit/ash slimes layer at the bottom of North Dike’s sluiced wet ash foundation; and a lack of consolidation of the wet ash underlying North Dike and leading to the potential for static liquefaction of the unconsolidated coal ash [Def. Ex. 154; Tr. XII at 213-39].

60. The Court, however, given the evidence and expert testimony presented at Phase I, does not find these physical factors to be strictly concurrent causes out of which one “but for” factor can be isolated as a single cause of the failure of North Dike.

61. The Court also does not find the slimes layer to be the single, “but for” cause of the dike failure because each of these physical factors, in conjunction with the others, caused and substantially contributed to the failure.

62. That is, the 200-foot setback of North Dike from perimeter Dike C placed North Dike over the unique subsurface conditions of the Swan Pond slack water embayment, and, over time, as sluiced wet coal was deposited over these conditions, the unusually weak slimes layer beneath the sluiced wet ash foundation of North Dike was created and remained under North Dike as TVA continued to build up the ash stack.

63. The pressure on this slimes layer increased due to the continued loading on North Dike and the increasing elevation of the ash stack, resulting in the potential for static liquefaction of the unconsolidated coal ash contained in Dredge Cell 2 and North Dike.

64. This liquefaction occurred, or was “triggered,” by the movement of the slimes layer on December 22, 2008.

65. Thus, while TVA is correct that the evidence does not show that perimeter Dike C triggered the failure of North Dike, or that TVA’s improper construction of perimeter Dike C alone caused North Dike to fail, the evidence shows that the failure to properly construct perimeter Dike C and the first dredge cell dikes resulted in TVA’s locating North Dike over the Swan Pond slack water embayment, a location which was one of the “but for” causes of the slimes layer underneath the wet sluiced coal ash of North Dike.

2. Increased Water Levels in North Dike

66. Dr. Marks testified that the failure of North Dike was caused by increased water levels which led to excessive water pressure within the pores of the embankment material of North Dike, causing seepage and internal erosion which resulted in a series of progressive, fairly shallow slope failures and instantaneous liquefaction of the stored coal ash [Tr. VI at 106-07].

67. To support this theory, Dr. Marks pointed to a calculated factor of safety of 0.97 for the progressive shear failure [Tr. VII at 164], surface maintenance and repair deficiencies on North Dike [*see e.g.*, Tr. VI at 31 ff], and Dr. Marks's water level readings for MW-15 before and around the time of the dike failure [*see e.g.*, Tr. VI at 177 ff].³³

a. Factor of Safety and Stability Analysis

68. Determining the factor of safety for a dike is a standard engineering practice used to determine the stability of dikes [Pls. Ex. 467 at 13; Tr. VII at 49; Tr. XIII at 85] and was a practice utilized by TVA as a way to evaluate dikes at the KIF plant [Pls. Ex. 467 at 13; Tr. VII at 49; Tr. XIII at 85].

69. Factors of safety are obtained using a calculation which includes the friction angles of sluiced fly ash and bottom ash—the lower the friction angle selected for use, the lower the resulting factor of safety [Tr. IV at 118].

³³Dr. Marks did not perform testing or intrusive investigations at the site and his work product was not subject to the peer reviews that the AECOM Report received [Tr. IX at 8-10, 15-16].

70. A factor of safety of 1.5 means the dike is stable; a factor of safety of 1.0 means the dike has failed [Tr. VII at 49-51].

71. A factor of safety of 1.5 is the standard engineering practice for an acceptable minimum factor of safety for dike structures such as those at the KIF plant [Pls. Ex. 467 at 13; Tr. VII at 47-49; Tr. XIII at 85; Pls. Ex. 80 at 1-2; Pls. Ex. 81 at 1].

72. The factor of safety for a dike at the KIF plant would change as the level of water in the dike changed because the water levels in the dredge cells and dikes were constantly changing [Pls. Ex. 6124 at 104; Tr. XI at 7-9; Pls. Exs. 214, 222].

73. Dr. Marks testified that he determined the factor of safety for North Dike at the time of the failure to be 0.97, a failed or failing factor of safety [Tr. VII at 164; Tr. XII at 13].

74. Dr. Marks testified that he arrived at this conclusion by using friction angles of 26 degrees for the sluiced fly ash and 32 degrees for the bottom ash [Tr. IX at 115-18; Def. Ex. 206 at 1147].

75. Dr. Marks testified that he determined these friction angles by averaging data he obtained from WorleyParsons, Singleton Laboratories, and AECOM [Tr. IX at 115-18; Def. Ex. 206A at 1147].

76. However, the Court's review of this same data shows that Dr. Marks mistakenly reported AECOM's friction angle for sluiced fly ash as 16.7 degrees, rather than the 30 degrees used, resulting in an average friction angle which reflects a 4-degree understatement of the sluiced fly ash—26 degrees rather 30 degrees [Tr. XIII at 10-11].

77. Dr. Marks also used a mistaken friction angle for the bottom ash, using a friction angle of 32 degrees as opposed to 37 degrees, the friction angle used by WorleyParsons and AECOM [Def. Exs. 1147, 1150].

78. Dr. Walton testified that due to these incorrect friction angles, Dr. Marks understated the factor of safety of North Dike by 20% [Tr. XIII at 13].

79. Dr. Walton testified that using the friction angles calculated by AECOM and WorleyParsons, the adjusted factor of safety calculation would be 1.16, 20% higher than the factor of safety determined by Dr. Marks and a factor of safety which is above the factor of safety for a failed dike [Tr. XIII at 13].³⁴

80. The evidence also shows that Dr. Marks overestimated the seepage elevation for North Dike by approximately 5 feet due to his use of elevation 780, rather than elevation 770, for the toe of North Dike [Tr. IX at 32-36, 62-63].

81. Dr. Marks also did not take into account the presence of a seven-level internal lateral drain system in North Dike, testifying that he did not include the drain system as part of his seepage analysis because the documents he reviewed gave no indication of the system

³⁴Dr. Marks testified that assuming the existence of a stabilizing foundation bridge lift in North Dike, he came up with a 1.2 factor of safety with regard to a potential deep-seated failure extending down to elevation 730 [Tr. XIII at 16-17]. Dr. Marks did not, however, produce calculations for this analysis and he testified that it was based on a sampling from under perimeter Dike C, as opposed to under North Dike [Tr. IX at 26-27, 41-42, 56, 90]. In addition, Dr. Marks testified that in his calculations, he used 100 feet, rather than 200 feet, as the setback distance between perimeter Dike C and Dredge Cell 2 [*Id.*].

[Tr. XIII at 103-13; Tr. XI at 58; Tr. XIV at 68-72; Def. Ex. 154 at TVK-717013-18; Tr. VIII at 162; Tr. IV at 95].

82. However, the presence of this drain system was confirmed by drawings submitted by TVA, by Drs. Walton and Brown, by the findings of the AECOM Report in regard to the South Dike test trench, and by photographic evidence showing pieces of perforated drain pipe and non-perforated collection transfer pipe among relics of the dike failure [Tr. XIII at 103-13; Tr. XI at 58; Tr. XIV at 68-72; Tr. III at 5; Def. Ex. 154 at TVK-717013-18; Tr. VIII at 162].

83. Given these errors, the Court does not find Dr. Marks's seepage analysis and calculated factors of safety to be supported by the evidence.

b. Surface Maintenance and Repair Deficiencies on North Dike

84. Plaintiffs assert that the photographs taken during the October 2008 Inspection show seepage-induced internal erosion and surface maintenance deficiencies on North Dike which should have been noted and investigated by the TVA inspectors [Tr. VI at 149-52].

85. TVA asserts that there would have been no surficial signs of an imminent failure on North Dike during the October 2008 Inspection because the failure plane where the slimes layer was located was far below the surface and therefore, the inspectors performing the October 2008 Inspection would have had no way of knowing that North Dike was going to fail [Tr. XIII at 24-25].

86. During Phase I, Mr. Buttram and Mr. Dotson were shown photographs of conditions at the KIF plant during the time of the October 2008 Inspection.

87. They testified that they would describe the conditions depicted in the photographs as surface erosion [Tr. I at 110-15; Tr. V at 118-20, 219-22; Tr. VI at 53].

88. According to Dr. Marks's testimony, to a properly trained inspector, these photographs, in addition to others not included in the October 2008 Inspection Report, show evidence of serious stability problems, including red water seepage in the ditch alongside Swan Pond Road, which Dr. Marks testified indicated high water levels in West Dike [Bates 277795], excessive seepage, which Dr. Marks testified was a sign that the embankment had stability problems [Bates 277802-805], and ponding, which Dr. Marks testified represented the water level in the dredge cell [Bates 277802-805].

89. Dr. Marks testified that if he had seen the conditions depicted in these and other photographs at the time of the inspection, he would have immediately gone to the manager of the KIF plant and told him to stop dredging into Dredge Cell 2 and to pump the water out of the dredge cells, which, he testified, could have prevented or lessened the failure.

90. Dr. Tschantz, who was also shown the photographs, criticized the October 2008 Inspection Report's characterization of the conditions depicted in the photographs as "erosion," asserting that this characterization was much too broad [Tr. III at 177-79; Pls. Ex. 6044 at 7].

91. Dr. Tschantz testified that while it was difficult to assess the photographs without having been present at the inspection and without knowledge of the terrain on that day beyond the boundaries of the photograph [Tr. III at 182-83, 222; Pls. Ex. 6045 at 22], in

his opinion, the October 2008 Inspection Report left out a number of important photographs [Tr. III at 177-79; Pls. Ex. 6044 at 7] and, upon becoming aware of the conditions depicted in the photographs he reviewed from the inspection, TVA should have conducted further investigations into the conditions of North Dike because a properly trained inspector would have characterized the conditions as serious depressions or possible sinkholes that could indicate a loss of material eroding out of the central part of the dike structures [Tr. III at 177-79; Pls. Ex. 6044 at 7].

92. Dr. Tschantz testified that he would have identified the erosion conditions as problems which needed to be immediately investigated and potentially remedied and that addressing these problems could have prevented or lessened the impact of the dike failure [Tr. III at 180].

93. Dr. Tschantz also testified that the October 2008 Inspection was not consistent with what he considered the standard of care for conducting inspections of dikes and dams and that several of the conditions he observed in the photographs were “poster child” examples of conditions the inspectors should have been aware of and investigated [Tr. III at 182; Pls. Ex. 6044 at 7].

94. Dr. Tschantz acknowledged that an investigation into the conditions in the photographs from the October 2008 Inspection would not have prevented the type of failure that occurred on December 22, 2008, but “at least [an investigation of the conditions] would have got somebody out there to begin to look at things and they may have uncovered something.” [Tr. III at 210].

95. Mr. Settles was also shown the photographs from the October 2008 Inspection during Phase I.

96. Mr. Settles testified that he discussed these erosion areas with Mr. Dotson after the October 2008 Inspection and that he and his crew repaired the erosion areas [Tr. XI at 71-72, 75-77, 112, 184; Tr. XII at 78-79].

97. However, there are no records or reports of these repairs because Mr. Settles considered erosion repairs to be routine maintenance and it was not his practice to record or report daily erosion repairs in his daily progress reports or any other report [Tr. XI at 71-76, 177, 182; Tr. XII at 88; Def. Ex. 34].

98. Upon consideration, the Court concludes that the TVA inspectors who inspected the KIF plant for the October 2008 Inspection, and those who reviewed and discussed the results of that inspection, were negligent in noting, recording, and addressing conditions and surface maintenance deficiencies which should have been investigated and potentially remedied.

c. Water Level Readings

99. In response to the 2003 and 2006 blowouts on West Dike, TVA installed piezometers, well points, and monitoring wells throughout the dikes of Dredge Cell 2, including three monitoring wells, MW-13, MW-14, and MW-15 [Pls. Ex. 562 at TVK-40057].

100. The piezometers installed in the dikes became part of TVA's groundwater monitoring system [Tr. II at 147-49].

101. MW-13, MW-14, and MW-15 were not a part of TVA's groundwater monitoring system and therefore were not placed into Geosyntec's program [Tr. I at 144-47; 154-55, 185-87; Tr. II at 146; Pls. Exs. 186, 606].

102. Plaintiffs contend that TVA was negligent in not having a groundwater monitoring system that regularly evaluated the water level data collected from MW-13, MW-14, and MW-15.³⁵

103. Plaintiffs assert that the water level data from MW-13, MW-14, and MW-15, show that the water levels in North Dike increased during the colder, wetter months of the year, that there was a linear increase in the water level readings from November 2008, and that these increased water levels indicate a high water level in North Dike right before the failure which raised the potential for excessive seepage and dike failure.

104. As support for this assertion, plaintiffs point to Dr. Marks's determination that the water level reading for MW-15, a 30-foot deep monitoring well screened between 29.8 and 24.5 feet below North Dike [Tr. X at 14], reflects the phreatic surface, or the surface water table [Tr. VI at 172-73], at elevation 780 in North Dike as of December 22, 2008, and that the water pressure caused the liquefaction of the coal ash [Tr. VI at 184; Tr. VII at 162-63].

³⁵Mr. Williams testified that he separately recorded the water level readings from MW-1 through MW-16—including MW-13, MW-14, and MW-15—in a separate spreadsheet which also included graphs tracking the water pressure [Tr. II at 26-29; Pls. Ex. 919].

105. TVA asserts that this theory is based on two suppositions that are not supported by the evidence: first, because the high water level reading in MW-15 did not represent the phreatic surface in North Dike; and second, because this theory relies on a projected water level reading using a linear extrapolated value from past data which is not supported by the evidence.

106. The Court agrees with TVA that the high water level reading in MW-15 did not represent the phreatic surface in North Dike.

107. Every witness examined on this point, except for Dr. Marks, including Dr. Walton, Mr. Davis, Mr. Buttram, and Mr. Dotson, testified that the water level reading for MW-15 isolated between 25 and 30 feet below the surface of North Dike and measured the water pressure at this depth, not the phreatic surface, which was measured by the shallower piezometers [Tr. I at 13, 27-28, 151-53; Tr. V at 23-25; Tr. XIII at 6; Tr. XIV at 64-67; Def. Ex. 9].

108. As to Dr. Marks's projected water level reading for MW-15 on December 22, 2008, he testified that he determined the water level reading for MW-15 by using water level readings from October 23, 2008 and November 19, 2008, to arrive at a linear extrapolated value [Tr. VI at 186-87; Tr. X at 16].³⁶

³⁶Dr. Marks testified that he arrived at the water level readings for MW-15 by "laying a straight edge on the slope of the line from October to November without calculating the slope. Just, in other words, just drawing a line." [Tr. VI at 185-87]. Thus, instead of calculating an accurate linear increase, Dr. Marks relied upon a straight-edge ruler to project results which have been shown to exceed arithmetically calculated changes by amounts ranging from over one-and-a-half feet for MW-15 (a 26 percent overstatement) to almost four feet for MW-13 (a 34 percent overstatement) [Pls. Exs. 6047, 919].

109. Evidence submitted by TVA, however, shows that continued dredging could also result in a lesser increase, a decrease, or a state of equilibrium for the water level readings [Pls. Ex. 919; Attachment 1 to Doc. 502].

110. For example, after dredge cell loading resumed in November 2005, the largest single monthly water level reading increase for MW-15, +7.86 feet, was reported in December 2005 [Pls. Ex. 919; Attachment 1 to Doc. 502]; the monthly change in water level readings reported for January 2006 was +2.95 feet, less than half the December increase; and subsequent water level readings, during which dredge cell loading continued, reflect a state of equilibrium over the next six months [Pls. Ex. 919; Attachment 1 to Doc. 502].

111. The evidence also shows that the water level readings for MW-13 and MW-14 followed a similar pattern, with each experiencing a large spike, +12.01 and +9.32 feet, respectively, between November and December 2005 [Pls. Ex. 919 at TVK-54242], but with no subsequent straight linear increase [Pls. Ex. 919 at TVK-54242-43; Def. Ex. 154 at App. 4d].

112. Rather, the water level readings rose only slightly for MW-13 and MW-14, +1.28 and +2.50 feet, between December 2005 and January 2006, respectively, and then essentially stabilized until October 2006, although dredge cell loading continued [Pls. Ex. 919 at TVK-54242-43; Def. Ex. 154 at App. 4d].

113. In addition, although the water levels in all three of the monitoring wells in North Dike rose after dredge cell loading resumed in the spring of 2007, the levels decreased

as dredging continued through mid-November 2007 [Pls. Ex. 919 at TVK-54242-44; Pls. Ex. 188 at 5; Pls. Ex. 919; Attachment 1 to Doc. 502].

114. In sum, while Dr. Marks asserts that the rate of increase in water levels would have remained constant between November 2008 to December 2008, and, given his calculations regarding the water level elevations, would therefore result in a significant increase in water levels, Dr. Marks provided no factual predicate in the historical monthly water level readings to support his conclusion.

115. TVA, on the other hand, submitted evidence that the data indicates that the historical water level readings following a large increase in water level elevations tend to move toward a state of equilibrium—not a continued linear increase.³⁷

116. In addition, as shown by the testimony of Mr. Williams regarding the November 2006 water level readings [Tr. IX at 5], Dr. Marks's testimony that the largest prior change in water level elevation for MW-13, MW-14, and MW-15, was in November 2006, when the second blowout on West Dike occurred, is not supported by the evidence [Tr. X at 72].

117. Plaintiffs' data [Pls. Ex. 919] shows an apparent rise of +3.15 feet for MW-15 between the September and October 2006 readings.

118. However, Mr. Williams testified that because of the 2006 blowout, no readings for November 2006 were actually taken [Tr. IX at 5].

³⁷For example, there is no such rise in the water level readings while Dredge Cell 2 was being actively filled during the summer of 2007 [Pls. Ex. 919, Attach. 1].

119. Mr. Williams testified that the figure for the October reading was in error because the measurements recorded for that date reflect identical readings for MW-14, MW-15, MW-16A, and MW-16B, a condition which Mr. Williams testified was unlikely given the 1,000-foot distance between the monitoring wells [Tr. II at 59-60].

120. Mr. Williams did testify, however, that there was a “spike” or “definite upward movement” in the water level readings taken on November 19, 2008 for MW-13, MW-14, and MW-15 [Tr. II at 115-22; Pls. Exs. 919, 6047].

121. According to Mr. Williams, from October 23, 2008 to November 19, 2008, MW-13 increased by over eight feet, MW-14 increased by a little over six feet, and MW-15 increased by almost six feet and became artesian [Tr. II at 116].

122. Mr. Williams also testified that the increased water level readings for MW-13, MW-14, and MW-15 were within the historical range of readings for those wells [Tr. II at 115-22; Pls. Exs. 919, 6047].

123. Mr. Williams testified that this upward movement in water levels occurred during a period of on-going active dredging into Dredge Cell 2 during the winter months which are typically colder and see more rainfall, resulting in less evaporation from the dikes [Tr. II at 116].

124. Upon the Court’s consideration of this evidence and testimony, the Court finds that while there is some evidence that the monitoring wells in North Dike experienced a definite upward movement in water levels in the months preceding the December 22, 2008

failure of North Dike, there is also evidence that this upward movement for the water levels was within historical ranges.

125. In addition, the Court finds that plaintiffs have not proved, by a preponderance of the evidence, that the water levels in the monitoring wells in North Dike would have continued to rise by the time of the dike failure in a straight, linear increase, as opposed to a decrease, a slighter increase, or an equilibrium.

3. Coal Ash Management Policies and Procedures

126. The Court concludes that the evidence presented at Phase I shows that TVA personnel were not properly informed or trained in TVA's mandatory policies, procedures, and practices for coal ash management and that to the extent TVA personnel were informed and trained in TVA's mandatory policies, procedures, and practices, these were negligently performed.

127. The Court concludes that this conduct was a violation of the engineering standard of care and that it substantially contributed to the failure of North Dike because had those charged with and responsible for inspecting and maintaining the dikes and dredge cells at the KIF plant performed such responsibilities in accordance with the applicable standard of care and adhered to TVA's mandatory policies, procedures, and practices, the issues underlying the failure of North Dike would have been investigated, addressed, and potentially remedied before the failure of December 22, 2008.

128. Throughout the history of the KIF plant, TVA had policies, procedures, and practices, for coal ash management, some of which were formal written policies, operations manuals, and permit requirements, some informal guidelines and practices.

129. Mr. Gordon Park is a former TVA manager who, at various times throughout his employment with TVA, served as an environmental engineer for TVA specializing in air permitting and air regulations, headed a group within TVA's fossil power program which was responsible for permitted programs, and served as manager of TVA's environmental compliance group where he was responsible for obtaining air, water, and waste permits for TVA [Tr. VII at 73-80].

130. According to Mr. Parks, TVA's policies and procedures are based on the industry's best practices and standards and it is TVA's policy and procedure to abide by and follow engineering standards as those standards relate to environmental engineering [Tr. VII at 86-89].

131. According to Mr. Park, TVA personnel and inspectors were responsible for knowing about a mandatory policy or procedure and of following it to the extent it applied to their work [*Id.* at 82-87].

132. Drs. Brown and Tschantz both opined that TVA violated the applicable engineering standard of care by not informing and training its personnel in mandatory policies and procedures for coal ash management and that their performance of those policies and procedures was negligent [Tr. VIII at 42-70, 80-93, 95-100, 170-90; Tr. III at 175-95; Pls. Exs. 337 at 10, 486, 538, 3080].

133. As explained below, there is little evidence that TVA inspectors and personnel were aware that TVA had mandatory policies, procedures, and practices in place for coal ash management or that they were aware of any details or requirements of those policies, procedures, and practices.

134. There is also evidence that to the extent TVA personnel were aware of TVA's mandatory policies, procedures, and practices, TVA personnel did not feel bound to follow them or implement them in accordance with the applicable engineering standard of care.

135. The policies, procedures, and practices for coal ash management at TVA included the annual dike stability inspections, daily dike inspections, Engineering Procedure 1.09, the CDG, the operations manuals incorporated into TVA's TDEC permits, the requirements of the TDEC permits, and the groundwater monitoring system implemented after the 2003 and 2006 blowouts.

136. Beginning in 1967, and up to and including the time of the failure, TVA had a policy, procedure, and practice to conduct annual dike stability inspections [Tr. I at 57-58, 73; Tr. II at 237; Tr. VII at 24-25; Pls. Exs. 80, 88, 191, 538, 603]. *Mays*, 699 F. Supp. 2d at 996.

137. According to Mr. Parks, it was TVA's policy and procedure to conduct these annual dike stability inspections in accordance with the applicable engineering standards of care [Tr. VII at 86-89; Pls. Ex. 538].

138. The Court concludes, however, that the October 2008 Inspection was not conducted in accordance with the applicable engineering standard of care.

139. First, the inspectors took no more than four hours to conduct the October 2008 Inspection, an inspection which covered the approximately 300 acres that made up the facilities at the KIF plant, excluding the time the inspectors were at lunch [Tr. VI at 126].

140. A comprehensive inspection of such a large facility should, under the appropriate standard of care and given the procedures for inspections in Engineering Procedure 1.09, have taken much longer [Tr. III at 170-89, 210; Tr. VIII at 40-70; Pls. Ex. 3080; Tr. VI at 126].

141. Second, the TVA inspectors who performed the October 2008 Inspection, Mr. Dotson, Mr. Albright, and Mr. Buttram, were not provided with or aware of any written instructions, criteria, policies and procedures, or rules and regulations for conducting annual dike stability inspections [Tr. I at 64; Tr. V at 84, 165].

142. For instance, Mr. Buttram, the TVA inspector who was responsible for preparing the October 2008 Inspection Report, was not shown Engineering Procedure 1.09 until a few weeks before trial when he was preparing for his testimony [Tr. I at 57-59, 64].

143. Mr. Albright, the leading inspector for the October 2008 Inspection, had also never seen any written instructions on what to look for during dike stability inspections [Tr. II at 196-98].

144. Similarly, Mr. Dotson was never given any written inspection procedure, criteria, or checklist for conducting dike stability inspection and he testified that he was not aware of any rules or regulations regarding how annual dike stability inspections should be conducted [Tr. V at 165].

145. Mr. Dotson testified that the only thing provided to the TVA inspectors prior to the annual dike stability inspections were copies of the previous year's annual inspection [*Id.* at 165].

146. Third, the TVA inspectors did not review any design drawings or permit requirements relative to the KIF plant before or during the October 2008 Inspection [Tr. II at 203; Tr. V at 169].

147. For example, Mr. Albright testified that he had never reviewed any design drawings in connection with the annual dike stability inspections, that he was not concerned with whether the dikes and dredge cells were constructed according to the plans, and that he was not aware of any other inspections performed at the KIF plant to ensure that the dikes and dredge cells compared the structures to the design plans [Tr. II at 195].

148. Mr. Albright also testified that he was never referred to any other documents, besides the previous years' reports, when conducting the inspections and drafting the subsequent reports [*Id.* at 203].

149. TVA personnel and inspectors were also not familiar with the operations manuals, the design plans that went along with the operations manuals and the TDEC permits, or how to interpret the requirements of TDEC permits and operations manuals [Tr. VIII at 82].

150. Fourth, there is no evidence that the training of the TVA inspectors was specific to the KIF plant, the procedures and guidelines given in Engineering Procedure 1.09, the annual dike stability inspections, or the operations manuals.

151. For example, while Mr. Buttram testified that he received some training, explanations, and oversight from Mr. Albright prior to the October 2008 Inspection, Mr. Buttram had no specific training on embankment stability, dike stability or embankment inspections, no training on examination of embankment damages, no training in emergency action planning, early warning systems, overtopping protections or repair or evaluation of earthen embankments, and no training in anything related to stability inspections, maintenance of earthen embankments, or stability inspections or ash pond dikes [Tr. I at 67-68, 137-38].

152. Fifth, Mr. Buttram's understanding was that he was to report any issues, such as erosion conditions, that he and the inspectors found during the October 2008 Inspection [Tr. I at 105], and that it was his responsibility to discuss erosion conditions immediately with plant personnel, even before the final inspection report was written [Tr. I at 106].

153. However, despite the erosion conditions depicted in the photographs from the October 2008 Inspection which Dr. Tschantz described as "poster child" examples of what should have been addressed and potentially remedied immediately, Mr. Buttram could not recall whether he communicated any erosion conditions from the October 2008 Inspection to anyone in the maintenance department at TVA [Tr. I at 132-133].

154. The evidence and testimony presented at Phase I also did not show whether these erosion conditions from the October 2008 Inspection were ever repaired or attempted to be repaired, as Mr. Settles did not keep track of routine repairs, repairs which plaintiffs' experts testified should have been addressed and potentially remedied immediately.

155. Sixth, the Court finds there to be inconsistencies with the description by Mr. Kilgore, TVA's CEO, regarding the annual dike stability inspections as a practice of "comprehensive" and "formal" annual inspections to make sure that the dikes at the KIF plant fulfilled their purpose [Tr. III at 20-24]³⁸ and the characterizations by the TVA inspectors of the term annual dike stability inspection as a "misnomer" [Tr. V at 167].

156. According to Mr. Dotson, the term annual dike stability inspection was a misnomer because the inspections were not intended to evaluate the stability of the ash dikes [Tr. VI at 59-61; Pls. Ex. 538], but to note changes that had taken place in the previous year, to show the progression of the build out of the facility, and to record maintenance issues [Tr. V at 167].

157. Similarly, according to Mr. Buttram, although the October 2008 Inspection Report was entitled "Annual Ash Pond Dike Stability Inspection," the TVA inspectors performing the inspection did not do a true stability inspection [Tr. I at 57] and thus, the title was a misnomer [*Id.* at 73].

158. Mr. Kilgore, on the other hand, testified that it was TVA's practice to conduct formal annual inspections and other inspections on a quarterly and daily basis, and that the annual inspections were comprehensive [Tr. III at 16-17, 21-30].

³⁸Mr. Kilgore testified that while he did not know whether the annual dike stability inspections could be called a requirement, the annual and daily inspections were not "optional" and were practices followed by TVA [Tr. III at 20-24].

159. According to Mr. Kilgore, one of the purposes of these annual dike stability inspections was to ensure that the dikes at the KIF plant fulfilled their function [*Id.* at 24].

160. Moreover, the October 2008 Inspection Report was prepared in January 2009, almost two months after inspection and nearly a month after the dike failure occurred [Tr. VI at 124-25]; it reads, however, as if the failure of North Dike and the resulting spill had never occurred [*Id.*].

161. In addition, Dr. Tschantz testified that the October 2008 Inspection Report was 80% boilerplate, that it was cut and pasted from the prior year's inspection report, and that a number of the recommended actions listed in the October 2008 Inspection Report were maintenance issues that were copied over from previous years' reports [Tr. III at 176-77].

162. The MLA Report found similarly, stating that TVA "engineers conducted annual inspections, but did not follow-up on the recommendations until the next annual inspection, often repeating the same recommendations year after year. In practice, there was no ultimate authority in charge of the byproducts ponds until remediation was commenced after the [dike failure]." [*Id.*; Pls. Ex. 485].

163. The Court concludes that while TVA had a policy, procedure, and practice, to perform annual dike stability inspections, TVA did not inform or train its inspectors appropriately as it gave them virtually no guidance as to how to perform inspections, did not present them with procedures for performing such inspections, despite having such procedures available—*e.g.*, Engineering Procedure 1.09, the CDG, and the operations manuals—and that the annual dike stability inspection performed in October 2008 was not

performed to ensure that the dikes fulfilled their function and were not in compliance with the engineering standard of care for managing coal ash facilities.

164. Another aspect of TVA's policies and procedures for coal ash management that troubles the Court was TVA's groundwater monitoring system.

165. Tests and samplings taken from the dikes in 1975 show that some of the ash-soil mixtures in perimeter Dike C had low strength and that the weight of the upper ash in perimeter Dike C was not adequately consolidating [Tr. VII at 36-43; Pls. Ex. 755].

166. The 2003 and 2006 blowouts in West Dike occurred because of excessive water pressure and seepage and the proximity of water to the surface of the West Dike [Pls. Ex. 6127 at 87, 136, 163-170, 190-91, 203-04], and a study performed after the blowouts indicated that the coal ash upon which the dredge cells were built was not properly consolidating and was subject to liquefaction [Pls. Ex. 560].

167. Engineering consultants were retained by TVA after both blowouts to investigate the causes of the blowouts and to recommend proposed fixes and repairs, one of which was a groundwater monitoring system, and it was later recommended that TVA follow a more structured water monitoring and maintenance program for the dredge cells [Pls. Ex. 269 at 40; Pls. Ex. 337 at 10].

168. TVA represented to TDEC that "to ensure that the proposed fix [to West Dike] is successful, TVA will install piezometers on the north, south, and western faces of the dredge cells. To monitor the performance of the drainage system, the phreatic surface

measured in these piezometers will be compared with that predicted in the models.” [Pls. Ex. 562 at Depo. Ex. 431; Tr. II at 17-22].

169. Thereafter, TVA installed piezometers in the dredge cells and began to utilize the groundwater monitoring system to monitor, track, and evaluate the water levels in the piezometers in West Dike, including the red zone alert system for when the water levels in those piezometers were close to the surface and action by TVA was needed.

170. There is no evidence, however, that TVA or its consultants performed investigatory work in regard to North Dike to determine if similar conditions existed or if other conditions existed which might undermine the stability of North Dike.

171. TVA also did not install piezometers in North Dike, installing only monitoring wells which, according to TVA, did not perform as water level tracking devices similar to piezometers.

172. While Mr. Williams recorded the water level readings from the monitoring wells in North Dike, because there were no piezometers in North Dike and because monitoring wells did not track the same levels as piezometers, no data from the monitoring wells was inputted into the groundwater monitoring program [Tr. I at 144-55, 185-87; Tr. II at 146; Pls. Exs. 186, 606].

173. Mr. Williams testified that it was not his responsibility to interpret the water level data, only to send it to TVA management, and that he assumed that someone else, like Mr. Buttram or some other person within TVA management, was interpreting the data [Tr. II at 153-56].

174. However, there is no evidence that anyone from TVA management was interpreting the data.

175. Accordingly, the water level data from the monitoring wells in North Dike was not evaluated, interpreted, compared to models, or analyzed as was the practice for the piezometers in West Dike and in the other parts of the KIF plant in which the groundwater monitoring system was implemented.

176. As noted previously, the water level readings from the monitoring wells in North Dike increased somewhat in November 2008, although the levels were within the historical range of readings [Tr. II at 115-22; Pls. Exs. 919, 6047].

177. Mr. Williams did not pass along these elevated water level readings to TVA management until December 18, 2008, four days before the failure and nearly a month after the levels were recorded [Tr. II at 109-10; Pls. Exs. 3609, 3610, 3611].

178. Dr. Brown found this failure to monitor the water levels in North Dike similar to the groundwater monitoring program in place in West Dike to be below the engineering standard of care.

179. Dr. Brown testified that TVA had represented to TDEC that it would monitor all of the dikes, that TVA's permit modification was contingent on that representation, and that this monitoring was required by TVA's TDEC permit [Tr. VIII at 20-30].

180. In Dr. Brown's words, TVA was "asleep at the switch" and that, "in my career of 30 years, this is one of the worst instances of disregard of environmental responsibility from a company I have ever heard. This is a promise the company made to monitor the

facility and keep it safe. They just decided they didn't want to do it or didn't have to do it. I can't believe it, not after what I read Geosyntec told them about the slopes and the stability, the water levels and becoming unstable in 2004." [*Id.* at 20-30].

181. Mr. Kilgore testified that pursuant to the representations TVA made in its application for the TDEC permit, TVA should have monitored the water levels in North Dike [Tr. III at 48-53].

182. Mr. Davies, a Geosyntec engineer, testified that these increased water level readings should have led to at least a suspension of active dredging into Dredge Cell 2 and further investigation by TVA into the level of saturation of North Dike, and that MW-13, MW-14, and MW-15, should have been a part of TVA's groundwater monitoring program after seepage was noticed in the area of the dike, including when TVA was not sluicing into the dredge cells [Tr. X at 50-67, 70-75; Pls. Ex. 223].

183. According to Dr. Brown, not monitoring the water levels in North Dike, despite increased water levels being a cause of the 2003 and 2006 blowouts, was "totally unstructured" and a violation of the applicable engineering standard of care [Tr. VII at 75-80; Pls. Ex. 269 at 50].

184. After considering all of the evidence and testimony regarding these mandatory policies, procedures, and practices, their substance, scope, and implementation, the Court concludes that the policies and procedures were not treated as mandatory by TVA personnel, that the policies and procedures were not consistently followed or implemented, that TVA was inconsistent in how it treated these policies, procedures, and practices, representing on

some occasions that these were requirements, on other occasions that these were merely practices that were followed, that TVA neglected to inform and train its inspectors personnel in these policies and procedures, and that these policies, procedures, and practices were negligently performed.

185. Given the foregoing, the Court also concludes that TVA personnel were uninformed and untrained in TVA's mandatory policies and procedures for coal ash management and that their performance of these policies and procedures was negligent, particularly in regard to the October 2008 Inspection [Tr. III at 177-78, 187-200, 207-17; Tr. VIII at 27-28, 38-44, 64-67, 80-85, 95-98, 104-05; Pls. Ex. 486; Tr. VI at 159, 189-90].

186. The Court concludes that TVA's failure to inform and train TVA personnel in the applicable policies and procedures for coal ash management and TVA personnel's negligent performance of those policies and procedures were substantial contributing causes of the failure of North Dike because the problems with the location, configuration, and design of North Dike were compounded by negligent coal ash management practices and, as a result, TVA was not aware of and did not notice and properly investigate the stability of North Dike and the conditions which would have indicated to a reasonable engineer that investigations and potential remedial measures were warranted [Tr. III at 177-78, 187-200, 207-10, Tr. VIII at 27-28, 38-44, 64-67, 80-85, 95-98, 104-05; Pls. Ex. 486; Tr. VI at 103-04].

C. The Discretionary Function Doctrine

187. In addition to proving causation by a preponderance of the evidence, plaintiffs must also prove that conduct by TVA which caused the dike failure was nondiscretionary conduct for which TVA may be liable under the discretionary function doctrine.

188. Plaintiffs assert that even if some of the causes of the dike failure were the result of discretionary conduct for which TVA cannot be liable, most of the causes of the dike failure arose out of nondiscretionary conduct which fell below the applicable engineering standard of care and did not involve policy considerations or the permissible exercise of policy judgment.

189. TVA asserts that the causes of the dike failure directly result from TVA's discretionary conduct and decisions grounded in considerations of public policy and involving the permissible exercise of policy judgment and thus, are protected by the discretionary function doctrine [Doc. 502, p. 9 n.3; Doc. 503, p. 8].

190. TVA asserts that even if several of the causes identified by plaintiffs substantially contributed to the failure, those causes arose out of discretionary conduct and decisions by TVA protected by the discretionary function doctrine [Doc. 503, p. 22].

191. Referencing the Court's prior ruling that TVA cannot be liable for decisions relating to the design and construction of the KIF plant and the decision to keep in operation the KIF plant's wet coal ash system, TVA asserts that its decision to setback North Dike from perimeter Dike C by 200 feet to avoid placing additional load on perimeter Dike C, thus

locating North Dike over the Swan Pond slack water embayment, was a discretionary decision [Doc. 502, pp. 30-31].

192. As an initial matter, the Court emphasizes its previous rulings that TVA's design decisions are protected by the discretionary function doctrine. *See Mays*, 699 F. Supp. 2d at 1004-11, 1016, 1019, 1022; *TVA Ash Spill Litig. I*, 787 F. Supp. 2d at 725; *TVA Ash Spill Litig. II*, 805 F. Supp. 2d 468.

193. The Court also emphasizes its previous ruling that "several of Plaintiffs' tort claims fall within the category of cases which address the actual implementation of a particular policy decision that is itself protected by the discretionary function doctrine. That is, once a government agency makes a policy decision protected by the discretionary function doctrine, the agency must then proceed with care in the implementation of that decision." *Mays*, 699 F. Supp. 2d at 1019; *see id.* ("The implementation of such policy considerations constitutes part of the conduct challenged by Plaintiffs in these cases.").

194. The Court concludes that while TVA's decision to locate the KIF plant around the Watts Bar Reservoir and the design of the KIF plant its dike and dredge cell structures were indeed discretionary decisions, the discretionary function doctrine does not shield TVA from liability for TVA's negligent implementation of these decisions and TVA's failure to construct perimeter Dike C and the new dredge cell dikes in accordance with those plans, conduct which resulted in TVA locating and constructing North Dike over the Swan Pond slack water embayment.

195. Once having exercised its discretion to locate, design, and construct a wet coal ash facility pursuant to a discretionary design decision, TVA is accountable for its negligence in failing to implement that decision, *Mays*, 699 F. Supp. 2d at 1020 (stating that “once TVA exercised its discretion to construct, use, and keep in operation the Swan Pond facilities, it was obligated to operate the facilities in a non-negligent manner”), and having undertaken, in its discretion, the decision to locate, design, and construct a wet coal ash facility at all, TVA is liable for doing so negligently.

196. As this Court has previously held:

In these cases, once TVA determined and implemented the policy decision to have a coal ash storage facility at Swan Pond, TVA had an obligation to continue and pursue that policy decision in a non-negligent manner. Following or acting pursuant to such policies and procedures was not a matter of discretion—the issues raised by plaintiffs’ claims in these cases are not solely questions of social wisdom, but also of negligence, not questions of political or economic practicability, but of due care.

Mays, 699 F. Supp. 2d at 1021.

197. Negligent failure to follow design drawings and plans involves no discretionary function or duty. *See, e.g., Indian Towing Co. v. United States*, 350 U.S. 61, 69 (1955) (holding that the negligent failure to maintain a lighthouse in good working order subjected the government to suit even though the initial decision to undertake and maintain lighthouse service was a discretionary policy judgment); *Caplan v. United States*, 877 F.2d 1314, 1316 (6th Cir. 1989) (stating that once the government determined a policy—the policy of deforestation—the government was accountable for negligence in implementing that policy

by failing to warn of unstable trees); *Reminga v. United States*, 631 F.2d 449, 452 (6th Cir.1980) (holding that the discretionary function doctrine did not apply to the government's negligent preparation of a navigational chart because once having exercised its discretion to issue navigational charts, the government is accountable for its negligence in failing to locate hazards accurately on the charts).

198. Accordingly, the Court concludes that TVA's decision and conduct in locating North Dike over the Swan Pond slack water embayment is not protected by the discretionary function doctrine.

199. Plaintiffs also argue that all conduct relating to TVA's coal ash management practices and procedures is nondiscretionary conduct for which TVA is liable under the discretionary function doctrine [Doc. 506, pp. 90-99].

200. TVA argues that this same conduct is discretionary because it involves decisions and conduct related to training, hiring, and supervising of employees, the substance of TVA's policies and procedures, and TVA's design and repair decisions [Doc. 502].

201. TVA asserts that the discretionary function doctrine precludes any claims relating to the hiring, training, and assignment of TVA employees because these claims directly attack discretionary employee assignment decisions of TVA managers and because the discretionary function doctrine precludes tort claims based on allegations of negligent hiring, retention, training, and assignment of individuals to perform government work, unless the individual does not have a specific certification mandated by the government. *See Hudson v. United States*, No. 2:06-CV-01, 2008 WL 517009, at *6 (E.D. Tenn. Feb. 25,

2008) (holding the discretionary function doctrine to preclude alleged negligence in the hiring and supervision of contract physicians by the Veterans Administration).

202. TVA asserts that plaintiffs have not contended that any TVA personnel failed to possess specific certifications mandated by the government or failed to perform the duties assigned to them.

203. In *Hudson*, the district court determined that:

A review of relevant case law reveals a myriad of cases which hold that the hiring, training, and supervising of employees are discretionary in nature and fall within the discretionary function exception.

Id., 2008 WL 517009, at *6 (citing *United States v. Gaubert*, 499 U.S. 315, 332-34 (1991); *United States v. Varig Airlines*, 467 U.S. 797, 819-20, (1984); *Wood v. United States*, 290 F.3d 29 (1st Cir. 2002); *Vickers v. United States*, 228 F.3d 944, 950 (9th Cir. 2000); *Burkhart v. Wash. Metro. Area Transit Auth.*, 112 F.3d 1207 (D.C. Cir. 1997); *Layton v. United States*, 984 F.2d 1496 (8th Cir.), *cert denied*, 510 U.S. 877 (1993); *Fortney v. United States*, 912 F.2d 722 (4th Cir. 1990); *McMichael v. United States*, 751 F.2d 303, 307 (8th Cir. 1985)).

204. Other cases are in accord. *See, e.g., Dovenberg v. United States*, 407 F. App'x 149, 149 (9th Cir. 2010) (stating that decisions regarding the training and supervision of government employees “fall squarely within the discretionary function exception”); *Kelly v. United States*, 241 F.3d 755, 763 (9th Cir. 2001) (stating that “[t]his court and others have held that decisions relating to the . . . training . . . of employees usually involve policy judgments of the type Congress intended the discretionary function exception to shield”); *Burkhart*, 112 F.3d at 1217 (stating that the hiring, training, and supervision choices that the

government faces are choices “susceptible to policy judgment”); *LeRose v. United States*, 285 F. App’x 93, 97 (4th Cir. 2008) (“[D]ecisions regarding the hiring, supervision and retention of [Government employees] are precisely the type of decisions that are protected under the discretionary function exception”); *Santana-Rosa v. United States*, 335 F.3d 39, 43-44 (1st Cir. 2003) (“[T]he court must also conclude that decisions regarding . . . work assignments are susceptible to policy-related analysis.”).

205. Given the foregoing, the Court agrees with TVA that the hiring, training, and assignment of TVA personnel to perform work is protected under the discretionary function doctrine.

206. The Court, however, finds plaintiffs’ allegations regarding TVA’s decisions and conduct in regard to TVA personnel and TVA’s coal ash management policies, procedures, and practices to encompass more than just the hiring, training, and assignment of personnel.

207. While the decision of who to hire and the formal training and assignments given to government employees is protected as discretionary, the “[n]egligent failure to perform a policy decision—such as a failure to provide information and training to employees and/or inspectors for carrying out pre-determined policies and procedures for coal ash operation and management—would not involve the same policy judgments as the actual creation of those policies and procedures.” *TVA Ash Spill Litig. I*, 787 F. Supp. 2d at 718-19 (citing *In re Ohio River Disaster Litig.*, 862 F.2d 1237, 1246 (6th Cir. 1988) (agreeing with the district court’s finding that the Army Corps of Engineer’s failure to conduct periodic

inspections and failure to properly train personnel involved nondiscretionary conduct)); *see also Reminga*, 631 F.2d at 452 (holding that the discretionary function doctrine did not apply to the government's negligent preparation of a navigational chart because once having exercised the discretion to issue navigational charts, the government is accountable for its negligence in failing to locate hazards accurately on the charts).

208. Plaintiffs presented evidence at Phase I that TVA's policies, procedures, and practices, for coal ash management, such as TVA's practice of performing annual dike stability inspections, Engineering Procedure 1.09, and the requirements of TVA's TDEC permits, were mandatory; yet the evidence presented at Phase I shows that TVA personnel were not properly or adequately informed of these policies, procedures, and practices, including the purpose of the annual inspections as inspections to analyze dike stability and the procedures for inspecting dike and dredge structures as outlined in Engineering Procedure 1.09.

209. The Court does not find TVA's failure to inform its personnel of its policies and procedures for coal ash management at the KIF plant to be decisions and conduct the discretionary function doctrine was intended to protect.

210. Plaintiffs also argue that the substance of TVA's policies, procedures, and practices for its annual and daily dike stability inspections and the groundwater monitoring system were not in accordance with the applicable standard of care and that these are not protected by the discretionary function doctrine.

211. TVA asserts that the discretionary function doctrine precludes plaintiffs' claims based on allegations that TVA's inspections or its groundwater monitoring system should have been more comprehensive or more than visual surface inspections of the dikes and dredge cells.

212. TVA asserts that it followed a long-established practice of conducting annual surface inspections of the dikes and dredge cells, not a practice of annually conducting more intrusive subsurface inspections, and that this long-standing practice constitutes a discretionary decision for which TVA cannot be liable under the discretionary function doctrine.

213. Referencing the Court's previous ruling that the "substance or comprehensiveness of TVA's coal ash policies and procedures" arise out of discretionary decisions and thus cannot be subject to challenge in tort, *TVA Ash Spill Litig. I*, 787 F. Supp. 2d at 718, TVA asserts that the groundwater monitoring system was not a mandatory policy or procedure, a permit requirement, or that it was intended to include North Dike, and, even if it was, that it could not be challenged for its substance as this would fall under the discretionary function doctrine.

214. TVA also notes that courts have held that even though government employees may have been negligent in not implementing more extensive inspections, courts cannot impose a "reasonableness" requirement on government decisions and conduct regarding what type of inspections to implement. *See Autery v. United States*, 992 F.2d 1523 (11th Cir. 1993), *rev'g*, 786 F. Supp. 944 (S.D. Ala. 1992) (considering an unwritten policy of

“windshield” inspections); *see also Rosebush v. United States*, 119 F.3d 438, 441-43 (6th Cir. 1997) (citing *Autery* with approval).

215. In *Mays*, the Court found that TVA’s decisions regarding what policies and procedures would govern coal ash management at the KIF plant were protected by the discretionary function doctrine, and that plaintiffs had not presented evidence of specific, mandatory directives, as required by *Gaubert*, 499 U.S. 315, that required TVA to follow a specific course of conduct. *Id.*, 699 F. Supp. 2d 991, 1013, 1022. *See also Chesney v. TVA*, 782 F. Supp. 2d at 585 (reiterating that TVA’s discretionary decisions include what policies and procedures should govern the operation, management, and oversight of the ash disposal facilities).

216. Prior to Phase I, during Phase I, and in plaintiffs’ post-trial submissions, plaintiffs request the Court to reconsider these previous rulings and allow a comparison of TVA’s policies and procedures to national dam safety standards given TVA’s decision in 2001 to submit information about its coal ash disposal facilities for inclusion in the National Inventory of Dams (the “NID”).

217. Plaintiffs argue that TVA’s submission of its facilities for inclusion in the NID raises a factual issue about whether TVA simultaneously decided to place those facilities under an inspection regime that required a specific mandatory course of conduct, such as the national dam safety standards followed by facilities that are a part of the NID.

218. Plaintiffs argue that even if TVA did not adopt these national dam safety standards, because TVA decided to include the KIF plant in the NID, those national

standards and regulations are relevant to whether TVA was negligent in its coal ash management policies and procedures.

219. The Court agrees with TVA that the fact that TVA included its coal ash facilities in the NID shows that TVA placed its coal ash facilities under an inspection regime that required a specific mandatory course of conduct and agrees with TVA that the national damn safety standards and regulations are therefore not evidence of mandatory, nondiscretionary duties owed by TVA.

220. Plaintiffs' argument that the facilities at the KIF plant were included in the NID in 2001 does not change the Court's ruling.

221. There was no evidence presented at Phase I that TVA adopted any specific national standards, requirements, or guidelines, as mandatory directives that must be followed as part of TVA's policies and procedures for coal ash management at the KIF plant.

222. Plaintiffs have also provided no evidence that inclusion in the NID, by itself, mandates any specific, mandatory course of action from which TVA could not deviate.

223. The Court also finds that, to the extent plaintiffs have argued that the substance and scope of TVA's policies, procedures, and practices for coal ash management were not sufficient, or below the applicable engineering standard of care, those claims challenge the substance of TVA's policies, procedures, and practices, and, as the Court has held previously, those claims are barred by the discretionary function doctrine.

224. Finally, plaintiffs argue that TVA personnel's negligent performance of mandatory policies and procedures for coal ash management, particularly TVA's annual dike stability inspections, falls outside of the discretionary function doctrine.

225. The Court agrees that negligent or inadequate performance by TVA personnel of TVA's policies and procedures for coal ash management is not a decision or type of conduct that is protected by the discretionary function doctrine. *See Mays*, 699 F. Supp. 2d at 1018-19 (noting that some of plaintiffs' allegations "focus on neglect, failure to correct structural and engineering problems with the Swan Pond facilities, failure to maintain, and a failure to have in place policies and procedures for dealing with coal ash waste").

226. Once TVA made a decision to make it a practice to implement and conduct annual dike stability inspections for the purpose of making sure the dikes and dredges cells at the KIF plant fulfilled their function, TVA must have proceeded in accordance with the applicable engineering standard of care in accordance with those decisions. *See Mays*, 699 F. Supp. 2d at 2019 ("[O]nce a government agency makes a policy decision protected by the discretionary function doctrine, the agency must then proceed with care in the implementation of that decision.").

227. Failing to comply with the engineering standard of care in regard to inspections is not conduct that Court finds to be protected by the discretionary function doctrine because the Court does not find this to be conduct that involves policy considerations or the permissible exercise of policy judgment. *See, e.g., Indian Towing Co.*, 350 U.S. at 68-69 (holding that the negligent failure to maintain a lighthouse in good working order subjected

the government to suit even though the initial decision to undertake and maintain lighthouse service was a discretionary policy judgment); *Caplan*, 877 F.2d at 1316 (once the government determined a policy, the government was accountable for negligence in implementing that policy); *Reminga*, 631 F.2d at 452 (once having exercised the discretion to issue navigational charts, the government is accountable for its negligence in failing to locate hazards accurately on the charts); *Arizona Maint. Co. v. United States*, 864 F.2d 1497, 1504 (9th Cir. 1989) (having made a policy decision to use dynamite instead of drilling for exploring subsurface conditions for a canal, the federal government was liable for its failure to comply with the engineering standard of care for the use of the dynamite).

D. Duty

228. The Court also concludes that TVA owed plaintiffs a general duty of reasonable care, under the common law, to conduct its coal ash storage and disposal operations at the KIF plant so as to avoid injury to plaintiffs' property. *McCall v. Wilder*, 913 S.W.2d 150, 153 (Tenn. 1995) ("Stated succinctly, a duty of reasonable care exists if defendant's conduct poses an unreasonable and foreseeable risk of harm to persons or property."); *Sterling v. Velsicol Chem. Corp.*, 647 F. Supp. 303, 316 (W.D. Tenn. 1986), *rev'd in part*, *Sterling v. Velsicol Chem. Corp.*, 855 F.2d 1188 (6th Cir. 1988) ("there was a duty, a standard of conduct, imposed by law on Velsicol to protect others from unreasonable harm arising from the dumping of the chemicals on its farm.").

229. In this litigation, that duty is imposed by the Tennessee common law.

E. Claims

1. Private Nuisance

230. Under Tennessee law, a private nuisance has been defined as ““anything which annoys or disturbs the free use of one’s property, or which renders its ordinary use or physical occupation uncomfortable . . . [and] extends to everything that endangers life or health, gives offense to the senses, violates the laws of decency, or obstructs the reasonable and comfortable use of property.”” *Lane v. W.J. Curry & Sons*, 92 S.W.3d 355, 364 (Tenn. 2002) (quoting *Pate v. City of Martin*, 614 S.W.2d 46, 47 (Tenn. 1981)).

231. “The key element of any nuisance is the reasonableness of the defendant’s conduct under the circumstances.” *Sadler v. State*, 56 S.W.3d 508, 511 (Tenn. Ct. App. 2001) (citation omitted); *Frank v. Gov’t of City of Morristown*, 294 S.W.3d 566, 571 (Tenn. Ct. App. 2008). *See also TVA Ash Spill Litig. II*, 805 F. Supp. 2d at 490.

232. Thus, a nuisance claim does not describe a defendant’s conduct, but a type of harm suffered by the plaintiff. *Zollinger v. Carter*, 837 S.W.2d 613, 615 (Tenn. Ct. App. 1992; *Wilson v. Ours*, No. M2006-0703-COA-R3-CV, 2008 WL 4211117, at *5 (Tenn. Ct. App. Mar. 23, 2009).

233. Plaintiffs contend that nondiscretionary, negligent conduct by TVA in regard to the KIF plant constitutes an unreasonable use of property for which TVA is liable to plaintiffs under a theory of private nuisance.

234. TVA maintains that plaintiffs’ claims for private nuisance are not actionable under Tennessee law because a single event, such as a dike failure, is not actionable in

nuisance. *See Burnette v. West Knox Util. Dist.*, No. C.A. 1155, 1988 WL 67154 (Tenn. Ct. App. Jun. 30, 1988), *perm. app. denied* (holding that the plaintiff's nuisance claim due to damages sustained to the plaintiff's property as a result of flooding was not actionable in nuisance because the court was "not convinced that a single episode of inundation [by flooding] constitutes a nuisance [because] [a] nuisance, if temporary, is capable of abatement").

235. After due consideration, the Court concludes that under Tennessee law, an actionable claim for a private nuisance may involve a single act or conduct having a continuous effect on a plaintiff's legally protectable property interest. *See Butcher v. Jefferson City Cabinet Co.*, 437 S.W.2d 256, 258 (Tenn. Ct. App. 1968) (considering a nuisance claim and noting that "[i]t is not necessary that the act or acts complained of be habitual or periodical. Where a single act produces a continuing result, the violation by a party may be complete without a reoccurrence of the violation"); *Williams v. Cross*, 65 S.W.2d 198, 201 (Tenn. Ct. App. 1932) (discussing an alleged nuisance due to the presence of a toilet near to property owned by the plaintiff, which, at various times, would overflow and cause noxious odors to waft onto the plaintiff's property).

236. According to plaintiffs, coal or fly ash is or was present on each of their properties, in the air over and around their properties, and in waterways surrounding their properties as a result of the dike failure.

237. While the Court has reservations as to whether each plaintiff may be able to prove each of the necessary elements for a private nuisance claim, the Court finds that the

allegations in this litigation do involve allegations of an invasion of a legally protectable property interest which may rise to the level of what a reasonable person with ordinary sensibilities would consider an unreasonable interference with the use and enjoyment of his or her property. *See Lane*, 92 S.W.3d 364-65; *Pate*, 614 S.W.2d at 47. *Pate*, 614 S.W.2d at 47; *Jenkins v. CSX Transp., Inc.*, 906 S.W.2d 460, 462 (Tenn. Ct. App. 1995).

238. This litigation is therefore distinguishable from *Burnette v. West Knox Util. Dist.*, discussed by TVA, because unlike here, the plaintiffs in *Burnette* did not allege that harmful substances entered and remained on the plaintiffs' property as a result of the inundation. *Id.*, 1988 WL 67154.

239. Here, as noted in *TVA Ash Spill Litig. II*, plaintiffs have alleged that particles from the coal ash spill entered and remain on their property, on shoreline strips surrounding their properties, and in the air over and around their properties, and that the presence of these particles constitutes an interference with plaintiffs' use and enjoyment of their property because caused or causes unsightly and smelly scum to appear on the shorelines adjacent to their properties, caused or causes fish to die and decay within sight of their properties, rendered plaintiffs' properties unusable as staging areas for recreational activities, and caused their properties to have lost some usable value. *Id.*, 806 F. Supp. 2d at 490.

240. Whether some or all of these alleged invasions constitute legally protectable property interests, whether any of these alleged invasions occurred on each plaintiff's property, and whether these alleged invasions constitute an invasion so unreasonable as to be offensive or inconvenient to the normal person or ordinary person in the community,

remains a question to be resolved in Phase II subject to proof of each of the aforementioned elements.

2. Negligence Per Se

241. Plaintiffs contend that TVA is liable under a theory of negligence per se for the violation of various federal and Tennessee environmental statutes, including the Resource Conservation and Recovery Act (“RCRA”), 42 U.S.C. §§ 6901, *et seq.*, the Clean Water Act (“CWA”), 32 U.S.C. §§ 1251, *et seq.*,³⁹ the Tennessee Water Quality Control Act (“TWQA”), Tenn. Code Ann, §§ 69-3-101, *et seq.*, the Tennessee Solid Waste Disposal Act (“TSWDA”), Tenn. Code Ann. §§ 68-211-102, *et seq.*, and the Rules for Solid Waste Processing and Disposal (“Solid Waste Rules”), Tenn. Comp. R. & Reg. § 1200-01-07.⁴⁰

242. Plaintiffs argue that these statutes and rules create statutory standards of care that TVA violated in the course of its nondiscretionary conduct in regard to the dike failure.

243. TVA contends that plaintiffs’ claims for violations of these statutes and rules do not create a private right of action and are not actionable under a theory of negligence per se.

³⁹The CWA is also referred to in case law and several of the parties’ briefs as the Federal Water Pollution Control Act (“FWPCA”).

⁴⁰The TSWDA makes it unlawful to “dispose of solid waste, *id.* § 68-112-104(4), and provides for the promulgation by the TDEC of the Solid Waste Rules. *See* Tenn. Comp. R. & Reg. § 1200-01-07, *Rules of Tenn. Dep’t of Env’t & Conservation Div. of Solid Waste Mgmt.*, Chapter 1200-01-07, Solid Waste Processing and Disposal, *available at* <http://tn.gov/sos/rules/1200/1200-01/1200-01-07.20100517.pdf>.

244. “‘Courts considering whether to recognize negligence per se based on violation of broad environmental . . . statutes and regulations . . . have approached this issue by determining whether, in enacting the statute, the legislature intended to create a private right of action.’” *Miller v. E.I. DuPont de Nemours & Co.*, 880 F. Supp. 474, 480 (S.D. Miss. 1994) (quoting *Rodriguez v. Am. Cyanamid Co.*, 858 F. Supp. 127, 129 (D. Ariz. 1994)).

245. It has also been noted that “[t]he doctrines of per se negligence and civil liability implied from statute, though theoretically distinct, are closely related and the root issue would seem to . . . be the same under either analysis[.]” *Frederick L. v. Thomas*, 578 F.2d 513, 517 (3rd Cir. 1978).

246. It is well-settled that the RCRA and the CWA do not permit private causes of action for damages. *See Ailor v. City of Maynardville, Tenn.*, 368 F.3d 587, 601 (6th Cir. 2004) (“The RCRA, like the CWA, does not provide for compensatory damages.”); *Meghrig v. KFC Western, Inc.*, 516 U.S. 479, 485-88 (1996) (holding that the RCRA citizen suit provision does not permit a private cause of action for damages to recover prior costs of cleaning up toxic waste); *Middlesex City Sewerage Auth. v. Nat’l Sea Clammers Ass’n*, 453 U.S. 1, 14-15 (1981) (holding that there is no implied private right of action under the CWA).

247. In other words, courts have concluded that negligence per se claims premised on the RCRA and the CWA are not actionable because private rights of action do not exist under those statutes. *See Short v. Ultramar Diamond Shamrock*, 46 F. Supp. 2d 1199, 1200-01 (D. Kan. 1999) (“Plaintiffs cannot use the theory of negligence per se to bootstrap a private cause of action for damages when one [a private cause of action for damages] is not

provided for by the RCRA.”); 325-343 E. 56th St. Corp. v. Mobil Oil Corp., 906 F. Supp. 669, 687-88 (D.D.C. 1995) (“Having found no express or implied private cause of action for money damages under RCRA, and finding a Congressional intent that the RCRA citizen suit provisions serve only to allow private plaintiffs to act as ‘private attorney generals,’ the court determines that Plaintiff’s negligence per se claim for violations of 42 C.F.R. Pts. 280–81 (RCRA regulations) should be dismissed.”). *In re Oil Spill by the Oil Rig Deepwater Horizon in the Gulf of Mexico, on April 20, 2010*, MDL No. 2179, 2011 WL 4575696, at *10-*11 (E.D. La. Sept. 30, 2011, *as amended* Oct. 4, 2011) (finding no private right of action under the CWA).

248. Accordingly, given the above-cited law, plaintiffs’ negligence per se claims under the RCRA and the CWA will be **DISMISSED**.

249. Plaintiffs’ negligence per se claims under Tennessee law are also based on the TWSDA and the TWQCA.

250. Similar to federal law, under Tennessee law, the determination of whether negligence per se claims are actionable under a certain statute has been found to be “analytically related” to whether an implied private right of action exists under a legislative enactment. *See Rains v. Bend of the River*, 124 S.W.3d 580, 588-89, n.5 (Tenn. Ct. App. 2003) (discussing the doctrine of negligence per se under Tennessee law); *Thomas & Assocs., Inc., v. Metro Gov’t of Nashville*, No. M2001-00757-COA-R3-CV, 2003 WL 21302974, at *10 (Tenn. Ct. App. June 6, 2003) (noting that Tennessee courts have held that negligence per se claims are closely akin to implied private rights of action).

251. The intent of the legislature is at the foundation of the analyses for both a negligence per se claim and a private right of action and to recover under each, a plaintiff must demonstrate (a) a membership in the particular class of persons for whose benefit or protection the statute was enacted, (b) the inadequacy of existing remedies, and (c) that recognition of a cause of action would be consistent with the overall statutory scheme. *See Ergon, Inc. v. Amoco Oil Co.*, 966 F. Supp. 577, 583-84 (W.D. Tenn. 1997) (describing the test for determining the existence of an implied right of action) and *Estate of French v. Stratford Home*, 333 S.W.3d 546, 562 (Tenn. 2011) (describing the necessary factors for establishing an actionable negligence per se claim).

252. Unless the legislative intent is made manifestly clear, Tennessee law does not permit a court to casually engraft means of enforcement onto a legislative enactment which “as a whole provides for governmental enforcement of its provisions.” *Brown v. Tenn. Title Loans, Inc.*, 328 S.W.3d 850, 857 (Tenn. 2010) (quoting *Premium Fin. Corp. of Am. v. Crump Ins. Servs. of Memphis, Inc.*, 978 S.W.2d 91, 94 (Tenn. 1998)).

253. Tennessee courts have held that the TSWDA does not provide for a private right of action for persons harmed by a violation of its provisions. *Goff v. Elmo Greer & Sons Const. Co.*, 297 S.W.3d 175 (Tenn. 2009), *cert. denied*, 130 S.Ct. 1910 (2010) (noting that the TSWDA provides for criminal and civil penalties for violations of its provisions, and while it would “apply to circumstances like the burial of [waste] on private property, our courts have recognized that [the TSWDA] does not provide a private right of action for persons harmed by a violation of its provisions”) (citing *Wayne Cty. v. Tenn. Solid Waste*

Disposal Control Bd., 756 S.W.2d 274, 283 (Tenn. Ct. App. 1988)); *see also United Inventory Servs., Inc. v. Tupperware Brands Corp.*, No. 08-1208, 2010 WL 1009978 (W.D. Tenn. Mar. 15, 2010) (same).

254. Similarly, in *Ergon Inc. v. Amoco Oil Co.*, the district court considered and dismissed the plaintiff's claims for private causes of action under both the TWQCA and the TSWDA, finding no implied private right of action to exist under either statute because both contain explicit statutory remedies, neither provide for private actions or authorize a plaintiff to recover damages, and both vest all enforcement power in state regulatory authorities. *Id.*, 966 F. Supp. at 584-86.

255. As held in *Ergon*, the Court concludes that the TSWDA and the TWQCA provide exclusively for governmental enforcement of the statutory provisions, do not permit a plaintiff to recover monetary damages for a violation of any provisions, and contain language indicating that the Tennessee legislature did not intend for any provision within the statutes to abridge common law or statutory rights that were available to private plaintiffs prior to the enactment of the states. *Id.*, 966 F. Supp. at 585-86 (finding that the non-abridgment provision of the TWQCA manifested the legislature's intent to allow private citizens to "continue to exercise any rights they held before the enactment of [the TWQCA]"); *see e.g., Brown*, 328 S.W.3d at 855, 857 (observing that "[w]here an act as a whole provides for governmental enforcement of its provisions, we will not casually engraft means of enforcement of one of those provisions unless such legislative intent is manifestly

clear” and finding that the Tennessee Title Pledge Act was not intended to create such a private right of action); Tenn. Code Ann. §§ 68-201-114, 68-221-718, 69-3-118.

256. Furthermore, plaintiffs have provided no argument or case law supporting the position that the remedies provided in the TSWDA and the TWQCA are inadequate or that a private cause of action or negligence per se claim is consistent with the overall statutory schemes.

257. Finally, plaintiffs have also failed to argue or show that the TSWDA, the TWQCA, or the Solid Waste Rules contain a statutory standard of care, a required element for a negligence per se claim. *See Thomas & Assocs., Inc.*, 2003 WL 21302974, at *8 (holding that while the plaintiffs may fall within the class of persons the TSWDA is designed to protect, this status “does not somehow transform the legislation’s registration and permit process, and the State’s general supervision of disposal sites, from, in the Court’s view, administrative requirements, into a standard of care”); *United Inventory Servs.*, 2010 WL 1009978, at *3-*5 (observing that a negligence per se claim must establish a standard of care and finding that because the plaintiff failed to demonstrate that the TSWDA contains such a standard, finding the plaintiff’s negligence per se claim was for a violation of the TSWDA was no actionable and dismissing that claim).

258. Accordingly, given the above-cited law, plaintiffs’ negligence per se claims under the TSWDA, the TWQCA, and the Solid Waste Rules will be **DISMISSED**.

259. In sum, all plaintiffs’ claims based on theories of negligence per se will be **DISMISSED**.

3. Trespass

260. As set forth in *TVA Ash Spill Litig. II*, a trespass claim under Tennessee law may be premised upon the entry onto a plaintiff's property of tangible or intangible particles. *Id.*, 805 F. Supp. 2d at 483-85.

261. While there is no requirement of actual and substantial harm to property, each plaintiff claiming under a theory of trespass must show that tangible or intangible particles from the coal ash spill actually entered onto each plaintiff's property. *Id.*; see also *Stephens v. Loch Foods, LLC*, 667 F. Supp. 2d 768, 795-96 (E.D. Tenn. 2009) (holding that it would follow the "modern" view of trespass); *Burlison v. United States*, No. 2:07-cv-02151-JPM-cgc, 2011 WL 1002808, at *8 (W.D. Tenn. Mar. 15, 2011) ("Under Tennessee law, '[e]very unauthorized entry upon another's realty is a trespass, regardless of the degree of force used or the amount of damage.'" (quoting *Baker v. Moreland*, No. 89-62-II, 1989 WL 89758, at *4-*5 (Tenn. Ct. App. Aug. 9, 1989) (noting that "[e]very unauthorized entry upon another's realty is a trespass, regardless of the degree of force used or the amount of damage.")).

262. Given the evidence presented at Phase I, the Court concludes that plaintiffs' trespass claims are potentially actionable, provided each plaintiff is able to demonstrate the elements of that plaintiff's trespass claim in Phase II, including the threshold requirement that each plaintiff show that tangible or intangible particles from the coal ash spill actually entered their respective properties.

V. CONCLUSION

Based on the Court's findings of fact and conclusions of law as stated above, the Court **FINDS** in favor of plaintiffs and against TVA because specific nondiscretionary conduct on the part of TVA caused the failure of the coal ash containment dike at TVA's KIF plant on December 22, 2008 and that, but for the nondiscretionary conduct described above, the dike failure would not have occurred. TVA will therefore be **LIABLE** for damages to each plaintiff, provided each plaintiff is able to demonstrate in the Phase II proceedings his or her entitlement to relief under claims of negligence, trespass, and/or private nuisance. For the reasons given above, it is **ORDERED** that plaintiffs' claims of negligence per se, recklessness, strict liability, and public nuisance are **DISMISSED** from this litigation.

The parties are **DIRECTED**, within twenty-one (21) days of the entry of this memorandum opinion and order, to file briefs of no more than twenty (20) pages regarding the parties' recommendations for how this Court should conduct the Phase II proceedings.

Per the parties' agreement and the orders of this Court, the findings of fact and conclusions of law contained in this memorandum opinion will be **BINDING** on all parties to the TVA Ash Spill Litigation. Appropriate judgment orders will be **ENTERED** in each case following the resolution of the Phase II proceedings.

IT IS SO ORDERED.

s/ Thomas A. Varlan _____
UNITED STATES DISTRICT JUDGE