

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
FLORIDA POWER & LIGHT COMPANY) Docket Nos. 52-040 & 52-041
)
(Turkey Point Units 6 and 7))

NRC STAFF INITIAL STATEMENT OF POSITION

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Pursuant to 10 C.F.R. §§ 2.337(g)(2) and 2.1207(a)(1), and the Atomic Safety and Licensing Board's (Board) November 22, 2016, and February 24, 2017, scheduling orders,¹ the United States Nuclear Regulatory Commission (NRC) Staff hereby submits its Initial Statement of Position and Direct Testimony, together with supporting Affidavits, and Exhibits, regarding admitted Contention 2.1.

As set forth below, the NRC Staff has examined the potential environmental impacts from the proposed deep injection wells within the range dictated by the nature and scope of the proposal and has rigorously explored, objectively evaluated, and fully documented the Staff findings and conclusion that the impact will be SMALL. Accordingly, Contention 2.1 is without merit and the Board should find in favor of the NRC Staff.

INTRODUCTION

Section 7.2.2.2, "Groundwater-Quality Impacts," of NUREG-2176, "Environmental Impact Statement for Combined Licenses (COLs) for Turkey Point Nuclear Plant Units 6 and 7,

¹ Order (Amending Final Scheduling Order) (November 22, 2016) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16327A189); Order (Granting Unopposed Request for Extension of Time) (February 24, 2017) (ADAMS Accession No. ML17055C716).

Final Report” dated October 2016 (FEIS) (NRC-008A-D) summarizes the NRC Staff position on the migration component of Contention 2.1, the only issue remaining for litigation in this proceeding. *Florida Power & Light Co.* (Turkey Point Units 6 & 7), LBP-16-03, 81 NRC 169, 185-86 (2016). FEIS § 7.2.2.2 is part of the FEIS evaluation of cumulative impacts, which considers “past, present, and reasonably foreseeable future actions that could affect groundwater quality. For this analysis, the geographic area of interest is the expected area of migration of wastewater injected into the Boulder Zone of the Lower Floridan aquifer[.]” FEIS § 7.2.2.2 at 7-16; NRC-008B at 7-16. In regard to impacts to groundwater quality, FEIS § 7.2.2.2 states as follows:

[One] potential cumulative [impact] on groundwater quality [is] related to the injection of wastewater into the Boulder Zone and include[s] other wastewater-injection well operations, and any potential use of saline groundwater from this aquifer. There are more than 180 active Class 1 injection wells that inject wastewater into the Boulder Zone and 13 of these wells are located at the Miami-Dade South District Wastewater Treatment Plant (SDWWTP) wastewater injection site approximately 9 mi north of the proposed FPL [Underground Injection Control] UIC wells. All Boulder Zone UIC wells must be permitted and monitored by the [Florida Department of Environmental Protection] FDEP UIC program, which is responsible for protecting underground sources of drinking water (USDWs) within Florida. Upward migration of treated municipal waste wastewater injected into the Boulder Zone has been observed at the Miami-Dade [South District Wastewater Treatment Plant] (Maliva et al. 2007-TN1483 [NRC-043]; Starr et al. 2001-TN1251 [NRC-044]; EPA 2003-TN3658 [NRC-045]), and has resulted in injected wastewater moving upward into the middle Floridan confining unit. As mentioned in Section 2.3, previous studies reported that injectate had migrated into the Upper Floridan aquifer at the [South District Wastewater Treatment Plant] site (Starr et al. 2001-TN1251 [NRC-044]; EPA 2003-TN3658 [NRC-045]). However, Walsh and Price (2010-TN3656 [NRC-046]) report that upwelling has not migrated above the [Avon Park Permeable Zone] of the [Middle Confining Unit] at the [South District Wastewater Treatment Plant]. Reese and Richardson (2008-TN3436 [NRC-040]) provided an explanation for this by recognizing, “the Avon Park Permeable Zone has been identified in previous studies as the...lower part of the Upper Floridan Aquifer in...the southern part of southeastern Florida.” The cause of the observed migration of contaminants has been attributed (McNeill 2000-TN4572 [NRC-048]; McNeill 2002-TN4571 [NRC-064]) to a lack of adequate geologic confinement, or a well construction problem. However, Starr et al. (2001-TN1251 [NRC-044]) conclude that “The vertical and spatial distribution of contamination in the Upper Floridan and Lower Floridan aquifers shows a pattern more

consistent with point-source contamination, such as leaking wells, than from widespread upward migration through a leaking confining layer.”

Variable density modeling of the potential transport of wastewater in the Boulder Zone from the proposed Units 6 and 7 UIC wells (FPL 2014-TN4069) indicate that it is not likely that the injected wastewater may reach the location of the Miami-Dade SDWWTP UIC wells within the operational period of Units 6 and 7. Pressure within the Boulder Zone from continued injection at the SDWWTP would deter movement of injection from the proposed site in that direction and prevent significant commingling of the two injection plumes. As explained in Section 5.2, if this transport did occur, dilution and dispersion would reduce the concentrations within the effluent plume over the transport distance. The FDEP UIC permit for the Miami-Dade SDWWTP UIC wells requires that concentrations of potential contaminants are monitored in the USDW aquifer and in the confining zone separating the injection zone from the USDW aquifer. Remedial action would be taken to protect the USDW if contaminants were detected. The review team² concludes that cumulative impacts resulting from operation of both UIC systems are unlikely and would have insignificant effects on water in the Boulder Zone. If transported contaminants migrated upward near the SDWWTP, they would be detected by the monitoring program required by FDEP. These geologic characteristics, fate and transport processes, and monitoring requirements would adequately protect the Upper Floridan aquifer from degradation resulting from cumulative effects of wastewater injection at Units 6 and 7 and the Miami-Dade SDWWTP site. Therefore, the review team determined that the cumulative impact of injecting wastewater in the Boulder Zone would be minor.³

FEIS § 7.2.2.2 at 7-17 to 7-17; NRC-008B at 7-16 to 7-17. The NRC Staff received several comments on the DEIS in regard to deep well injection of reclaimed wastewater used at Turkey Point 6 & 7. The Staff answered comments concerning the issues raised in Contention 2.1 in Appendix E (at pages E-211 to E-213) to the final EIS. NRC-008D at E-211 to E-213. This Staff answer identifies the portions of the final EIS that the Staff modified to address Contention 2.1. *Id.* The Staff position in regard to migration is set forth in detail below. As also set forth in detail

² The “review team” included the NRC Staff and the staff of the U.S. Army Corp of Engineers. As used in the context of the FEIS text discussed here and in the NRC Staff Testimony (NRC-004), the review team is synonymous with the NRC Staff.

³ Although the FEIS includes a wide variety of new information to better address the issues raised in Contention 2.1, as indicated by bars in the FEIS text margin, the Joint Intervenor did not challenge any of that information.

below, the concentrations of the constituents in the injectate (listed in FEIS Table 3-5, at 3-39; NRC-008A at 3-39) are so low that the environmental impacts would be small if the Constituents at Table 3-5 concentrations were released into the Upper Floridan aquifer. The Staff submits that these two positions are independent alternative grounds on which the Board could rule, and that either is dispositive of Contention 2.1 in favor of the Staff.

BACKGROUND

The procedural history of this proceeding relevant to Contention 2.1 is set forth below.

On June 30, 2009, the Florida Power and Light Company (Applicant or FPL), pursuant to the Atomic Energy Act of 1954, as amended (AEA), and the Commission's regulations, submitted an application for combined licenses (COL) for two nuclear power reactors to be located adjacent to the existing Turkey Point Units 1 through 5, at the Turkey Point site near Homestead, Florida (Application). See Letter from M. K. Nazar, FPL, to M. Johnson, Office of New Reactors, NRC, dated June 30, 2009 (ADAMS Accession No. ML091830589). The Application designated the proposed units as Turkey Point, Units 6 & 7. Application Rev. 0, Part 1 at 1 (ML091870846). The Application includes an Environmental Report, which provides the Applicant's assessment of the environmental impacts of the proposed action, as required by 10 C.F.R. §§ 52.80(b) and 51.50(c). See Application, Rev. 6, Part 3 (ER) (ML14311A285).⁴

On June 18, 2010, the NRC published a Notice of Hearing and Opportunity to Petition for Leave to Intervene, which provided members of the public sixty days from the date of publication to file a petition for leave to intervene in this proceeding. See "Florida Power & Light Company, Combined License Application for the Turkey Point Units 6 & 7, Notice of Hearing, Opportunity for Leave to Petition to Intervene and Associated Order Imposing Procedures for Access to

⁴ The ADAMS Accession number for the ER depends on the revision number being cited. The most recent revision to the ER is Revision 6 (ML14311A285).

Sensitive Unclassified Non-Safeguards Information and Safeguards Information for Contention Preparation,” 75 Fed. Reg. 34,777 (June 18, 2010) (Notice of Hearing).

In response to the Notice of Hearing, on August 17, 2010, Mark Oncavage, Dan Kipnis, Southern Alliance for Clean Energy, and the National Parks Conservation Association (Joint Intervenors) submitted a Petition through which they sought to intervene in this proceeding. See Joint Intervenors’ Petition for Intervention (Aug. 17, 2010) (ML102300582) (2010 Petition). In addition, the Village of Pinecrest petitioned to intervene or, in the alternative, participate in the proceeding as an interested governmental entity. See Petition by the Village of Pinecrest, Florida, for Leave to Intervene in a Hearing on [FPL’s] [COL] Application For Turkey Point Units 6 & 7, or in the Alternative, Participate as a Non-Party Local Government (Aug. 16, 2010) (ADAMS Accession No. ML102280601).

In a decision dated February 28, 2011, the Board admitted Joint Intervenors’ Contention NEPA 2.1 and admitted the Joint Intervenors as parties to this proceeding. See *Florida Power & Light Co.* (Turkey Point Units 6 and 7), LBP-11-06, 73 NRC 149, 190-94, 251-52 (2011). The Board also granted the Village of Pinecrest’s request to participate in the proceeding under 10 C.F.R. § 2.315(c). *Id.* at 165, 251.

As originally proposed, Contention 2.1 related to the Applicant’s proposal to obtain reclaimed wastewater from the Miami-Dade Water and Sewer Department South District plant, use this water to cool the main condenser via cooling towers, and inject the blowdown into permeable strata (denoted as the Boulder Zone) approximately 2900 feet (ft.) (883.9 m) below the surface at the plant site. Specifically, Contention 2.1 asserted that the Applicant’s ER omitted analysis of the environmental effects of six constituents in the reclaimed wastewater.

Based on a subsequent revision to the application, the Applicant moved to dismiss Contention 2.1 as moot, which the Board granted. See Memorandum and Order (Granting FPL’s Motions to Dismiss Joint Intervenors’ Contention 2.1 and CASE’s Contention 6 as Moot) at 3, 6 (unpublished) (Jan. 26, 2012) (ADAMS Accession No. ML12026A438). The Joint

Intervenors contemporaneously submitted an amended Contention 2.1, which the Board modified and admitted on May 2, 2012. See *Florida Power & Light Co.* (Turkey Point Units 6 and 7), LBP-12-09, 75 NRC 615, 629 (2012) (ADAMS Accession No. ML12123A644). In response to a subsequent FPL motion for summary disposition, the Board dismissed portions of amended Contention 2.1 and reformulated the contention. Memorandum and Order (Granting in Part and Denying in Part Motion for Summary Disposition of Amended Contention 2.1) at 10 (unpublished) (Aug. 30, 2012) (ADAMS Accession No. ML12243A323).

On March 5, 2015, the NRC published a notice of availability of a draft Environmental Impact Statement (DEIS) on the Application (NRC-007A-B). 80 Fed. Reg. 12,043 (March 5, 2015). In response to the March 5 notice of availability of the DEIS, on April 13, 2015, the City of Miami submitted its Petition, which proposed three environmental contentions. See Petition by the City of Miami, Florida, for Leave to Intervene in a Hearing on [FPL's] Combined Construction and Operating License Application for Turkey Point Units 6 & 7, or in the Alternative, Participate as a Non-Party Local Government (Apr. 13, 2015). On May 8, 2015, the Applicant and the NRC Staff filed their respective answers to the Petition. See [FPL's] Answer Opposing [Petition] (May 8, 2015). See *also* NRC Staff Answer to [Petition] (May 8, 2015). On June 10, 2015, the Board issued an Order denying the Petition on the grounds that the City of Miami failed to proffer an admissible contention, but granting the City of Miami's request to participate as an interested local governmental body pursuant to 10 C.F.R. § 2.315(c). *Florida Power & Light Co.* (Turkey Point Units 6 and 7), LBP-15-19, 81 NRC 815, 828 (2015).

On December 15, 2015, FPL filed a motion for summary disposition of Contention 2.1. See "[FPL] Motion for Summary Disposition of Joint Intervenors' Amended Contention 2.1." (ADAMS Accession No. ML15349A987) (FPL Motion). The Joint Intervenors responded to the FPL Motion in "Joint Intervenors' Answer to [FPL] Motion for Summary Disposition of Joint Intervenors' Amended Contention 2.1," dated February 3, 2016 (ADAMS Accession No. ML16034A487) (Intervenors' 2016 Answer). The Joint Intervenors opposed the FPL Motion in

regard to upward migration (Intervenors' 2016 Answer at 6-12). The Board granted the FPL Motion in part, denied it in part, and reformulated the remaining portion of Contention 2.1.

Turkey Point, LBP-16-03, 81 NRC at 185-86.

As reformulated by the Board, Contention 2.1 currently states the following:

The DEIS [draft EIS] is deficient in concluding that the environmental impacts from FPL's proposed deep injection wells will be "small." The chemicals ethylbenzene, heptachlor, tetrachloroethylene, and toluene in the wastewater injections at concentrations listed in DEIS Table 3-5 may adversely impact the groundwater should they migrate from the Boulder Zone to the Upper Floridan Aquifer.

Id. at 186. Joint Intervenors' Contention 2.1, as amended, remains pending before the Board.

On October 5, 2016, the Board issued a case management and scheduling order to govern the further course of the contested proceeding. Order (Revising Initial Schedule) (October 5, 2016) (ADAMS Accession No. ML16279A219).

On October 28, 2016, the NRC Staff issued and published a notice of availability of the FEIS. The NRC Staff published the FEIS in four volumes (NUREG-2176, Volumes 1, 2, 3, and 4 (ADAMS Accession Nos. ML16300A104, ML16300A137, ML16301A018, and ML16300A312)). See 81 Fed. Reg. 76,392 (Nov. 2, 2016) (NRC-008A-D). The NRC issued a supplement to the FEIS on December 2, 2016. See 81 Fed. Reg. 90,875 (Dec. 15 2016) (ML16337A147) (NRC-049). The Joint Intervenors did not challenge any information in the FEIS or the supplement.

The Board issued additional orders to govern the course of the proceeding; namely, the Final Scheduling Order (Nov. 15, 2016) (ADAMS Accession No. ML16320A248); Order (Amending Final Scheduling Order) (Nov. 22, 2016) (ADAMS Accession No. ML16327A189); and Order (Granting Unopposed Request for Extension of Time) (February 24, 2017) (ADAMS Accession No. ML17055C716).

DISCUSSION

I. Legal Standards

The contention at issue in this proceeding arises under the National Environmental Policy Act of 1969, as amended (NEPA), and the NRC regulations that implement that statute. See 42 U.S.C. § 4321 (2006); 10 C.F.R. Part 51. NEPA requires that an agency prepare an Environmental Impact Statement (EIS) for a major Federal action that significantly affects the quality of the human environment. 42 U.S.C. § 4332(2)(C). The NRC has determined that the Issuance of a COL is an action that requires an EIS. 10 C.F.R. § 51.20.

Under NEPA, the NRC is required to take a “hard look” at the environmental impacts of a proposed action, as well as reasonable alternatives to that action. See *Louisiana Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 87-88 (1998). This “hard look” is tempered by a “rule of reason” that requires agencies to address only impacts that are reasonably foreseeable – not remote and speculative. See, e.g., *Long Island Lighting Co.* (Shoreham Nuclear Power Station, Unit 1), ALAB-156, 6 AEC 831, 836 (1973). “NEPA does not call for certainty or precision, but an *estimate* of anticipated (not unduly speculative) impacts.” *Louisiana Energy Servs.* (National Enrichment Facility), CLI-05-20, 62 NRC 523, 536 (2005) (emphasis in original). Further, “NEPA gives agencies broad discretion to keep their inquiries within appropriate and manageable boundaries.” *Louisiana Energy Servs., L.P.*, CLI-98-3, 47 NRC at 103 (internal citation omitted).

In challenging the Staff’s environmental review, Joint Intervenors must identify, with some specificity, the alleged deficiencies in the Staff’s NEPA analysis. See *Hydro Resources, Inc.* (Albuquerque, NM), CLI-99-22, 50 NRC 3, 13 (1999). While there may be mistakes in the EIS, mistakes that are not significant or material do not indicate that the Staff’s NEPA review was inadequate. See *Exelon Generation Co.* (Early Site Permit (ESP) for Clinton Site), CLI-05-29, 62 NRC 801, 811 (2005) (“[I]n an NRC adjudication, it is Intervenors’ burden to show the ‘significance and materiality’ of mistakes in the EIS”). The Staff’s NEPA analysis is

adequate unless the Staff “has failed to take a ‘hard look’ at significant environmental questions – i.e., the Staff has unduly ignored or minimized pertinent environmental effects.” See *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-03-17, 58 NRC 419, 431 (2003) (discussing what an intervenor must allege, with adequate support, to litigate a NEPA claim). As the Commission has stated, “[o]ur Boards do not sit to ‘flyspeck’ environmental documents or to add details or nuances. If the ER (or EIS) on its face comes to grips with all important considerations nothing more need be done.” *Clinton ESP*, CLI-05-29, 62 NRC at 811 (quoting *System Energy Resources, Inc.* (Early Site Permit for Grand Gulf Site), CLI-05-4, 61 NRC 10, 13 (2005)).

Finally, “in an adjudicatory hearing, to the extent that any environmental findings by the Presiding Officer (or the Commission) differ from those in the FEIS, the FEIS is deemed modified by the decision.” *Hydro Resources, Inc.* (Rio Rancho, NM), CLI-01-4, 53 NRC 31, 53 (2001). The hearing process serves the public participation purposes of NEPA because it allows for “more rigorous public scrutiny” of an EIS than “circulation for comment.” See *id.* at 53 (quoting *Philadelphia Electric Co.* (Limerick Generating Station, Units 1 and 2), ALAB-819, 22 NRC 681, 707 (1985)).

II. NRC Staff Witnesses for Contention 2.1

For Contention 2.1, the NRC Staff is presenting a panel of the following witnesses: Daniel O. Barnhurst, Ann L. Miracle, Paul D. Thorne, and Alicia Williamson-Dickerson. They have authored the “Pre-filed Direct Testimony of Daniel O. Barnhurst, Ann L. Miracle, Paul D. Thorne, and Alicia Williamson-Dickerson Regarding Contention 2.1” (NRC Staff Testimony) (NRC-002). The testimony of Alicia Williamson-Dickerson sponsors the introduction of the Staff FEIS, NUREG-2176 (which is in four volumes (NRC-008A-D), plus a supplement (NRC-049)), into the record of this proceeding as required by 10 C.F.R. § 2.337(g). The remaining testimony presents the opinions of NRC Staff witnesses for Contention 2.1. The witnesses are sponsoring the exhibits upon which they rely in their respective testimony.

Daniel O. Barnhurst, Ann L. Miracle, and Paul D. Thorne have provided testimony regarding the Staff's position with respect to Contention 2.1. NRC Staff Testimony at A1; NRC-002 at A1. The NRC Staff Testimony presents the opinions of three qualified expert witnesses and demonstrates, as set forth below, that the FEIS prepared by the Staff meets its obligations under NEPA.

III. Contention 2.1 Lacks Merit and the Board Should Find in Favor of the Staff

The essence of Joint Intervenors' Contention 2.1 has always been that first the ER, and then the DEIS, "fails to adequately address the impacts associated with the disposal of plant liquid effluents, including chemical . . . waste, into the Lower Floridan Aquifer[.] 2010 Petition at 26.⁵

For the reasons set forth in more detail below, the NRC Staff has documented in the FEIS that there will be only small environmental impacts associated with the deep well injection at Turkey Point Units 6 and 7 of water containing ethylbenzene, heptachlor, tetrachloroethylene, and toluene, the only remaining chemicals at issue in Contention 2.1, at concentrations listed in FEIS Table 3-5 (NRC008A at 3-39). The NRC conclusion that ethylbenzene, heptachlor, tetrachloroethylene, and toluene (the Constituents) will have no environmental impact rests on three bases: First, the concentrations of the Constituents in the water disposed of into the Lower Floridan aquifer are below EPA limits for drinking water, and if water containing the Constituents at those concentrations were released directly into an Underground Source of Drinking Water, there would be no adverse human health impact (NRC Staff Testimony at A6;

⁵ The only specific impact the 2010 Petition identifies is the impact on drinking water. 2010 Petition at 27 (referring to the Underground Source of Drinking Water). Likewise, the only specific impact the Joint Intervenors identify in connection with the FPL 2016 Motion is potential impact to human health through a potential effect on drinking water. Joint Intervenor 2016 Answer at 13. "The reach of a contention is necessarily hinges upon its terms coupled with its stated bases." *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC 287, 309 (2010) (emphasis in original) (collecting citations). In view of *Pilgrim*, and because Joint Intervenors identified no impact to the quality of groundwater other than in regard to drinking water standards, the scope of Contention 2.1 is limited to human health impacts resulting from impacts to drinking water.

NRC-002 at A6) and no impact to groundwater quality (NRC Staff Testimony at A7-A8; NRC-002 at A7-A8). Second, the concentration of each of the Constituents in the water that would be used at Turkey Point Units 6 & 7 is now below its method detection limit as a result of additional treatment, and each Constituent would pose no threat to human health even if injected directly into an Underground Source of Drinking Water. NRC Staff Testimony at A38; NRC-002 at A38. Third, the most likely fate of blowdown injected into the Boulder Zone would be to spread horizontally in the Boulder Zone no more than five miles in any direction, and to migrate vertically at most about 300 feet into the Middle Confining Unit, where it would not impact users of the Upper Floridan Aquifer. NRC Staff Testimony at A86, A119, A126; NRC-002 at A86, A119, A126. The FEIS documents each of these bases. *Id.* The Joint Intervenors had the opportunity to challenge each of these bases after the Staff published the FEIS on October 28, 2016, and failed to do so. See Order (Revising Initial Schedule) at 2-3 (October 5, 2016) (ADAMS Accession No. ML16279A219). As explained in more detail below, each of the above bases is sufficient for the Board to find in the NRC Staff's favor.

A. System Operation and Turkey Point Site Stratigraphy Relevant to Contention 2.1.

The following describes the proposed operation of Turkey Point Units 6 & 7 relevant to Contention 2.1: The circulating-water system removes waste heat from the facility and rejects that heat to the environment through the mechanical draft cooling-towers. NRC Staff Testimony at A11; NRC-002 at A11. A large portion of the cooling water will evaporate as it is circulated a maximum of four times through the cooling system. *Id.* Make-up water will be added to the system to compensate for that lost to evaporation. *Id.* Water in the cooling system that is no longer suitable for use (called "blowdown") would be combined with other plant effluent and returned to the environment by deep well injection. *Id.*, citing FEIS at 3-9; NRC-008A at 3-9.

FPL's primary source of cooling water will be reclaimed wastewater from the Miami-Dade Water and Sewer Division South District Wastewater Treatment Plant. NRC Staff Testimony at A12; NRC-002 at A12. The reclaimed wastewater will be treated at the South

District Wastewater Treatment Plant and then conveyed by pipelines to the Turkey Point site where it will receive further treatment at the FPL Reclaimed Wastewater Treatment Facility (adjacent to the proposed site) before it is used. *Id.* The cooling system for Turkey Point Units 6 and 7 is more fully discussed in FEIS § 3.2.2 (NRC-008A, § 3.2.2). NRC Staff Testimony at A12; NRC-002 at A12.

The amount of reclaimed water to be received from the South District Wastewater Treatment Plant, diverted or lost through plant cooling related processes and injected to the Boulder Zone of the Lower Floridan Aquifer is outlined in FEIS Table 3-6 (NRC-008A, Table 3-6) and in the FPL Environmental Report (Application Part 3) (ER), Rev. 6, Table 3.3-1 and Figure 3.3-1 (NRC-016, Table 3.3-1 and Figure 3.3-1). NRC Staff Testimony at A13; NRC-002 at A13. In summary, these are:

- Normal reclaimed wastewater supply received by Turkey Point Reclaimed Wastewater Treatment Facility - 50,481 gpm (72.7 Mgd)
- Normal and maximum circulating water system makeup flow rate- 38,400 gpm (55.3 Mgd)
- Normal circulating water system evaporation rate - 28,800 gpm
- Circulating water system cooling-tower blowdown rate - 9714 gpm
- Other system flows combined for discharge – 2747 gpm
- Normal discharge flow rate to deep injection wells- 12,461 gpm (17.9 Mgd). *Id.*

The major aquifer in south Florida and at the Turkey Point site that is the subject of Contention 2.1 is the “Floridan aquifer system.” NRC Staff Testimony at A15, citing FEIS at 2-47; NRC-002 at A15, citing NRC-008A at 2-47. The Floridan aquifer system consists of several alternating layers of relatively permeable and impermeable rock that lie below a predominately low permeability “intermediate confining unit.” NRC Staff Testimony at A16;

NRC-002 at A16. The intermediate confining unit is more than 800 ft thick at the Turkey Point site. *Id.*

The Floridan aquifer system contains three major hydrogeologic units, in descending order: the Upper Floridan aquifer, the Middle Confining Unit, and the Lower Floridan Aquifer, which contains the Boulder Zone. *Id.* At the Turkey Point site, the Upper Floridan aquifer is 1010 ft below ground surface. *Id.* The top of the Middle Confining unit is 1450 ft below ground surface and it is 1465 ft thick. *Id.* The Boulder Zone of the Lower Floridan aquifer occurs at a depth of 3030 ft below ground surface. *Id.*, citing FEIS at 2-53 (NRC-008A at 2-53).

B. Intervenors Did Not Challenge Changes Made in Response to Contention 2.1 in the FEIS

In Appendix E to the FEIS, the NRC Staff describes changes it made to better address Joint Intervenors' contention that injection of wastewater may adversely impact groundwater if it were to migrate into an underground source of drinking water. To more fully describe the stratigraphy of the Turkey Point site and the region, and to describe the impact on human health of the Constituents at concentrations expected in the injectate, the NRC Staff revised Sections 2.3, 5.2, 7.2 and Appendix G of the FEIS, which are sections in the DEIS relevant to Contention 2.1. NRC Staff Testimony at A18; NRC-002 at A18. The FEIS includes the NRC Staff evaluation of more recent studies related to regional and site geology and causes and extent of upwelling where it has occurred. The FEIS also includes additional analyses and modeling of effluent movement after injection in the Boulder Zone and the possible pathways, and risk assessments of the impacts of deep well injection in south Florida. The additional information in the FEIS provides further evidence of NRC Staff's "hard look" at the impacts of deep well injection and also provides support for the NRC Staff's conclusions that the impacts of deep well injection on groundwater quality will be SMALL and that groundwater migration is unlikely.

In addition to enhanced discussion of studies related to the confinement capability of the Middle Confining Unit, the NRC Staff included newer sampling data taken in 2013-2014 from the

South District Wastewater Treatment Plant. As discussed in the Staff testimony (NRC Staff Testimony at A38; NRC-004 at A38), these samples were taken after high-level disinfection was implemented at the South District Wastewater Treatment Plant. The samples show that all the Constituent concentrations at issue in Contention 2.1 were below the method detection limits, which means that even if current detection technology shows concentrations above zero for the Constituents, the concentrations are too low to be quantified. NRC Staff Testimony A31, A32, A34, A38; NRC-002 at A31, A32, A34, A38. Further, it is not reasonable to call for concentrations of zero, as the Joint Intervenors do for heptachlor and tetrachloroethylene, when current detection technology cannot make that showing. NRC Staff Testimony at A32, A37; NRC-002 at A32, A37.

Further, the NRC Staff added a discussion to the FEIS of a 2005 EPA rule, discussed in more detail below, which eliminated the previous EPA prohibition on upwelling of injected effluent into an Underground Source of Drinking Water (USDW) in specified Florida counties if the effluent had received advanced treatment with high-level disinfection, since with such treatment, the effluent will not pose an adverse risk to human health. As discussed further below, the water sent to FPL from the South District Wastewater Treatment Plan will receive advanced treatment with high-level disinfection, which will enable FPL to obtain their Class I UIC permit from the Florida Department of Environmental Protection. This further supports NRC Staff's conclusions that impacts of deep well injection on groundwater quality will be SMALL; it is another indication that environmental regulations that FPL will have to follow will be protective of human health.

Joint Intervenors have had access to the FEIS since October 2016, and yet have not amended Contention 2.1 to challenge any of the information the NRC Staff added to the FEIS to address the potential environmental impacts of deep well injection of treated wastewater at the Turkey Point site. Nor have Joint Intervenors challenged the Staff's conclusions, based on that information, that there would be no impacts to drinking water and SMALL impacts to

groundwater quality as a result of deep well injection. The Joint Intervenors have not challenged the additional sampling data from the South District Wastewater Treatment Plant that shows that the 2013-2014 Constituent levels are below the detection limits in all samples. Moreover, the Joint Intervenors have not challenged the NRC Staff's additional discussion of what processes the blowdown will go through before it is injected, or how those processes will cause the blowdown to meet EPA drinking water standards for the Constituents. Finally, the Joint Intervenors have not challenged the EPA finding that there are no adverse impacts to human health from potential effluent migration into an Underground Source of Drinking Water, provided the effluent has received high-level disinfection. As explained in Sections 2.3, 5.2, 7.2 and Appendix G of the FEIS (NRC-008A, §§ 2.3 and 5.2; NRC-008B, § 7.2; NRC-008C, App. G), the NRC Staff relied, in part, on this EPA finding in drawing its conclusion that deep well injection of wastewater effluent at Turkey Point will have a SMALL impact on groundwater quality. The Joint Intervenors have not challenged this finding.

C. The FEIS Discussion of Groundwater Impacts Complies with NEPA

The NRC Staff's testimony demonstrates that the Staff evaluation of the deep well injection of cooling-tower blowdown water documented in the FEIS is adequate, and that Contention 2.1 lacks merit. As explained in the NRC Staff Testimony on Contention 2.1 and as supported by the NRC Staff exhibits, the Staff has conducted its environmental review appropriately, in compliance with the NRC's regulations that implement NEPA, and in accordance with applicable Staff review guidance. In reviewing the application, conducting its independent environmental analysis, and reaching conclusions as to the associated impacts, the NRC Staff has adequately addressed the impacts from FPL's proposed deep injection wells. The Joint Intervenors have not challenged the NRC Staff's analysis, conclusions, or the support for those conclusions, which are documented in FEIS § 5.2.3.2 at 5-39 to 5-42 (NRC-008A, § 5.2.3.2 at 5-39 to 5-42) and discussed more fully below.

1. The NRC Staff Took a “Hard Look” at Groundwater Impacts

Under NEPA, the NRC is required to take a “hard look” at the environmental impacts of a proposed action, as well as reasonable alternatives to that action. See *Louisiana Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 87-88 (1998). This “hard look” however, is tempered by a “rule of reason” that requires agencies to address only impacts that are reasonably foreseeable – not remote and speculative. See, e.g., *Long Island Lighting Co.* (Shoreham Nuclear Power Station, Unit 1), ALAB-156, 6 AEC 831, 836 (1973). The Staff’s Testimony and exhibits demonstrate that the NRC Staff’s analysis in the FEIS took the required hard look at the environmental impacts from FPL’s deep injection wells; thus, the FEIS is adequate and Contention 2.1 lacks merit.

The Joint Intervenors assert that the DEIS “has not adequately analyzed and discussed the site-specific conditions of Turkey Point that make upward migration possible, the risks associated with wastewater injection activities, and the potential of wastewater chemical constituents to contaminate [underground sources of drinking water] USDWs.” Intervenors’ 2016 Answer at 2. But the level of information that the NRC Staff provided in the FEIS—including information regarding site specific and regional conditions that may lead to upward migration of injected effluents, risks associated with the injection of wastewater, and the potential of wastewater chemical constituents in the injectate to impact the Upper Floridan aquifer, including underground sources of drinking water—is consistent with the Commission’s ruling that “an environmental impact statement [is not] intended to be a ‘research document,’ reflecting the frontiers of scientific methodology, studies, and data,” but a tool for reasonable analysis that allows an agency “to draw the line and move forward with decisionmaking.” *Pilgrim*, CLI-10-11, 71 NRC at 315 (quoting *Town of Winthrop v. FAA*, 535 F.3d 1, 11-13 (1st Cir. 2008)).

In the FEIS, the NRC Staff adequately evaluated the impacts of deep well injection at the Turkey Point site. The Staff used multiple lines of inquiry in order to evaluate the potential for upward migration of injected effluents to the Floridan Aquifer and groundwater quality. More specifically, the NRC Staff 1) reviewed studies that characterized the confining ability of the Middle Confining Unit and the causes and extent of upwelling at other deep well injection sites, 2) compared hydrogeological conditions and parameters at the sites at which upwelling occurred to conditions and parameters at the proposed site, 3) evaluated numerical modeling of flow of injected wastewater presented by the Applicant and performed confirmatory calculations, and 4) considered the injection well testing and groundwater monitoring requirements of the Florida Department of Environmental Protection's Underground Injection Control (UIC) program, which governs the type of deep injection wells proposed for use at Turkey Point. FEIS at 5-21; NRC-008A at 5-21. The extent of the analyses done by the Staff in the FEIS is sufficient to have covered all important considerations regarding FPL's deep-well injection proposal and satisfies NEPA's "hard look" requirement.

The FEIS describes in detail the evaluations Staff conducted in order to determine the potential for upward migration of wastewater into the Upper Floridan aquifer. The Staff examined information from an exploratory well constructed at the Turkey Point site to identify the porosity and permeability rock layers within the subsurface that form a barrier to upward flow from the Boulder Zone at a depth of over 3,000 feet below the surface. NRC Staff Testimony at A109, A111; NRC-002 at A109, A111. The Staff evaluated the hydraulic gradient in the Boulder Zone, considered the density of the injectate, and reviewed FPL's analysis of pressure build-up of the wastewater. NRC Staff Testimony at A112; NRC-002 at A112. The Staff also reviewed studies of vertical migration of injected wastewater at other sites in Southeast Florida to draw conclusions about potential migration pathways from the Boulder Zone to the Upper Floridan aquifer. FEIS at 5-23; NRC-008A at 5-23. Furthermore, the Staff considered multiple studies that have been conducted to characterize the confining nature of the Middle Confining Unit and

determine the causes of upwelling (either by flow through the matrix of the Middle Confining Unit, or through pathways caused by natural geologic features or well-related problems), where it has occurred. NRC Staff Testimony at A83; NRC-002 at A83. Each study is described at length in the FEIS. FEIS 5-23 to 5-26; NRC-008A at 5-23 -5-26. To understand the possible pathways of injected wastewater, the Staff evaluated local and regional site studies, modeling conducted by FPL, and Staff's own independent modeling. NRC Staff Testimony at A83, A86, A88; NRC-002 at A83, A86, A88. The results of this modeling are described and explained in detail in the FEIS. FEIS at 5-27 to 5-28; NRC-008A at 5-27 to 5-28. After thorough consideration and evaluation of the information collected, Staff reasonably concluded that upwelling into the Upper Floridan aquifer at the Turkey Point site is unlikely to occur. FEIS at 5-22, 5-28; NRC-008A at 5-22, 5-28.

In regard to groundwater quality impacts, the Staff also relied on sources of expert information to assess the risk of injecting wastewater in the region. The Staff reviewed several assessments of the risk to human and ecological health from deep wastewater injection, including a published assessment conducted by the EPA, which utilized site characterization data and modeling. FEIS at 5-40; NRC-008A at 5-40. These studies indicate that offsite concentrations of contaminants would likely be below applicable drinking water limits, and in many cases would be below laboratory detection limits. NRC Staff Testimony at A8; NRC-002 at A8. The Staff also considered in its analysis that Turkey Point would be subject to the Florida Department of Environmental Protection's Class I UIC well requirements, which require institutional controls and monitoring programs to detect upward migration of injected wastewater. Detection of contaminants at UIC monitoring wells in the Middle Confining Unit and Upper Floridan aquifer would require remedial action. Fla. Admin. Code 62-4-TN1084; NRC-042. After review of the studies described in the EIS, and after consideration of the requirements that the UIC program will impose on FPL, the Staff reached a reasonable and

supportable conclusion that groundwater impacts from the proposed project would be minor or undetectable.

The Staff's NEPA analysis is adequate unless the Staff "has failed to take a 'hard look' at significant environmental questions – i.e., the Staff has unduly ignored or minimized pertinent environmental effects." See *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-03-17, 58 NRC 419, 431 (2003) (discussing what an intervenor must allege, with adequate support, to litigate a NEPA claim). As the Commission has stated, "[o]ur Boards do not sit to "flyspeck" environmental documents or to add details or nuances. If the ER (or EIS) on its face "comes to grips with all important considerations" nothing more need be done."'" *Clinton ESP*, CLI-05-29, 62 NRC at 811 (quoting *Systems Energy Resources, Inc.* (Early Site Permit for Grand Gulf Site), CLI-05-4, 61 NRC 10, 13 (2005)). The scale of the analyses outlined above allowed the Staff to adequately analyze impacts from deep well injection at the Turkey Point site. Accordingly, the review by the Staff is "reasonably complete" and provides suitably reliable information to enable the Agency to take a "hard look" at adverse environmental impacts. See *Methow Valley*, 490 U.S. at 352.

2. The Staff's Determination that Groundwater Impacts will be SMALL is Well-Supported

Using the approach outlined in regulations promulgated by the Council on Environmental Quality, 40 C.F.R. § 1508.27, the NRC promulgated a three-level (*i.e.*, SMALL, MODERATE, and LARGE) standard system to guide its categorization of impact significance in environmental reviews. See 10 C.F.R. Part 51, App. B, Table B-1 n.3. The Staff followed this approach in drafting the Turkey Point COL FEIS. FEIS at 1-4 to 1-5; NRC-008A at 1-4 to 1.5. As explained in Part 51, App. B, Table B-1 n.3 and the FEIS, an impact is SMALL if "environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource." 10 C.F.R. Part 51, Subpt. A, App. B, Table B-1 n.3; FEIS at 1-4; NRC-008A at 1-4.

To make their impact determination regarding groundwater quality, the Staff considered the conclusions drawn from their analyses in the FEIS as well as the definition of impact findings provided in 10 C.F.R. Part 51. The Staff concluded that deep water injection of plant effluents on groundwater quality will be SMALL. FEIS at 5-42; NRC-008A at 5-42. As stated in the Staff's testimony, this impact determination rests on several bases. NRC Staff Testimony at A20; NRC-002 at A20. Accordingly, the Staff's groundwater impact determination of SMALL is clearly supported by the FEIS.

The Staff bases its determination on a number of factors discussed in detail the Staff's testimony and in the FEIS. First, the Staff considered an EPA assessment that compared the risk to human health from deep well injection relative to that of other disposal methods. NRC Staff Testimony at A45; NRC-002 at A45. This risk is further lowered when waste effluent is treated to reclaimed waste water standards (discussed in more detail below). NRC Staff Testimony at A67; NRC-002 at A67. EPA also removed the "no-migration-rule," which prohibited upwelling into drinking water aquifers in Southeast Florida because EPA modeling indicated that the risk of groundwater degradation from upward migration was extremely low. *Id.* Moreover, and explained further below, the Staff also considered the fact that wastewater sampling at the South District Wastewater Treatment Plant indicated that the concentrations of the four contaminants at issue in Contention 2.1 were below EPA drinking water standards. NRC Staff Testimony at A6, A20, A26-A38; NRC-002 at A6, A20, A26-A38; FEIS at 5-41; NRC-008A at 5-41. Finally, the Staff considered that even if migration of wastewater effluent into the Upper Floridan aquifer did occur, the impact to users would be minimal because the reclaimed wastewater from the South District Wastewater Treatment Plant will be treated by high-level disinfection and will meet EPA standards for safe drinking water, and there are no nearby users. NRC Staff Testimony at A20, A38, A88; NRC-002 at A20, A38, A88. The Upper Floridan aquifer is brackish in the area surrounding proposed Turkey Point Units 6 & 7; the

nearest user is more than 7 miles away and uses the water for surface application and not as a drinking water source. NRC Staff Testimony at A126; NRC-002 at A126.

These factors support the Staff's conclusion that the impact of wastewater effluent on groundwater quality would be SMALL, even if upward migration were to occur. For the impact level to be higher, substantial changes in geology, concentrations of chemical constituents in the wastewater, and water use would need to occur. The results of Staff's careful analysis of groundwater quality impacts at the Turkey Point site indicate that environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. As such, the Staff's finding that the potential environmental impacts at the Turkey Point site of deep-well injection on the environment are SMALL is well-supported.

D. The Concentrations of Four Chemical Constituents in the Wastewater Injections Will Not Adversely Affect Groundwater Through Migration

Contention 2.1 asserts that the concentrations of ethylbenzene, heptachlor, tetrachloroethylene, and toluene in the wastewater effluent from Turkey Point Units 6 & 7 may adversely impact groundwater quality if the effluent were to migrate from the Boulder Zone to the Upper Floridan aquifer. LBP-16-03, 81 NRC at 186. As discussed above, the Staff concluded after thorough evaluation and analyses of multiple sources – which Joint Intervenors do not challenge -- that the potential environmental impacts at the Turkey Point site of deep well injection of wastewater effluent would be SMALL. The Staff's conclusion is largely based on three findings: 1) the concentrations listed in Table 3-5 in the FEIS for the Constituents in the blowdown that will be injected into the Boulder Zone are below EPA's protective drinking water standards; 2) the chemical concentrations are likely to be even lower than those listed in Table 3-5 due to additional treatment of the wastewater effluent prior to injection; and 3) significant upwelling of injected wastewater is not likely at the Turkey Point site and, if upwelling did occur, it would not noticeably impact underground sources of drinking water in the Upper Floridan aquifer.

1. The Chemical Constituents in the Wastewater Injectate Are Below EPA Maximum Contaminant Levels for Drinking Water

Contention 2.1 is primarily concerned with groundwater quality. Joint Intervenors raise the issue of whether FPL's plan to inject wastewater deep into the earth under the proposed Units 6 & 7 will harm users of the Upper Floridan aquifer. The NRC Staff, as evidenced by the exhaustive discussions in the FEIS on the impacts of the injected wastewater, thoroughly considered, analyzed and evaluated what the potential impacts of deep-well injection would be on users of groundwater in the vicinity of the Turkey Point site. NRC Staff Testimony at A83, A105, A115, A122, A126; NRC-002 at A83, A105, A115, A122, A126. One of the considerations the NRC Staff included in its overall finding that the impacts of deep-well injection on groundwater quality would be SMALL is the fact that sampling of reclaimed municipal wastewater at the South District Wastewater Treatment Plant, which FPL would use at Turkey Point Units 6 and 7, indicated that the Constituents are actually only present at very low concentrations. FEIS Table 3-5; NRC-008A, Table 3-5; NRC Staff Testimony at A51; NRC-002 at A51.

The South District Wastewater Treatment Plant wastewater, which will be used as the primary source of cooling water for proposed Units 6 & 7 before being injected, is treated in accordance with Federal Underground Injection Control (UIC) requirements set forth by the EPA. NRC Staff Testimony at A8, A12, A20, A40; NRC-002 at A8, A12, A20, A40; see 40 C.F.R. § 146.15. This treatment entails both primary and secondary treatment to prevent release of pollutants from the South District Wastewater Treatment Plant facility and to then remove total suspended solids and treat soluble organic matter. NRC Staff Testimony at A40; NRC-002 at A40. The chemicals ethylbenzene, heptachlor, tetrachloroethylene, and toluene

are contaminants that must be reduced to meet stringent standards.⁶ In 2005, Federal UIC requirements added an additional treatment process for municipal wastewater facilities, called high-level disinfection. NRC Staff Testimony at A40; NRC-002 at A40. The purpose of high-level disinfection is to treat the wastewater to “a level that is no longer a threat to [underground sources of drinking water] USDWs” if it were to migrate from the injection zone into an Underground Source of Drinking Water. NRC Staff Testimony at A42; NRC-002 at A42. According to the EPA, high-level disinfection is designed to be as effective in protecting an Underground Source of Drinking Water (USDW) from chemicals in wastewater as confinement requirements because, even if the wastewater moves into an Underground Source of Drinking Water, “the quality of the wastewater has been treated to a level that is no longer a threat to USDWs.” NRC Staff Testimony at A52, A67; NRC-002 at A52, A67.

These federal UIC treatment requirements are important to the Staff’s analysis of the impacts of deep-well injection on groundwater quality because they are measures to ensure that, before the wastewater is even injected into the ground, the water is of such quality that it will pose no measureable threat to public health. EPA determines the standards by establishing a Maximum Contaminant Level (MCL) for each contaminant, which is protective of human health. 40 C.F.R. § 141.61; NRC Staff Testimony at A6, A20, A26-A37; NRC-002 at A6, A20, A26-37. While these standards are enforceable for public water systems, they usually do not apply to treated wastewater. However, in the event wastewater effluent comes into contact with a drinking water supply, the more stringent drinking water standards would prevent levels of contaminants in the water from being high enough to have adverse impacts on human health. NRC Staff Testimony at A28; NRC-002 at A28.

⁶ According to the NRC Staff testimony, “secondary treatment technology must reduce total suspended solids to 20 mg/L or less, and have a 5-day carbonaceous biochemical oxygen demand of 20 mg/L, or must remove at least 90% of each of these pollutants, whichever is more stringent.” NRC Staff Testimony at A56; NRC-002 at A56.

Before high-level disinfection was implemented at the South District Wastewater Treatment Plant, the sampling of wastewater at the site detected all named constituents except for ethylbenzene, though the levels of the three detected constituents were below EPA Maximum Contaminant Levels. FEIS Table 3-5; NRC-008A at 3-5; NRC Staff Testimony at A30, A33-A35; NRC-002 at A30, A33-35. Additional sampling of wastewater in 2013 and 2014, after high-level disinfection was implemented at the South District Wastewater Treatment Plant, shows that each of the four constituents were below both the EPA Maximum Contaminant Levels and the laboratory Method Detection Limit, which means that the concentrations are so low that they were below the level at which the laboratory can reliably quantify them. FEIS Table 3-5, note b; NRC-008A, Table 3-5 note b; NRC Staff Testimony at A29; NRC-002 at A29. As such, even before high-level disinfection treatment was conducted the reclaimed wastewater met UIC standards for injection. NRC Staff Testimony at A38, A40, A41; NRC-002 at A38, A40, A41. After treatment, the quality of the wastewater was even higher. *Id.*

Table 3-5 in the FEIS shows concentrations of chemicals calculated to be present in effluent at the point of injection based on the results of the laboratory analyses of samples of reclaimed wastewater collected at the South District Wastewater Treatment Plant from 2007 through 2011. These reclaimed wastewater samples had received secondary treatment. NRC Staff Testimony at A38; NRC-002 at A38. As shown in the FEIS Table 3-5, three of the four chemical constituents were detected in the waste water at levels well below the EPA Maximum Contaminant Level for each compound. FEIS Table 3-5; NRC-008A, Table 3-5. Ethylbenzene, which has an MCL of 0.7 milligrams per liter (mg/L) (40 C.F.R. § 141.61(a)), was consistently below the laboratory detection limits. FEIS Table 3-5; NRC-008A, Table 3-5.

Heptachlor has a Maximum Contaminant Level of 0.0004 mg/L. 40 C.F.R. § 141.61(c). The pre-high-level disinfection samples (collected from 2007-2011) reflected concentrations of 0.000023 mg/L, which is eight times lower than the safe drinking water level. NRC Staff Testimony at A30; NRC-002 at A30. Samples collected during 2013-2014 yielded results below

the method detection limit for heptachlor. *Id.*; FEIS Table 3-5, note b; NRC-008A, Table 3-5, note b. EPA considers tetrachloroethylene to be safe for drinking at concentrations of 0.005 mg/L or less. 40 C.F.R. § 141.61(a); NRC Staff Testimony at A35; NRC-002 at A35. The 2007-2011 sampling of the reclaimed wastewater detected a concentration of tetrachloroethylene at 0.00359 mg/L. FEIS Table 3-5; NRC-008A, Table 3-5. This is nearly two times lower than the Maximum Contaminant Level for this chemical. NRC Staff Testimony at A35; NRC-002 at A35. Finally, the Maximum Contaminant Level for toluene is 1.0 mg/L. 40 C.F.R. § 141.61(a). Samples taken from the South District Wastewater Treatment Plant during 2007-2011 indicated a value of 0.00174 mg/L of toluene. NRC Staff Testimony at A34; NRC-002 at A34. This is over five hundred times lower than the levels EPA considers to be protective of human health. *Id.*

To the extent the Joint Intervenors assert that cooling-tower blowdown injected into the Boulder Zone may adversely affect the quality of groundwater and may be harmful to users, their claim is unfounded. NRC Staff Testimony at A38; NRC-002 at A38. As noted above, the Federal UIC program requires that wastewater that may come into contact with Underground Sources of Drinking Water (USDW) be treated to meet EPA standards that are protective of human health. *Id.* The wastewater effluent that FPL proposes to inject into the Boulder Zone will be subject to those stringent requirements. *Id.* Indeed, sampling of the wastewater affirmatively demonstrates that the levels of ethylbenzene, heptachlor, tetrachloroethylene, and toluene are consistently below EPA Maximum Contaminant Levels, and are even below detection limits if the reclaimed wastewater is subject to high-level disinfection. FEIS Table 3-5, note b; NRC-008A, Table 3-5, note b. As reflected in Staff testimony and in the FEIS, the NRC Staff determined that the impact on human health from reclaimed water entering the groundwater through injection would be SMALL. NRC Staff Testimony at A38; NRC-002 at A38. This conclusion is supported, in part, by the fact that the quality of the wastewater that will be injected into the Boulder Zone is already at a level that is safe for drinking water purposes.

NRC Staff Testimony at A26-38; NRC-002 at A26-A38. As such, the injected wastewater will not adversely impact the groundwater quality in the Boulder Zone or Upper Floridan aquifer.

NRC Staff Testimony at A6; NRC-002 at A6. As indicated above, these analyses are documented in the FEIS and the Joint Intervenors have not challenged them.

2. The Wastewater Will be Further Treated Through the Cooling Process at the Turkey Point Site Prior to Injection

As noted above, the reclaimed wastewater at the South District Wastewater Treatment Plant is required to meet Federal UIC permit standards for water quality before it leaves the plant, such that the wastewater will meet these standards before it is used as part of the cooling process at Turkey Point Units 6 & 7. NRC Staff Testimony at A40; NRC-002 at A40. The treatment process requires that the wastewater meet EPA drinking water standards in order to protect public health, should the injectate migrate into an Underground Source of Drinking Water (USDW). *Id.* Turkey Point Units 6 & 7 will receive reclaimed wastewater from the South District Wastewater Treatment Plant for use as cooling water after the wastewater has been treated to meet EPA standards for water quality, which it would then inject into the Boulder Zone after use. *Id.*; NRC Staff Testimony at A12; NRC-002 at A12. It is likely that the concentration of the Constituents in the cooling-tower blowdown water at the point of injection at Turkey Point Units 6 & 7 will be even lower than the values presented in Table 3-5. NRC Staff Testimony at A61-A63; NRC-002 at A61-A63.

The Staff explains the additional processes that will be applied to the reclaimed wastewater in its testimony. *Id.* Once the wastewater is on site at Turkey Point, it will undergo an evaporative cooling process and dilution, which will lower the concentrations of the chemical contaminants to those reported in FEIS Table 3-5 prior to injection. NRC Staff Testimony at A8, A29, A56, A60; NRC-002 at A8, A29, A56, A60. The wastewater will also go through the process of volatilization, which transfers contaminants from the aqueous phase directly to the gaseous phase, thus lowering the contaminant concentrations in the water even further. NRC

Staff Testimony at A61-A63; NRC-002 at A61-A63. The Staff states in its testimony that volatilization will be effective in removing the low concentrations of three of the contaminants (ethylbenzene, tetrachloroethylene, and toluene) as the water circulates four times through the cooling towers at the site at temperatures greater than 110° Fahrenheit. NRC Staff Testimony at A62-A63; NRC-002 at A62-A63. The Staff states that as much as 75-98% of the levels of the three chemicals in the wastewater would be removed. NRC Staff Testimony at A62; NRC-002 at A62.

The additional processes that will be used to treat the reclaimed wastewater will also be effective in reducing or degrading the levels of heptachlor. Heptachlor is broken down primarily through chemical hydrolysis, which is strongly influenced by the temperature of the cooling system. NRC Staff Testimony at A63; NRC-002 at A63. During the cooling process, water temperatures will increase to as much as 110° degrees Fahrenheit, thus increasing the rate of hydrolysis and decreasing the concentration of heptachlor. *Id.* Volatilization and photodegradation are also methods to reduce the concentrations of heptachlor, and both processes will occur while the water cycles through the cooling system. *Id.* The Staff indicates that the concentration of heptachlor could be further reduced by as much as 50% as a result of these additional processes before injection. *Id.*

In Contention 2.1, Joint Intervenors raise the issue of possible impacts of the four chemical constituents on users of the Upper Floridan aquifer. The Staff states that the wastewater from the South District Wastewater Treatment Plant will be cycled through the cooling water system at Turkey Point four times, which will “substantially reduce any remaining concentrations of the four constituents through the process of volatilization (for VOCs) and chemical hydrolysis and photodegradation (for heptachlor).” NRC Staff Testimony at A67; NRC-002 at A67. As such, the NRC Staff’s conclusion that the impact of deep well injection of wastewater on groundwater quality will be SMALL is adequately supported by these findings.

3. There Will be Minimal Migration between the Boulder Zone and the Upper Floridan Aquifer

NEPA obligates the NRC to describe the environmental effects of the proposed action. In so doing, the FEIS thoroughly describes and evaluates the injection environment and analyzes what is most likely to happen to the injected wastewater. FEIS at 5-26 to F-29; NRC-008A at 5-26 to 5-29; NRC Staff Testimony at A122-A127; NRC-002 at A122-A127. The Staff's testimony and the FEIS demonstrate that upwelling of wastewater injectate will be minimal. NRC Staff Testimony at A122-A127; NRC-002 at A122-A127. The strata underlying the Turkey Point site indicates that any upwelling will not reach the Upper Floridan aquifer and will not be harmful to users. *Id.*

As part of the FDEP UIC permit process, FPL is required to demonstrate that plant effluent injected into the Boulder Zone will not impact underground sources of drinking water. NRC Staff Testimony at A25; NRC-004 at A25. This means that FPL must make this showing for each injection well location. *Id.* The NRC Staff also evaluated the stratigraphy of the Turkey Point site, documenting its evaluation in Sections 2.3, 5.2, 7.2 and Appendix G of the FEIS. NRC Staff Testimony at A83, A93, A99; NRC-002 at A83, A93, A99. In its analysis, the Staff reviewed expert studies on the adequacy of the Boulder Zone to receive and the Middle Confining Unit to confine injected effluent. *Id.*

The NRC Staff determined the most likely scenario for the movement of injected effluent in the Boulder Zone by reviewing extensive literature and conducting confirmatory analyses. *Id.* The Staff found that, because the injected wastewater would have a lower Total Dissolved Solids content and an elevated temperature compared to the native water in the Boulder Zone to which it would be injected, the injected wastewater would have a lower density than the native water, resulting in buoyancy. NRC Staff Testimony at A89, A127; NRC-002 at A89, A127. Further, the Staff concluded that the natural gradient of the Boulder Zone is very small compared to the pressure developed at the injection point by the injection pumps; accordingly,

the injected reclaimed wastewater will be forced in all directions from the injection point into the Boulder Zone. NRC Staff Testimony at A127; NRC-002 at A127.

From the injection point, the Staff determined that buoyant forces will dominate the small natural gradient due to the lower density warm injectate, resulting in an overall upward hydraulic gradient in the Boulder Zone. *Id.* However, expert studies show that upward flow of injected wastewater would nonetheless be inhibited by the more than 1,465 ft thick sequence of predominately low-permeability rocks that lie between the Boulder Zone and the underground sources of drinking water aquifer. *Id.* Due to the overall dip of the base of the Middle Confining Unit in southeast Florida, any migration within the Boulder Zone beyond the site would move northeast toward (but beneath) the Biscayne Bay and away from areas in which the upper aquifers are used. *Id.*

The Staff performed a separate confirmatory analysis of the modeling presented by FPL. The results of this analysis are presented in Section G.3.3 of Appendix G. The Staff verified that, in the absence of well-defined pathways, upward migration of injectate from the Boulder Zone would likely be less than 300 ft. FEIS at G-50; NRC-008C at G-50; NRC Staff Testimony at A112, A119; NRC-002 at A112, A119. In the confirmatory modeling presented in Section G.3.3 of the FEIS, the NRC staff calculated the extent of upward migration of injectate from the injection site in the Boulder Zone through the Middle Confining Unit. *Id.* The confirmatory analysis determined that upward migration of injectate from the Boulder Zone would likely be less than 300 ft. NRC Staff Testimony at A119; NRC-002 at A119.

The Staff concludes that while some vertical migration may occur, site conditions are consistent with those indicated by studies to prevent significant migration. Significant vertical migration of effluent out of the Boulder Zone due to flow through the matrix or natural pathways (fractures, faults) is not expected at the Turkey Point site. NRC Staff Testimony at A20, A79, A88; NRC-002 at A20, A79, A88. If significant vertical migration of effluent occurred, it would not likely reach the Upper Floridan aquifer. NRC Staff Testimony at A88; NRC-002 at A88.

Injected blowdown is not likely to migrate horizontally from the point of injection to a location beneath actual users, and is not likely to migrate from the point of injection through the Middle Confining Unit, so the Constituents are not likely to migrate into the Upper Floridan aquifer. NRC Staff Testimony at A17, A88, A128; NRC-002 at A17, A88, A128.

Joint Intervenors make a number of arguments in Contention 2.1 regarding the potential migration of wastewater into underground sources of drinking water that are without merit. First, Joint Intervenors challenge the viability of the tests FPL conducted on well EW-1, along with its conclusions. Joint Intervenors' 2016 Answer at 7-9. FPL drilled well EW-1 as an exploratory well to evaluate site hydrogeology and the characteristics of the confining geological layers. NRC Staff Testimony at A79, A80; NRC-002 at A79, A80. The results of the EW-1 studies can be found in FEIS §§ 2.3.1.2, 5.2.1.3, and 5.2.3.2 (NRC-008A, §§ 2.3.1.2, 5.2.1.3, and 5.2.3.2) as well as in a 2012 FPL report.⁷ NRC Staff Testimony at A83, A95-A96; NRC-002 at A83, A95-A96. The tests at EW-1 provide part of the basis for Staff's conclusions regarding the ability of the Middle Confining Unit to confine injected wastewater. NRC Staff Testimony at A95-A96, A107-A108; NRC-002 at A95-A96; A107-108. However, the Joint Intervenors have not challenged any of the information the NRC Staff added to the FEIS to address Contention 2.1, nor have they identified any adverse impact to groundwater quality other than potential impacts to an Underground Source of Drinking Water. See 2010 Petition at 27; Joint Intervenor 2016 Answer at 13.

Joint Intervenors submitted the affidavit of Mark Quarles, an environmental consultant and licensed geologist, to support their position that the tests at EW-1 were subject to flawed testing and that NRC Staff conclusions about the confining ability of Middle Confining Unit

⁷ FPL (Florida Power & Light Company) 2012. Report on the Construction and Testing of Class V Exploratory Well EW-1 at the Florida Power & Light Company Turkey Point Units 6 & 7. McNabb Hydrogeologic Consulting, Inc., Jupiter, Florida. Accession No. ML14336A337. NRC-056.

cannot be based on this information.⁸ Mr. Quarles cites issues with the testing procedures. He says that, first, the studies were drawn from tests at a single well (¶ 10); that pulverized drill cuttings do not provide adequate information to determine bedrock conditions (¶ 13); that an inadequate number of bedrock samples were taken and were randomly collected, indicating that the samples were not representative of bedrock conditions for the entirety of the boring (¶ 14, 15); and that the straddle packer testing was insufficient due to the failure of a 9 out of 19 packers failing to generate numeric results (¶ 19). Mr. Quarles also asserts that the data collected from the EW-1 tests indicate voids in the bedrock and high porosity, which suggest “significant fractures and substantial weathering that may not be capable of preventing substantial vertical and horizontal migration of injected wastewater.” ¶ 22. As such, according to Mr. Quarles, Staff’s conclusions based on these tests “do not support the conclusion that a confining layer of sufficient thickness, lithological characteristics, and hydraulic characteristics exists to prevent vertical migration of wastewater injected into the Boulder Zone from migrating into [underground sources of drinking water] USDWs.” Quarles Aff. ¶ 24.

To the extent Mr. Quarles is concerned about data from one well not being sufficient to identify hydrogeological issues elsewhere on the Turkey Point site, his concern is unfounded. While EW-1 was FPL’s first exploratory well at the Turkey Point site, there will ultimately be 18 wells on site (12 for injection, 6 for monitoring). NRC Staff Testimony at A80; NRC-002 at A80. Although the data cited by the Staff as a basis for its conclusion about Middle Confining Unit confinement is taken from the EW-1 well, data from all 12 injection wells must show that the Middle Confining Unit offers confinement of injected fluids in order to be issued a UIC program permit by the FDEP. NRC Staff Testimony at A25; NRC-002 at A25. As such, all wells on site

⁸ Joint Intervenors’ Answer to [FPL’s] Motion for Summary Disposition of Joint Intervenors’ Amended Contention 2.1, attach. 2, Third Affidavit of Mark A. Quarles (Feb. 3, 2016) [Quarles Aff].

must demonstrate the same level of Middle Confining Unit confinement that EW-1 has demonstrated. *Id.*

Further, study of the EW-1 well and the NRC Staff's conclusions based on those studies are discussed in at length in the NRC Staff's testimony and in the FEIS, which the Joint Intervenors have not challenged. The NRC Staff states that the testing at EW-1 evaluated

“whether effective vertical confinement is present below the base of the [underground sources of drinking water] USDW. This testing included analysis of drill cuttings, rock cores, geophysical logging, and packer flow testing of selected intervals. Geophysical log data included caliper, gamma ray, spontaneous potential, dual-induction, borehole compensated sonic, video, flowmeter, fluid conductivity, and temperature data.”

NRC Staff Testimony at A107; NRC-002 at A107.

The NRC Staff testimony and the FEIS also discuss the procedures by which testing at EW-1 was conducted. The Staff maintains that the testing and samples taken at EW-1 were adequate and appropriate for their intended purpose. NRC Staff Testimony at A108-A112; NRC-002 at A108-A112. In particular, the NRC Staff evaluated geophysical logs and flow tests. NRC Staff Testimony at A117; NRC-002 at A117. FPL analyzed the data and obtained results (NRC Staff Testimony at A116; NRC-002 at A116) and the NRC Staff performed independent analysis that confirmed the results obtained by FPL. NRC Staff Testimony at A112, A119; NRC-002 at A112, A119; FEIS, App. G, § G.3.3 at G-50; NRC-008C, § G.3.3 at G-50; NRC-058. In the confirmatory modeling presented in the FEIS, the NRC Staff calculated the extent of upward migration of injectate from the injection zone through a competent Middle Confining Unit. FEIS at G-48; NRC-008C at G-48. The NRC Staff testimony describes the pertinent procedures in more depth. NRC Staff Testimony at A108-A111; NRC-002 at A108-A111.

Further, even if Mr. Quarles is correct and some of the samples and analyses in the EW-1 tests were faulty, the EW-1 testing was not the only data collected by Staff to determine if confinement of the injectate is adequate to protect underground sources of drinking water (USDW) aquifers, as described below. Among other things, the Staff reviewed regional studies

characterizing the hydrogeology of south Florida, evaluated return velocities in sonic logs, evaluated numerical modeling of flow of injected wastewater and reviewed studies of the geologic and hydrogeologic characteristics that affect the ability of the Middle Confining Unit to confine injected wastewater, including several studies from sites where upward migration has occurred, such as the South District Wastewater Treatment Plant. NRC Staff Testimony at A99-A106; NRC-002 at A99-106; NRC-043; NRC-044; NRC-046; NRC-047; NRC-048; NRC-053; NRC-064. The NRC Staff evaluation of these data confirmed the presence of confining layers and a lack of evidence for extensive vertical pathways through the Middle Confining Unit. NRC Staff Testimony at A99-A106, A112, A119; NRC-002 at A99-106, A112, A119; NRC-043; NRC-044; NRC-046; NRC-047; NRC-048; NRC-053; NRC-064.

Second, Joint Intervenors question the Staff's conclusions on confinement integrity by asserting that a 2012 United States Geological Survey (USGS) regional study undermines Staff's conclusions. Again, Joint Intervenors provide an affidavit from Mr. Quarles to support their position. Quarles Aff. ¶¶ 30-38. Mr. Quarles states that a 2008 USGS study concludes that the degree of confinement provided by the Middle Confining Unit is "uncertain," and therefore undermines the Staff's confidence "that an adequate confining layer exists." Quarles Aff. ¶ 29. Mr. Quarles states that the Staff did not rely on the more recent 2012 USGS study that "collected data very near the Turkey Point site" and concluded that "tectonic faults and karst collapse structures" provide pathways for the possible vertical flow of water through the Middle Confining Unit and into USDWs. *Id.* at ¶¶ 30, 31, 32. As such, Mr. Quarles asserts that the Staff "relied on outdated and inaccurate information to conclude that adequate confining layers exist at the Turkey Point site." *Id.* at ¶ 37. In addition, earlier studies incorrectly identified the Avon Park Permeable Zone as part of the Upper Floridan aquifer. NRC Staff Testimony at A91-A95; NRC-002 at A91-A95; NRC-010; NRC-040; NRC-043; NRC-044; NRC-046; NRC-056; FEIS at 2-57 and 5-23; NRC-008A at 2-57 and 5-23.

Mr. Quarles is incorrect that the Staff did not rely on the more recent 2012 USGS study when drawing its conclusions about the confinement effectiveness of the Middle Confining Unit. The 2012 study is discussed in Staff's testimony as well as in the FEIS and was considered by Staff when drawing its conclusions. NRC Staff Testimony at A105, A106; NRC-002 at A105, A106; FEIS at 2-25; NRC-008A at 2-25; NRC-046; NRC-053. The Staff acknowledges that the 2012 USGS study identified karst collapse features in the vicinity of the Turkey Point site, and indicated that these features extend from the Middle Confining Unit to the Upper Floridan aquifer. NRC Staff Testimony at A105; NRC-002 at A105. The Staff determined, however, that migration above the Avon Park Permeable Zone and into the Upper Floridan aquifer resulting from natural features has not been definitively identified at any site in south Florida. NRC Staff Testimony at A106; NRC-002 at A106; FEIS at 5-25; NRC-008A at 5-25. Joint Intervenors do not dispute this conclusion.

To evaluate the likelihood that injected wastewater would remain confined in the saline aquifers below the Upper Floridan underground sources of drinking water (USDW) aquifer, the Staff, with respect to well integrity, considered the injection well testing and groundwater monitoring requirements of the Florida Department of Environmental Protection's UIC program. FEIS at 5-17 to 5-18; NRC-008A at 5-17 to 5-18. Moreover, upwelling related to well construction issues is not expected at the Turkey Point Units 6 and 7 site because under newer well construction techniques, the pilot hole is cemented before the actual well is drilled. NRC Staff Testimony at A179; NRC-002 at A79; FEIS at 2-56; NRC-008A at 2-56. The NRC Staff determined that the proposed monitoring of injection well construction and operation is sufficient to detect incorrect well construction or well failure during operation in a timely manner. FEIS at 5-22, 5-41; NRC-008A at 5-22, 5-41. During operation, the wells will be tested to ensure mechanical integrity. NRC Staff Testimony at A179; NRC-002 at A79. These monitoring and testing provisions will allow FPL to take appropriate remedial action.

Geologic uncertainty will never be zero, but the Staff review was aimed at drawing an impact conclusion based on the best available information. NEPA requires application of a “rule of reason” to environmental analyses. See *Louisiana Energy Servs.*, CLI-05-20, 62 NRC at 536. The Staff has performed a reasonable analysis here. Accordingly, the Contention 2.1 component asserting the Middle Confinement Unit’s lack of ability to prevent upward migration of injected cooling-tower blowdown from the Boulder Zone should be rejected.

CONCLUSION

For the reasons set forth above, Contention 2.1 is without merit and the Board should find in favor of the NRC Staff.

Respectfully submitted,

/Signed (electronically) by/

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Executed in accord with 10 C.F.R. § 2.304(d)

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Dated at Rockville, Maryland
this 1st day of March, 2017

March 1, 2017

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
)
FLORIDA POWER & LIGHT COMPANY) Docket Nos. 52-040 & 52-041
)
(Turkey Point Units 6 and 7))

CERTIFICATE OF SERVICE

I hereby certify that the "NRC STAFF INITIAL STATEMENT OF POSITION" has been filed through the E-Filing system this 1st day of March, 2017.

/Signed (electronically) by/

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