UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)		
	)	Docket Nos.	52-029-COL
Progress Energy Florida, Inc.	)		52-030-COL
	)		
(Combined License Application for	)		
Levy County Nuclear Plant, Units 1 and 2)	)	ASLBP No.	09-879-04-COL

PRE-FILED DIRECT TESTIMONY OF
ELDON C. BLANCHER II, PhD
Regarding Impact of Cooling Tower Salt Emissions

I. BACKGROUND AND PROFESSIONAL QUALIFICATIONS

Q1. Please state your name and business address.

A1. My name is Dr. Eldon C. Blancher II. My business address is 775 N. University Boulevard, Suite 200, Mobile, Alabama.

Q2. Please state your employer and position.

A2. I am Chief Scientist and Chief Executive Officer of Sustainable Ecosystem Restoration, an environmental consulting company.

Q3. Please describe your professional qualifications.

A3. I hold a Doctorate degree in Environmental Engineering Sciences from the University of Florida, a Masters degree in Zoology and Physiology from Louisiana State University, and a Bachelors degree in biological sciences from the University of New Orleans. I also performed post-doctoral research involving factors, primarily nutrients, affecting the production of plants, such as algae and submerged aquatic plants, in Lake Okeechobee, including aquatic and wetland habitats around the lake. I am certified by the American Academy of Environmental Engineers as a certified Environmental Scientist in Biology. I am a member of the Water Environment Federation, and served as chair of the Marine Water Quality and Ecology Committees of that organization. I also have been active in the Society of Environmental Toxicology and Chemistry, and have served on several committees in that organization. I have specialized, for more than 30 years, in assessing the impacts of the discharges of various substances on wetland and aquatic systems. During my career, I have performed such impact analyses for numerous habitats, including habitats throughout Florida. These analyses include the impact of direct and

indirect discharges to wetlands, lakes, streams, and estuaries, including areas designated as Outstanding Florida Waters ("OFW")[1], and wildlife management areas. With respect to environmental impacts from salt discharges, I have assessed saltwater impacts from oil and gas activity on several forested and herbaceous wetland systems; prepared and executed computer models of saltwater releases into both freshwater and marine habitats to assess the impacts on flora and fauna; and evaluated the impact of saltwater intrusion into a swamp resulting from hydrologic modification. For more than 18 years, I managed an aquatic toxicology laboratory certified in Florida, Louisiana, South Carolina, and North Carolina. During that time, I studied the impact of low level salinities on a variety of organisms and assessed potential releases of waters containing various salt concentrations into a variety of freshwater and estuarine systems. My impact assessment studies included assessing the effect of cooling water discharges from power generating facilities and the subsequent increase in dissolved solids within those waters. PEF602 contains a statement of my professional qualifications.

Q4. What is the purpose of your testimony?

A4. The purpose of my testimony is to address, on behalf of Progress Energy Florida, Inc. ("PEF"), certain aspects of Contention 4A, Part B as admitted by the Nuclear Regulatory Commission's ("NRC") Atomic Safety and Licensing Board ("Board") in the Levy County Nuclear Plant, Units 1 and 2 ("LNP") Combined Construction Permit and Operating License ("COL") proceeding. As admitted by the Board, Part B of Contention 4A asserts that "[t]he Draft Environmental Impact Statement (DEIS) fails to comply with 10 C.F.R. Part 51 and the National Environmental Policy Act because it fails to specifically and adequately address, and inappropriately characterizes as SMALL, certain direct, indirect and cumulative impacts, onsite and offsite, of constructing and operating the proposed LNP facility [including] ... Impacts to wetlands, floodplains, special aquatic sites and other waters, associated with salt drift and salt deposition resulting from cooling towers (that use salt water) being situated in an inland, freshwater wetland area of the LNP site."

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[1] For the convenience of the reader, PEF601 lists selected acronyms from this testimony and their meaning.

Q5. What aspects of Part B of Contention 4A will you address in your testimony?

A5. My testimony will focus on the potential environmental impacts of the cooling tower salt drift emissions that will result from the operation of the LNP, as those emissions are deposited on the ground surface. The testimony of Dr. George C. Howroyd (PEF500) quantifies the deposition of those emissions.

Q6. Are you knowledgeable of the matters regarding Contention 4A, Part B?

A6. Yes. I am knowledgeable of matters relating to salt drift and the potential impacts to wetlands, floodplains, special aquatic sites, OFW, and other waters (for purposes of my testimony, I will refer to these areas as the "aquatic resources"). As I mentioned above, I have worked on numerous matters involving salt impacts to freshwater, as well as to associated flora and fauna. I have also looked at low flow considerations and downstream impacts of seepage waters with high levels of dissolved solids (i.e., salts) on the Little Manatee River in Manatee County, Florida.

Q7. What issues raised by Contention 4A, Part B are relevant to your testimony?

A7. I understand that Contention 4A, Part B, raises the following issues with respect to salt drift deposition into the freshwater aquatic environment: (1) the potential impacts to the aquatic resources from salt deposition due to the proposed LNP's cooling towers being situated in an inland, freshwater wetland area; and (2) whether the NRC in its Final Environmental Impact Statement ("FEIS") for the LNP has adequately addressed and characterized impacts on the aquatic resources relating to salt drift from the LNP's cooling towers.

Q8. What has been your role in the LNP project relative to Contention 4A, Part B?

A8. I was engaged by PEF as a consultant in the State of Florida site certification hearings for the LNP in the area of environmental impacts from the facility, including potential impacts from increased temperature and salt water levels to a variety of biota, including both flora and fauna. I also evaluated potential impacts to adjacent fauna and flora from nutrients contained in the LNP's discharges. My focus was primarily on the impact to adjacent estuarine areas, and in particular, sea grass and associated flora and fauna. In addition, I was engaged to support PEF in responding to Contention 4A, Part B by evaluating the potential impacts on waters and the aquatic environment from the LNP's estimated cooling tower salt drift. In support of that evaluation, I visited the LNP site and completed an extensive tour of the LNP's north and south properties, as illustrated in the map contained in BRD001, p. 2. I studied the various habitat types located on the site

and adjacent properties. I also reviewed the salt drift modeling performed for PEF in this proceeding by Dr. George Howroyd, and used that model's output to evaluate the salt drift impacts to aquatic resources in the area. I also reviewed the affidavits that Dr. Howroyd and Dr. Mitchell Griffin submitted earlier in this proceeding, as well as the affidavits on the subject submitted previously by Dr. Sydney Bacchus. I also reviewed the prefiled testimony of Drs. Howroyd (PEF500) and Griffin (PEF001).

II. OVERVIEW

Q9. Please summarize your testimony.

A9. My testimony sets forth my professional opinion regarding the impacts on the aquatic resources, including associated flora and fauna, from salt deposition resulting from operation of the LNP cooling towers. My analysis shows that, consistent with NRC Guidance, the worst case salt deposition rates as calculated by Dr. Howroyd, even under extreme drought conditions, would result in salt concentrations too low to cause damage to the aquatic resources onsite and offsite at the LNP. Accordingly, I agree with the conclusions in the FEIS that: "[n]o adverse impacts on vegetation are predicted for lands outside of the LNP site because the maximum predicted monthly salt deposition rates for the 2001 through 2005 meteorological data years were all below the threshold limit for offsite lands" (NRC001, Section 5.3.1.1 at p. 5-21); "the impact on vegetation from salt drift is expected to be minor, infrequent and limited to the LNP site" (NRC001, Section 5.3.1.1 at p. 5-22); "[c]onsidering the very low additional contribution to surface-water salinity from cooling-tower drift and the low likelihood for substantial concentrations of salts in surface waters, cooling-tower drift is not expected to impair freshwater ecosystems on the LNP site" (NRC001, Section 5.3.1.1 at p. 5-24); "[i]ncidents of salt toxicity in animals that reside around the LNP site would be highly unlikely;" and "little impact [from salt drift] is expected on amphibians" (NRC001, Section 5.3.1.1 at p. 5-25).

III. DESCRIPTION OF AQUATIC RESOURCES AND POTENTIAL IMPACTS FROM SALT DEPOSITION

Q10. What habitat types are located on the LNP site and adjacent properties?

A10. The LNP site and adjacent properties contain a complex series of habitats of both upland and numerous small wetland areas. The upland areas have been under extensive silviculture activities for more than a century, and consist primarily of pine plantation with mixed hardwood-conifer areas. NRC001, Section 2.2.1 at p. 2-5. Extensive furrowing (ridges where trees are planted) for the pine plantation remain on the site, and the sil-

viculture practices have dramatically altered hydrologic regimes throughout the site. These altered hydrologic regimes generally do not have the more salt-sensitive species observed in pristine wetlands.

Q11. How could these habitats, in theory, be adversely impacted by salt deposition?

A11. Significant salt deposition has the potential to affect the existing vegetation in these habitats by burning leaves. In addition, prolonged exposure to salt water from accumulated salt deposition, combined with rainfall to produce a salt runoff, could potentially be harmful to a variety of freshwater wetlands plants and animals. Impacts could be manifested as salt burn on vegetation, mortality of sensitive plants, and a shift in species. The extent of these impacts is dependent upon the magnitude of the salt deposit rate, the period of time that the salt is deposited and accumulated, and rainfall amounts. As my testimony shows, however, in my professional opinion, cooling tower salt drift from the LNP will not cause such impacts on the aquatic resources, including associated flora and fauna, onsite and offsite at the LNP, because the magnitude of the salt deposition will be negligible and the deposited salt will be diluted by rainfall and/or surface waters.

Q12. What process did you use to assess the potential impact on the aquatic resources of salt drift from the LNP?

A12. When it analyzed the impacts of salt drift from the LNP cooling towers, the FEIS relied upon NRC Guidance found in NUREG-1555, *Standard Review Plan for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan* ("NUREG-1555" or "NRC Guidance"), Section 5.3.3.2, which indicates salt deposition thresholds for visible leaf damage in the range of 10 to 20 kg/ha/mo. NRC001, Section 5.3.1.1 at p. 5-21; *See* PEF603. Visible leaf damage constitutes a meaningful surrogate indicator for overall impairment of freshwater wetland vegetation because it indicates that plants are under stress. I compared the NRC Guidance threshold with the worst case maximum salt deposition rates calculated by Dr. Howroyd (6.81 kg/ha/mo offsite and 10.75 kg/ha/mo onsite (*see* PEF500 at pp. 10-11)), and determined that the maximum offsite deposition rate calculated by Dr. Howroyd is well below the NRC Guidance threshold, and the maximum onsite deposition rate only slightly exceeds the lower end of the threshold range during one of the five years modeled. NRC001, Section, 5.3.1.1 at p. 5-22; PEF500 at pp. 11-12. As the FEIS properly concludes (NRC001, Section 5.3.1.1 at p. 5-21), given the amount of rainfall that is typical at the LNP site, salt drift from the LNP cooling towers will not result in measurable impacts on the aquatic resources, including

flora or fauna. Indeed, my review of the NRC Guidance and my professional experience with the subject matter tells me that the thresholds set forth in the Guidance are extremely conservative (especially for Florida, as I describe below). In order to test those thresholds, and to reach my own independent conclusion as to the potential impacts of salt deposition from the LNP on the aquatic resources, I also performed the independent analysis described below.

Q13. Please describe the basis for your independent analysis.

A13. An important factor when evaluating salt drift impacts is the amount of salt deposited in the area at issue. Accordingly, as set forth below, my analysis began with the maximum onsite and offsite salt deposition rates as calculated by Dr. Howroyd. Another critical factor when evaluating salt drift impacts is the degree to which salt deposited in the area could be diluted by rainfall. Rainfall will dilute and transport most of the salts deposited from salt drift from the LNP to water bodies downstream of the LNP, which have higher salinity. Such flushing will result in dilution of the salt so that there would be very little, or no, effects on the aquatic resources, including flora and fauna. However, during periods of extreme drought, the potential impact of salt accumulation, and its subsequent concentration by evapotranspiration (water loss by plants), increases. In order to evaluate the combined impacts of (1) cumulative salt deposition from the depositions calculated by Dr. Howroyd, and (2) the effect of extreme drought conditions, I prepared the spreadsheet set forth in PEF604.

Q14. Please describe how you prepared the spreadsheet.

A14. As the substantive inputs, I utilized the maximum rate of predicted onsite and offsite salt deposition that was calculated by Dr. Howroyd and the minimal potential rainfall using historic records for Levy County through 2011.

Q15. Please describe more specifically the rainfall data that you used.

A15. I used current rainfall analyses (cnty-SWFWMD) prepared by the Southwest Florida Water Management District ("SWFWMD") from their website (http://www.swfwmd.state.fl.us/data/wmdbweb/rainfall_data_summaries.php) which documents rainfall records from Levy County. PEF605. This information demonstrates that, from 1915 through 2011, the lowest dry season (8 months from October through May) rainfall on record was 10.08 inches of rainfall (in 2000). PEF605 at Column B, Row 88.

Q16. What was the next step in your analysis?

A16. In order to translate the salt deposition rates to likely salt concentrations under the worst case, I prepared the spreadsheet set forth in PEF604. Using as a baseline the rainfall data and Dr. Howroyd's worst case salt deposition rates as described above, I then calculated the theoretical salt concentrations resulting from extended periods of salt deposition during potential extended periods of low rainfall. As shown in columns 1-3 of the spreadsheet, I converted the rainfall from inches to a volume (liters) per square meter. After converting Dr. Howroyd's dry deposition rates of 6.8 kg/ha/mo (offsite) and 10.75 kg/ha/mo (onsite) into 0.68 grams/square meter/month and 1.075 grams/square meter/month, respectively, I multiplied those amounts by the number of months (8) of the dry season to obtain 8 month accumulated dry salt deposition quantities offsite and onsite. The 8 month accumulations are shown in Columns 4 and 6 of the spreadsheet. By dividing those quantities of dry salt accumulation by various volumes of rainfall, I ended up in Columns 5 and 7 with offsite and onsite salt concentrations in grams per liter or parts per thousand (ppt). Accordingly, the Table represents the potential worst case salt concentrations from 8 months worth of accumulated deposition based on maximum salt deposition levels and a wide range of low rainfall during the dry season.

Q17. What do the results of your spreadsheet show?

A17. As set forth in the highlighted row under column 7 of my spreadsheet, based on 8 consecutive months of the highest onsite salt deposition rate calculated by Dr. Howroyd (10.75 kg/ha/mo) combined with the lowest cumulative rainfall observed in Levy County during the dry season in nearly 100 years (10.08 inches rounded down to 10.00), the maximum level of salt concentration on the ground would be 0.03 grams per liter.

Q18. What does the maximum salt concentration as set forth in your spreadsheet (PEF604) tell you about the potential impacts of salt drift from the LNP on vegetation?

A18. It is generally accepted that exposure to salinities of 4 parts per thousand (ppt) or greater for extended periods of time results in leaf damage to most freshwater plants, including those of the type at or near the LNP that will receive salt depositions. The most conservative models show habitat stress (i.e., leaf damage) beginning at 1 ppt. As described above, my spreadsheet indicates that, under the worst case scenario (nearly 100 year drought conditions in Levy County combined with the highest projected salt deposition for 8 consecutive months), the maximum salt concentration would be merely 0.03 grams per liter (using the density of water of 1 gram/milliliter, this converts to approximately 0.03 ppt salt concentration). That concentration is far below the concentration at

which even the most conservative models begin to suggest habitat stress. Accordingly, it is clear that salt drift from the LNP will not measurably impact the vegetation on the LNP site or in adjacent or downstream areas. Indeed, as an extra conservative measure, I included in my spreadsheet various rows showing rainfalls well below even the lowest recorded dry period rainfalls to determine what minimal theoretical rainfall would be necessary to result in salt concentrations that could be damaging to freshwater plants. PEF604. Under the highest salt deposition both onsite and offsite, those rows show that damaging concentrations of salt water would occur only if the theoretical rainfall for an 8 month period was less than 0.5 inches. This is an event which, based on historical rainfall data extending over almost 100 years, is unlikely to ever occur. Indeed, the dry season rainfall data for all Florida counties in the vicinity of the LNP show that the lowest amount of dry season rainfall in nearly 100 years was 6.69 inches. PEF605, Column Q (Charlotte County), Row 59.

Q19. May some plants that will be exposed to salt deposition from the LNP be stressed by prolonged salinities of less than 1.0 ppt?

A19. Some very sensitive freshwater plants could possibly be impacted by salinities of less than 1.0 ppt, but my spreadsheet demonstrates that this salinity is highly unlikely to ever occur from salt drift from the LNP. The calculated worst case salinities resulting in 0.03 grams per liter (approximately 0.03 ppt) will not result in any impact to even the most sensitive species, in my professional opinion.

Q20. What does your spreadsheet tell you about the appropriateness of the NRC Guidance thresholds?

A20. The Levy County data (highlighted row of my spreadsheet's table) tells me that, even assuming eight consecutive months of 10.75 kg/ha/mo of salt deposition and the most severe drought conditions, rainfall in Levy County, Florida clearly will mitigate any potential effects of salt deposition from the LNP and, in my professional opinion, will negate any potential for salt drift impacts. For that reason, I find the NRC Guidance level of 10 kg/ha/mo to be extremely conservative as applied to salt drift from the LNP.

Q21. Do you have any other views regarding the NRC Guidance?

A21. The NRC Guidance is intended to apply to nuclear power plants nationwide, and, as a result, is especially conservative for application in Florida systems. Salt depositions exceeding the NRC Guidance threshold would only rarely result in salt drift impacts in more arid areas where the rainfall (and humidity) is less than that typically observed in subtropical Florida systems. The NRC Guidance is also conservative when applied to the

LNP, given that the proximity of the native hydric vegetation onsite and offsite at the LNP to the Florida coast, for the most part, makes that vegetation well adapted to occasional salt drift.

IV. ASSESSMENT OF POTENTIAL IMPACTS

Q22. What does your analysis show with respect to salt drift impact on vegetation either onsite or offsite at the LNP?

A22. My analysis shows that the salt drift from the LNP will not measurably impact the freshwater vegetation on the LNP site or in adjacent or downstream areas. Even the highest level of predicted salt drift combined with the worst case drought periods recorded for Levy County (nearly 100 year return period) would result in a salt concentration of merely 0.03 grams per liter, which is much less than 1% of the concentration of seawater, and which will not be harmful to freshwater flora on or near the LNP site. Even with evaporative loss and subsequent concentration of these salts on leaf edges, no long-term impacts would result from salt drift from the LNP's cooling towers. The FEIS reaches the same conclusion, with which I agree. NRC001, Section 5.3.1.1 at p. 5-22.

Q23. What does your analysis show with respect to salt drift impact on fauna either onsite or offsite at the LNP?

A23. Some sensitive freshwater fauna begin to experience some stress starting at 1 ppt salinity or higher. When salinities reach 4 ppt, most freshwater organisms exhibit signs of stress, and prolonged exposure to salinities of 4 ppt and above usually result in some measureable stress effects. These concentrations obviously are much higher than the concentration of 0.03 grams per liter (approximately 0.03 ppt) as predicted by worst case conditions of maximum deposition and worst case drought as depicted in my spreadsheet (PEF604). These levels are well within the tolerance levels of most sensitive freshwater organisms including sensitive invertebrates and vertebrates such as amphibians and salamanders. The FEIS review team estimated the additional salinity concentration of runoff during cooling tower operations to be 0.026 ppt. Based on that concentration, the FEIS found that "little impact [from salt deposition] is expected on amphibians." NRC001, Section 5.3.1.1 at p. 5-25. I agree with that finding.

Q24. What does your analysis show with respect to salt drift impact on water bodies onsite or offsite at the LNP?

A24. When the low concentrations of salt described above are combined with and further diluted by downstream flows, even under drought conditions, no measurable impact to water bodies will occur. With the precipitation that generally occurs in Levy County,

the salt concentration will be further diluted. My review of the adjacent habitats combined with my salinity analysis demonstrates that downstream movement of salt from the salt drift will not result in significant changes in any downstream salinities. In fact, since much of the drainage from the LNP is to estuarine environments, which have elevated salinities due to tidal activities, the impact from salt drift contribution would not be measurable. Thus, in my opinion, there will be no measureable impacts on water body salinity from salt drift. The FEIS reaches a similar conclusion – with which I agree – based on the review team's "conservative runoff salinity concentration." NRC001, Section 5.3.1.1 at p. 5-24.

Q25. Are you aware of any studies in the vicinity of the LNP that support your conclusions?

A25. Yes. I reviewed two documents regarding the Crystal River Energy Center ("CREC") that show there were no significant adverse impacts to vegetation caused by salt drift or salt deposition from the CREC's cooling towers. PEF606; PEF607. The CREC is located approximately 9.6 miles from the LNP (NRC001, Section 2.1, at p. 2-1), uses the same ultimate water source for its cooling towers, and has vegetation similar to the LNP. The trees adjacent to the CREC, while closer to the Gulf of Mexico, are similar to the vegetation found at the LNP. NRC001, Section 5.3.1.1 at p. 5-23. In an affidavit submitted earlier in this proceeding, the Intervenors' witness Dr. Bacchus claimed that vegetation in the vicinity of the CREC exhibited signs of stress from salt deposition that is greater than minor or infrequent leaf damage. In my review of both PEF606 and PEF607, there was no visible vegetation damage due to cooling tower salt drift observed in the vicinity of the CREC facility. PEF607 shows that the only discernible significant vegetation changes (i.e., leaf damage and death of some vegetation) were due to saltwater intrusion along the coast due to rising sea levels (referred to as hydrologic water level changes) and not from salt drift from the CREC's cooling towers. PEF607 at p. 22. The FEIS reaches the same conclusion, with which I agree. NRC001, Section 5.3.1.1 at p. 5-23.

Q26. You state above that vegetation at the CREC is similar to vegetation at the LNP. Can you elaborate on that point?

A26. The studies at CREC clearly identify the types of vegetation found in areas around the CREC facility, and these habitats include the same types of vegetation found in the vicinity of the LNP. The exception is that the CREC is located closer to the coast and has more estuarine vegetation to the west. However, vegetation to the north and east of the CREC is essentially the same as found at the LNP site and adjacent areas: coastal

pine hammock and adjacent mesic pine flatwoods that have been converted to pine plantations. Interspersed at the LNP are some cypress swamp and fragments of freshwater marsh communities within the site, but these habitats are typical of the west Florida coastal region and are also located in the vicinity of the CREC.

V. CONCLUSIONS

Q27. What are your conclusions regarding the allegations of environmental impacts from cooling tower salt drift asserted in Contention 4A, Part B?

A27. In my professional opinion, I conclude that salt drift from the LNP will not result in any measureable impact to wetlands, floodplains, special aquatic sites, OFW and other waters, including associated flora and fauna. Based on the NRC Guidance and my independent analysis, the deposition of salt from the LNP cooling towers (as calculated by Dr. Howroyd) will not result in concentrations, even under the maximum predicted salt deposition combined with the worst drought conditions on record, that will cause any measurable damage to those aquatic resources at the LNP site and in the surrounding areas.

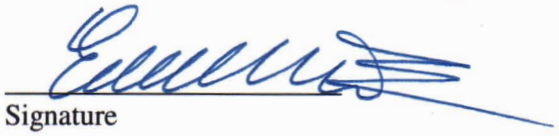
Q28. In your professional opinion, does the FEIS adequately address and appropriately characterize the impacts of salt drift from the LNP's cooling towers?

A28. Yes. After performing its analysis (NRC001, Section 5.3.1.1 at pp. 5-19 through 5-26), the FEIS concludes that "[n]o adverse impacts on vegetation are predicted for lands outside of the LNP site because the maximum predicted monthly salt deposition rates for the 2001 through 2005 meteorological data years were all below the threshold limit for offsite lands," and that "the impact on vegetation from salt drift is expected to be minor, infrequent and limited to the LNP site." NRC001, Section 5.3.1.1 at pp. 5-21through 5-22. The FEIS also concludes: "Considering the very low additional contribution to surface-water salinity from cooling-tower drift and the low likelihood for substantial concentration of salts in surface waters, cooling-tower drift is not expected to impair freshwater ecosystems on the LNP site." NRC001, Section 5.3.1.1 at p.5-24. The FEIS adds that "[i]ncidents of salt toxicity in animals that reside around the LNP site would be highly unlikely;" and "little impact [from salt drift] is expected on amphibians." NRC001, Section 5.3.1.1 at p. 5-25. For the reasons set forth in my testimony above, in my professional opinion these conclusions are accurate and the FEIS adequately describes and appropriately characterizes the impact of salt drift from the LNP's cooling towers.

Q29. Does that conclude your testimony?

A29. Yes.

I, Eldon C. Blancher, swear under penalties of perjury that the foregoing testimony is true and correct to the best of my knowledge and belief.



Signature

20 June 2012

Date