Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

July 6, 2006

L-2006-167
10 CFR 50.4
EPP 3.2.2

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Re: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Environmental Protection Plan Report
Responses to FDEP Comments on FPL
Proposal for Information Collection
Clean Water Act Section 316(b)

On May 31, 2005, FPL forwarded to the NRC a copy of FPL's proposal to the Florida Department of Environmental Protection (FDEP) for an information collection study pursuant to the Clean Water Act Section 316(b) at the St. Lucie Plant via FPL letter L-2005-119. On September 19, 2005, the FDEP provided FPL with comments on the proposal. This letter forwards FPL's response to the FDEP comments that FPL submitted to the FDEP on June 13, 2006. The attached information is being submitted pursuant to the requirements of Section 3.2.2 of the St. Lucie Units 1 and 2 Environmental Protection Plans.

Please contact Ken Frehafer at (772) 467-7748 if there are any questions on this matter.

Very truly yours,

Gordon L. Johnston
Vice President
St. Lucie Plant

GLJ/KWF

Attachment

C001

FPL

Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

June 13, 2006

Marc Harris
Florida Department of Environmental Protection
Industrial Wastewater Section
Division of Water Resource Management
2600 Blairstone Road
Tallahassee, Florida 32399-2400

Subject: **Florida Power & Light Company (FPL)**
St. Lucie Nuclear Plant
NPDES Permit Number FL0002208
Responses to FDEP Comments on FPL St. Lucie Nuclear Plant
Proposal for Information Collection Dated May 2005
Section 316(b) Phase II

Dear Mr. Harris:

Attached please find the "Responses to FDEP Comments on FPL St. Lucie Plant Proposal for Information Collection Dated May 2005" and nine (9) associated attachments.

If you have any questions on these responses to comments (particularly Comment 1 dealing with the use of Big Mud Creek as the source water for calculation baseline effects) or feel you need additional clarification, please contact me at 772-467-7453 or Ron Hix at 561-691-7641.

Sincerely,

Vince Munne
Environmental Compliance Supervisor
Plant St. Lucie
Florida Power & Light

RE: Florida Power & Light Company (FPL)
Responses to FDEP Comments on FPL St. Lucie Nuclear Power Plant
Proposal for Information Collection Dated May 2005

Comment 1. Use of Indian River Lagoon for the Calculation Baseline:

A significant issue with the St. Lucie PIC is the selection of the Indian River Lagoon as the source water for calculating the baseline effects. The definition of Calculation Baseline in section 125.93 of the Federal Register Volume 69, Number 131 includes the following language "...the standard 3/8-inch mesh traveling screen is oriented parallel to, the shoreline near the surface of the source waterbody; and the baseline practices, procedures, and structural configuration are those that your facility would maintain in the absence of any structural or operational controls, including flow or velocity reductions, implemented in whole or in part for the purpose of reducing impingement mortality and entrainment."

This language would appear to require the facility to use the Atlantic Ocean rather than the Indian River Lagoon in their calculation of baseline as it is the source water body. The facility maintains that the intake was moved from the Big Mud Creek, within the Indian River Lagoon (IRL) to the Atlantic Ocean during the pre-construction planning phase as a direct result of environmental concerns expressed by the Nuclear Regulatory Commission (NRC). This issue has been discussed in a teleconference among FPL, USEPA Region 4, USEPA Washington, DC Office of Water, and FDEP.

Response: Prior to the teleconference cited above, on June 1, 2005 FPL submitted information supporting the position presented in the Proposal for Information Collection (a copy is included as **Attachment 1**). As a follow-up to the referenced teleconference, on March 24, 2006, Kristy Bulleit, an attorney for the Utility Water Act Group (UWAG) representing FPL, spoke with Mary Smith, Director, Engineering and Analysis Division, EPA – Office of Water (Washington, DC), concerning FPL's decision to use of Big Mud Creek for the calculation baseline for the St. Lucie Nuclear Plant. As you are aware, EPA has been in the process of developing a 316(b) Q&A [to be posted on the EPA 316(b) website]; it was expected that our situation would be addressed in the 316(b) Q&A. In that conversation, Mary Smith stated that EPA will be deleting the proposed Q&A on the topic of different water body locations and will revise the "shoreline" Q&A to read as follows:

> "Under the assumption approach, a facility may use a different shoreline location to estimate the calculation baseline if the move to the current location was implemented in whole or in part for purposes of reducing IM/E. A facility must show that the move to the current location was done to reduce IM/E because there are no criteria in the assumption approach that address this issue."

Mary Smith also advised Kristy Bulleit that FPL can provide FDEP with the above language as it reflects EPA's current intent. She also stated that if FDEP or Kerrie-Jo Shell, EPA Region 4, feels it

is necessary to consult EPA Headquarters, the contact person is Jan Goodwin, Chief, Economic & Environmental Assessment Branch, EPA – Office of Water (Washington, DC) at (202) 566-1060.

Intent – The following attachments provide documentation for the reasons FPL switched from the Big Mud Creek intake location to the Atlantic Ocean intake. It is clear from these documents that the main intent of relocating the St. Lucie Nuclear Plant intakes from Big Mud Creek to the Atlantic Ocean was to reduce Impingement Mortality and Entrainment. The information presented below will be addressed in detail in the Comprehensive Demonstration Study.

Attachment 2 – *Correspondence from the Martin County Taxpayers Association (MCTA) to FPL*: In this correspondence, dated March 20, 1969, the MCTA recognized the need for a new plant, but states, "We are willing to condone the vast overcut of the so-called access canal to provide fill for plant construction (in Big Mud Creek), but protest vigorously the withdrawal of cooling water from the Indian River."

Attachment 3 – *FPL Response to the MCTA*: In this correspondence, dated April 3, 1969, FPL states, "Preliminary indications from our scientific advisors are that the Indian River intake is feasible, and on this basis have indicated this source as our primary design. We have, however, instructed our engineers to so design the plan as not to preclude another source of intake should any studies demonstrate that harm would come to the Indian River. An ocean intake is not the preferred method because of its associated potential for storm damage and the consequent effects on the reliability of the plant."

Attachment 4 – *US Department of Interior (DOI) to FPL*: Question 6 of this correspondence, dated March 26, 1969, which requested size, type, depth, and location of an Indian River intake location, was quoted in the June 1, 2005 submittal.

Attachment 5 – *FPL to US DOI*: FPL's response, dated April 14, 1969, was also quoted in the June 1, 2005 correspondence. It states that the intake will be located in the Indian River, although if studies, "... indicate it would be in the public interest to utilize the Ocean as a source of cooling water, we will request the necessary permits from the applicable agencies and submit and amendment to our application to the AEC.

Attachment 6 - *FPL to US Atomic Energy Commission (AEC)*: In this correspondence, dated April 1, 1969, FPL also states, "Should any of our studies indicate that it would be in the public interest to utilize the Ocean as the source of cooling water, we will submit an amendment to our Application."

Attachment 7 – *State of Florida, Department of Health and Rehabilitative Services (DHRS)*: This correspondence, dated October 17, 1969, DHRS states, "We appreciate institution of ecological studies based upon both (1) Intake from the Indian River and discharge to the Atlantic Ocean and (2) intake from the Atlantic Ocean and discharge to the same body of water. It is believed timely, however, that we express a strong preference for the latter cooling water supply and disposal systems.

Attachment 8 – *Excerpts from the Final Environmental Statement, prepared by AEC, related to the St. Lucie Nuclear Plant Unit No. 1*: This document, dated June 1973, was quoted extensively in Attachment 1. On pages XI -10 through XI-12 this report acknowledges that the St. Lucie Nuclear Plant was originally designed to have an Indian River intake and discusses the "pros and cons" of once-through cooling from the intake on the Indian River (Big Mud Creek).

The "pros" included:

- increased flushing to remove pollution from sewage outfalls, stabilization of salinity and temperature to slow growth of bacteria, algae, and some of the grasses, while supplying more nutrients to mangrove communities; allowing the waters to support increased populations of fishes and invertebrates and become a more efficient nursery ground and possibly offsetting potential increased entrainment (see "cons");
- flushing action in Big Mud Creek would probably prevent it from returning to an anoxic state, thus minimizing fish kills;
- economic savings (almost $10,000,000 capital costs) along with more plant efficiency as recirculation occurs with an Atlantic Ocean intake;
- elimination of an Atlantic Ocean navigation hazard;
- elimination of a proposed recirculation canal and intake defouling procedure (not actually built); and
- elimination of the intake canal, approximately 32 acres that would be available for other purposes.

The "cons" listed were:

- *Altering the natural current patterns and flushing rates in the Indian River; and*
- High impingement and entrainment rates.

In summary, the AEC staff concluded, "... extensive studies would be necessary to insure that beneficial rather than detrimental ecological effects would occur in the Indian River. In view of these uncertainties and the minimal environmental damage predicted from the proposed design (Atlantic Ocean intake proposed in the Final Environmental Statement), this alternative (Indian River intake) is not recommended.

Comment 2. Cooling Water Intake Structures:

The Cooling Water Intake Structures (CWIS) are significantly improved upon compared to the calculated baseline intake structure. The intake structures (two 12' ID pipes and one 16' ID pipe) are 1,200 feet offshore in the Atlantic Ocean, with openings at mid-depth, each with a velocity cap. The velocity caps convert the horizontal water flow to lateral water flow, which according to the facility's consultants, is easier for fishes and other motile organisms to avoid. Water from the CWIS is delivered to the 300-foot wide by 5,000-foot long Intake Canal. Water velocity within the Intake Canal ranges between 0.5 and 1.0 feet/second. Three sets of barrier nets, used to exclude turtles, fishes, and unauthorized personnel, are located within the Intake Canal. At the facility end of the Intake Canal are trash racks and intake traveling screens.

Even if the calculated baseline for this facility were based upon the Atlantic Ocean as the source waterbody, the facility's CWIS have already been constructed with many of the entrainment and impingement-reducing technologies in place. These technologies would be factored into the calculation of percent E&I reduction over the calculated baseline.

Response: We agree with FDEP that the FPL St. Lucie Nuclear Plant's CWIS was constructed and has been operating for over 2 decades with many of the entrainment and impingement-reducing

technologies available. In the Comprehensive Demonstration Study (CDS) FPL will demonstrate the reduction in impacts to the environment as compared to a baseline facility. Data will be collected from the Big Mud Creek/Indian River Lagoon and the Atlantic Ocean to demonstrate the credit allowable under the rule for the locational choice in addition to the other existing control technologies.

Comment 3. Need for a Pilot Study:

Regardless of which area is used as a baseline, the study design is seriously lacking specifics on what mathematical methods will be used to calculate the baseline and reduction figures and with what confidence. The actual sampling to be done is very vague as well. For example, page 37 in section 7.1 states:

"The metric to be applied to the data collected through this sampling program will remain undefined in order to provide maximum flexibility during the preliminary data collection effort (i.e., data will be collected to allow the use of the most appropriate metric)."

Response: It is our intent that the data be collected and compiled to allow the use of any of the metrics discussed in the rule (biomass, individual counts or representative important species). The metric(s) to be used for the demonstration will be selected after careful review of all data. Other statistical methods and data transformations will be selected based on the character and distribution of the data.

At times, the document seems to allude to a pilot study without actually saying they are doing one. It would be prudent (and cost-saving) for the facility to design a pilot study which would include "oversampling" of the areas of concern and depth profile work. This is needed to determine what a plankton or fish tow actually represents (i.e., two 7-minute otter trawl tows at 2 knots at depth X represents 75% of the fish species found in twenty-five 7-minute tows). This would allow determination of the actual distribution of the various biota in the water column, estimates of variability using their sampling methods, and the calculation of the correct number of samples to take to achieve a given level of confidence in the baseline and reduction estimates (i.e., 90% confidence that the percent reduction in impingement mortality of fish eggs is between X% and Y%; 80% confident that the baseline population of zooplankton is between X and Y). It is possible that the facility could sample for two years and have so much variability that their estimates will be unacceptably "vague" (i.e, 90% confident that the percent reduction is between 30% and 80%). This would be an unfortunate result given the effort and expense of the study.

Response: FPL agrees with FDEP and states in the PIC that collection of current biological data is necessary. However, there are several reasons why a pilot study is not warranted at this site. First, the historical monitoring data were reviewed and evaluated to develop the proposed sampling plan (i.e., the historical data could be viewed as an 8-year pilot study in preparing the proposed sampling plan).

Second, the primary purpose of the Impingement Mortality and Entrainment (IM&E) Characterization Study is to **characterize** current IM&E in sufficient detail to support development of the other elements of the CDS. Another objective is to **estimate** the calculation baseline. However, in the preamble to the Phase II final rule (*Ibid*, page 41596) EPA recognized that year-to-year

variability caused by natural or anthropogenic factors may affect the performance of a particular technology; and that meeting a specific numerical performance standard may not be possible. This is especially true with only one to two years of baseline biological data -- which is all that the rule allows or anticipates based on the required implementation schedule. Therefore, the adaptive management provisions of the Technology Installation and Operation Plan were added to the final rule to account for this uncertainty.

As EPA states (*Ibid*), "the plan provisions allow implementation to be adaptive, and allow for data development and assessment to proceed in a manner that is appropriate for the facility, technology and the waterbody characteristics." The impingement and entrainment data being collected at the St. Lucie Nuclear Plant will be used to assess the viability and feasibility of potential alternatives; and to select and design an initial approach for compliance with performance standards. The Verification Monitoring Study demonstrates whether a facility is meeting the applicable reduction standards. Following the logic of the rule, the IM&E Characterization Study can be thought of as a "pilot study" for the Verification Monitoring. Additional data collected during a Verification Monitoring Study can be used to refine the initial estimate of the calculation baseline. On the other hand, if the data collected during the impingement and entrainment study demonstrate that the facility is already meeting the performance standard then additional verification studies may not be required.

Third, in addition to the year-to-year variability, there is significant seasonal variability in biological data. Consequently, a short-term pilot study (less than one year) likely will not provide the data needed to answer the statistical questions that are posed in the above comments. In fact, a short-term pilot study (one to two months) could produce misleading statistical conclusions. Nevertheless, as the impingement and entrainment study proceeds, if changes to the sampling plan are necessary and appropriate, they will be implemented.

The performance standards developed by EPA are based on conceptually simple reduction metrics; and are specified as an acceptable range of reduction (e.g., reduce entrainment by 60 to 90 percent). The performance standards make no reference to statistical confidence limits. In fact, EPA states in the preamble to the Phase II rule (*Ibid*, page 41600) "EPA is expressing the performance standard in the form of ranges rather than a single performance benchmark because of the uncertainty inherent in predicting the efficacy of any one of these technologies, or a combination of these technologies, across the spectrum of facilities subject to today's rule." At least part of this uncertainty comes from the seasonal and year-to-year variability in biological data. Further down the same page, EPA states "In specifying a range, EPA anticipates that facilities will select the most cost effective technologies or operational measures to achieve the performance level (within the stated range) based on conditions found at their site, and that Directors will review the facility's application to ensure that appropriate alternatives were considered." Therefore compliance can be demonstrated by meeting the acceptable range of the performance standard based on the annualized impingement mortality and entrainment rates.

While a significant amount of historical monitoring data exists for this facility, that data was collected when only Unit 1 was operational. The existence of Unit 2 and the age of the older data makes more current sampling necessary.

Response: FPL agrees with FDEP and is collecting current data as stated in the PIC. Based on input provided by FDEP in these comments, FPL is considering additional field sampling. Should the sampling plan be modified, FDEP will be provided an amendment to the PIC.

We strongly suggest a pilot study, the results of which will be used to give specific sampling strategies (sample size, sample method, population quantified, level of confidence, metric to be used, etc) for the multiyear study.

Response: The information presented above can not be answered in a short-term pilot study with regards to sample size, population quantified, level of confidence, metric to be used, etc. Unfortunately, it could take years to address level of confidence and to determine optimum sample size. Compliance with the rule does not afford the time required to address these issues prior to the characterization study, so they are evaluated as part of the study. The sampling strategy was developed based on the objective to assess when and what organisms are present, life stage and size. To this end the sampling study was designed with 26 equally spaced paired temporal events per year (each event includes day and night sampling). The time interval and sampling frequency is sufficient to meet this objective. However, as has been stated in the PIC, the sampling interval can be adjusted during the second year of sampling based on the biological variability of the data collected.

Comment 4. Section 5.3.3 Summary:

There are some conflicting statements within the PIC in regards to the historical data. The first sentence of the summary states that fish and shellfish were not observed to accumulate in the Intake Canal, yet Section 7.2 Impingement Sampling Plan states that "the relatively long residence time of larger fish and shellfish in the canal, the numbers of many fish species found impinged on the screens are not representative of what is being pulled into the CWIS".

Response: Fish and shellfish that enter the Intake Canal are able to survive and feed on each other during their residence time in this large canal. Eventually the fish may weaken and become unable to swim against the intake current and at that time are pulled onto the screens and removed by the traveling screens. So there is no direct relationship between large fish and shellfish being pulled into the canal and what is collected on the screens. Some large organisms may live out their full life cycle in the canal, while others (such as plankton) may have a short residence time.

The last sentence of the summary states that "Impingement sampling at the screens and entrainment behind the screens has not been conducted at the Plant"; but Section 5.3.2 discusses the intake screen impingement studies that were conducted between 1976 and 1978.

Response: Section 5.3.2 is correct, impingement studies were conducted at the St. Lucie Nuclear Plant.

A 1983 analysis of the data by Applied Biology, Inc. concluded that no significant variations in fishes inhabiting the nearshore waters in the vicinity of the St. Lucie Plant could be attributed to the Plant. However, the report also noted that there was considerable year-to-year variation in the numbers of fishes in these waters, which calls into question whether the study's sampling design was sufficient to detect significant differences attributable to the plant even if they existed.

Response: The conclusions of the 1983 study are not applicable to the current situation. New data are being collected at the St, Lucie Nuclear Plant.

Comment 5. Section 7.2 Impingement Sampling Plan:

As noted above, the historic data suggests that organisms were not accumulating in the Intake Canal, so the logic presented in section 7.2 for not performing impingement sampling is not supported. Additionally, a direct measure of what is actually being impinged or entrained at the plant with all its E&I-reducing technologies in place is critical for comparison back to the calculated baseline effects. The most difficult part of this comparison will be how to model the theoretical baseline facility, since the immediate shoreline is a high energy Atlantic Ocean beach.

Response: FPL agrees with FDEP that this Plant's location on an island with a high energy coast presents a unique baseline situation. FPL chose to relocate its CWIS in this high energy area, at significantly higher cost, as a measure to reduce impingement mortality and entrainment of organisms in the Indian River Lagoon.

FPL will assess the benefits and the impacts (sampling design, plant operation, feasibility, safety and validity of the approach) for collecting direct samples from the traveling screens, and how these data could be used in the CDS. The potential issue is that there is no direct relationship between what gets impinged on the screens and what may have been entrapped in the Intake Canal. The level of survival of entrapped organisms would be difficult to assess.

Comment 6. Section 7.2.2 Sampling Frequency and Methodology:

As suggested earlier, sampling frequency/effort should be determined based upon a pilot study to determine "of what" each type of sampling is representative and with what confidence. Trawling is proposed for mid-depth and bottom. Since this data will be used in the calculation of baseline effects, it seems appropriate to also include surface trawls since the baseline facility would not be selectively drawing intake water from mid-depth or bottom. The appropriate depths for long term sampling can be determined in a pilot study.

Response: The pilot study was addressed in the first response. Regarding the use of surface trawls, trawls are bottom sampling devices and it is difficult (but possible) to pull a trawl at mid-depth; surface sampling with trawls is not feasible. Gill nets can be used for near-surface sampling, but FPL believes that gill netting would not be allowed by the regulatory agencies in this area due to the possibility of entanglement of sea turtles. The mid-depth sampling would represent the depth area of the velocity caps, the bottom sampling would be used to develop additional credit for locating the intake at mid-depth (in an area of lower organism density).

Trawling is proposed for both the IRL and Atlantic Ocean. The IRL sampling may or may not be necessary depending upon EPA's position statement on the use of the IRL in the baseline calculation.

Response: Sampling in Big Mud Creek and the Indian River Lagoon was initiated in January 2006. EPA Headquarters' current position on this issue was addressed in Response to Comment 1.

Regarding the data being collected, it would be useful to also include weather conditions (wind speed, direction) and sea state as these factors can affect the

difficulty of obtaining the samples as well as where the animals may be in the water column.

Response: FPL agrees with FDEP and will collect this information as part of the PIC.

Comment 7. Section 7.2.3 Treatment of Data:

More detail is needed in this section. What type of statistical treatment of the data is intended and what will it intend to demonstrate?

Response: The proposed sampling plan will provide data that can be analyzed and evaluated using different statistical methods and metrics. The data will be summarized by location, by sampling event and by species/age group using standard descriptive statistics (e.g., maximum, minimum, mean, median, standard deviation, range ...). The data will be collected and compiled to allow the use of any of the metrics discussed in the rule (biomass, individual counts or representative important species). The metric(s) to be used for the demonstration will be selected after careful review of the data. Other statistical methods and data transformations will be selected based on the character and distribution of the data. Reductions in impingement and entrainment will also be developed by paired analysis of organisms collected in the Atlantic Ocean, Big Mud Creek/Indian River Lagoon, and at the screens. These paired analyses will provide the basis for the reduction ratios. Additional detail is provided in the amended PIC Sampling Plan.

Comment 8. Section 7.3.1 Plant Entrainment:

The PIC proposes to sample the Intake Canal rather than sampling organisms that were actually entrained in the plant's cooling water system. As with the impingement sampling, a direct measure seems more appropriate than an indirect measure. Entrapment of larger organisms is dealt with through a live capture and release program, but the fate of entrapped zooplankton would ultimately be to either die in the Intake Canal (including being consumed by other larger entrapped organisms) or to pass through the cooling water system. Since the larger entrapped organisms likely feed upon the zooplankton within the Intake Canal and are later released, it doesn't seem appropriate to consider all entrapped zooplankton in the entrainment calculation.

Response: FPL is conducting entrainment sampling at the intake headwalls, as stated in the PIC. Sampling at the intake canal headwall directly measures entrainable organisms that are drawn from the Atlantic Ocean. FPL will consider adding entrainment sampling at the screens and will evaluate its feasibility and use of these data in the CDS. Should additional sampling be implemented, an amendment to the PIC will be submitted to the FDEP.

It is important to note that should the IRL be used as the baseline, there is an effect on the plankton from the freshwater being discharged from Lake Okeechobee. It will be important to consider that factor in the design of the sampling plan and to keep records of the discharge to use as a possible covariate in the data analysis. A paper was presented by B.L. Winner of the Florida Fish and Wildlife Conservation Commission titled "Ichthyofaunal survey of the St Lucie estuary and effects of freshwater inflow: Too much of a good thing?" that gives background on this variable.

Response: FPL agrees with FDEP and data on discharge records into the Indian River Lagoon will be collected and used in the evaluation of data from this site. We will review this paper and incorporate this information into the CDS.

The depth(s) at which the plankton tows will be taken is not stated in the PIC and should be determined in the pilot study.

Response: Plankton tows in the Indian River Lagoon will be oblique tows (bottom to surface) to incorporate organisms throughout the water column in this relatively shallow estuary. The plankton samples collected at the headwall are also oblique tows from near bottom to surface.

Comment 9. Section 7.3.3 Treatment of Data:

This section is very vague. In order to have a scientifically defensible study result, it is necessary to decide before starting what the measures will be, how much variability in the calculation can be tolerated, and what mathematical methods will be used to make the determination. Only then can you design a study to assure the goals will be met and the money well spent.

Response: This comment has been addressed in Response to Comment 7.

Comment 10. Section 7.3.4 Calculation of Base Densities:

It will be necessary to determine what biota are being sampled "representatively". As stated earlier in this review, a pilot study is needed for that determination.

Response: It can not be predetermined what biota is susceptible to the intakes at any site, this is the reason a characterization study is conducted over one to two years and is used to select the metrics for compliance (representative important species, total numbers, biomass). Some information is available from the historical studies, and current data will augment the database of susceptible organisms at this site. Actual sampling will provide the data identifying the fish and shellfish vulnerable to impingement and entrainment at the St. Lucie Nuclear Plant. The characterization data will provide the basis for selection of the metric that will be used for compliance.

Regarding the "linear interpolation" for the densities of unsampled days, at this time, it isn't known that the densities have a linear relationship. There are a number of statistical "hole-filling" techniques. It would be a good idea to investigate the most appropriate one to use based on what is learned about the relationship in the actual study and not commit to a "linear" one right now.

Response: FPL agrees and acknowledges that there are other methods available and the study design will not preclude their use. Linear interpolation is the most common approach used for this type of data. Based on the highly variable nature of biological data, other methods may be considered once the data are available. The rule states that both impingement and entrainment are proportional to facility flow. Densities for unsampled days will be extrapolated weighted on flow.

Comment 11. Section 7.4 QA/QC Plan:

In order to evaluate procedures used in the study, it is important that the Department have the opportunity to review the project Quality Assurance Plan and Standard Operating Procedures.

Response: FPL submitted its Quality Assurance Plan to FDEP on February 15, 2006. The St. Lucie Nuclear Power Plant Standard Operating Procedures for this field program are included as **Attachment 9.**

It would be useful to have a description of the type of database that will be used. Will the consultants use Microsoft Access, some other commercial package, or will they develop a custom, in-house program? A description of how they plan to submit the data to DEP (and EPA) would also be useful (e.g., a tab-delimited text file, Access database, or something else?).

Response: FPL's consultant (Golder Associates Inc.) has developed a custom database for 316(b) in Microsoft Access. Their staff is available to discuss and demonstrate this database. The raw data will not be submitted to FDEP, the CDS will include tabulated summary data from the characterization study.

Attachment 1

Information Submitted to EPA and FDEP on June 1, 2005
(Prior to Teleconference)

Applicability to the 316(b) Rule and Calculation Baseline
of
Pre-operational Technology and Design Changes in Response to EPA and other Agency Comments Regarding Reduction of Entrainment and Impingement Impacts

Florida Power & Light Company (FPL) met with the Florida Department of Environmental Regulation (FDEP) in Tallahassee on May 25, 2005 to discuss the St. Lucie Nuclear Power Plant Proposal for Information Collection (PIC). EPA Region IV participated via audioconference (Karrie-Jo Shell). The following information is provided for your review and further consideration in support of using the Indian River Lagoon as the selected Calculation Baseline for the Plant. We believe that this is consistent with 316(b) regulatory requirements as supported in the Preamble to the 316(b) Rule and EPA technical documents.

Location

It is important to note that the St. Lucie Nuclear Plant is located on an island, and that it currently withdraws water from the East side of Hutchinson Island (the Atlantic Ocean), and that the Plant was originally designed to withdraw water from the West side of the island (the Indian River Lagoon).

Applicable Performance Standards

The St. Lucie Plant is required to demonstrate that it has or will reduce impingement mortality by 80 to 95 percent and entrainment by 60 to 90 percent from the calculation baseline. The definition of calculation baseline "means an estimate of impingement mortality and entrainment that would occur at your site assuming that the cooling system has been designed as a once-through system..." In the preamble to the final rule [Federal Register (FR) Vol. 69, No. 131, page 41595, July 9, 2004), EPA states that the definition of the calculation baseline "recognizes and provides credit for any structural or operational controls, including flow or velocity reductions, a facility has adopted that reduce impingement mortality or entrainment."

Calculation Baseline

The calculation baseline location for the St. Lucie Plant has been selected based upon the original plant design to locate the CWIS on the Indian River Lagoon (at Big Mud Creek). As provided in *The Final Environmental Statement for St. Lucie Plant Unit No. 1* [United States Atomic Energy Commission (USAEC), 1973], "Indian River (Big Mud Creek) could be used as a source of cooling water for the Plant with discharge to the Atlantic Ocean. The Plant was originally designed for such a system (see Figure XI-1 of USAEC, 1973), however, the plan was altered prior to issuance of a construction permit because of possible adverse effects on the ecological balance in the Indian River."

FPL could have chosen not to relocate the intake to the Atlantic Ocean from the Indian River Lagoon during the permitting stage of the plant. Instead the decision was made to spend millions of dollars to minimize Adverse Environmental Impacts (AEI) to the Indian River Lagoon and implement Best Technology Available (BTA) and protect the aquatic environment. This decision was made over 30 years ago, with input from numerous federal and state agencies, as well as local parties. This technology implementation decision is as relevant today under the current 316(b) Rule as it was under the previous Rule.

To capture the significance of this important decision to minimize AEI and meet BTA, FPL has proposed sampling the Indian River Lagoon as the Calculation Baseline for the St. Lucie Plant, and the Atlantic Ocean for the current CWIS. We plan to compare the difference in impingeable and entrainable organisms in these source waters to develop credit for the aquatic resources "saved" by the decision to relocate the intakes to the Ocean. If EPA does not allow FPL to use the Indian River Lagoon for the Calculation Baseline, it would negate the important decision made, the aquatic resources saved for the past 30 years, and the millions of dollars spent to minimize AEI and implement BTA.

The importance of the decision to relocate the CWIS was recognized by EPA in the current Rule by assigning a "N/A" in Appendix A of the Rule. For these facilities, EPA stated that they "would already meet otherwise applicable performance standards based on existing technologies and measures" (Federal Register, Volume 69, No. 131, July 9, 2004, Page 41646). EPA projected "zero" compliance costs for these facilities including the St. Lucie Plant. To make the above determination it would appear that EPA used this historical record in developing the Rule and determining that the St. Lucie Plant already meets the performance standards. FPL is asking for the same opportunity that EPA had in determining that the St. Lucie Plant meets the performance standard by also using the Indian River Lagoon for the Calculation Baseline.

Facility Description
The St. Lucie Plant (Unit 1) was originally designed to have the CWIS located off the Indian River Lagoon in Big Mud Creek, as described in a letter description of the design aspects of the Hutchinson Island Power Plant (currently named St. Lucie Plant), responses submitted to the U. S. Department of Interior, dated April 14, 1969 from FPL:

> *Question: We understand that you intend to use Indian River water for cooling purposes. What will be the size, type, depth, and location of your intake facility?*
>
> *Answer: The intake facility will be located on the west side of the plant approximately 450 feet from Big Mud Creek. The intake structure will be reinforced concrete approximately 60 feet wide by 70 feet long by 44 feet high. It will house four circulating water pumps in separate bays, screens and miscellaneous other equipment. The top deck will be at plant grade which is elevation plus 18 feet, and the invert will be at approximately elevation minus 26 feet. A bridge crane on a steel structure will be installed above the top deck to service the equipment.*
>
> *At present we have studies under way to determine the effects of taking the cooling water from the River. These studies include hydraulics of the Indian River and Ocean, stability studies of the inlets, beaches and channels, predicted mixing area of the cooling water effluent, chemical analyses, background studies of phytoplankton, zooplankton, benthic plants and fauna, and fisheries. Upon completion of these studies which are scheduled to be complete in July 1969, we will furnish them to the appropriate County, State and Federal agencies.*
>
> *In the event that our studies indicate it would be in the public interest to utilize the Ocean as a source of cooling water, we will request the necessary permits from the applicable agencies and submit an amendment to our application to the AEC.*

Although locating the CWIS in the Indian River Lagoon/Big Mud Creek had some postulated environmental benefits, due to the potential for fish entrainment and impingement impacts FPL selected a higher cost alternative, to relocate the Plant's CWIS to an offshore location in the Atlantic Ocean as demonstrated in the submittal of the Environment Report submitted to the USAEC dated May 20, 1971: "The once through cooling systems considered are:

(1) the earlier version based on taking cooling water from the Indian River and discharging it to the ocean, and

(2) the present design in which water is taken from, and released to the ocean.

The first version was discarded as described in Section 2.3.6 of the original Environmental Report because of possible hazards to the ecology of the Indian River. The present system takes its water from and discharges into an area which is both low in nutrients and biota. The estimated costs for these two versions of the cooling water system are:

Indian River to Ocean	$ 3,340,000
Ocean to Ocean	$13,138,000

The ocean to ocean system, while considerably more expensive, justifies its cost in protecting the environment by assuring minimum damage to the aquatic biota. The spread between the cost of the mechanical cooling towers and the once-through, ocean to ocean system is not great enough to be the controlling factor. The selection of the once-through system was made to prevent salt spray damage and for the other reasons discussed" *(Final Environmental Statement, 1971).*

The CWIS pipelines were subsequently designed to be constructed below the ocean floor with intakes at a location 1,200 ft offshore. The pipelines were also designed with velocity caps located at mid-depth to further minimize fish entrainment and impingement.

The Final Environmental Statement, 1973, (Section XI.4.f; page XI-10) documents the fact that once-through cooling with an intake in the Indian River Lagoon (Big Mud Creek) was the originally planned configuration. The document also discusses the fact that the decision to move the intake to the Atlantic Ocean was made to reduce entrainment and impingement and not for economic advantage.

As discussed during the FDEP presentation on May 25, 2005, it is our belief that EPA intended to give credit to facilities for design and construction technologies, operational measures and/or restoration measures that have already been implemented to minimize adverse environmental impact. In the preamble to the Phase II Rule for Existing Facilities (FR Vol 69, No. 131, page 41601), EPA provides additional clarity to the criteria and analysis of the calculation baseline, "In many cases, existing technologies at the site show some reduction in impingement and entrainment when compared to this baseline. In such cases, impingement mortality and entrainment reductions (relative to the calculation baseline) achieved by these existing technologies should be counted toward compliance with the performance standards. In addition, operational measures such as operation of traveling screens, employment of more efficient return systems, and even **locational choices** should be credited for any corresponding reduction in impingement mortality and entrainment".

It is stated further in the preamble to the Final Phase II Rule (FR Vol 69, No. 131, page 41612) that "the purpose of a calculation baseline is to properly credit facilities that have installed control technologies prior to the promulgation of the rule."

The rule defines Calculation Baseline (125.93) as (emphasis added) "... and the baseline practices, procedures, ***and structural configuration are those that your facility would maintain in the absence of any structural*** or operational ***controls,*** including flow or velocity reductions, ***implemented in whole or in part for the purposes of reducing impingement mortality or entrainment. ...You may request that the calculation baseline be modified to be based on a location of the opening of the cooling water structure*** at a depth other than at or near the surface ***if you can demonstrate*** that the other depth would correspond to ***a higher baseline level of impingement mortality and/or entrainment.***"

The Unit 1 Final Environmental Statement, Section XI-10, states "Indian River (Big Mud Creek) could be used as a source of cooling water for the Plant with discharge to the Atlantic Ocean. The plant was originally designed for such a system (See Figure XI-1). However, the plant was altered prior to issuance of a construction permit because of possible adverse effects on the ecological balance in the Indian River."

Because the St. Lucie Plant is on an island, the original design would have withdrawn water from one side of the island and discharged it to the other side, in order to minimize thermal recirculation. Further, because the Indian River side was dredged to support navigation, it would have deeper water and would have been the logical choice for the intake side. The Unit 1 Final Environmental Statement (see Figure XI-1 reproduced below) confirms the original design exactly as described above.

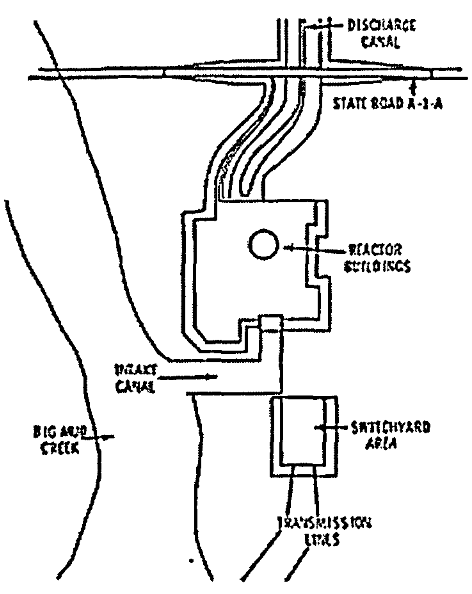

Figure XI-1

The St. Lucie Plant PIC relies on receiving credit and determining the calculation baseline based on decisions that were made during the planning phase of the St. Lucie Nuclear Power Plant licensing effort. EPA makes this consideration clear in the Phase I Rule for New Facilities, which provides regulation for the construction and operation of power plant cooling water intake structures which should be considered during the planning and design of "new" power plants subject to the rule. Specifically, in the preamble to the Phase I Rule for New Facilities, (FR Vol

66, No. 243, Page 65280), EPA states that facilities "can use the location of their cooling water intake structures to achieve further reductions in impingement and entrainment. Location of the cooling water intake structure can be addressed during the planning and design phases of new facility construction. At that time, it may be possible to choose a particular waterbody type and a specific location on that waterbody where (considering the proposed capacity of the cooling water intake structure) the potential for impingement and entrainment is relatively low." Since EPA has established that decisions made during planning for new power plants can be used to meet the performance standards, this consideration should be granted for existing facilities that clearly, through the regulatory process, made technological and/or operational changes during the planning phase in order to reduce impingement and entrainment impact. This decision-making process is well documented in the Final Environmental Statement, 1973.

The selection of the St. Lucie Plant Calculation Baseline proposed is also supported, and referenced in the Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule (EPA-821-R-04-007), Page 3-16, which provides an example of the:

> "relocation of CWISs offshore or otherwise in areas that minimize impingement and entrainment impacts (compared to conventional onshore locations), though the ability of existing facilities to do so may be quite limited. There are limited published data quantifying the locational differences in I&E rates at individual power plants. However, some information is available for selected sites:
>
> o For the St. Lucie plant in Florida, EPA Region 4 permitted the use of a once-through cooling system instead of closed cycle cooling by locating the outfall *(intake)* 1,200 off shore (with a velocity cap) in the Atlantic Ocean. This avoided impacts on the biologically sensitive Indian River estuary."

As stated in the Technical Development Document, due to the "existing" nature of facilities, the quantification of the reduction of impingement and entrainment impacts due to the relocation of the cooling water intake structure is limited, however, since the decision to relocate the CWIS at the St. Lucie Plant was documented and acknowledged through the federal regulatory process, consideration should be granted for decisions made during the planning phase of the St. Lucie Nuclear Plant.

Also, the preamble to the Final Phase II Rule (FR Vol 69, No. 131, page 41577) establishes that the final regulation is supported by three major documents:

1) Economic and Benefits Analysis for the Final Section 316(b) Phase II Existing Facilities Rule (EPA-821-R-04-005), hereafter referred to as the Economic Benefits Analysis. This document presents the analysis of compliance costs, closures, energy supply effect, and benefits associated with the final rule.
2) Regional Analysis for the Final Section 316(b) Phase II Existing Facilities Rule (EPA-821-R-04-006), hereafter referred to as the Regional Analysis Document or the Regional Studies Document. This document examines cooling water intake structure impacts and regulatory benefits at the regional level; and
3) Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule (EPA-821-R-04-007), hereafter referred to as the Technical Development Document. This document presents detailed information on the methods used to develop unit costs and describes the set of technologies that may be used to meet the final rule requirements.

The above documents have been reviewed extensively by FPL and their consultants at Golder Associates. These documents should be taken into consideration and used during review and comment of the St. Lucie Plant's PIC.

Attachment 2

Correspondence from Martin County Taxpayer Association (MCTA) to FPL

Martin County Taxpayers Association, Inc.
(A CORPORATION NOT FOR PROFIT)
P. O. BOX 741 TELEPHONE 287-2578
STUART, FLORIDA 33494

E. H. GLUCKLER
EXECUTIVE SECRETARY

20 March 1969

RECEIVED
MAR 24 1969
EASTERN DIVISION

Mr. R.D.Hill, Vice-President,
Florida Power andLight Co.
PO Box 31,
West Palm Beach, Florida, 33401.

Dear Mr. Hill:

The board of directors of the Martin County Taxpayers Association, in a recent meeting, voted unanimously to adopt the following resolution concerning a protest over one facet of the proposed construction of a nuclear generating plant on Hutchinson Island. Following is the full text of the resolution:

"Resolved, that the board of directors of the Martin County Taxpayers Association, at a board meeting March 7, vote unanimously to protest the announced plan of the Florida Power and Light Company to withdraw from the Indian River, the cooling water needed for its nuclear generating plant to be built on Hutchinson Island.

"We recognize the need for the new plant, welcome the company's program, and oppose only the present cooling plan.

"The preponderant objective opinion of independent scientists, ecologists and biologists is that withdrawing water from the Indian River, with its replacement by sea water from the two inlets, St. Lucie and Fort Pierce, will do untold damage to the hydrology and ecology of this valuable estaurine area.

" The brackish ecology of a considerable area will be destroyed, a vast acreage of phytoplankton, larval fauna and bethnic organisms basic to the chain of life will be killed by passing through the plant and discharging into the sea, hydrology will be changed with either negative or unknown results by the massive withdrawal of estaurine water and the life within it.

" Without trying to suggest engineering remedies, it is well known that cooling can be accomplished, without damage to the estuary, by both withdrawing and discharging to the sea, by a closed system, or in other ways.

" The Indian River Estuary is vital to the economy of this area. Its rich production is our overwhelming asset, and cannot be risked by

Martin County Taxpayers Association, Inc.
(A CORPORATION NOT FOR PROFIT)
P. O. BOX 741 TELEPHONE 287-2578
STUART, FLORIDA 33494

E. H. GLUCKLER
EXECUTIVE SECRETARY

the Florida Power and Light Company plan now proposed. We are willing to condone the vast overcut of the so-called access canal to provide fill for plant construction, but protest vigorously the withdrawal of cooling water from the Indian River."

Copies of this resolution are being sent to other interested boards, individuals or groups, as indicated below.

Very truly yours,

E.H.Gluckler, executive secretary.

CC:

Florida Air and Water Pollution Control Board
Department of the Interior, Bureau of Sports Fisheries and Wildlife
Florida Board of Conservation
Federal Water Pollution Control Administration
Atomic Energy Commission
Gov. Claude R.Kirk, Jr.
U.S. Sen. Edward J.Gurney
U.S. Sen. Spessard Holland
U.S. Rep. Paul G.Rogers
St.Lucie County Commission
Martin County Commission
U.S.Army Corps of Engineers

Attachment 3

FPL Response to the MCTA

FLORIDA POWER & LIGHT COMPANY

HELPING BUILD FLORIDA

West Palm Beach, Florida
April 3, 1969

Mr. E. H. Gluckler, Executive Secretary
Martin County Taxpayer's Association
P. O. Box 741
Stuart, Florida 33494

Dear Mr. Gluckler:

It was nice for you to meet with Mr. Spencer, Mr. Law and me the other day regarding your letter of March 20 and to discuss Florida Power & Light Company's proposed Hutchinson Island power plant.

We appreciate having the views of concerned citizens' groups, such as yours, and welcome this opportunity to further discuss some of the things which our company is doing to prevent any harm to the environment from our proposed power plant. We are certainly happy that this project has received the overall acceptance of your group. You can count on the fact that Florida Power & Light Company will do everything possible to merit your confidence and to be "good neighbors" throughout the life of the plant.

First, I would like to make clear our company's policy. We will do everything feasible to avoid harm to our environment from any and all of our operations. This is not just a platitude; it is plain, good business as well as good citizenship. Our record vindicates our policy. In 40 years of operation there has not been a single case of harm attributable to our power plant cooling water use. On the contrary, our plants year after year continue to be the source of most sought-after fishing and recreation spots in our state.

But we have not chosen to stop with our record. We have carefully considered the expressed concerns of many citizens such as yourselves for possible adverse effects of plant cooling water usage. We have sought scientific advice from private, educational, and governmental sources. We are engaged in extensive investigative programs at Hutchinson Island. Dr. Robert L. Dean, Chairman of the Department of Coastal and Oceanographic Engineering, University of Florida, is conducting studies to determine the effect of cooling water usage on inlet stability, inlet currents, beach erosion, Indian

River currents, Indian River salinity, ocean mixing, and other effects. Dr. James B. Lackey, Professor of Biology, Emeritus, University of Florida, and Dr. William S. Carr, Professor of Zoology, University of Florida, are investigating plankton, benthic fauna, bottom plants, and spawning prevalence in both the Indian River and the ocean. Additional studies are being undertaken in meteorology, ground water hydrology, and soil conditions. This massive scientific effort is needed in order to thoroughly and carefully evaluate the many complex interactions involved.

Preliminary indications from our scientific advisers are that an Indian River intake is feasible, and on this basis have indicated this source as a preliminary design. We have, however, instructed our engineers to so design the plan as not to preclude another source of intake should any of the studies demonstrate that harm would come to the Indian River. An ocean intake is not the preferred method because of its associated potential for storm damage and the consequent effects on the reliability of the plant. However, we have advised the Atomic Energy Commission that should our studies indicate that it would be in the public interest to utilize the ocean for cooling water, we will submit an amendment to our application. Our letter to the Atomic Energy Commission is attached.

We hope that your organization will withhold judgment on matters relating to the plant until these studies have been completed and evaluated. We expect this to be in the late summer of this year. We pledge to you and all our customers that Florida Power & Light Company will continue to use every effort to carry out its obligation to provide Florida's ever-increasing population with economical and reliable electric service and do it in such a way that no harm comes to environment.

Thank you again for this opportunity to discuss these important matters with you.

Sincerely yours,

R. D. Hill
Vice President

RDH:mj
Encl.

Attachment 4

US Department of Interior (DOI) to FPL

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

March 26, 1969

In reply address:
Acting Regional Coordinator
Department of the Interior
30-A Peachtree-Seventh Building
Atlanta, Georgia 30323

AIRMAIL

Florida Power and Light Company
P.O. Box 3100
Miami, Florida 33101

Gentlemen:

Interested agencies of the Department of the Interior are in the process of reviewing your application No. 69-55 to dredge an access channel in Indian River near Fort Pierce, Florida, and have received a 30-day extension of time from the Corps of Engineers for the submission of comments. These agencies have also been reviewing your Preliminary Safety Analysis Report (PSAR) to the Atomic Energy Commission. Several questions have arisen on which we would appreciate the comments of your engineering division, in order that we may complete our review and provide comments.

1. Your application to the Corps of Engineers states that 1.5 million cubic yards of dredged material will be placed on the plant site. Inspection of the application drawing indicates that apparently several times that amount will actually be dredged. What is the actual amount of material to be dredged from Indian River and Big Mud Creek, and what is to be done with the amount of material in excess of the 1.5 million cubic yards of foundation material?

2. What is the purpose of a 26-foot deep navigation channel when the controlling depth for navigation in Indian River is presently 10 feet?

3. We would appreciate receipt of a detailed map, preferably on a topographic quadrangle, showing the length of channel in Indian River; the length, width, and depth of dredging to be done in Big Mud Creek; the location of all spoil sites for disposal of all the materials to be dredged; and the dimensions and arrangement of dikes for control of this material.

4. Please describe the equipment to be used in the construction of dikes and in the dredging and transmission of material to the fill and spoil areas.

5. Your PSAR states that, if necessary, materials under the reactor site will be removed to an elevation of minus 60 feet, replaced and compacted. Further, if portions of these removed materials are not suitable for compacted fill, they will be spoiled and suitable fill used. Where will these unsuitable materials be placed, and what will be the source of the replacement fill?

6. We understand that you intend to use Indian River water for cooling purposes. What will be the size, type, depth, and location of your intake facility?

7. Your PSAR states that under winds of 50-60 m.p.h., it is estimated that an extreme low tide of minus 3 feet m.l.w. can be expected to occur at the plant site. Presumably this level might be even lower in the event of hurricane force winds. What effect would these winds and lower water levels have on the source and quality of cooling water?

8. Please describe the proposed cooling water discharge channel to the ocean: size, type, and possible effects on beach erosion rates.

9. What is the anticipated cooling water intake and discharge in cubic feet per second?

10. What is the anticipated increase in temperature of cooling water between point of intake and point of discharge?

11. What is the number and capacity of pumps and heat exchangers in the final cooling loop?

We realize that some of these questions deal with facilities which will be the subject of future applications to the Corps of Engineers. However, it is the responsibility of this Department to evaluate the effects of projects such as this on all aspects of the environment. It has been our experience that it is difficult for us to properly discharge our responsibilities to the applicant as well as to the public when a project analysis is attempted in piecemeal fashion. Therefore, we believe that the only sensible and equitable procedure is to consider the project as a whole in order that the occurrence of unexpected problems in the future may be reduced. Your continued cooperation will be greatly appreciated.

Sincerely yours,

C. Edward Carlson

C. Edward Carlson
Acting Regional Coordinator

Attachment 5

FPL to US DOI

P O BOX 3100 MIAMI FLORIDA 33101

FLORIDA POWER & LIGHT COMPANY

April 14, 1969

Mr. C. Edward Carlson
Acting Regional Coordinator
U. S. Department of the Interior
30-A Peachtree-Seventh Building
Atlanta, Georgia 30323

Dear Mr. Carlson:

This is in reply to your letter of March 26, 1969 which requested answers to eleven questions on the design aspects of our Hutchinson Island power plant. Your questions and our answers are presented below.

1. Question: Your application to the Corps of Engineers states that 1.5 million cubic yards of dredged material will be placed on the plant site. Inspection of the application drawing indicates that apparently several times that amount will actually be dredged. What is the actual amount of material to be dredged from Indian River and Big Mud Creek, and what is to be done with the amount of material in excess of the 1.5 million cubic yards of foundation material?

   Answer: A revised application drawing was submitted to the Corps of Engineers on April 3, 1969. This revised drawing indicates an access channel of constant width from the Intracoastal Waterway to the plant site with approximately 1,500,000 cubic yards of material to be dredged from the proposed channel. It is estimated that 1,250,000 yards will be required at the plant and the remaining 250,000 yards will be spoiled adjacent to the plant area for use for parking areas, storage areas, and temporary construction areas. Spoil material will be disposed of within a diked area so that the decant will not return directly to the Indian River or Big Mud Creek.

2. Question: What is the purpose of a 26-foot deep navigation channel when the controlling depth for navigation in Indian River is presently 10 feet?

   Answer: The purpose of the 26-foot depth of channel is to obtain the fill required for construction of the plant with a minimum width of channel.

3. Question: We would appreciate receipt of a detailed map, preferably on a topographic quadrangle, showing the length of channel in Indian River; the length, width, and depth of dredging to be done in Big Mud Creek; the location of all spoil sites for disposal of all the materials to be dredged; and the dimensions and arrangement of dikes for control of this material.

Answer: The term "spoil" site is probably a misnomer. We are presently planning to store the dredged material suitable for compacted fill in the area of the switchyard. The dike that is being installed around the excavation area for flood protection of the foundation preparation will include the dredge storage area. The top of this dike will be 12 feet above mean low water with side slopes of one vertical to three horizontal. Dredged material unsuited for compacted fill will also be stored within a similar diked area and subsequently used for storage and parking areas. The decant from the dredged material used for this dike will be directed so that the flow is towards the swamp adjacent to the plant.

The construction specifications will require that the turbidity of the receiving waters will not be increased by more than 50 Jackson units above the existing level of turbidity due to decant from the dredging operations.

4. Question: Please describe the equipment to be used in the construction of dikes and in the dredging and transmission of material to the fill and spoil areas.

Answer: The equipment for dredging and construction of dikes has not at this time been selected. However it is anticipated that the dikes will be constructed by the use of scrapers and bulldozers from materials obtained in the major construction excavation within the plant area. The dredge will probably be sized for a 35-foot ladder and will pump the suitable dredged material to the storage area in the switchyard. When the dredged material dries to the proper moisture content, it will be transported by scrapers to the compacted fill area. Dredged material unsuitable for compacted fill in the foundation area will be stored within a diked area on the owner's property and will be used for construction of dikes along the discharge cooling water canal or for construction of parking and storage areas.

It is our intent to dredge only sufficient material required for construction of the plant.

5. Question: Your PSAR states that, if necessary, materials under the reactor site will be removed to an elevation of minus 60 feet, replaced and compacted. Further, if portions of these removed materials are not suitable for compacted fill, they will be spoiled and suitable fill used. Where will these unsuitable materials be placed, and what will be the source of the replacement fill?

   Answer: Unsuitable fill will be used for construction of dikes along discharge cooling water canal, parking areas, and storage areas. All replacement fill will be obtained from the dredged channel in the Indian River and Big Mud Creek.

6. Question: We understand that you intend to use Indian River water for cooling purposes. What will be the size, type, depth, and location of your intake facility?

   Answer: The intake facility will be located on the west side of the plant approximately 450 feet from Big Mud Creek. The intake structure will be reinforced concrete approximately 60 feet wide by 70 feet long by 44 feet high. It will house four circulating water pumps in separate bays, screens and miscellaneous other equipment. The top deck will be at plant grade which is elevation plus 18 feet, and the invert will be at approximately elevation minus 26 feet. A bridge crane on a steel structure will be installed above the top deck to service the equipment.

   At present we have studies under way to determine the effects of taking the cooling water from the River. These studies include hydraulics of the Indian River and Ocean, stability studies of the inlets, beaches and channels, predicted mixing area of the cooling water effluent, chemical analyses, background studies of phytoplankton, zooplankton, benthic plants and fauna, and fisheries. Upon completion of these studies which are scheduled to be complete in July 1969, we will furnish them to the appropriate County, State and Federal agencies.

   In the event that our studies indicate it would be in the public interest to utilize the Ocean as a source of cooling water, we will request the necessary permits from the applicable agencies and submit an amendment to our application to the AEC. We have advised the AEC in this regard, and a copy of our letter to them is enclosed for your records.

7. Question: Your PSAR states that under winds of 50-60 mph, it is estimated that an extreme low tide of minus 3 feet m.l.w. can be expected to occur at the plant site. Presumably this level might be even lower in the event of hurricane force winds. What effect would these winds and lower water levels have on the source and quality of cooling water?

Answer: The extreme low tide of minus three feet is associated with a maximum possible hurricane and is calculated to be the lowest water level conceivable. Under this condition, the winds at the site would be 50-60 mph. Higher winds would not cause lower water levels.

8. Question: Please describe the proposed cooling water discharge channel to the ocean: size, type, and possible effects on beach erosion rates.

Answer: The discharge cooling water canal will terminate in a concrete box located approximately 300 feet west of the ocean shore line. A 14-foot diameter pipe will run from the box to a point approximately 800 feet east of the shore line for discharge into the Atlantic Ocean. This pipe will be installed under the ocean floor with a minimum of five (5) feet of cover and will have no effect on beach erosion.

9. Question: What is the anticipated cooling water intake and discharge in cubic feet per second?

Answer: Approximately 1600 cubic feet per second is the anticipated cooling water system requirement.

10. Question: What is the anticipated increase in temperature of cooling water between point of intake and point of discharge?

Answer: Approximately 12 degrees.

11. Question: What is the number and capacity of pumps and heat exchangers in the final cooling loop?

Answer: Four (4) cooling water pumps each with a capacity of approximately 400 cubic feet per second will furnish cooling water to two (2) turbine condenser shells. Three (3) intake cooling

water pumps each with 50 percent system capacity and rated at approximately 66 cubic feet per second will furnish cooling water to two (2) component cooling water heat exchangers and two (2) turbine cooling water heat exchangers.

We are glad to cooperate with the Department of the Interior in furnishing answers to the foregoing questions. Please let us know if you need further information.

Yours very truly,

A. M. Davis
Vice President

AMD:rp
Encl.

Attachment 6

FPL to US Atomic Energy Commission (AEC)

FLORIDA POWER & LIGHT COMPANY

HELPING BUILD FLORIDA

P. O. Box 3100
MIAMI, FLORIDA 33101

April 1, 1969

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Re: Docket No. 50-335 - Hutchinson Island Plant, Unit No. 1

Dear Dr. Morris:

The Preliminary Safety Analysis Report portion of our Application for a Construction Permit for this project contemplates intake of cooling water from the Indian River and discharge to the Atlantic Ocean.

Our ecological and environmental studies of the adjacent River and Ocean areas are well underway. One of the purposes of this work is to determine if there are likely to be any adverse effects due to using the River as the cooling water source. Concurrently, design studies are in progress on alternate plans using the Ocean both for intake and discharge.

Should any of our studies indicate that it would be in the public interest to utilize the Ocean as the source of cooling water, we will submit an amendment to our Application.

We would like for this letter to become a part of our official Application for a permit to construct the Hutchinson Island Plant.

Very truly yours,

George Kinsman
Senior Vice President

GK:std

Attachment 7

State of Florida, Department of Health and Rehabilitative Services (DHRS)

STATE OF FLORIDA

CLAUDE R KIRK JR
GOVERNOR

JAMES A. BAX
SECRETARY

DEPARTMENT of HEALTH and REHABILITATIVE SERVICES

DIVISION OF HEALTH
WILSON T SOWDER M D M P H DIRECTOR
BOX 210—JACKSONVILLE 32201—TEL 904-354-3961

October 17, 1969

St. Lucie County IW
Florida Power & Light Co.
Hutchinson Island Nuclear
Plant /116

Mr. A. M. Davis
Vice President
Florida Power & Light Company
Post Office Box 3100
Miami, Florida 33101

Dear Mr. Davis:

We appreciate receipt of Amendments 2 and 3 to your Hutchinson Island Preliminary Safety Analysis Report. A search of the report has not disclosed the volume of condenser and other equipment cooling waters to be circulated through the plant. We would be pleased to know their volumes and proposed temperature rise during minimum, maximum and normal intake water temperature at various operating rates.

We appreciate institution of ecological studies based upon both (1) intake from the Indian River and discharge to the Atlantic Ocean and (2) intake from the Atlantic Ocean and discharge to the same body of water. It is believed timely, however, that we express a strong preference for the latter cooling water supply and disposal system.

Very truly yours,

Nick Mastro

Nick Mastro, Assistant Chief
Bureau of Sanitary Engineering

NM:mj

cc: D.A. & W. P. C.
cc: Mr. Richard W. Starr

Attachment 8

Excerpts from the Final Environmental Statement, prepared by AEC, related to the St. Lucie Nuclear Unit No. 1

Final

environmental statement

DOCKET- 50335-63

related to the

ST. LUCIE PLANT UNIT NO. 1

FLORIDA POWER AND LIGHT COMPANY

Docket No:50-335

JUNE 1973

UNITED STATES ATOMIC ENERGY COMMISSION

DIRECTORATE OF LICENSING

Aesthetically the towers would be at least 200 ft taller than the reactor dome, thus tending to dominate the skyline, and the plume would be visible for several miles.

In summary, natural draft saltwater cooling towers could be utilized but insufficient test data are available now to confirm predicted minimal impact from salt carryover and drift. Costs would be substantially higher than the proposed cooling system design, and there would be significant negative, aesthetic impacts. The Staff concludes this alternative at this Site is unacceptable because the large incremental cost, the adverse aesthetic impact, and the potential drift problem outweigh potential environmental gains over the currently proposed cooling system.

f. Once-Through Cooling with Intake on Indian River

Indian River (Big Mud Creek) could be used as a source of cooling water for the Plant with discharge to the Atlantic Ocean. The Plant was originally designed for such a system (see Figure XI-1). However, the plan was altered prior to issuance of a construction permit because of possible adverse effects on the ecological balance in the Indian River.[11]

This intake alternative would alter the natural current patterns and flushing rates in Indian River and Big Mud Creek. The natural flushing time of the river now is estimated by the Staff to be on the order of one year. With the intake on Indian River, preliminary computations by the Staff indicate this flushing time would be reduced to approximately 1 month. Currents induced in Indian River and Big Mud Creek would be very low, approximately 0.02 and 0.05 fps, respectively, and the present salinity range of 15 to 32 ppt would be narrowed.

Several possible benefits might result from this increased flushing action. Indian River is presently polluted by sewage outfalls, drain field seepage and sanitary wastes from boats. As a result of this pollution, the Florida Health Board closed the waters to shellfishing in 1970. Increased flushing action could remove much of this pollution.

A reduction in pollutants and a stabilization of salinity and temperature would combine to slow the growth of bacteria, algae, and some of the grasses. At the same time nutrients would be continually supplied from the mangrove communities and runoff from the

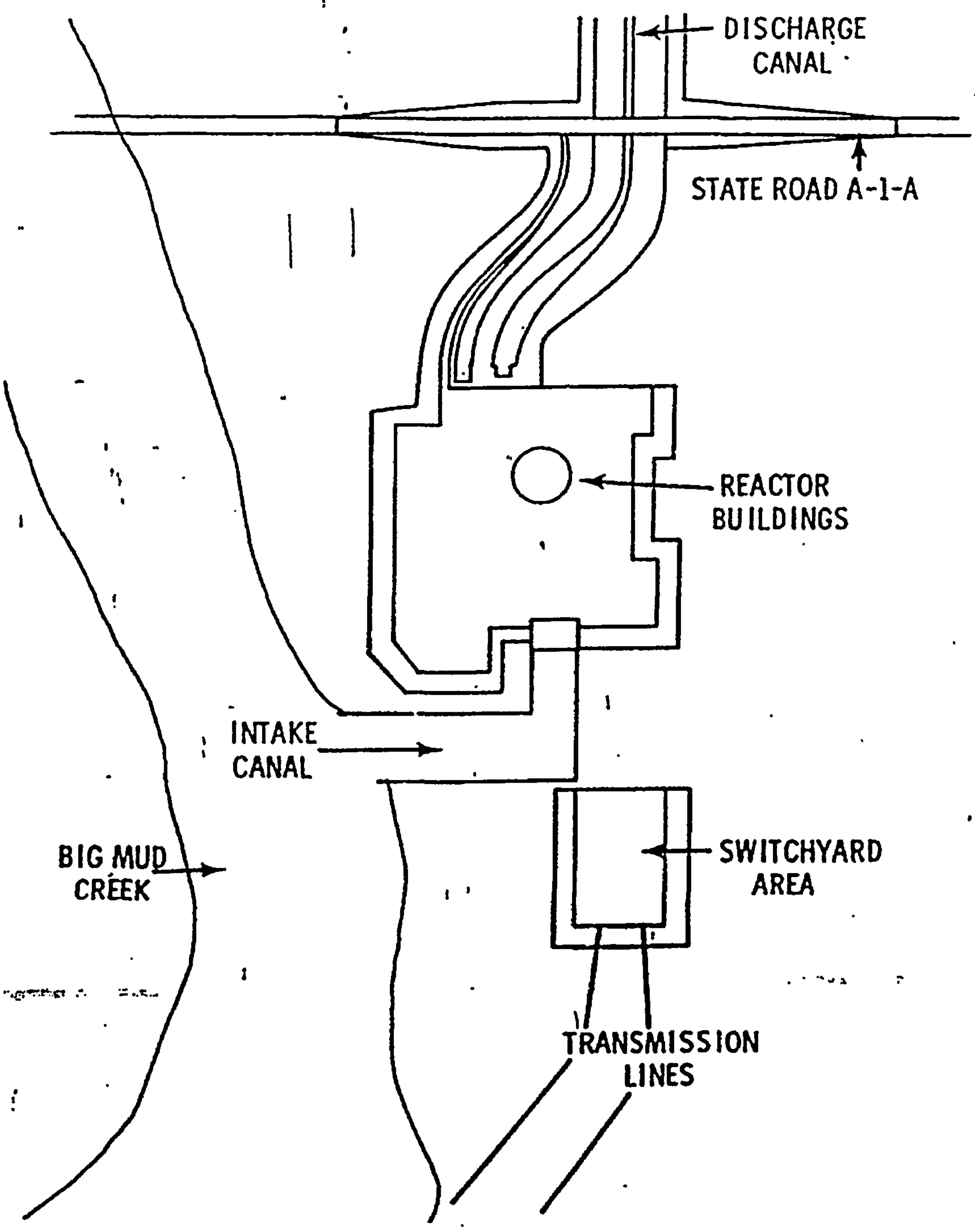

FIGURE XI-1. PLANT PLOT PLAN SHOWING BIG MUD CREEK INTAKE

savanna. Thus the waters might well support an increased population of fishes and invertebrates and become a more efficient nursery ground. This increased productivity would perhaps more than offset the problem of entrainment discussed below.

The flushing action in Big Mud Creek would probably prevent it from returning to an anoxic state (see Section IV.B.2). The problem of hydrogen sulfide production and possible resulting marine kills would be minimized.

On the other hand, an Indian River intake would probably result in substantially more entrainment and damage of organisms than will occur with the proposed intake system, particularly if Big Mud Creek remains a productive area. Despite this damage, it is quite possible the overall productivity of the Indian River-Big Mud Creek nursery ground would be enhanced.

Economic savings could result from an Indian River intake. The Applicant estimated an incremental capital cost increase of $9.8 million from switching to the proposed Atlantic Ocean intake.[12] At the present time, however, any savings would be less than $9.8 million due to construction advances that have occurred since the estimate was prepared. In addition, the Staff estimates recirculation from the discharge plume to the intake will increase annual operating costs approximately $50,000 due to a slightly higher (1.5°F to 3°F) than ambient inlet temperature to the condenser.

Other benefits from an Indian River intake include (1) elimination of the Atlantic Ocean intake as a navigation hazard, (2) elimination of the proposed recirculation canal and intake defouling procedure, and (3) elimination of the 5000-ft long intake canal—approximately 32 acres proposed for the intake and recirculation canals would be made available for other purposes.

The staff concludes, however, that extensive studies would be necessary to insure that beneficial rather than detrimental ecological effects would occur in the Indian River. In view of these uncertainties and the minimal environmental damage predicted from the proposed design, this alternative is not recommended.

g. Alternative Discharge Configurations

The proposed discharge configuration from shoreline to point of discharge consists of a buried 12-ft diameter pipeline terminating at a dredged MLW depth of 36 ft (18 ft ocean depth) at a

distance approximately 1200 ft from shore. This pipeline is a two-port, Y-type jet discharge. The ports do not form a true Y; rather, one leaves at a 45° angle to the main trunk. The horizontal discharge velocity is estimated to be 13 fps and is estimated to produce a maximum rise in surface water temperature of about 6°F above ambient.

In selecting this configuration, the Applicant sponsored hydraulic model and other studies[13] for the purpose of evaluating the heat dissipation characteristics and related costs of alternative configurations. Four alternative configurations were considered: (1) the presently planned 13 fps Y-discharge at 18 ft ocean depth, (2) a 10 fps single jet at 18 ft ocean depth, (3) a 10 fps single jet at 30 ft ocean depth, and (4) a 10 fps multiport diffuser at 18 ft ocean depth. Discharge velocities, maximum surface water temperature rise and incremental cost of these configurations have been estimated by the Applicant and are shown in Table XI-3.

Single port discharge configurations at 18-ft and 30-ft ocean depths result in surface temperature increases of about 10°F and 6°F respectively, as compared to about 6°F for the present design. These designs assume additional dredging well below the ocean depths noted, however. Where dredging is not assumed, the Staff estimates the temperature rises produced by 10 fps single jets at MLW depths of 18 and 30 ft to be about 15 and 12°F respectively.

The proposed design is expected to produce temperatures having a minimal environmental impact, which will comply with the relevant Florida water quality standards (Section V.C.2.f.). The 10 fps single jet at 18 ft ocean depth is a less costly alternative, but would produce an unacceptable temperature increase with possible resulting environmental impacts which would not comply with the Florida water quality standards. The remaining two alternative configurations would cost more and would not represent an improvement in environmental impact when compared with the proposed design.

h. Discharge Water Dilution System

It is feasible to dilute the heated effluent from the condenser cooling system to attain lower temperatures at the discharge. The proposed recirculation canal could be used to divert water from the intake canal to the discharge canal, bypassing the condenser. For example, at an estimated cost of $9 million an

Two Circuit Overhead Transmission System: $1.7 million capital cost decrease (savings) incurred uniformly over a 2-year period; no startup delay; no change in operating and maintenance costs.

2. Indian River Intake

This alternative offers a cost advantage over the present design and may result in environmental enhancement. Cost savings result from elimination of most of the intake canal and the recirculation canal, and from a slightly higher operating efficiency resulting from no recirculation between the heated discharge and the intake. The estimated capital cost reduction of $9.8 million converts to a present value of $8.6 million and the annual operating cost saving of $50,000 converts to a present value of $0.5 million. Total present value savings from an Indian River intake is thus estimated to be $9.1 million. These savings are contingent upon the degree of construction completion at time of conversion, however.

Potential major environmental benefits from this alternative include (1) removal of pollutants from Indian River with possible reopening to shellfishing, (2) increased productivity of Indian River-Big Mud Creek as a nursery ground and (3) maintenance of Big Mud Creek as a productive area. The major adverse impact would probably be increased damage to marine organisms from entrainment, if the total productivity of Indian River and Big Mud Creek is increased. There is also an undefined potential for adverse impact on the ecology of Indian River resulting from environmental changes. Since the environmental impact of the proposed Atlantic Ocean intake is considered minimal and acceptable by the Staff, it is concluded that the ocean intake constitutes the preferable approach.

3. Altern te Discharge Configurations

Configurations that would result in the same or lower surface temperatures than the reference case would cost more. Additional line lengths would be required for either single port or multiport configurations to reach the ocean depths required. Equal or lower cost configurations would result in substantially higher surface temperatures, generally more than 10°F above ambient. The potential environmental impact of these temperatures is considered by the Staff to be unacceptable and such discharges would not comply with the relevant Florida water quality standards (see discussion in Section V.C.2.f). Impacts associated with the surface temperatures resulting from the reference case are considered by the Staff to be minor and do comply with the relevant Florida water quality standards; therefore, the reference case is considered superior to the alternate configurations analyzed.

REFERENCES (Continued)

References for Section X (Continued)

(10) 1970 National Power Survey, Federal Power Commission, December 1971, p. II-3-14.

(11) Letter from J. N. Nassikas, Chairman, Federal Power Commission to H. L. Price, Director of Regulation, USAEC, July 2, 1971.

References for Section XI

(1) Letter from J. N. Nassikas, Chairman, Federal Power Commission to H. L. Price, Director of Regulation, USAEC, July 2, 1971.

(2) "An Evaluation of the Powered Spray Module for Salt Water Service at Turkey Point," Southern Nuclear Engineering, Inc., Dunedin, Florida, May 1970.

(3) Florida Power and Light Company, Hutchinson Island Plant Unit No. 1, Environmental Report, Supplement I, p. V-6, January 6, 1972.

(4) Jersey Central Power and Light Company, Forked River Nuclear Station Unit 1, Applicant's Environmental Report, January 1972.

(5) G. E. McVehil, "Evaluation of Cooling Tower Effects at Zion Nuclear Generating Station," Final Report to Commonwealth Edison Company, Chicago, Illinois, by Sierra Research Corporation, Boulder, Colorado, pp. 37-38, 1970.

(6) Florida Power and Light Company, St. Lucie Unit No. 1 (formerly Hutchinson Island), Environmental Report Supplement 8, October 25, 1972.

(7) Pollution Control Council, Pacific Northwest Area, "A Survey of Thermal Power Plant Cooling Facilities," pp. 21, 31, 1969.

(8) Preliminary Report: "Effect of Cooling Tower Effluents on Atmospheric Conditions in Northeastern Illinois," Circular 1000, Illinois State Water Survey, Urbana, pp. 11, 13, 14, 1971.

REFERENCES (Continued)

References for Section XI (Continued)

(9) D. J. Broehl, "Field Investigation of Environmental Effects of Cooling Towers for Large Steam Electric Plants," Portland General Electric Company, Portland, Oregon, p. 24, 1968.

(10) G. F. Bierman, G. A. Kunder, J. F. Sebald, and R. F. Visbisky, Characteristics, Classification and Incidence of Plumes from Large Natural Draft Cooling Towers, paper presented at the American Power Conference 33rd Annual Meeting, Chicago, Illinois, pp. 10-11, April 22, 1971.

(11) Atomic Safety and Licensing Board, Initial Decision, June 30, 1970.

(12) Florida Power and Light Company, Hutchinson Island Plant Unit No. 1, Environmental Report, Supplement I, p. V-9, January 6, 1972.

(13) Florida Power and Light Company, Hutchinson Island Plant Unit No. 1, Environmental Report, p. 32, May 20, 1971.

(14) Ebasco Services, Inc., Hutchinson Island Unit No. 1, Cooling Water Discharge Report for Florida Power and Light Company, pp. 7-10, May 1971.

(15) Florida Power and Light Company, Hutchinson Island Plant Unit No. 1, Environmental Report Supplement No. 3, p. 18-2, May 30, 1972.

(16) Florida Power and Light Company, Hutchinson Island Plant Unit No. 1, Environmental Report, Supplement No. 3, p. 8-2, May 30, 1972.

(17) Letter from James Coughlin, Vice President, Florida Power and Light Company to Daniel R. Muller, Assistant Director for Environmental Projects, USAEC, p. 5-6, March 12, 1973.

(18) Ibid, p. 5-5.

Attachment 9

St. Lucie Nuclear Power Plant Standard Operating Procedures

STANDARD OPERATING PROCEDURES (SOP)

FOR

SECTION 316 (b) PHASE II RULE
IMPINGEMENT MORTALITY AND ENTRAINMENT STUDY
ST. LUCIE PLANT – ST. LUCIE COUNTY, FLORIDA

Prepared By

Ecological Associates Inc.
P.O. Box 405
Jensen Beach, Florida 34958

March 2006

TABLE OF CONTENTS

ECOLOGICAL ASSOCIATES INC.
STANDARD OPERATING PROCEDURES (SOP)

FOR

SECTION 316 (b) PHASE II RULE
IMPINGEMENT MORTALITY AND ENTRAINMENT STUDY
ST. LUCIE PLANT – ST. LUCIE COUNTY, FLORIDA

1.0 Introduction

This document describes the methods, procedures, and protocols (collectively referred to hereafter as procedures) to be used by staff of Ecological Associates, Inc. (EAI) in support of Florida Power and Light Company's (FPL's) impingement mortality and entrainment study at the St. Lucie Plant (PSL). The objective of this monitoring program is to determine if the location, design, technology, and/or operational measures implemented at the St. Lucie Plant have sufficiently reduced levels of impingement mortality and entrainment relative to baseline conditions to achieve compliance with the new Environmental Protection Agency (EPA) standards set forth for existing plants (Phase II Rule) under Section 316(b) of the Clean Water Act (CWA). Activities governed under these Standard Operating Procedures (SOP) include sample collection, sample processing, taxonomic identification of specimens, and collection of physicochemical data.

Fish, shellfish, and ichthyoplankton sampling will be conducted within three general areas adjacent to the St. Lucie Plant (Figure 1): Atlantic Ocean in the vicinity of the facility's offshore intake structures; intake canal near the Unit 2 intake pipe (16 ft); and Big Mud Creek (BMC)/Indian River Lagoon (IRL) within the vicinity of the plant's Emergency Cooling Water Intake System. As described in the Proposal for Information Collection (PIC), the field sampling program will allow comparison of numbers of

organisms impacted under the present Cooling Water Intake System (CWIS) configuration, which uses the Atlantic Ocean as source cooling water, with those that would have been impacted had the CWIS utilized the Indian River Lagoon as the source cooling water, as originally designed. Data will be collected bi-weekly, during both day and night periods. Data analyses will examine trends in species composition, abundance, and biomass, as well as seasonal and diurnal variation between these two areas.

Sampling will be accomplished using three methods: 1) entrained organisms will be sampled in the intake canal using a stationary 1-m plankton net fitted with a 0.300-mm mesh net; 2) organisms susceptible to entrainment within the BMC/IRL will be sampled using towed plankton nets (paired 20-cm diameter, 0.300-mm mesh bongo nets; and 3) organisms susceptible to impingement will be sampled in both the ocean and BMC/IRL using an otter trawl. Ocean trawls will consist of both mid-water and bottom tows.

Questions on sampling techniques, staffing, schedules, health and safety issues, and/or Quality Assurance/Quality Control (QA/QC) issues should be directed to one of the following individuals:

➢ Bob Ernest, EAI Project Manager	Office: (772) 334-3729
	Cell: (772) 284-5817
➢ R. Erik Martin, QA/QC Officer	Office: (772) 334-3729
	Cell: (772) 284-5803
➢ Mark Mohlmann, H&S Officer	Office: (772) 334-3729
	Cell: (772) 349-2135
➢ Phillip Light, Field Team Leader	Office: (772) 334-3729
	Cell: (772) 427-3737

2.0 Mobilization (General for All Types of Sampling Events)

2.1 Confirm vehicle, boat, and staff availability for scheduled sampling date, as applicable.

2.2 At least 48 hours prior to a sampling event, notify designated FPL PSL contact by email of impending field activities:

- FPL St. Lucie Plant Contacts:
    - o Vince Munne – Environmental Compliance
        - Office: (772) 467-7453
        - Cell: (772) 263-2847
        - Email: vince_munne@fpl.com
    - o Dave Niebch – Land Utilization
        - Office: (772) 467-7316
        - Cell: (772) 240-9523
        - Email: David_Niebch@fpl.com

2.3 Copy all email correspondence to Golder Project Manager.

- Isabel Johnson – Golder Associates, Inc.
    - o Office: (352) 336-5600
    - o Cell: (352) 359-8299
    - o Email: ijohnson@golder.com

2.4 At least 24 hours prior to the date of departure:

2.4.1 Contact FPL PSL by phone to confirm sampling schedule (arrival date & time).

2.4.2 Notify the Florida Fish and Wildlife Conservation Commission Law (FWC) Enforcement Dispatch Center, (305-956-2500), as required by EAI's Special Activity License (SAL; #05SR-071B).

2.4.3 Assemble equipment and supplies using applicable Equipment and Supplies Checklist and ensure that all needed gear is in proper operating condition.

2.4.4 Review Health and Safety Plan (HASP) and ensure that all requisite safety gear are included with equipment and supplies.

2.4.5 Calibrate field instrumentation (Appendix A).

2.5 On the date of field sampling:

2.5.1 Review sampling protocols prior to initiating field activities.

2.5.2 Conduct a Safety and Environmental Tailboard meeting at the site prior to sampling to address any safety and environmental conditions the field team may encounter (refer to HASP).

3.0 Field Collection

3.1 Nearfield Ocean Trawl Sampling (Fish and Shellfish)

3.1.1 Mobilize

3.1.1.1 Use Equipment and Supplies Checklist to assemble and ready field gear (Appendix B).

3.1.1.2 Provide a Float Plan to EAI's primary contact person.

3.1.2 Embarkation

3.1.2.1 Conduct safety briefing prior to loading gear on vessel.

3.1.2.2 Ensure all personnel are wearing Personal Flotation Devices (PFDs) and closed-towed, non-skid footwear at all times when working on or around water.

3.1.2.3 Load gear aboard vessel.

3.1.2.4 Maintain boat log indicating persons on trip, destination, and times of departure and return.

3.1.2.5 Depart for the St. Lucie Plant via the St. Lucie Inlet.

3.1.3 Vessel

3.1.3.1 A leased vessel will be used for most trips. It is moored in the Manatee Pocket immediately south of Pirate's Cove Marina.

3.1.3.2 EAI's 25 ft Parker may be used for some trips. Launch boat at Sandsprit Park.

3.1.4 Ancillary Data Collection

3.1.4.1 Upon arrival on station, record weather conditions, tidal stage, sea state, current direction, and water depth on Field Data Sheet.

3.1.4.2 Abort sampling activities if the Field Team Leader determines that conditions are unsafe or will not permit the safe collection of representative samples (e.g.,

threatening weather, rough sea conditions, unusual waterbody conditions, etc.).

3.1.4.3 Collect water quality data twice during each diel sampling event, prior to initiation of sampling and upon completion of all sampling. This will provide data to bracket the period of sampling.

3.1.4.3.1 Prior to arriving on station, turn on meters and allow to warm up.

3.1.4.3.2 Measure temperature, pH, dissolved oxygen, conductivity, and salinity with Quanta or equivalent backup meter.

3.1.4.3.3 Take measurements at surface, mid-depth, and near bottom.

3.1.4.3.4 Record results on Field Data Sheet.

3.1.5 Sample Locations and Methods

3.1.5.1 Conduct sampling along three shore-parallel transects/stations (Figure 1).

3.1.5.2 Use 16-ft otter trawl for bottom tows and 16-ft modified otter trawl for mid-water tows.

3.1.5.3 Begin sampling along each transect just south of the PSL ocean discharge pipes (center on discharge canal). Ensure that the start of the tow is slightly south of the discharge to prevent entanglement with relict construction debris.

3.1.5.4 Conduct each tow north to south.

3.1.5.5 Conduct each tow for 15 minutes.

3.1.5.6 Conduct one mid-water and one bottom trawl along each transect.

3.1.5.7 Operate at slow speed (2 – 2.5 knots). Ensure that the tow line has the proper scope to keep the net at the appropriate sampling depth.

3.1.6 Collect Samples

3.1.6.1 Prepare the trawl for deployment. Attach trawl harness to the stern cleats on each gunwale and attach the trawl bridle to the trawl doors. Tie off the cod end of the net and make sure the net and lines are not twisted and will deploy correctly.

3.1.6.2 Prepare a flow meter for deployment.

3.1.6.2.1 Sea Gear meters. No preparations necessary.

3.1.6.2.2 General Oceanics meters.

3.1.6.2.2.1 Complete the following immediately prior to net deployment at the first sampling location to ensure accurate readings.

3.1.6.2.2.2 Remove the screw at rear of the flow meter.

3.1.6.2.2.3 Hold nose of meter down.

3.1.6.2.2.4 Inject syringe with tap water into meter chamber until full.

3.1.6.2.2.5 Replace screw.

3.1.6.2.2.6 Record the meter reading

3.1.6.2.3 Feed meter towing line through davit pulley. Attach one end of the flow meter bridal to a small depressor and the other end of the bridle to the tow line. Adjust the bridal and tow line as necessary to accommodate water depth. The flow meter should be deployed at a depth of approximately 5 feet.

3.1.6.2.4 Record the initial meter reading of the flow meter on the Field Data Sheet. Ensure that the flow meter propeller does not turn prior to its deployment.

3.1.6.3 Position the boat at the north end of the station transect and motor forward maintaining an appropriate speed to deploy the net (just at or above idle). Ensure that all personnel are clear of all lines and are positioned outside of the bridle and harness.

3.1.6.4 Record the water depth at the start of the tow on the Field Data Sheet.

3.1.6.5 Deploy the net by tossing cod end off the stern and to the side of the motor and/or prop, as applicable, ensuring that net, lines, and tickler chain clear the prop. Swing the doors over one side of the boat and guide the bridle, tow line, and harness to the stern clear of the prop.

3.1.6.6 When the net is fully deployed (tow line becomes taut), immediately deploy the flow meter from the davit and ensure that it is properly oriented and facing into the current. Immediately activate stopwatch. Record time of deployment and GPS start point on Field Data Sheet.

3.1.6.7 Record the GPS starting waypoint on the Field Data Sheet.

3.1.6.8 Pull net at approximately 2 knots for 15 minutes in a relatively straight line and at constant depth parallel to shore.

3.1.6.9 At the end of the tow, immediately retrieve flow meter and record the end time, end GPS position, and flow meter reading on the Field Data Sheet. Take the boat out of gear and haul in the tow line and harness, maintaining tension on the lines. As the boat nears the net, it may be necessary to bump in and out of forward gear so the boat doesn't drift back over the net.

3.1.6.10 Bring the doors along side of the boat, clear of the prop. Pull the doors over the side and into the boat, and shake net to concentrate catch into cod end.

3.1.6.11 Empty cod end into collection tub.

3.1.6.12 Carefully examine net liner in the mouth and body of the net and remove any entangled organisms.

3.1.6.13 If at anytime during the tow the net snags on debris or the bottom, or if is determined that it has not fished properly, discard the contents of the trawl overboard and repeat the tow after addressing the cause of the problem.

3.1.7 Process the sample.

3.1.7.1 Wear work gloves when processing samples to avoid injury.

3.1.7.2 Carefully, sift through debris in collection tub and transfer specimens to a processing tub filled with seawater and equipped with an aerator.

3.1.7.3 Use a small dip net to remove specimens from the processing tub one at a time for processing.

3.1.7.4 Process live specimens first and return to the water as quickly as possible. Retain dead specimens until the trawl tows have been completed before discarding.

3.1.7.5 Sort, identify and enumerate fish and shellfish contained in the sample. Identify specimens to the lowest practicable taxon. Scientific and common names will follow Nelson et al., (2004). Field guides (e.g., Robins et al., 1998) will be available during collections, and a checklist of previously collected species and common identification characters will be developed over the life of the project and available for reference.

3.1.7.6 Measure and weigh (to the nearest 0.1 g) a subset of 50 individuals of each species present in the sample. Record these data on the Fish and Shellfish Length and Weight Data Sheet. If more than 50 individuals are present, enter the total number and batch weight of all remaining specimens on the Data Sheet. If samples contain excessively large numbers of individuals, a random split may be used to obtain a representative sub-sample that can be analyzed within a one-hour period. If specimens of a particular taxon are in poor shape or individuals too small to obtain an accurate weight in the field, a batch weight may be obtained for all individuals in the sample.

3.1.7.7 Determine total length (TL; maximum length with the lobes of the caudal fins pinched together) and standard Length (SL; maximum length from anterior-most part of head or jaws to the hypural plate) for all bony fishes. (Alternatively, only SL will be measured and established TL-SL regression equations may be used for assigning TL to individual specimens.) Determine disk width for rays. Determine carapace width for crabs. Determine post-ocular carapace length for shrimp.

3.1.7.8 Established length-weight regression equations may be used for assigning weights to individual specimens in lieu of actual field measurements, at the discretion of the Project Manager.

3.1.7.9 Place specimens retained for QA/QC purposes or representative specimens of species that cannot be identified to the species level in plastic bags labeled with the date, station number, sample period (day or

night), and sampling depth (bottom or mid) and store on ice for subsequent identification and/or preservation in the lab.

3.1.7.10 Ensure that all required information has been entered on the Field Data Sheet prior to leaving the site.

3.1.8 Laboratory Follow-up

3.1.8.1 Specimens retained for QA purposes will be preserved in 10-percent formalin solution. For fish greater than 150 mm, an incision about 30 mm in length will be made along the abdominal cavity on the right side, to ensure penetration of preservative into the tissues.

3.1.8.2 Organisms that cannot be readily identified in the laboratory will be preserved and sent to a recognized expert for taxonomic identification or verification. A list of experts, appropriate to the taxon in question and approved by the Golder Project Manager, will be maintained at the EAI laboratory.

3.1.8.3 A reference collection of all species collected during the project will be maintained and archived at the EAI laboratory.

3.2 Nearfield IRL/BMC Trawl Sampling

3.2.1 Mobilize

3.2.1.1 Use Equipment and Supplies Checklist to assemble and ready field gear (Appendix C).

3.2.1.2 Provide a Float Plan to EAI's primary contact person.

3.2.2 Embarkation

3.2.2.1 Conduct safety briefing prior to launching vessel.

3.2.2.2 Ensure all personnel are wearing a PFD and closed-towed, non-skid footwear at all times when working on or around water.

3.2.2.3 Launch vessel and load gear.

3.2.2.4 Maintain boat log indicating persons on trip, destination, and times of departure and return.

3.2.2.5 Prior to leaving the dock, contact following agencies to alert them to sampling activities in Big Mud Creek:

- U.S. Coast Guard, Ft. Pierce: (772) 464-6100
- FPL Security Shift Captain: (772) 467-7005
- FPL Land Utilization: (772) 240-9523

3.2.2.6 Depart for the St. Lucie Plant.

3.2.3 Vessel

3.2.3.1 EAI's 25 ft Parker will be used for most trips. Launch boat at Jensen Beach Causeway.

3.2.4 Safety Tailboard

3.2.4.1 Upon arriving on station, disconnect security cable across mouth of BMC and proceed by boat to Land Utilization office.

3.2.4.2 Moor vessel in barge canal.

3.2.4.3 Conduct safety tailboard with designated Land Utilization representative.

3.2.4.4 Upon completion of safety tailboard proceed to Station 1 to initiate sampling activities.

3.2.5 Ancillary Data Collection

3.2.5.1 Prior to sample collection at each station, record weather conditions, tidal stage, sea state, current direction, and water depth on Field Data Sheet.

3.2.5.2 Abort sampling activities if the Field Team Leader determines that conditions are unsafe or will not permit the safe collection of representative samples (e.g., threatening weather, rough sea conditions, unusual waterbody conditions, etc.).

3.2.5.3 Collect water quality data once at each station during each diel sampling event.

3.2.5.3.1 Prior to arriving at Station 1, turn on meters and allow to warm up.

3.2.5.3.2 Measure temperature, pH, dissolved oxygen, conductivity, and salinity with Quanta or equivalent backup meter.

3.2.5.3.3 Take measurements at surface, mid-depth, and near bottom at Station 1 and at mid-depth only at Stations 2 and 3.

3.2.5.3.4 Record results on Field Data Sheet.

3.2.6 Sample Locations and Methods

3.2.6.1 Conduct sampling along three transects/stations beginning at Station 1 (Figure 1).

3.2.6.2 Upon completion of both trawling and ichthyoplankton at Station 1:

3.2.6.2.1 Secure security cable across mouth of BMC.

3.2.6.2.2 Notify FPL Plant Security that sampling operations within BMC have been completed.

3.2.6.3 Use 10-ft otter trawl for all tows.

3.2.6.4 Conduct one bottom trawl at each station.

3.2.6.5 Tow trawl in relatively straight line for 5 minutes, unless drift algae conditions necessitate shorter tow time. A slight arc to the tow path may be necessary to reduce effects of prop wash.

3.2.6.6 Operate at slow speed (approximately 2 knots). Ensure that the tow line has the proper scope to keep the net on the bottom.

3.2.7 Collect Samples

3.2.7.1 Follow procedures listed under 3.1.6 for ocean trawling, with the following exceptions.

3.2.7.1.1 Deploy flow meter at mid depth and adjust flow meter bridal to ensure that depressor does not contact bottom during deployment.

3.2.7.1.2 Conduct tows into prevailing current, if detectable.

3.2.7.1.3 Pull net at approximately 2 knots for 5 minutes in a relatively straight line and at constant depth.

3.2.7.1.4 If the sample contains a large quantity of drift algae, such that the mouth of the net becomes clogged, discard the sample and repeat the tow using a 3-minute tow time.

3.2.7.1.5 If samples contain excessively large numbers of individuals or excessively large amounts of drift algae, a random split may be used to obtain a representative sub-sample that can be analyzed within a one-hour period.

3.2.8 Process the sample.

3.2.8.1 Follow procedures listed under 3.1.7 for ocean trawl sampling.

3.2.9 Laboratory Follow-up

3.2.9.1 Follow procedures listed under 3.1.8 for ocean trawl sampling.

3.3 Nearfield IRL/BMC Bongo Net Sampling (Ichthyoplankton and Shellfish Larvae)

3.3.1 Mobilize

3.3.1.1 Use Equipment and Supplies Checklist to assemble and ready field gear (Appendix D).

3.3.1.2 Affix exterior sample labels on sample containers. Tape interior labels to container lids.

3.3.1.3 Fill sample containers with 90-100 ml of formaldehyde (which will yield approximately 10% formalin when

the container is filled with sample) and place in carrying case.

3.3.2 Concurrent Sampling

3.3.2.1 Conduct bongo net sampling concurrent with trawling.

3.3.2.2 Adhere to procedures established in 3.2.2 through 3.2.5.

3.3.3 Sample Locations and Methods

3.3.3.1 Conduct sampling at three stations beginning at Station 1 (Figure 1).

3.3.3.2 Use 20-cm diameter paired bongo nets fitted with 0.300 mesh nets.

3.3.3.3 Conduct one bongo net tow at each station.

3.3.3.4 Tow for 5 minutes.

3.3.3.5 Operate at slow speed (1.5-2 knots).

3.3.3.6 Fish the net at mid depth.

3.3.4 Collect Samples

3.3.4.1 Prepare the bongo net for deployment. Feed towing line through davit pulley and attach to net frame. Ensure that cod-ends are securely connected to both nets. Attach float line to cod-end.

3.3.4.2 Prepare two flow meters for attachment to the bongo net, following steps listed under 3.1.6.2.

3.3.4.3 Position the flow meters within the mouth of each side of the bongo frame using the attachment rods.

3.3.4.4 Attach the depressor to the center frame of the bongo net. The depressor should not hang more than 1 foot below the frame.

3.3.4.5 Immediately prior to deployment, record the initial meter readings of each flow meter on the Field Data Sheet. Ensure that the flow meter propellers do not turn prior to deployment

3.3.4.6 Position the boat into the current (or wind if no current is detected) and motor forward maintaining an appropriate speed to deploy the net (just at or above idle).

3.3.4.7 Maintain a constant speed of approximately 1.5-2 knots, place the bongo net in water and begin to slowly deploy nets ensuring that flow meters are properly oriented into the current. As soon as the bongo net is completely beneath the surface of the water, activate stopwatch. Record time of deployment and GPS start point on Field Data Sheet.

3.3.4.8 Direct the boat in a broad counter clockwise arc to prevent the net from washing under the boat and contacting the prop.

3.3.4.9 Pull net for 5 minutes, unless algae or other debris in the water column prevents the net from fishing effectively for that length of time. If shorter tows are required, pull net for 2.5 minutes and composite two tows for the equivalent of a 5-minute tow.

3.3.4.10 If the net collects large amounts of debris or contacts the bottom, retrieve the net, discard sample, rinse net, record new flow meter readings, and redeploy. Record new start time and meter reading on Field Data Sheet.

3.3.4.11 Constantly monitor bongo net while deployed to ensure it fishes at appropriate depth. Make slight adjustments to the amount of line deployed to maintain a constant position in the water column. This is particularly important in shallow areas (Stations 2 and 3) where too much scope will cause the net to skim the seagrasses and foul and too little scope will cause the net to break the water's surface.

3.3.4.12 When net is brought out of the water, deactivate stopwatch. Record time of retrieval and GPS end point on Field Data Sheet. Record the final meter reading of each flow meter on the Field Data Sheet.

3.3.5 Preserve and Label the Sample

3.3.5.1 Elevate bongo frames on davit and thoroughly but gently rinse down contents of nets from the outside using source water. Once all of the net contents have been rinsed into the cod-end, tip the cod-end to drain excess water, and then use a squeeze bottle filled with source water to rinse sample from proximal end of net back into the cod-end.

3.3.5.2 Carefully unscrew cod-end to avoid spillage. Remove large debris such as sticks and leaves, and rinse any organisms adhering to this material back into the cod-end. Use squeeze bottle to rinse all contents of cod-end into sample bottle(s) spiked with preservative.

3.3.5.3 The maximum volume of the drained sample material should not exceed 25% of the sample bottle. fill remaining volume of sample bottle with filtered seawater (filtered through 0.300-mm mesh) being careful not to overflow.

3.3.5.4 Fill in sample information on exterior sample label using pencil or water-proof ink. Place interior label with sample identification number inside jar and tightly secure lid.

3.3.5.5 If more than one jar is required per sample, label should indicate jar number (e.g., 1 of 2, 2 of 2, etc.). Contents of multiple-jar samples will be composited in the laboratory for analysis.

3.3.5.6 Record sample information on Field Data Sheet.

3.3.5.7 Place sample containers securely in their carrying case.

3.4 Entrainment Sampling (Ichthyoplankton and Shellfish Larvae)

3.4.1 Mobilize

3.4.1.1 Use Equipment and Supplies Checklist to assemble and ready field gear (Appendix E).

3.4.2 Embarkation

3.4.2.1 Prior to leaving the lab, contact the following to alert them to sampling activities in the intake canal:

- FPL Security Shift Captain (nighttime sampling only: (772) 467-7005
- FPL Land Utilization: (772) 240-9523

3.4.2.2 Depart for the St. Lucie Plant.

3.4.3 Safety Tailboard

3.4.3.1 Upon arriving at the plant conduct safety tailboard with designated Land Utilization representative.

3.4.3.2 Upon completion of safety tailboard proceed to initiate sampling activities.

3.4.3.3 Ensure all personnel are wearing PFDs and closed-towed, non-skid footwear at all times when working on or around water.

3.4.4 Activate Intake Canal Floodlights (Nighttime Sampling Only)

3.4.4.1 Open and secure front panel of generator.

3.4.4.2 Turn on ignition key.

3.4.4.3 Once generator starts, toggle on Master Switch.

3.4.4.4 Toggle on 4 switches to activate individual lights on lighting array.

3.4.4.5 Ensure that work areas of the canal are adequately illuminated.

3.4.4.6 Contact FPL Land Utilization representative to report any problems with lighting apparatus.

3.4.4.7 Postpone nighttime operations if the Field Team Leader determines that the lighting environment is inadequate for safe operations.

3.4.5 Ancillary Data Collection

3.4.5.1 Prior to sample collection, record weather conditions, tidal stage, sea state, current direction, and water depth on Field Data Sheet.

3.4.5.2 Abort sampling activities if the Field Team Leader determines that conditions are unsafe or will not permit the safe collection of representative samples (e.g., threatening weather, rough sea conditions, unusual waterbody conditions, etc.).

3.4.5.3 Collect water quality data once during each diel sampling event.

3.4.5.3.1 Prior to arriving at the plant, turn on meters and allow to warm up.

3.4.5.3.2 Deploy meters from west end of floating boat dock north of the Unit 2 headwall.

3.4.5.3.3 Measure temperature, pH, dissolved oxygen, conductivity, and salinity with Quanta or equivalent backup meter.

3.4.5.3.4 Take measurements at mid-depth.

3.4.5.3.5 Record results on Field Data Sheet.

3.4.6 Sample Locations and Methods

3.4.6.1 Conduct sampling at the west end of the scaffolding and catwalk structure adjacent to the Unit 2 intake headwall (Figure 1).

3.4.6.2 Use 1-m plankton net fitted with 0.300 mm mesh.

3.4.6.3 Conduct one tow per diel sampling event.

3.4.6.4 Fish net at mid depth.

3.4.6.5 Fish the net for 5 minutes, unless one of the plant's two units is down for repairs or refueling. If only one plant is operating, fish the net for 10 minutes.

3.4.7 Collect Samples

3.4.7.1 Identify and position shoreside observer for on-water operations.

3.4.7.1.1 Equip observer with cell phone and contact sheet for emergency operation numbers at the plant.

3.4.7.1.2 In case of an emergency (e.g., man overboard, capsized boat, etc.) observer will:

3.4.7.1.2.1 Contact PSL Control Room and notify operators of location and nature of emergency.

3.4.7.1.2.2 Maintain visual contact with persons in the water until assistance arrives.

3.4.7.2 Load sampling gear into FPL skiff at floating dock, including:

3.4.7.2.1 Plankton net and cod end.

3.4.7.2.2 Flow meter and bridle.

3.4.7.2.3 Net depressor.

3.4.7.2.4 Tow line.

3.4.7.2.5 Bow line with O-ring.

3.4.7.2.6 Safety life ring with 90 feet of line.

3.4.7.3 Secure net depressor with Carabiner clips to metal frame at mouth of net.

3.4.7.4 Prepare a flow meter for attachment to the net, following steps listed under 3.1.6.2. Secure both ends of the flow meter bridle to opposite sides of the metal net frame such that the meter is positioned near the center of the net.

3.4.7.5 Position the O-ring in the center of the bow line and secure the two free ends of the line to the bow cleats on opposite sides of the vessel.

3.4.7.6 Secure the distal end of the net towline to one of the aft cleats on the boat (the side from which the net will be deployed).

3.4.7.7 Slowly and carefully motor the boat away from the dock and position bow toward west end of Unit 2 catwalk. Secure mooring line attached to Unit 2 catwalk and attach terminal clip to O-ring of bow line. Allow boat to drift with current until bow line is taut. Turn off engine.

3.4.7.8 Immediately prior to deployment, record the initial meter readings of the flow meter on the Field Data Sheet. Ensure that the flow meter propellers do not turn prior to deployment

3.4.7.9 Ensure that all personnel are clear of all lines and are positioned outside of the tow line.

3.4.7.10 Deploy the net, cod end first, over the side of the boat into the Unit 2 intake current keeping the mouth of the net and depressor inside the boat. Once all of the net is in the water, place the mouth of the net and depressor over the side of the boat and allow the net to sink to the appropriate sample depth keeping tension on the tow line. Cleat off any excess tow line and activate stopwatch. Activate stopwatch and record time of deployment on Field Data Sheet. Depending on currents at time of sampling, scope may have to be adjusted periodically to maintain appropriate fishing depth.

3.4.7.11 Near the end of the tow, start the boat's outboard engine. After the net has fished the appropriate time, quickly but carefully use the bow line to pull the boat towards the Unit 2 catwalk, disconnect the mooring line from the O-ring, and allow the boat to drift in the current. Immediately begin retrieving the net.

3.4.7.12 Once the mouth of the net is above the water's surface, deactivate stopwatch. Once the meter is back on board, record the end time and final flow meter reading on the Field Data Sheet.

3.4.7.13 Slowly motor the boat back to the floating dock, secure the vessel and unload the gear.

3.4.8 Preserve and Label the Sample

3.4.8.1 Once on shore, elevate the plankton net and thoroughly but gently rinse down contents of net from the outside using source water. Once all of the net contents have been rinsed into the cod-end, tip the cod-end to drain excess water, and then use a squeeze bottle filled with source water to rinse sample from proximal end of net back into the cod-end.

3.4.8.2 Carefully unscrew cod-end to avoid spillage. Use squeeze bottle filled with filtered (0.300 mm net) source water to rinse all contents of cod-end into sample bottle(s) spiked with preservative.

3.4.8.3 The maximum volume of the drained sample material should not exceed 25% of the sample bottle. fill remaining volume of sample bottle with filtered seawater (filtered through 0.300-mm mesh) being careful not to overflow.

3.4.8.4 Fill in sample information on exterior sample label using pencil or water-proof ink. Place interior label

with sample identification number inside jar and tightly secure lid.

3.4.8.5 If more than one jar is required per sample, label should indicate jar number (e.g., 1 of 2, 2 of 2, etc.). Contents of multiple-jar samples will be composited in the laboratory for analysis.

3.4.8.6 Record sample information on Field Data Sheet.

3.4.8.7 Place sample container securely in secure carrying case for transport to the lab.

3.4.9 Depart Plant (Nighttime Sampling Only)

3.4.9.1 Turn off lighting array.

3.4.9.1.1 Toggle off switches for individual lights on lighting apparatus.

3.4.9.1.2 Toggle off Master Switch.

3.4.9.1.3 Turn off generator key and close front panel.

3.4.9.1.4 Notify FPL Plant Security that sampling has been completed.

4.0 Laboratory Sorting and Specimen Identification for Ichthyoplankton

4.1 Sorting

4.1.1 Obtain a sample from the raw sample storage area of the lab and fill in all requisite information at the top of the Laboratory Bench Sheet. Ensure that the sample is scheduled for processing by comparing the Sample Identification Number (SIN) with the Master Sample Inventory.

4.1.2 Remove and retain in-jar sample label. This will be returned to the sample container with the archived portion of the sample or sample residue. Record the SIN on the Laboratory Bench Sheet.

4.1.3 Working under a ventilated fume hood, or in an open-air location, carefully decant the formalin solution from the sample container

through a 0.300-mm mesh cone into a labeled Waste Formaldehyde transfer container. Transfer the waste formaldehyde to a Hazardous Waste holding container for subsequent disposal in accordance with EAI's HASP. Gently rinse residual formalin from the sieved sample into a sink. If woody debris, vegetation, or other large detritus are present in the sample, each piece of material may be washed in a larger mesh sieve (e.g., 5-mm) suspended over the 0.300-mm sieve. Following a thorough but gentle rinsing with tap water, discard any large detritus retained by the large mesh sieve.

4.1.4 Use a squeeze bottle filled with tap water to wash contents of the fine mesh cone into a 1-L beaker. Inspect the cone to ensure that all organisms have been transferred to the beaker.

4.1.5 Pour the organic material from the 0.300-mm sieve into a gridded sorting tray(s). Inspect the sieve to ensure that all organisms have been transferred to the sorting tray. Add enough tap water to cover sample material, and spread material over bottom of tray as evenly as possible. For large samples, it may be necessary to partition the sample among several sorting trays.

4.1.6 Prepare three sample vials containing 70% ethanol preservative and label each for either fish eggs, fish larvae, or meroplankton.

4.1.7 Inspect contents of each sorting tray grid under a dissecting scope. Move systematically from one grid to the next carefully searching for target organisms. Staining may be used, as necessary, to help distinguish specimens from debris.

4.1.8 Remove all fish eggs, fish larvae, and targeted meroplankton (refer to list provided by EAI Project Manager) from sorting tray using soft forceps or pipette, as practical, and place in appropriate labeled specimen bottle.

4.1.9 Prepare labels containing the SIN and insert it into each sample vial. Seal vials with a cap or stopper and affix a color-coded label to the top to designate its contents (fish eggs, fish larvae, or

meroplankton). Record the time that sorting was completed on the Laboratory Bench Sheet and store the sorted samples in designated area of the lab for subsequent taxonomic identification. Place the bench sheet in the Sorted Sample Folder.

4.1.10 Return the sample residue to its original container. Insert the original sample label after adding words "sorted residue" and preserve in 70% ethanol. Place a unique color-coded label on the lid, seal and store in the designated sorted sample storage area.

4.1.11 Until a laboratory technician has been deemed qualified, his/her sorting will be checked by EAI's QA/QC Officer or another qualified technician, as described in the QAP. During this period, prior to storing the sample residue, the QA/QC Officer or designee will inspect the sorting tray(s) of the original sorter, and any missed organisms will be removed, counted and placed into the appropriate sample vials. The total number of missed organisms missed will be recorded on the Laboratory Bench Sheet and Sorting Efficiency calculated. Additionally, on-going QC checks will be made over the life of the project, as described in the QAP. After all applicable QC checks are completed, the sample residue will be archived.

4.2 Sample Splitting

4.2.1 Samples containing excessive amounts of debris (algae, ctenophores, etc.) or high numbers of plankton may be split with a Folsom or Motodo sample splitter, at the direction of the Laboratory Manager. The Lab Manager will visually inspect the sample and determine if a split is appropriate. Samples that would require an experienced Certified Sorter more than four hours to process will generally be split.

4.2.2 Pour sample into sample chamber and dilute with sufficient amount of tap water from a wash bottle to ensure an even split. Gently but thoroughly stir sample, tilt splitter, and carefully pour

contents into collection trays. Check to ensure that water levels in the two collection trays are equal. If not, combine contents of both trays in sample chamber and repeat the process. Carefully and thoroughly rinse chambers after each use and empty wash water into collection trays.

4.2.3 Remove collection trays. Place contents of one tray in grided sorting tray(s) for processing. Place contents of other tray into labeled residue container.

4.2.4 If necessary, make additional splits, by pouring contents of one of the collection trays (a one-half split) back into the chamber and repeat the process, as necessary until desired organism density is obtained. With each successive split, pour the residue from the unused half into the labeled residue container. Record the total number of splits on the Laboratory Bench Sheet.

4.2.5 The count of individuals for each species in the split sample multiplied by the inverse of the split is the estimated number of organisms in the total sample.

4.3 Sample Weighing

4.3.1 Weigh sorted fish eggs, fish larvae, and meroplankton separately.

4.3.2 Zero analytical balance.

4.3.3 Place weighing dish on scale and record weight to nearest one-thousandth gram. Leave dish on scale.

4.3.4 Decant ethanol from sample vial using a mesh sieve, rinse internal label, sieve and sample vial with de-ionized water and transfer all specimens into 40 ml beaker.

4.3.5 Using forceps, place Whatman filter on top of vacuum pump apparatus, place glass sample receptacle on top of filter, seal with metal clamp.

4.3.6 Measure 100 ml of de-ionized water and pour into sample receptacle and turn on vacuum pump. When filter paper is exposed begin timing for 10 seconds then turn vacuum pump off.

4.3.7 Remove filter paper with forceps and place on weighing dish in analytical balance and weigh to nearest one-thousandth gram, record on data sheet. This represents the wet weight of the filter paper.

4.3.8 Place filter paper back on vacuum apparatus, attach sample receptacle and secure, pour sample from 40 ml beaker into sample receptacle. Use squirt bottle to thoroughly rinse sides of 40 ml beaker with de-ionized water to remove any residue and pour into sample receptacle.

4.3.9 Turn on pump and rinse sides of sample receptacle with de-ionized water until clean. Let pump run 10 seconds after filter paper is exposed and then turn off pump.

4.3.10 Use forceps to remove filter and place on weighing dish. Weigh sample to nearest one-thousandth gram, record on data sheet.

4.3.11 Subtract wet filter weight from value of wet filter and sample. This is the net wet sample weight.

4.3.12 Repeat steps 4.3.2 through for 4.3.11 for each of the different components of sample (fish eggs, fish larvae, and meroplankton).

4.4 Taxonomy

4.4.1 Obtain a bench sheet from the Sorted Sample Folder and locate the corresponding sample bottles. Fill in all requisite information (taxonomist name, date and start time) at the top of the Laboratory Bench Sheet. Remove and retain internal sample label.

4.4.2 Prepare a series of sample vials filled with 70% ethanol.

4.4.3 Pour the contents of the sample bottle into a sorting tray. Identify shellfish (meroplankton) and ichthyoplankton to the lowest practical taxon. Count and record the number of individuals for each taxon by life stage (e.g., egg, yolk-sac larvae, post-yolk-sac larvae, or juvenile for fish; larval stage for shellfish), on the Laboratory Bench Sheet. Specimens damaged beyond recognition

will be recorded as unidentified. Scientific and common names will follow Nelson et al. (2004).

4.4.4 In the event that a sample contains an excessive number (>200) of organisms of various life stages, subsampling may be conducted using the Folsom or Motodo sample splitter (see 4.2). The number of splits will be recorded on the Laboratory Bench Sheet, and numbers of organisms contained in the analyzed portion of the sample will be extrapolated to estimate the number in the full sample.

4.4.5 Determined total length (TL) to the nearest 1.0 millimeter for up to 50 undamaged larvae of each life stage for all species contained in the sample. Record lengths on the Laboratory Bench Sheet.

4.4.6 Place each taxon whose identity is questionable in separate vials. Return all other specimens to the original sample bottle. Prepare labels for each sample vial using pencil or extra fine-tipped waterproof marker. Place the SIN on one side of the label and the scientific name on the reverse side. Return the original sample label to the sample bottle containing composited species. Secure the vials/bottles with lids or stoppers, as appropriate, and place in the area designated for sample archival/QC.

4.4.7 Record the date and time the taxonomy was completed on the Laboratory Bench Sheet and file in the Taxonomic Folder.

4.4.8 One or more representative individuals of each species will be preserved in 70% ethanol and retained in a reference collection archived at EAI. Individuals will be selected to represent the various sizes and developmental stages of the species contained in the samples. An electronic photographic reference collection will also be maintained. If specimens are removed from a sample for the reference collection, a notation will be made on the Laboratory Bench Sheet.

4.4.9 Organisms that cannot be readily identified in the laboratory will be sent to an outside recognized expert (approved by the Golder Project Manager) for taxonomic identification/confirmation. Alternatively, electronic images of the specimens may be submitted to the expert, alleviating the need for sending specimens through the mail.

5.0 Sampling Location and Frequency

5.1 Sampling Locations (Figure 1)

5.1.1 Sampling will be conducted at the following locations:

5.1.1.1 Atlantic Ocean in vicinity of PSL offshore intake structures (Stations 1-3).

5.1.1.2 Big Mud Creek adjacent to PSL Emergency Cooling Water Intake System (Station 1).

5.1.1.3 Indian River Lagoon between ICW and mouth of Big Mud Creek (Stations 2 and 3).

5.1.1.4 Intake canal near Unit 2 headwall.

5.2 Sampling Commencement and Frequency

5.2.1 Initial sampling will begin in January 2006.

5.2.2 All sampling will be conducted bi-weekly for a total of 26 sampling events per year (Table 1).

5.3 Number and Location of Stations and Samples

5.3.1 Nearfield ocean trawl sampling.

5.3.1.1 During each sampling event, sampling will be conducted at each of three stations.

5.3.1.2 A single bottom trawl and a single mid-water trawl sample will be collected at each station during each diel sampling period.

5.3.1.3 Sampling will be conducted once during the day (½ hour after sunrise to ½ hour before sunset) and once during the night (½ hour before sunset to ½ hour after

sunrise). This yields 6 bottom and 6 mid-water trawl samples per sampling event.

5.3.1.4 A total of 156 bottom trawl and 156 mid-water trawl samples will be collected per year (6 samples per sampling event X 26 sampling events; Table 1).

5.3.2 Nearfield IRL/BMC trawl sampling.

5.3.2.1 During each sampling event, sampling will be conducted at each of three stations.

5.3.2.2 A single bottom trawl sample will be collected at each station during each diel sampling period.

5.3.2.3 Sampling will be conducted once during the day (½ hour after sunrise to ½ hour before sunset) and once during the night (½ hour before sunset to ½ hour after sunrise). This yields 6 bottom trawl samples per sampling event.

5.3.2.4 A total of 156 bottom trawl samples will be collected per year (6 samples per sampling event X 26 sampling events; Table 1).

5.3.3 Nearfield IRL/BMC ichthyoplankton sampling

5.3.3.1 Nearfield IRL/BMC bongo net sampling for ichthyoplankton will be conducted at each of three stations.

5.3.3.2 A single bongo net sample will be collected at each station during each diel sampling period.

5.3.3.3 Sampling will be conducted once during the day (½ hour after sunrise to ½ hour before sunset) and once during the night (½ hour before sunset to ½ hour after sunrise). This yields 6 bottom ichthyoplankton samples per sampling event.

5.3.3.4 A total of 156 bottom ichthyoplankton samples will be collected per year (6 samples per sampling event X 26 sampling events; Table 1).

5.3.4 Entrainment sampling

5.3.4.1 Sampling for ichthyoplankton entering the St. Lucie Plant intake canal will be conducted at one location.

5.3.4.2 A single 1-m plankton net sample will be collected during each diel sampling period.

5.3.4.3 Sampling will be conducted once during the day (½ hour after sunrise to ½ hour before sunset) and once during the night (½ hour before sunset to ½ hour after sunrise). This yields 2 entrainment samples per sampling event.

5.3.4.4 A total of 52 entrainment samples will be collected per year (2 samples per sampling event X 26 sampling events; Table 1).

6.0 Water Quality

6.1 A suite of standard water quality parameters, including temperature, pH, conductivity, dissolved oxygen, will be taken during each sampling event.

6.2 Water quality conditions will be measured *in situ* as stipulated in the procedures for each type of sample collection.

6.3 All meters taken into the field will be calibrated at the EAI office prior to and following data collection in accordance with EAI's Quality Manual and QAP for the St. Lucie Plant project.

7.0 Health and Safety

7.1 All employees will read and be familiar with the St. Lucie Plant HASP.

7.2 An approved copy of the HASP will be kept with the field team during all sampling activities.

7.3 Appropriate safety gear will be worn and utilized for all field activities in accordance with the HASP and any additional measures mandated by FPL.

FIGURE 1

FPL St. Lucie Plant
316(b) Monitoring Program
Sampling Locations

Table 1

Summary of 316(b) Field Sampling Program for St. Lucie Plant, St. Lucie County, Florida.

Impact Assessment	Gear	Frequency	Locations	Replicates	Number of Samples/Year
Nearfield Ocean	Bottom Otter Trawl 4.9-m semi-balloon	26/Yr (Night&Day)	3	1	156
	Mid-Water Otter Trawl 4.9-m semi-balloon	26/Yr (Night&Day)	3	1	156
Nearfield IRL/BMC	Bottom Otter Trawl 3.0-m semi-balloon	26/Yr (Night&Day)	3	1	156
	Bongo Net (0.300-mm mesh)	26/Yr (Night&Day)	3	1	156
Entrainment (Intake Canal)	1-m Plankton Net (0.300-mm mesh)	26/Yr (Night&Day)	1	1	52

APPENDIX A

CALIBRATION OF FIELD INSTRUMENTATON

FIELD INSTRUMENT CALIBRATION

General Information

The day of each sampling event, the Field Team Leader will verify that all equipment is in proper working condition, calibrated, and that batteries are properly charged (DEP-SOP-001/01 FT 1000). Calibrations performed prior to the collection of the first sample for each event are considered Initial Calibrations and are recorded on the EAI Field Instrument Calibration Log. Final Calibration Checks will be performed upon return to the lab. Initial and Final calibration checks will be performed for all measured variables.

If an Initial or Final Calibration Check fails to meet acceptance criteria, the instrument will be immediately recalibrated. If the instrument fails a second time, it will be removed from service. In this case, the Field Technician will use the back-up instrument during collection of field data (DEP-SOP-001/01 FT 1000). If a Final Calibration Check fails to meet acceptance criteria, and it is not possible to reanalyze the sample(s), the Field Team Leader will a) report all results between the last acceptable calibration check and the failed calibration check as "estimated" by using the 62-160, F.A.C. qualifier "J"; b) include a narrative description of the problem; and c) shorten the time period between verification checks or replace/repair the instrument, as appropriate.

Specific Procedures

Specific Procedures for each of the field instruments to be used during the 316(b) field sampling program at the Port Everglades Plant are provided in the following tables.

Table A-1
Procedures for System Conductivity Calibration of the YSI 85 Meter

1. Prior to calibration of the YSI 85, it is important to remember the following:
   1.1. Always use clean, properly stored, NIST traceable calibration solutions. When filling a calibration container prior to performing the calibration procedures, make certain that the level of calibration buffers is high enough in the container to cover the entire probe. Gently agitate the probe to remove any bubbles in the conductivity cell.
   1.2. Rinse the probe with distilled water (and wipe dry) between changes of calibration solutions.
   1.3. During calibration, allow the probe time to stabilize with regard to temperature (approximately 60 seconds) before proceeding with the calibration process. The readings after calibration are only as good as the calibration itself.
   1.4. Perform sensor calibration at a temperature as close to 25°C (77°F) as possible. This will minimize any temperature compensation error.
2. Turn the instrument on and allow it to complete its self-test procedure.
3. Select a calibration solution that is most similar to the sample you will be measuring.
4. Place at least 3 inches of solution in a clean glass beaker.
5. Use the **MODE** button to advance the instrument to display conductivity.
6. Insert the probe into the beaker deep enough so that the oval-shaped hole on the side of the probe is completely covered. Do not rest the probe on the bottom of the container – suspend it above the bottom at least ¼ inch.
7. Allow at least 60 seconds for the temperature reading to become stable.
8. Move the probe vigorously from side to side to dislodge any air bubbles from the electrodes.
9. Press and release the **UP ARROW** and **DOWN ARROW** buttons at the same time.
10. The **CAL** symbol will appear at the bottom left of the display to indicate that the instrument is now in Calibration Mode. The **°C** *should be flashing* to demonstrate that the instrument is reading Specific Conductance (temperature compensated; NOT Specific Conductivity which is NOT temperature compensated).
11. Use the **UP ARROW** and **DOWN ARROW** button to adjust the reading on the display until it matches the value of the calibration solution you are using.
12. Once the display reads the exact value of the calibration solution being used (the instrument will make the appropriate compensation for temperature variation from 25 °C), press the **ENTER** button once. The word "**SAVE**" will flash across the display for a second indicating that the calibration has been accepted.
13. Determine whether the instrument has passed or failed the Calibration Acceptance Standards as specified in DEP-SOP-001/01 FT 1000. Document the results in the EAI Field Instrument Calibration Records.

Table A-2

Procedures for Dissolved Oxygen Calibration of the YSI 85 Meter

1. Ensure that the sponge inside the instrument's calibration chamber is wet. Insert the probe into the calibration chamber.
2. Turn the instrument on by pressing the **ON/OFF** button on the front of the instrument. Press the **MODE** button until the dissolved oxygen is displayed in the mg/L. Wait for the dissolved oxygen and temperature readings to stabilize (usually 15 minutes is required).
3. Use two fingers to press and release both the **UP ARROW** and **DOWN ARROW** buttons at the same time.
4. The LCD will prompt you to enter the local altitude in hundreds of feet. Enter 0 for our location. Use the arrow keys to increase or decrease the altitude. When the proper altitude appears on the LCD, press the **ENTER** button once.
5. The Model 85 should now display **CAL** in the lower left of the display, the calibration value should be displayed in the lower right of the display and the current mg/L reading (before calibration) should be on the main display. Make sure that the current mg/L reading (large display) is stable. Verify that the reading satisfies the acceptable calibration criteria for the appropriate temperature:

Temp (°C)	Solubility of O2 in Water-saturated Air at Sea Level	Instrument response that results in a precision of +/- 0.2 mg DO/L and an accuracy of +/- 0.2 mg DO/L	Instrument response that results in a precision of +/- 0.2 mg DO/L and an accuracy of +/- 0.2 mg DO/L
20.0	9.092	8.892 – 9.292 mg/L	8.892 – 9.292 mg/L
21.0	8.915	8.715 – 9.115 mg/L	8.715 – 9.115 mg/L
22.0	8.743	8.543 – 8.943 mg/L	8.543 – 8.943 mg/L
23.0	8.578	8.378 – 8.778 mg/L	8.378 – 8.778 mg/L
24.0	8.418	8.218 – 8.618 mg/L	8.218 – 8.618 mg/L
25.0	8.263	8.063 – 8.463 mg/L	8.063 – 8.463 mg/L
26.0	8.113	7.913 – 8.313 mg/L	7.913 – 8.313 mg/L
27.0	7.968	7.768 – 8.168 mg/L	7.768 – 8.168 mg/L
28.0	7.827	7.627 – 8.027 mg/L	7.627 – 8.027 mg/L
29.0	7.691	7.491 – 7.891 mg/L	7.491 – 7.891 mg/L
30.0	7.559	7.359 – 7.759 mg/L	7.359 – 7.759 mg/L

Table 2. Solubility of Oxygen in Water (Saturated with Air) at Various Temperatures at an Atmospheric Pressure of 760 P mm (Sea Level). Values taken from DEP-SOP-001/01 FT 1500.

6. Once the mg/L reading has been verified to pass the acceptance criteria, press the **ENTER** button. The display should read **SAVE**, then should return to the Normal Operation Mode.
7. Each time the Model 85 is turned off, it may be necessary to re-calibrate before taking measurements. All calibrations should be completed at a temperature which is as close as possible to the sample temperature. Dissolved oxygen readings are only as good as the calibration.
8. Determine whether the instrument has passed or failed the Calibration Acceptance Standards as specified in DEP-SOP-001/01 FT 1000 (see Table 1). Document the results in the EAI Field Instrument Calibration Records.

Table A-3

Procedures for Temperature Calibration of all Thermistor Devices (YSI 85 Meter, YSI 60 Meter, and Fisherbrand Field Thermometer)

1. In conformance with DEP-SOP-0001/01 FT 1400 Field Measurement of Temperature, all calibrations for temperature will be performed using a NIST-traceable Celsius certified thermometer with scale marks for every 0.1°C increment, a range of 0°C to 100°C, and a correction chart supplied with certification.
2. The EAI Field Laboratory is equipped with a Brooklyn Thermometer Company, Inc. certified thermometer that meets the above standards (certified June 30, 2003). Store this thermometer in the manufacturer's hard case in a cool, dry area of the Field Lab.
3. The factory certificate states the following corrections are needed for the Brooklyn NIST-traceable standard thermometer.

Temperature	Thermometer Reading	Correction
0°C	0.09	-0.09
10°C	10.09	-0.09
20°C	20.10	-0.10
30°C	30.09	-0.09
40°C	40.12	-0.12

Table 3. NOTE: If the correction is – the true temperature is lower than the thermometer reading.

4. Inspect glass thermometers for liquid separation. Do not use a thermometer if the liquid has separated.
5. Allow the thermistor (meter) devices and the Brooklyn NIST-traceable standard thermometer to equilibrate to ambient in-situ temperature.
6. Record the temperature reading from the Brooklyn NIST-traceable standard thermometer to the nearest 0.1°C when the reading stabilizes and remains constant. Record this reading under "STD VALUE" (Standard Value) on the Field Instrument Calibration Records sheet.
7. Record the temperature reading from all thermistor (meter) devices and field thermometers against the Brooklyn NIST-traceable standard thermometer at several temperatures in the expected sample measurement range, using the correction factors indicated above. Record these readings under "INSTRUMENT RESPONSE" on the Field Instrument Calibration Records sheet.
8. Make note in the Field Instrument Calibration Records sheet, the degrees of deviation between the Standard Value and the Instrument Response. If the standard temperature is lower than the thermistor reading, then the correction is –; if the standard temperature is higher than the thermistor reading, then the correction is +. Using a waterproof Sharpie pen, write this correction on a piece of labeling tape on the thermistor itself.
9. The field measurement device may be used with a linear correction factor provided that the observed temperature difference with the standard thermometer is

documented at incremental temperatures over the range of the expected sample temperatures.

10. Use the resulting correction factor when making temperature measurements of samples with the thermistor.
11. Prominently display the correction factor on the field measurement device, with the date last checked.
12. Determine whether the instrument has passed or failed the Calibration Acceptance Standards as specified in DEP-SOP-001/01 FT 1000 (see Table 1). Document the results in the EAI Field Instrument Calibration Records.

Table A-4

Procedures for Dissolved Oxygen Calibration of the YSI 54 DO Meter

1. Ensure that the oxygen probe is prepared for operation and the two probe plugs are connected to the jacks on the side of the instrument.
2. With the instrument turned off, check the mechanical **ZERO** of the meter (pointer should indicate zero). Tap the meter case to overcome pivot friction – adjust with the screw meter on the case. Recheck when the position of instrument is changed.
3. Switch to the **RED LINE** position and adjust the meter to red line with the front panel control.
4. Place the probe in the calibration medium.
5. Switch to the **TEMP** position and read the temperature when the meter is steady.
6. Switch to the **ZERO** position and adjust the meter to zero with the **ZERO** control.
7. Switch to the 0-10 or 0-20 ppm position and calibrate the instrument with the **CAL** control.
8. There are two methods for calibration. We will use the following procedures:
9. Place the probe in fresh air of known temperature. Use the following table to obtain the oxygen concentration value. Adjust the instrument for that value. This method is possible because, under equilibrium conditions, the partial pressure of oxygen in air-saturated water is equal to that of the oxygen in water-saturated air.

Temperature (°C)	Solubility of Oxygen in Water-Saturated Air at Sea Level (mg/L)
0.0	14.621
1.0	14.216
2.0	13.829
3.0	13.460
4.0	13.107
5.0	12.770
6.0	12.447
7.0	12.139
8.0	11.843
9.0	11.559
10.0	11.288
11.0	11.027
12.0	10.777
13.0	10.537
14.0	10.306
15.0	10.084
16.0	9.870
17.0	9.665
18.0	9.467
19.0	9.267
20.0 (68.0 °F)	9.092
21.0 (69.8 °F)	8.915
22.0 (71.6 °F)	8.743
23.0 (73.4 °F)	8.578
24.0 (75.2 °F)	8.418
25.0 (77.0 °F)	8.263
26.0 (78.7 °F)	8.113
27.0 (80.6 °F)	7.968
28.0 (82.4 °F)	7.827

29.0 (84.2 °F)	7.691
30.0 (86.0 °F)	7.559
31.0	7.430
32.0	7.305
33.0	7.183
34.0	7.065
35.0	6.950
36.0	6.837
37.0	6.727
38.0	6.620
39.0	6.515
40.0	6.412
41.0	6.312
42.0	6.213
43.0	6.116
44.0	6.021
45.0	5.927
46.0	5.835
47.0	5.744
48.0	5.654
49.0	5.565
50.0	5.477

Solubility of Oxygen in Water (Saturated with Air) at Various Temperatures at an Atmospheric Pressure of 760 P mm (Sea Level). Values taken from DEP-SOP-001/01 FT 1500.

10. This table assumes the use of water saturated air. The error which may result from the lack of water vapor pressure using dry air is small.
11. *NOTE:* Calibration and measurement should be carried out on the same range to avoid compounding meter tolerance error. For example, if the instrument is calibrated on the 0-20 ppm range and read on the 1-10 ppm range, a 0.2 ppm error (1% of full scale on the 0-20 ppm range) could be added to a 0.1 ppm error (1% of 10 ppm) to total 0.3 ppm.
12. Determine whether the instrument has passed or failed the Calibration Acceptance Standards as specified in DEP-SOP-001/01 FT 1000 (see Table 1). Document the results in the EAI Field Instrument Calibration Records.

Table A-5

Procedures for Conductivity Calibration of the YSI 33 Meter

1. If necessary, with the switch **OFF**, adjust meter to 0 μMHOS with meter screw.
2. Make sure that plug probe is fitted tightly into jack.
3. Select a calibration solution that is most similar to the sample you will be measuring.
4. Fill a 250-mL glass beaker with the 1 mS/cm conductivity standard, and submerge the probe in the solution.
5. Switch to **RED LINE**. Adjust meter to red line with RED LINE control.
6. Switch to **TEMPERATURE**, read meter when needle is steady. Verify temperature using the NIST-traceable Celsius certified thermometer.
7. Read temperature, and set **°C CONTROL** to indicated temperature.
8. To measure conductivity, switch to appropriate μMHOS range for on-scale meter reading. Multiply meter reading by range. (μMHOS directly correspond to μS/cm.)
9. Determine whether the instrument has passed or failed the Calibration Acceptance Standards as specified in DEP-SOP-001/01 FT 1000. Verify that the reading falls within a 5% margin of error of the 1,000 μS/cm conductivity standard. Document the results in the EAI Field Instrument Calibration Records.

Table A-6

Procedures for Ph Calibration of the YSI 60 Meter

1. The YSI 60 ***MUST*** be calibrated before making pH measurements. Calibration may be performed at 1, 2, or 3-points (at pH 7, 4, and 10). Perform a 1-point calibration (at pH 7) ***ONLY*** if a previous 2 or 3-point calibration has been performed recently. In most cases, a 2-point calibration will be sufficient for accurate pH measurements, but if the general range of pH in the sample is not known, a 3-point calibration may be necessary. 3-point calibration assures accurate pH readings regardless of the pH value of the sample.
2. Turn the instrument on by pressing the **ON/OFF** key. If the instrument was already on, press the **MODE** key until pH is displayed.
3. Rinse the probe with deionized or distilled water, then carefully dry the probe with KimWipes (or rinse it with some of the pH buffer solution to be used for calibration).
4. Place 30 mL of the pH 7 buffer in the-100 mL plastic graduated cylinder. The graduated cylinder minimizes the amount of solution needed. Immerse the probe making sure that both the pH and temperature sensors are covered by the solution.
5. For best results:
   5.1. Calibrate as close as possible to the anticipated water temperature at the point of sampling.
   5.2. After storage in pH 4 buffer/KCl solution, place the sensor in pH 7 buffer and allow to acclimate before calibrating (5 to 10 minutes).
   5.3. Always give the pH and temperature sensors enough time to equilibrate with the temperature of the buffer.
6. To enter the calibration menu, use two fingers to press and release both the **UP ARROW** and **DOWN ARROW** keys at the same time. The YSI 60 display will show **CAL** at the bottom, **STAND** will be flashing and the main display will show **7.00** (the buffer to be used to adjust the offset).
7. ***NOTE:*** The YSI 60 automatically accounts for the fact that the true pH of the buffers changes with temperature, therefore, the pH values displayed during calibration will vary with temperature.
8. Press the **ENTER** key. The YSI 60 display will show **CAL** at the bottom, **STAND** will stop flashing and the pH calibration value is shown with the middle decimal point flashing.
9. When the reading is stable (does not change by 0.01 pH in 10 seconds), the decimal point will stop flashing. Press and hold the **ENTER** key to save the calibration point. The YSI 60 will flash **SAVE** on the display along with **OFS** to indicate that the offset value has been saved.
10. **SLOPE** will now appear on the display and be flashing. This indicates that the slope is ready to be set using a second pH buffer. The system is now calibrated at a single point. If you are only performing a single point calibration, press the **MODE** key to return to normal operation.
11. Rinse the probe with deionized or distilled water, then carefully dry the probe with KimWipes. *(Don't press any buttons!)*

12. If you are performing a 2-point Continuing Verification Check or 3-point Initial or Final calibration, thoroughly rinse the plastic 100-mL graduated cylinder with distilled water. Fill it with 30-mL if the second value pH buffer (pH 4) and immerse the probe into the solution.
13. Press the **ENTER** key. The YSI 60 display should now show **CAL** at the bottom, **SLOPE** will stop flashing and the pH calibration value (automatically sensed by the instrument) is shown with one of the decimal points flashing.
14. Since the second pH buffer is less than the first buffer (which was used to adjust the offset; pH 7), the left decimal point will flash.
15. When the reading is stable (does not change by 0.01 pH in 10 seconds), the decimal point will stop flashing. Press and hold the **ENTER** key to save the first SLOPE. The YSI 60 will flash **SAVE** on the display along with **SLP** to indicate that the first slope value has been saved.
16. **SLOPE** will start flashing again indicating that the slope is ready to be set using a third pH buffer.
17. The system is now calibrated at two points. If you are only performing a two point Continuing Verification calibration, press the **MODE** key to return to normal operation.
18. Rinse the probe with deionized or distilled water, then carefully dry the probe with KimWipes. **STOP HERE IF PERFORMING A 2-POINT CONTINUING VERIFICATION CALIBRATION.**
19. If you are performing a 3-point Initial or Final Calibration, rinse the 100-mL plastic graduated cylinder with distilled water and fill it with the third value pH buffer (pH 10). Immerse the probe into the solution. Make sure that the temperature sensor is immersed.
20. Press the **ENTER** key. The YSI 60 display will now show **CAL** at the bottom, **SLOPE** will stop flashing and the pH calibration value (automatically sensed by the instrument) is shown with one of the decimal points flashing. Since the third buffer is greater than the first (which was used to adjust the offset; usually pH 7), the right decimal point will flash.
21. When the reading is stable (does not change by 0.01 pH in 10 seconds), the decimal point will stop flashing. Press and hold the **ENTER** key to save the second **SLOPE.** The YSI 60 will flash **SAVE** on the display along with **SLP** to indicate that the second slope value has been saved.
22. Determine whether the instrument has passed or failed the Calibration Acceptance Standards as specified in DEP-SOP-001/01 FT 1000 (see Table 1). Document the results in the EAI Field Instrument Calibration Records.
23. The system is now calibrated at three points and will return to normal operation.
24. Rinse the probe with deionized or distilled water.

Table A-7

Procedures for Calibrating the Orion Research Model 201 Ph Meter

Single-Buffer Calibration

1. Choose a buffer which is near the expected sample pH.
2. Buffer should be at room temperature.
3. Set the slope to 100% or to the percent slope determined in a two-buffer calibration. Set the temperature to the temperature of the buffer.
4. Rinse electrode with distilled water and shake off excess water.
5. Place the electrode in the buffer. Wait for a stable display. Set the meter to the pH value of the buffer at its measured temperature (this table of pH values at various temperatures is supplied with the buffer).
6. Rinse electrode with distilled water and shake off excess water.

Two-Buffer Calibration

7. This procedure is recommended for precise measurement.
8. Choose two buffers which bracket the expected sample pH. The first should be pH 7 and the second near the expected sample pH (e.g., pH 4).
9. Ensure that buffers are at room temperature.
10. Rinse electrode with distilled water and shake off excess water.
11. Place electrode in the pH 7 buffer. Wait for a stable display. Set the meter to the pH value of the buffer at its measured temperature (this table of pH values at various temperatures is supplied with the buffer).
12. Rinse electrode with distilled water and shake off excess water.
13. Place electrode in the second buffer. When display is stable, set meter to the actual pH value of the buffer.
14. Rinse electrode with distilled water and shake off excess water.
15. Determine whether the instrument has passed or failed the Calibration Acceptance Standards as specified in DEP-SOP-001/01 FT 1000 (see Table 1). Document the results in the EAI Field Instrument Calibration Records.

APPENDIX B

EQUIPMENT AND SUPPLIES CHECKLIST
OCEAN TRAWL SAMPLING, ST. LUCIE PLANT

EQUIPMENT AND SUPPLIES CHECKLIST
OCEAN TRAWL SAMPLING, ST. LUCIE PLANT

Item	Calibration Required	Ready
Copy of SOP		
Copy of FWC Special Activity License (SAL)		
Copy of Health and Safety Plan		
Field and Boat Logs		
Clipboard and Field Data Sheets		
Contact list (Names and phone numbers of Coast Guard, FWC Law Enforcement, SeaTow, etc.)		
Cell phones (primary/backup)		
Clipboard and Field Data Sheets		
Boat gear (fire extinguisher, PFD's, flares, oar, first aid kit, air horn, anchor and line, and depth recorder)		
Handheld GPS (primary/backup) with spare batteries		
GPS coordinates of sample sites		
Tool box and tools		
Jerry jug w/extra gas		
Extra quarts of oil		
4.9-meter bottom otter trawl (primary and backup)		
4.9-meter mid-water otter trawl and backup doors		
Flow meters (primary/backup)		
Container of tap water and syringe for filling flow meter		
Trawl harness		
Primary water quality meter(s)	[redacted]	
Backup water quality meter(s)	[redacted]	
Igloo cooler with ice		
Multiple large plastic tubs for holding and sorting samples		
Fish length boards, calipers		
Hanging scales (large and small)		
Field guides and summaries of key taxonomic characters		
Ziploc bags of various sizes		
Interior labels for Ziplock bags and sample jars		
Pencils, waterproof markers, sample labels		
Field watch and stopwatch		
Rain gear		
Flashlight and headlamps		
Work gloves		
Q-beam spotlight and accessories (AC adaptor and spare batteries)		
Spare parts (batteries, etc.)		

APPENDIX C

EQUIPMENT AND SUPPLIES CHECKLIST
IRL/BMC TRAWL SAMPLING, ST. LUCIE PLANT

EQUIPMENT AND SUPPLIES CHECKLIST
OCEAN TRAWL SAMPLING, ST. LUCIE PLANT

Item	Calibration Required	Ready
Copy of SOP		
Copy of FWC Special Activity License (SAL)		
Copy of Health and Safety Plan		
Field and Boat Logs		
Clipboard and Field Data Sheets		
Contact list (Names and phone numbers of FPL contacts, Coast Guard, FWC Law Enforcement, SeaTow, etc.)		
Cell phones (primary/backup)		
Clipboard and Field Data Sheets		
Boat gear (fire extinguisher, PFD's, flares, oar, first aid kit, air horn, anchor and line, and depth recorder)		
Handheld GPS (primary/backup) with spare batteries		
GPS coordinates of sample sites		
Tool box and tools		
Jerry jug w/extra gas		
Extra quarts of oil		
3.0-meter bottom otter trawl (primary and backup)		
Flow meters (primary/backup)		
Container of tap water and syringe for filling flow meter		
Trawl harness		
Primary water quality meter(s)		
Backup water quality meter(s)		
Igloo cooler with ice		
Multiple large plastic tubs for holding and sorting samples		
Fish length boards, calipers		
Hanging scales (large and small)		
Field guides and summaries of key taxonomic characters		
Ziploc bags of various sizes		
Interior labels for Ziplock bags and sample jars		
Pencils, waterproof markers, sample labels		
Field watch and stopwatch		
Rain gear		
Flashlight and headlamps		
Work gloves		
Q-beam spotlight and accessories (AC adaptor and spare batteries)		
Spare parts (batteries, etc.)		

APPENDIX D

EQUIPMENT AND SUPPLIES CHECKLIST
IRL/BMC BONGO NET SAMPLING, ST. LUCIE PLANT

EQUIPMENT AND SUPPLIES CHECKLIST
BONGO NET SAMPLING, ST. LUCIE PLANT

Item	Calibration Required	Ready
Copy of SOP		
Copy of FWC Special Activity License (SAL)		
Copy of Health and Safety Plan		
Field and Boat Logs		
Clipboard and Field Data Sheets		
Contact list (Names and phone numbers of FPL contacts, Coast Guard, FWC Law Enforcement, SeaTow, etc.)		
Cell phones (primary/backup)		
Clipboard and Field Data Sheets		
Boat gear (fire extinguisher, PFD's, flares, oar, first aid kit, air horn, anchor and line, and depth recorder)		
Handheld GPS (primary/backup) with spare batteries		
GPS coordinates of sample sites		
Tool box and tools		
Jerry jug w/extra gas		
Extra quarts of oil		
3 Flow meters (2 primary & backup)		
Container of tap water and syringe for filling flow meter		
Primary water quality meter(s)		
Backup water quality meter(s)		
(3) Plankton nets and cod-ends (300-micron mesh)		
(2) Bongo net frames		
(2) Net depressors/planers		
Net repair kit		
100-ft of 3/8" line for towing nets		
Squeeze bottles (for washing down cod end)		
Plastic Ziploc baggies (various sizes)		
(16) 1-L plastic sample jars, spiked w/formaldehye, and lids		
Interior and exterior sample labels		
Box for holding and transporting specimen jars		
Pencils, waterproof markers		
Field watch and stopwatch		
Rain gear		
Flashlight and headlamps		
Latex or surgical gloves		
Tape (electric, duct)		
Spare parts (batteries etc.)		

APPENDIX E

EQUIPMENT AND SUPPLIES CHECKLIST
ENTRAINMENT SAMPLING, ST. LUCIE PLANT

EQUIPMENT AND SUPPLIES CHECKLIST
ENTRAINMENT SAMPLING, ST. LUCIE PLANT

Item	Calibration Required	Ready
Copy of SOP		
Copy of FWC Special Activity License (SAL)		
Copy of Health and Safety Plan		
Field and Boat Logs		
Clipboard and Field Data Sheets		
Contact list (Names and phone numbers of FPL contacts)		
Cell phones (primary/backup)		
Clipboard and Field Data Sheets		
Boat gear (fire extinguisher, PFD's, oar, and first aid kit)		
Tool box and tools		
Flow meters (primary & backup) and bridle		
Container of tap water and syringe for filling flow meter		
Primary water quality meter(s)		
Backup water quality meter(s)		
1-m plankton nets and cod-end (300-micron mesh)		
Net depressor/planers		
50 ft of 3/8" line for deploying net.		
Bow line with O-ring		
Net repair kit		
Squeeze bottles (for washing down cod end)		
(2) 1-L plastic sample jars, spiked w/formaldehye, and lids		
Interior and exterior sample labels		
Pencils, waterproof markers		
Field watch and stopwatch		
Rain gear		
Flashlight and headlamps		
Q-beam spotlight		
Latex or surgical gloves		
Spare parts (batteries etc.)		