FPL

April 23, 2009

Michael P. Halpin, Program Administrator
Office of Siting Coordination
Department of Environmental Protection
3900 Commonwealth Blvd., MS #48
Tallahassee, FL 32399-2400

Re: **Riviera Beach Energy Center**
Response to Completeness Questions and Comments

Dear Mr. Halpin:

Florida Power & Light Company (FPL) is pleased to submit to the Department of Environmental Protection (Department) its response to completeness questions and comments attached to the Department's Determination of Incompleteness dated March 25, 2009, for the Riviera Beach Energy Center Site Certification Application. Copies of the FPL completeness responses are being provided as shown on the attached distribution list.

FPL looks forward to working with the Department and other interested agencies in the certification process. If you should have any questions regarding this submittal, please do not hesitate to call me at 561-691-7518.

Sincerely,

Barbara P. Linkiewicz
Director of Environmental Licensing

cc: Peter Cunningham, HGS
William Hyde, Gunster, Yoakley & Stewart
Distribution List (attached)

1. Toni Sturtevant, Esq., Department of Environmental Protection, 3900 Commonwealth Blvd., Tallahassee, FL 32399-3000 (1 copy)

2. Jack Chisolm, Esq, Department of Environmental Protection, 3900 Commonwealth Blvd., Tallahassee, FL 32399-3000 (1 copy)

3. Michael P. Halpin, SCO, Department of Environmental Protection, 2600 Blair Stone Rd. Tallahassee, FL 32399 (5 copies/7 CDs)

4. Timothy A. Gray, Department of Environmental Protection, Southeast District Office, 400 N. Congress Avenue, P.O. Box 15425 (33416-5425), West Palm Beach, FL 33401 (2 copies/2 CDs)

5. Tom Ballinger, Public Service Commission, Gerald Gunter Bldg., 2450 Shumard Oak Blvd., Tallahassee, FL 32399-0850 (1 copy)

6. Kelly Martinson, General Counsel, Department of Community Affairs, 2555 Shumard Oak Blvd., Tallahassee, FL 32399-0850 (1 copy)

7. Dr. Barbara Lenczewski, Department of Community Affairs, 2555 Shumard Oak Blvd., Tallahassee, FL 32399-0850 (1 copy)

8. Mary Ann Poole, Division of Habitat and Species Conservation, Fla. Fish & Wildlife Conservation Commission, 620 S. Meridian St., Tallahassee, FL 32399-1600 (1 CD)

9. Steve Lau, Fla. Fish & Wildlife Conservation Commission, 620 S. Meridian St., Tallahassee, FL 32399-1600 (1 copy/1 CD)

10. Kimberly Menchion, Esq., Department of Transportation, 605 Suwannee St., MS 58, Tallahassee, FL 32399-0450 (1 CD)

11. Connie Mitchell, Department of Transportation, 605 Suwannee St., Tallahassee, FL 32399-0450 (1 copy/1 CD)

12. Larry Hymowitz, Department of Transportation, 3400 W. Commercial Blvd., Ft. Lauderdale, FL 33309 (1 copy/1 CD)

13. Forrest Watson, Dept. of Agriculture & Consumer Services, Division of Forestry, 125 Conner Blvd., Tallahassee, FL 32399-1650 (1 copy)

14. Barton Bibler, P.E., Manager, Bureau of Water, Env. Eng., Department of Health, 4052 Bald Cypress Way, Tallahassee, Fl 32399-1742 (1 copy)

15. Laura Kammerer, Bureau of Historical Preservation Resources, SHPO, Department of State, R.A. Gray Building, 500 S. Bronough Street, Tallahassee, FL 32399-0250 (1 copy)

16. James Golden, Senior Planner, Environmental Resource Regulation, SFWMD, Post Office Box 24680, 3301 Gun Club Road (33406), West Palm Beach, FL 32416 (2 copies/2 CDs)

17. Michael Busha/Peter Merritt, Treasure Coast Regional Planning Council, 301 E. Ocean Blvd., Stuart, FL 34994 (2 copies/2 CDs)

18. Pamala H. Ryan, City Attorney, City of Riviera Beach Attorney's Office, 600 W. Blue Heron Blvd., Riviera Beach, FL 33404 (1 CD)

19. Mary McKinney, Planning and Zoning Director, 600 W. Blue Heron Blvd., Riviera Beach, FL 33404 (1 copy/1 CD)

20. Charles Wu, Planning & Zoning Director, 200 2nd Street, 5th Floor, City Hall, West Palm Beach, FL 33401 (1 copy/1 CD)

21. Suzanne Payson, Assistant City Attorney, 200 2nd Street, 5th Floor, City Hall, West Palm Beach, FL 33401 (1 copy/1 CD)

22. West Palm Beach Public Library, 100 S. Clematis, West Palm Beach, FL 33401 (1 copy)

23. Riviera Beach Public Library, 600 West Blue Heron Blvd., Riviera Beach, FL 33404 (1 copy)

24. Palm Beach County Public Library, 3650 Summit Blvd., West Palm Beach, FL 33406 (1 copy)

25. Thomas J Lundeen, Deputy Director, Port of Palm Beach, One East 11 Street Suite 600, Riviera Beach, FL 33404 (1 copy/1 CD)

26. Paul Davis, Environmental Manager, Palm Beach County Dept of Environmental Resources Management, 2300 N. Jog Road, West Palm Beach, FL 33411-2743 (1 copy)

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: FLORIDA POWER & LIGHT COMPANY
RIVIERA BEACH ENERGY CENTER,
Applicant.
/

DOAH Case No. 09-1003
DEP OGC Case No. 09-0262
PPSA No. PA09-54

DEPARTMENT OF ENVIRONMENTAL PROTECTION'S DETERMINATION OF INCOMPLETENESS OF APPLICATION

Pursuant to section 403.5066, Florida Statutes (F.S.), the Florida Department of Environmental Protection (Department) hereby finds the application incomplete. A description of all completeness issues is attached and incorporated by reference herein. Pursuant to section 403.5066, F.S., as a result of the Department's declaration that the application is incomplete, the Applicant, within 15 days after the filing of this statement by the Department, is required to file with the Division of Administrative Hearings, the Department, and all parties:

(a) A withdrawal of the application; or,

(b) A statement agreeing to supply the additional information necessary to make the application complete. The additional information shall be provided within 30 days after the issuance of the Department's statement on completeness of the application. The time schedules under this act shall not be tolled if the Applicant makes the application complete within 30 days after the issuance of the Department's statement on completeness of the application. A subsequent finding by the Department that the application remains incomplete, based upon the additional information submitted by the Applicant or upon the failure of the Applicant to timely submit the additional information, tolls the time schedules under this act until the application is determined complete;

(c) A statement contesting the Department's determination of incompleteness; or

(d) A statement agreeing with the Department and requesting additional time beyond 30 days to provide the information necessary to make the application complete. If the Applicant exercises this option, the time schedules under this act are tolled until the application is determined complete.

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished via electronic mail only to the persons on the attached service list.

Respectfully submitted this 25TH day of March, 2009.

/s/ Toni Sturtevant

Toni Sturtevant, Assistant General Counsel
STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION
3900 Commonwealth Boulevard, M.S. 35
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FPL RIVIERA BEACH ENERGY CENTER
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Updated 03-09-09

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Charlie Crist
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Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

March 25, 2009

TO: Toni Sturtevant, OGC

FROM: Mike Halpin, Siting Coordination Office

Pursuant to § 403.5066, Florida Statutes, the Department of Environmental Protection (DEP) after consulting with the affected agencies has determined that the application for the site certification of Florida Power & Light Company's (FPL) Riviera Beach Energy Center is not complete to support a recommendation concerning certification. The following Item A represents the Florida Fish and Wildlife Conservation Commission's requests for additional or clarifying information; Item B South Florida Water Management District; Item C the DEP Siting Coordination Office; Item D the City of Riviera Beach; Item E the Department of State's request for additional information. The applicant should identify any items which may be more suitably handled through post-certification submittals, as well as propose related conditions of certification. Requests for completeness items related to federal permit applications are processed directly by the federally delegated or approved program and are not shown herein.

A. FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

Manatee Protection

1. The applicant indicates that maintenance dredging will be performed at the discharge canal. Is this activity planned to be performed prior to deconstruction or after the construction phase? At low tide (the coolest time period), the northwest corner of the embayment is high and dry, limiting the amount of space available for manatees. Hence the calculated areas of water within isotherms would be overestimated, which would have its greatest impact on the areas calculated for the manatee refuge, unless dredging would be completed before that time. FWC-MP-1

2. Please provide site plans of the area expected to be dredged and identify the spoil site. FWC-MP-2

3. FPL-Riviera Beach collected ambient and discharge water temperatures during this past winter. Please provide a site plan that indicates where these temperatures were collected. FWC-MP-3

4. Please identify the locations where ambient and discharge temperatures are recorded and how often these temperatures are collected. Water temperatures that FWC-MP-4

reflect ambient and warm-water refuge conditions need to be collected pre and post construction temperature regimes.

5. Is discharge temperature data collected at the offhshore discharge pipe? FWC-MP-5

6. Please provide additional detail regarding the temporary heating system that may be used (e.g. potential manufacturers) and a site plan showing proposed locations of the electrical heating units, intake, discharge locations and connecting pipelines. FWC-MP-6

7. What are the proposed hours of operation of the planned manatee visitor center and will the center be staffed? FWC-MP-7

8. Manatee monitoring plans will be required in this license with specific requirements to be agreed upon by FWC, USFWS and DEP. Monitoring plans need to include the time frame beginning 1-year in advance of construction, during the construction phase and post construction. Monitoring efforts shall include the temperature of the thermal refuge in comparison to ambient temperature and manatee behavior and distribution during the repowering effort. Manipulation of the interim warm-water refuge as part of the monitoring plan should be discussed by FPL, USFWS and FWC as a technique to enhance our understanding of manatee response to the loss of industrial warm-water habitat. FWC-MP-8

9. Long Term Plan – Post-construction, and within an agreed upon time frame, FWC, USFWS and FPL will develop a plan to minimize adverse affects to manatees that provides for the weaning of manatees from the repowered FPL-Riviera Beach warm-water discharge and/or establishing an alternative warm-water resource area prior to the plant significantly reducing operations or permanently being retired. FWC-MP-9

Thermal Modeling Analysis

10. *Section 1.0, par. 2:* FWC-TMA-10

Please note years that Units 1 and 2 were established and when retired.

11. *Section 1.0, par. 3*: FWC-TMA-11

Please note the fuel source(s) to be used by the repowered plant, and how fuel will be delivered to the plant (e.g., ship, barge, pipeline).

12. *Section 2.1.1.2:* FWC-TMA-12

a. The EQTP model used to simulate the thermal plume is based on cooling pond thermal dynamics and assumes that all heat loss is through the air-water interface (radiation, evaporation, conduction) and none through mixing or dilution with ambient waters. Given that effects of mixing due to tides and currents have been observed in the dynamics of cooling water discharge fields (Davies et al. 1997), and given that tidal currents in Lake Worth are strong (as noted in Section

2.1.3.1) and substantially affect the ambient thermal regime, what effect does this apparent violation of model assumptions have on interpretation of model output?

DAVIES, P. A., L. A. MOFOR and M. J. VALENTE NEVES. 1997. Comparisons of remotely sensed observations with modeling predictions for the behavior of wastewater plumes from coastal discharges. International Journal of Remote Sensing 18:1987-2019.

b. Has the EQTP model been tested in Lake Worth to validate model output on the shape and areal extent of the warm water plume against actual measured conditions? If so, what were the results (please provide summary tables, figures, maps)? If not, how are the thermal models going to be verified with empirical data? Where has the model been tested that has a similar physiography and tidal conditions as Lake Worth?

13. *Section 2.1.2.2:* FWC-TMA-13

Regarding the use of siphon pipes to discharge warm water into the manatee embayment when the plant is not operating at full load, has this been automated so that there is always warm water flowing into the embayment or has it been a decision to switch those pumps on? If the latter, has that occurred primarily when ambient temperatures are approaching the MPP trigger of 61 F? Will future operation of these siphon pipes and hence the discharge into the manatee embayment be the same as in recent years?

14. *Section 2.13, par. 2:* FWC-TMA-14

The NOAA water temperature monitoring station used to select minimum and maximum temperatures is located on the ocean side of the barrier island; this does not necessarily reflect the conditions within Lake Worth which may show greater variation. Long-term temperature data should be re-evaluated based on sources of temperature data from within the lagoon proper to determine whether lower minimum or higher maximum values should be used in the model. If the NOAA temperatures are more extreme, then the model can be kept as is.

15. *Section 2.2.1:* FWC-TMA-15

What percent recirculation is used/assumed/predicted in the EQTP model of the thermal refuge? Assuming that the system will behave as a completely closed cycle system when the intake and discharge units are separated by 500 ft of open water (along a shoreline) does not seem realistic. [Unlike the case at Canaveral where the thermal refuge is completely enclosed in the *intake* canal.] This would especially be the case when wind-driven or tidally-driven currents are pushing water to the south. How does this affect the results? Running a few different scenarios of % recirculation based on more realistic conditions would prove helpful.

16. *Section 3.1.2 (Surface Discharge Results):* FWC-TMA-16

a. Can FPL provide a map and area of the surface discharge thermal plume under "worst case" conditions for manatee protection (i.e., smallest area)? (i.e., not slack tide)

b. The description of the empirical data from ABI in 1974 is vague and gives no indication of how the plume results match to the model predictions; please clarify and elaborate.

c. Please provide a table of enclosed areas of water for isotherms given ambient water temperature of 58.5 F in winter (or whatever the new lower ambient temperature is selected for the model) and 91.6 F in summer (or whatever the new higher ambient temperature is selected for the model), as done in Table 10.9-1 in the thermal modeling study submitted for the Canaveral repowering site application.

d. Please provide a table of area of water above 68 F in winter in relation to ambient temperatures ranging from 58 F (or whatever the new lower ambient temperature is selected for the model) to 68 F.

17. *Section 3.2 (Manatee Thermal Refuge Results):* FWC-TMA-17

a. Can FPL provide a map and area of the surface discharge thermal plume under "worst case" conditions for manatee protection (i.e., smallest area)? (i.e., not slack tide)

b. Please provide a table of enclosed areas of water for isotherms given ambient water temperature of 58.5 F in winter (or whatever the new lower ambient temperature is selected for the model).

c. Please provide a table of area of water above 68 F in winter in relation to ambient temperatures ranging from 58 F (or whatever the new lower ambient temperature is selected for the model) to 68 F.

c. Did FPL do any 3-D modeling of the interim refuge plume? Is the area of the plume within the 68 F isotherm expected to be relatively homogeneous in temperature over depth or might there be temperature stratification, such that only certain depths will provide sufficient temperatures for manatee thermoregulation?

d. How quickly can FPL warm the interim thermal refuge to equilibrium state from a cold start? How will it be determined whether the ambient water temperature will be expected to drop below the trigger temperature?

18. *Section 4.0 or elsewhere in report:* FWC-TMA-18

Please provide a table that shows the number of days per winter in which the ambient waters in Lake Worth fell below the 61 F trigger temperature denoted in

the NPDES MPP, for each year going back at least 10 years. Please include in the table the number of days in which temperature was <68 F but > 61 F. This will provide a historical record to assist in foreseeing the range of thermal regimes that manatees have been exposed to in this region.

Monitoring Comments

19. FPL needs to ground-truth model results in winter to check validity of assumptions, with existing or new data. Volume and 3-D shape of the thermal plume may have important implications for manatee carrying capacity. Water plume extension should also be monitored through on-site measurements (water column temperature profiles and aerial thermal images) under various conditions of tidal state. FWC-MC-19

20. It is important for FPL to test the ability of the new unit to create an effective thermal refuge well prior to the winter in which the plant is completely shutdown, because that provides time to monitor the plume, identify problems or deficiencies, and modify the system before it is needed. This test would include measuring and monitoring the thermal plume under a range of ambient temperatures to truth and refine the model. Such monitoring should continue into the three winters of the shutdown. FWC-MC-20

B. SOUTH FLORIDA WATER MANAGEMENT DISTRICT

1. The proposed source of cooling water is the existing intake structure withdrawing from the Lake Worth Lagoon (Lagoon) near the Port of Palm Beach. Salinity data recorded at monitoring station LWL-6, located in the Lagoon approximately 1,500 feet east of the project site, indicates that the salinity of the Lagoon periodically falls below that of seawater, as defined by Section 1.8 of the Water Use Basis of Review (BOR). The Water Balance, Figure 4.5.0-1, appears to indicate an increase in withdrawals of approximately 159 million gallons per day from the Lagoon above the historical use from this source, as shown on Figure 3.3.4-10. Please clarify if the projected demand shown on Figure 4.5.0-1 represents average operating conditions or maximum (worst case) demands. SFWMD-1

2. Water Use Permits 50-04187-W for landscape irrigation and 50-04188-W for bearing cooling and other incidental industrial uses will be incorporated into the Conditions of Certification. These uses share the Surficial aquifer system withdrawal facilities located near the western property boundary. Please provide a saline water intrusion evaluation for these withdrawals. In addition, please provide a saline water intrusion monitoring plan, pursuant to Section 3.4 of the BOR, which includes a minimum of one monitoring well to be located between the withdrawal facilities and the Lagoon. SFWMD-2

3. Section 5.5 of Appendix 10.10 identifies potable water from the City of Riviera Beach (City) as the source for process and potable water. This section states: SFWMD-3

"While the converted Plant, on average, may use somewhat more water from this source than the existing Plant, the City has confirmed they have the water available." A letter from the City confirming there is sufficient potable and wastewater facility capacity was provided. Please submit a comparison of the existing vs. proposed demands for process and potable water. Please be advised that the City's application for renewal of their public water supply Water Use Permit is currently under review. Please be advised that the City's withdrawals from the Surficial aquifer system may be limited by Section 3.2.1.E of the BOR, which includes restrictions for allocating water by permit for water use withdrawals within the Northern Palm Beach County Service Area and Lower East Coast Service Areas 1, 2 or 3. Please be advised that, although the City has provided a letter stating that sufficient supply exists, this supply may not be adequate to meet increased process and potable water demands for the new plant. In addition, please note that potential increases in demand associated with the new plant have not been evaluated for compliance with the BOR as part of the SFWMD's review of the City's Water Use Permit application.

4. Section 5.2.1.1 states that water used during project construction will be obtained from the City and from the existing on-site wells. Please identify the quantity of water required for project construction activities. SFWMD-4

5. In Appendix 10.9, the assumptions of slack tide for the offshore jet and no ambient water dilution for the shoreline surface discharge, thermal refuge are very conservative. It would be desirable if the thermal models were calibrated or at least monitoring data were used to demonstrate that the models are indeed very conservative. How was the projected plume defined, as shown on Figure 10.9-9, with respect to temperature? Does the shape indicate the jet direction? In addition, please provide a copy of the report prepared by Applied Biology in the 1970s concerning the extent of the thermal plume. SFWMD-5

C. DEP SITING OFFICE

1. To what extent has FPL evaluated the feasibility of processes to capture CO_2 from any of its plants in Florida? Provide any reviews conducted or plans to conduct assessments regarding the availability of deep confined geological strata within a reasonable distance (e.g. <200 kilometers) of the plant site for possible future CO_2 storage. FDEP-SO-1

2. The Siting Office requests that FPL make a good faith effort to comply with the new statutory requirements, including those below from 403.5115(6), F.S: FDEP-SO-2

(a) A good faith effort shall be made by the applicant to provide direct written notice of the filing of an application for certification by United States mail or hand delivery no later than 45 days after filing of the application to all local landowners whose property, as

noted in the most recent local government tax records, and residences are located within the following distances of the proposed project:

1. Three miles of the proposed main site boundaries of the proposed electrical power plant.

2. One-quarter mile for a transmission line corridor that only includes a transmission line as defined by s. 403.522(22).

3. One-quarter mile for all other linear associated facilities extending away from the main site boundary except for a transmission line corridor that includes a transmission line that operates below those defined by s. 403.522(22).

(b) No later than 60 days from the filing of an application for certification, the applicant shall file a list with the department's Siting Coordination Office of landowners and residences that were notified.

3. Please confirm that all state and local permits/authorizations for the existing Riviera Plant are included in Appendices 10.3 through 10.11 of the Site Certification Application. FDEP-SO-3

D. CITY OF RIVIERA BEACH

The City of Riviera Beach (City) recommends that the following issues be added or addressed in the Application:

1. All lights shall be shielded in such a way as to direct the lighting toward the earth's surface and away from reflective surfaces. CRB-1
2. Light fixtures or lamps shall be shielded/shaded in such a manner as to direct incident rays away from all adjacent property. CRB-2
3. Facilities which may require floodlighting may not arrange the lighting in such a way that lighting will be directed toward roadways, onto adjacent property or into the night sky. CRB-3
4. All fixtures must meet the City's building code requirements. CRB-4
5. A Storm Water Pollution Plan must be submitted and the Energy Center must comply with all storm water management requirements imposed by the City. CRB-5
6. The City's Utility District shall have full access to the site to conduct periodic inspections to ensure compliance with the District's regulations. CRB-6

E. DEPARTMENT OF STATE

1. A review of the application indicates that the immediate FPL Riviera Beach Energy Center (RBEC) property, including an area of potential effect was subjected to a limited level of cultural resource review in November 2008 by Janus Research of Tampa, Florida for Golder Associates. We note that no significant cultural resources (archaeological sites, buildings or structures) were identified within the RBEC, but the review did not appear to include the construction parking area west of US 1. DOS-1

It is the opinion of this agency and we concur with the findings of Janus Research that it is unlikely that significant cultural resources will be encountered within the RBEC. However, the construction parking area was not investigated and the area of potential effect evaluation did not address indirect affects – such as noise, lights and emissions - to cultural resources within at least a half-radius from the RBEC site; or possible deeply buried cultural deposits within the plant site that the standard archaeological field methodology will not discover.

We request that the applicant address any potential indirect affects and historic properties or properties otherwise of significance for review by this agency; and develop and present an unexpected cultural resource discoveries training plan for demolition and construction contractors and project managers for review and approval by this agency.

2. In addition, we request that the construction parking area be subjected to standard archaeological field investigations, including subsurface testing. We note that U.S. Highway 1 parallels the western boundary of the RBEC plant property. Any alterations or changes to the linear roadway resource must be addressed in a supplemental cultural resource assessment DOS-2

3. Lastly, if new transmission line corridors or replacement transmission lines will be constructed in association with the RBEC that have not previously been surveyed, they will need to be investigated to determine if cultural resources are present and if such resources could be adversely impacted. DOS-3

Attached also, please find a copy of submitted letters/comments from Florida Fish and Wildlife Conservation Commission, South Florida Water Management District, City of Riviera Beach, City of West Palm Beach, and Florida Department of State Division of Historical Resources.

Attach:

Florida Fish and Wildlife Conservation Commission

Commissioners
Rodney Barreto
Chair
Miami

Kathy Barco
Vice-Chair
Jacksonville

Ronald M. Bergeron
Fort Lauderdale

Richard A. Corbett
Tampa

Dwight Stephenson
Delray Beach

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Managing fish and wildlife resources for their long-term well-being and the benefit of people.

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MyFWC.com

March 14, 2009

Mr. Mike Halpin, Administrator
Siting Coordination Office
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 48
Tallahassee, FL 32399

RE: FPL Riviera Beach Energy Center Conversion Project, Palm Beach County

Dear Mr. Halpin:

The Division of Habitat and Species Conservation, Marine Estuarine Sub-section, of the Florida Fish and Wildlife Conservation Commission (FWC) has coordinated our agency's review of the Cape Canaveral Energy Center Conversion project and provides the following information requests and comments for consideration in the application completeness review.

FPL seeks site certification for the dismantlement of the existing Riviera Beach power plant, construction of the new Riviera Beach Energy Center, the construction of a parking area, construction laydown area, some transmission-related activities, and a manatee viewing center. Florida Power & Light (FPL) proposes to convert the existing 300-megawatt plant that currently has two operational units that use fuel oil or natural gas to a 3-on-1 combined cycle unit with heat recovery steam generators. The converted lower emission plant will primarily burn natural gas and produce 1,250-megawatts of electricity. The project would use existing plant site boundaries, cooling water intake and discharge infrastructure, and transmission line right-of way.

The proposed project has the potential to affect manatees and their habitat. During the past 40-years manatees have used the thermal discharge of the Riviera Beach power plant as warm-water habitat. Due to the extensive manatee use at the Riviera Beach power plant and the surrounding waterway we have provided the enclosed questions and information needs regarding the proposed changes to the Riviera Beach power plant's thermal discharge and proposed maintenance dredging.

Thank you for the opportunity to provide comments and questions regarding this application. If you or your staff would like to coordinate further on the recommendations contained in this report, please contact me at 850-922-4330, or email me at ron.mezich@MyFWC.com.

Sincerely

Ron Mezich
Biological Scientist IV
/rm
Riviera Beach Energy Center_1773_RAI

Enclosure

cc: Carol Knox, FWC, Tallahassee
Leslie Ward, FWC, St. Petersburg

Riviera Beach Energy Center Site Certification Application

1. The applicant indicates that maintenance dredging will be preformed at the discharge canal. Is this activity planned to be preformed prior to deconstruction or after the construction phase? At low tide (the coolest time period), the northwest corner of the embayment is high and dry, limiting the amount of space available for manatees. Hence the calculated areas of water within isotherms would be overestimated, which would have its greatest impact on the areas calculated for the manatee refuge, unless dredging would be completed before that time.

2. Please provide site plans of the area expected to be dredged and identify the spoil site.

3. FPL-Riviera Beach collected ambient and discharge water temperatures during this past winter please provide a site plan that indicates where these temperatures were collected.

4. Please identify the locations where ambient and discharge temperatures are recorded and how often these temperatures are collected. Water temperatures that reflect ambient and warm-water refuge conditions need to be collected pre and post construction temperature regimes.

5. Is discharge temperature data collected at the offhshore discharge pipe?

6. Please provide additional detail regarding the temporary heating system
That may be used (e.g. potential manufacturers) and a site plan showing proposed locations of the electrical heating units, intake, discharge locations and connecting pipelines.
7. What are the proposed hours of operation of the planned manatee visitor center and will the center be staffed?

8. Manatee monitoring plans will be required in this permit with specific requirements to be agreed upon by FWC, USFWS and DEP. Monitoring plans need to include the time frame beginning 1-year in advance of construction, during the construction phase and post construction. Monitoring efforts shall include the temperature of the thermal refuge in comparison to ambient temperature and manatee behavior and distribution during the repowering effort. Manipulation of the interim warm-water refuge as part of the monitoring plan should be discussed by FPL, USFWS and FWC as a technique to enhance our understanding of manatee response to the loss of industrial warm-water habitat.

9. Long Term Plan – Post-construction, and within an agreed upon time frame, FWC, USFWS and FPL will develop a plan to minimize adverse affects to manatees that provides for the weaning of manatees from the repowered FPL-Riviera Beach warm-water discharge and/or establishing an alternative warm-water resource area prior to the plant significantly reducing operations or permanently being retired.

Comments on FPL Riviera Beach Power Plant Thermal Modeling Analysis

Section 1.0, par. 2: Please note years that Units 1 and 2 were established and when retired.

Section 1.0, par. 3: Please note the fuel source(s) to be used by the repowered plant, and how fuel will be delivered to the plant (e.g., ship, barge, pipeline).

Section 2.1.1.2:
1. The EQTP model used to simulate the thermal plume is based on cooling pond thermal dynamics and assumes that all heat loss is through the air-water interface (radiation, evaporation, conduction) and none through mixing or dilution with ambient waters. Given that effects of mixing due to tides and currents have been observed in the dynamics of cooling water discharge fields (Davies *et al.* 1997), and given that tidal currents in Lake Worth are strong (as noted in Section 2.1.3.1) and substantially affect the ambient thermal regime, what effect does this apparent violation of model assumptions have on interpretation of model output?

> DAVIES, P. A., L. A. MOFOR and M. J. VALENTE NEVES. 1997. Comparisons of remotely sensed observations with modelling predictions for the behaviour of wastewater plumes from coastal discharges. International Journal of Remote Sensing 18:1987-2019.

2. Has the EQTP model been tested in Lake Worth to validate model output on the shape and areal extent of the warm water plume against actual measured conditions? If so, what were the results (please provide summary tables, figures, maps)? If not, how are the thermal models going to be verified with empirical data? Where has the model been tested that has a similar physiography and tidal conditions as Lake Worth?

Section 2.1.2.2. Regarding the use of siphon pipes to discharge warm water into the manatee embayment when the plant is not operating at full load, has this been automated so that there is always warm water flowing into the embayment or has it been a decision to switch those pumps on? If the latter, has that occurred primarily when ambient temperatures are approaching the MPP trigger of 61 F? Will future operation of these siphon pipes and hence the discharge into the manatee embayment be the same as in recent years?

Section 2.13, par. 2: The NOAA water temperature monitoring station used to select minimum and maximum temperatures is located on the ocean side of the barrier island; this does not necessarily reflect the conditions within Lake Worth which may show greater variation. Long-term temperature data should be re-evaluated based on sources of temperature data from within the lagoon proper to determine whether lower minimum or higher maximum values should be used in the model. If the NOAA temperatures are more extreme, then the model can be kept as is.

Section 2.2.1: What percent recirculation is used/assumed/predicted in the EQTP model of the thermal refuge? Assuming that the system will behave as a completely closed

cycle system, when the intake and discharge units are separated by 500 ft of open water (along a shoreline), does not seem realistic. [Unlike the case at Canaveral where the thermal refuge is completely enclosed in the intake canal.] This would especially be the case when wind-driven or tidally-driven currents are pushing water to the south. How does this affect the results? Running a few different scenarios of % recirculation based on more realistic conditions would prove helpful.

Section 3.1.2 (Surface Discharge Results):

1. Can FPL provide a map and area of the surface discharge thermal plume under "worst case" conditions for manatee protection (i.e., smallest area)? (i.e., not slack tide)
2. The description of the empirical data from ABI in 1974 is vague and gives no indication of how the plume results match to the model predictions; please clarify and elaborate.
3. Please provide a table of enclosed areas of water for isotherms given ambient water temperature of 58.5 F in winter (or whatever the new lower ambient temperature is selected for the model) and 91.6 F in summer (or whatever the new higher ambient temperature is selected for the model), as done in Table 10.9-1 in the thermal modeling study submitted for the Canaveral repowering site application.
4. Please provide a table of area of water above 68 F in winter in relation to ambient temperatures ranging from 58 F (or whatever the new lower ambient temperature is selected for the model) to 68 F.

Section 3.2 (Manatee Thermal Refuge Results):

1. Can FPL provide a map and area of the surface discharge thermal plume under "worst case" conditions for manatee protection (i.e., smallest area)? (i.e., not slack tide)
2. Please provide a table of enclosed areas of water for isotherms given ambient water temperature of 58.5 F in winter (or whatever the new lower ambient temperature is selected for the model).
3. Please provide a table of area of water above 68 F in winter in relation to ambient temperatures ranging from 58 F (or whatever the new lower ambient temperature is selected for the model) to 68 F.
4. Did FPL do any 3-D modeling of the interim refuge plume? Do they expect the area of the plume within the 68 F isotherm to relatively homogeneous in temperature over depth or might there be temperature stratification, such that only certain depths will provide sufficient temperatures for manatee thermoregulation?
5. How quickly can FPL warm the interim thermal refuge to equilibrium state from a cold start? How will it be determined whether the ambient water temperature will be expected to drop below the trigger temperature?

Section 4.0 or elsewhere in report: Please provide a table that shows the number of days per winter in which the ambient waters in Lake Worth fell below the 61 F trigger temperature denoted in the NPDES MPP, for each year going back at least 10 years. Please include in the table the number of days in which temperature was <68 F but > 61 F. This will provide a historical record to assist in foreseeing the range of thermal regimes that manatees have been exposed to in this region.

MONITORING COMMENTS

1. FPL needs to ground-truth model results in winter to check validity of assumptions, with existing or new data. Volume and 3-D shape of the thermal plume may have important implications for manatee carrying capacity. Water plume extension should also be monitored through on-site measurements (water column temperature profiles and aerial thermal images) under various conditions of tidal state.
2. It is important for FPL to test the ability of the new unit to create an effective thermal refuge well prior to the winter in which the plant is completely shutdown, because that provides time to monitor the plume, identify problems or deficiencies, and modify the system before it is needed. This test would include measuring and monitoring the thermal plume under a range of ambient temperatures to truth and refine the model. Such monitoring should continue into the three winters of the shutdown.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

LAN 04-06

March 16, 2009

Mr. Michael P. Halpin, P.E.
Siting Coordination Office
Department of Environmental Protection
3900 Commonwealth Boulevard, MS #48
Tallahassee, FL 32399-3000

Dear Mr. Halpin:

Subject: FPL Riviera Beach Energy Center, PA09-54
Site Certification Application Completeness Review

South Florida Water Management District (SFWMD) staff has reviewed the Site Certification Application submitted by the Florida Power & Light Company (FPL) for the above subject project, pursuant to Sections 403.501-539, F.S., and Rule 62-17, F.A.C. Based on that review, we have the following completeness questions/comments:

(1) The proposed source of cooling water is the existing intake structure withdrawing from the Lake Worth Lagoon (Lagoon) near the Port of Palm Beach. Salinity data recorded at monitoring station LWL-6, located in the Lagoon approximately 1,500 feet east of the project site, indicates that the salinity of the Lagoon periodically falls below that of seawater, as defined by Section 1.8 of the Water Use Basis of Review (BOR). The Water Balance, Figure 4.5.0-1, appears to indicate an increase in withdrawals of approximately 159 million gallons per day from the Lagoon above the historical use from this source, as shown on Figure 3.3.4-10. Please clarify if the projected demand shown on Figure 4.5.0-1 represents average operating conditions or maximum (worst case) demands.

(2) Water Use Permits 50-04187-W for landscape irrigation and 50-04188-W for bearing cooling and other incidental industrial uses will be incorporated into the Conditions of Certification. These uses share the Surficial aquifer system withdrawal facilities located near the western property boundary. Please provide a saline water intrusion evaluation for these withdrawals. In addition, please provide a saline water intrusion monitoring plan, pursuant to Section 3.4 of the BOR, which includes a minimum of one monitoring well to be located between the withdrawal facilities and the Lagoon.

(3) Section 5.5 of Appendix 10.10 identifies potable water from the City of Riviera Beach (City) as the source for process and potable water. This section states: "While the converted Plant, on average, may use somewhat more water from this source than the existing Plant, the City has confirmed they have the water available." A letter from the City confirming there is sufficient potable and wastewater facility capacity was provided.

Please submit a comparison of the existing vs. proposed demands for process and potable water. Please be advised that the City's application for renewal of their public water supply Water Use Permit is currently under review. Please be advised that the City's withdrawals from the Surficial aquifer system may be limited by Section 3.2.1.E of the BOR, which includes restrictions for allocating water by permit for water use withdrawals within the Northern Palm Beach County Service Area and Lower East Coast Service Areas 1, 2 or 3. Please be advised that, although the City has provided a letter stating that sufficient supply exists, this supply may not be adequate to meet increased process and potable water demands for the new plant. In addition, please note that potential increases in demand associated with the new plant have not been evaluated for compliance with the BOR as part of the SFWMD's review of the City's Water Use Permit application.

(4) Section 5.2.1.1 states that water used during project construction will be obtained from the City and from the existing on-site wells. Please identify the quantity of water required for project construction activities.

(5) In Appendix 10.9, the assumptions of slack tide for the offshore jet and no ambient water dilution for the shoreline surface discharge, thermal refuge are very conservative. It would be desirable if the thermal models were calibrated or at least monitoring data were used to demonstrate that the models are indeed very conservative. How was the projected plume defined, as shown on Figure 10.9-9, with respect to temperature? Does the shape indicate the jet direction? In addition, please provide a copy of the report prepared by Applied Biology in the 1970s concerning the extent of the thermal plume.

If you have any questions concerning the above, please do not hesitate to contact me at (561) 682-6862.

Sincerely,

James J. Golden, AICP
Lead Planner
Environmental Resource Regulation Department

/jjg

c: See Attached Distribution List

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: FLORIDA POWER & LIGHT COMPANY RIVIERA BEACH ENERGY CENTER Applicant	DOAH Case No. 09-1003 DEP OGC Case No. 09-0262 PPSA No. PA0954

_____/

RECOMMENDATIONS ON THE COMPLETENESS OF APPLICATION

The City of Riviera Beach (City), by and through its undersigned counsel, makes the following statement and files these Recommendations on the Completeness of the Application as contemplated by section 403.5066(1)(a), Florida Statutes.

The application for the most part addresses issues that were raised during the City's site plan review process for the new energy center. However, the City recommends that the following issues be added or addressed in the Application:

a. All lights shall be shielded in such a way as to direct the lighting toward the earth's surface and away from reflective surfaces.
b. Light fixtures or lamps shall be shielded/shaded in such a manner as to direct incident rays away from all adjacent property.
c. Facilities which may require floodlighting may not arrange the lighting in such a way that lighting will be directed toward roadways, onto adjacent property or into the night sky.
d. All fixtures must meet the City's building code requirements.
e. A Storm Water Pollution Plan must be submitted and the energy center must comply with all storm water management requirements imposed by the City.
f. The City's Utility District shall have full access to the site to conduct periodic inspections to ensure compliance with the District's regulations.

I HEREBY CERTIFY that a true and correct copy of the foregoing has been sent ONLY to the State of Florida Department of Environmental Protection via email at the following address: Toni Sturtevant, Assistant General Counsel, toni.sturtevant@dep.state.fl.us.

Respectfully submitted this 16th day of March, 2009.

PAMALA H. RYAN, City Attorney
CITY OF RIVIERA BEACH
600 W. Blue Heron Boulevard
Riviera Beach, Florida 33404
(561) 845-4059 / FAX (561) 845-4017
pryan@rivierabch.com

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

March 16, 2009

Mr. Michael P. Halpin, P.E.
Siting Administrator
Florida Department of Environmental Protection
2600 Blair Stone Road, Suite 649, MS #48
Tallahassee, Florida 32399-2400

Re: DHR Project No.: 2009-1061
Date Received by DHR: February 13, 2009
FPL Riviera Beach Energy Center
Application for Site Certification
Palm Beach County

Dear Mr. Halpin:

Our office reviewed the referenced siting application in accordance with Chapters 403 and 267, *Florida Statutes*, for possible impact to historic properties listed, or eligible for listing, in the National Register of Historic Places, or otherwise of historical, architectural or archaeological significance. The State Historic Preservation Officer/Division of Historical Resources advises and assists state agencies and applicants to identify historic properties, assessing effects upon them, and considering alternatives to avoid or minimize adverse effects.

A review of the application indicates that the immediate FPL Riviera Beach Energy Center (RBEC) property, including an area of potential effect was subjected to a limited level of cultural resource review in November 2008 by Janus Research of Tampa, Florida for Golder Associates. We note that no significant cultural resources (archaeological sites, buildings or structures) were identified within the RBEC, but the review did not appear to include the construction parking area west of US 1.

It is the opinion of this agency and we concur with the findings of Janus Research that it is unlikely that significant cultural resources will be encountered within the RBEC. However, the construction parking area was not investigated and the area of potential effect evaluation did not address indirect affects – such as noise, lights and emissions - to cultural resources within

at least a half-radius from the RBEC site; or possible deeply buried cultural deposits within the plant site that the standard archaeological field methodology will not discover.

We request that the applicant address any potential indirect affects and historic properties or properties otherwise of significance for review by this agency; and develop and present a unexpected cultural resource discoveries training plan for demolition and construction contractors and project managers for review and approval by this agency.

In addition, we request that the construction parking area be subjected to standard archaeological field investigations, including subsurface testing. We note that U.S. Highway 1 is parallels the western boundary of the RBEC plant property. Any alterations or changes to the linear roadway resource must be addressed in a supplemental cultural resource assessment.

Lastly, if new transmission line corridors or replacement transmission lines will be constructed in association with the RBEC that have not previously been surveyed, they will need to be investigated to determine if cultural resources are present and if such resources could be adversely impacted.

Therefore, until completion of the requested investigations and submission of investigation reports for review and comment, and a commitment from FPL to develop an approved contractor training plan, this agency cannot complete our comments for this application.

If you have any questions concerning our comments, please contact Laura Kammerer, Deputy State Historic Preservation Officer for Review and Compliance, by telephone at 850-245-6333, or by electronic mail at lkammerer at dos.state.fl.us. Thank you for your interest in protecting Florida's historic properties.

Sincerely,

Frederick P. Gaske, Director, and
State Historic Preservation Officer

The City of West Palm Beach
"The Capital City of the Palm Beaches"

PLANNING AND ZONING DEPARTMENT
P.O. Box 3366
West Palm Beach, Florida 33402
Telephone: (561) 822-1435
Fax: (561) 822-1459
Administration

March 16, 2009

Cindy Mulkey
Department of Environmental Protection
Siting Coordination Office
Mail Station 48
3900 Commonwealth Blvd.
Tallahassee, Florida 32399

Re: FPL Riviera Beach Energy Center Completeness Review

Dear Ms. Mulkey:

The City of West Palm Beach has performed a completeness review of the FPL Riviera Beach Energy Center Site Certification Application. The City met with representatives of FPL on March 11, 1009, to discuss the Site Certification Application. The City has determined that the information provided in the application and the follow-up meeting is enough for the City to make an adequate review of the matters within the City's jurisdiction at this time. Based on this information, the City will submit a conditions list to the Department of Environmental Protection in the future at the appropriate time.

If you require any additional information, please contact Eric Schneider, Principal Planner, at (561) 822-1435.

Sincerely,

Charles K. Wu, AICP
Planning Director

c: Ed Mitchell, City Administrator
Suzanne Payson, Assistant City Attorney
Angella Vann, Planning and Zoning Administrator
Eric Schneider, Principal Planner

A. FLORIDA FISH AND WILDLIFE COMMENTS

Manatee Protection

FWC – MP-1. The applicant indicates that maintenance dredging will be performed at the discharge canal. Is this activity planned to be performed prior to deconstruction or after the construction phase? At low tide (the coolest time period), the northwest corner of the embayment is high and dry, limiting the amount of space available for manatees. Hence the calculated areas of water within isotherms would be overestimated, which would have its greatest impact on the areas calculated for the manatee refuge, unless dredging would be completed before that time.

RESPONSE: The dredging of the manatee embayment area will be completed prior to installation of the temporary manatee heating system, prior to the beginning of the 2009 manatee season. Since dredging is planned to be completed prior to installation of the temporary heating system, the information presented in the Site Certification Application (SCA) regarding areas within the isotherms for the manatee refuge is appropriate.

FWC – MP-2. Please provide site plans of the area expected to be dredged and identify the spoil site.

RESPONSE: The area expected to be dredged is shown on the attached bathymetric survey (see Attachment FWC-MP-2) completed in 2001. Portions of this area will be dredged to a maximum depth of -5 feet MLW. The spoil will be deposited on the existing Plant site to be determined at an upland location.

FWC – MP-3. FPL-Riviera Beach collected ambient and discharge water temperatures during this past winter please provide a site plan that indicates where these temperatures were collected.

RESPONSE: See Attachment FWC-MP-3 showing the locations where ambient and discharge water temperatures were collected. The ambient temperature measurement device was set up at the 3B Intake screen well and was positioned approximately 15 feet below the surface of the water. Two discharge temperature measurement devices were set up at the manatee embayment area where the manatees gather during cold weather. One was positioned at the surface and the other was positioned 3 feet below the surface.

FWC – MP-4. Please identify the locations where ambient and discharge temperatures are recorded and how often these temperatures are collected. Water temperatures that reflect ambient and warm-water refuge conditions need to be collected pre and post construction temperature regimes.

RESPONSE: Ambient and discharge cooling water temperatures are measured at the inlet and outlet cooling water piping connections at the condenser and are continuously recorded in the plant's operating data collection system. Based on the ambient and discharge temperature measurements taken this past winter, these temperatures are consistent with the ambient water temperature measured at the intake and the temperature of the water discharged into the manatee embayment area.

FWC – MP-5. Is discharge temperature data collected at the offshore discharge pipe?

RESPONSE: No. Discharge temperatures are not collected at the offshore discharge pipe.

FWC – MP-6. Please provide additional detail regarding the temporary heating system that may be used (e.g. potential manufacturers) and a site plan showing proposed locations of the electrical heating units, intake, discharge locations and connecting pipelines.

RESPONSE: A conceptual design has been developed for the temporary heating system, and the site plan showing the proposed locations of the electrical heating units, intake, discharge, and connecting pipelines is presented in Figure FWC-MP-6-1 (attached). The final locations of the temporary heating system equipment will be determined during detailed design.

As shown on the conceptual site plan, water will be withdrawn from the Lake Worth Lagoon using pumps installed in the existing Units 1 and 2 intake structure, then pumped through electric heaters and discharged into the manatee embayment area. There will be multiple pumps and heaters installed which will allow for system operation under varying ambient conditions and the system is designed to allow for additional heating to be added if required. A dedicated 13.2-kV distribution feeder from FPL's electric system will provide the electrical power for the temporary heating system.

The use of the existing Units 1 and 2 intake structure will prevent debris from being pumped through the system and will prevent any impacts to manatees or other marine species.

Potential manufacturers of the temporary heating system equipment include Watlow (electric heaters) and Gormann-Rupp (pumps).

FWC – MP-7. What are the proposed hours of operation of the planned manatee visitor center and will the center be staffed?

RESPONSE: FPL is still very early in the planning process of the manatee visitor center. At a minimum, it is envisioned that the manatee viewing center would be open during business hours during the manatee season, which occurs roughly mid-November through March. FPL will also evaluate potential benefits to the community that could be provided during times when the manatees would not be present.

Yes, the center will be staffed. However, because FPL is still in the early planning stage for the center, personnel details have not yet been determined.

FWC – MP-8. Manatee monitoring plans will be required in this permit with specific requirements to be agreed upon by FWC, USFWS and DEP. Monitoring plans need to include the time frame beginning 1-year in advance of construction, during the construction phase and post construction. Monitoring efforts shall include the temperature of the thermal refuge in comparison to ambient temperature and manatee behavior and distribution during the repowering effort. Manipulation of the interim warm-water refuge as part of the monitoring plan should be discussed by FPL, USFWS and FWC as a technique to enhance our understanding of manatee response to the loss of industrial warm-water habitat.

RESPONSE: Comment acknowledged.

FWC – MP-9. Long Term Plan – Post-construction, and within an agreed upon time frame, FWC, USFWS and FPL will develop a plan to minimize adverse affects to manatees that provides for the weaning of manatees from the repowered FPL-Riviera Beach warm-water discharge and/or establishing an alternative warm-water resource area prior to the plant significantly reducing operations or permanently being retired.

RESPONSE: Comment acknowledged.

Thermal Modeling Analysis

FWC – TMA-10. Section 1.0, par. 2: Please note years that Units 1 and 2 were established and when retired.

RESPONSE: Unit 1 began service in 1946 and was retired in 1983. Unit 2 began service in 1953 and was retired in 1991.

FWC – TMA-11. Section 1.0, par. 3: Please note the fuel source(s) to be used by the repowered plant, and how fuel will be delivered to the plant (e.g., ship, barge, pipeline).

RESPONSE: As noted in Section 4.3 of the SCA (page 4-4), the primary fuel for the RBEC will be natural gas that will be delivered to the Site via a pipeline. The backup fuel will be ultra-low sulfur light oil and will be delivered to the Site via barge from the adjacent Port of Palm Beach or by truck.

FWC – TMA-12a. Section 2.1.1.2: The EQTP model used to simulate the thermal plume is based on cooling pond thermal dynamics and assumes that all heat loss is through the air-water interface (radiation, evaporation, conduction) and none through mixing or dilution with ambient waters. Given that effects of mixing due to tides and currents have been observed in the dynamics of cooling water discharge fields (Davies et al. 1997), and given that tidal currents in Lake Worth are strong (as noted in Section 2.1.3.1) and substantially affect the ambient thermal regime, what effect does this apparent violation of model assumptions have on interpretation of model output?

> **Davies, P. A., L. A. Mofor and M. J. Valente Neves. 1997. Comparisons of remotely sensed observations with modelling predictions for the behaviour of wastewater plumes from coastal discharges. International Journal of Remote Sensing 18:1987-2019.**

RESPONSE: Section 2.1.3.1 of Appendix 10.9 of the SCA does not state that tidal currents in Lake Worth Lagoon (LWL) are strong; it states that "…tidal currents in and out of Lake Worth Inlet are relatively strong…." This is because the full tidal flow is forced through the relatively narrow inlet channel (design channel mid-width of 200 feet, see Section 3.3.4.1 and Figure 3.3.4-2 of the SCA). Section 2.1.3.1 of Appendix 10.9 of the SCA mentions this current because it is discussing the Receiving Body of Water (RBW) in the vicinity of the offshore discharge which is about 1,941 feet offshore, near the ship's channel for the Port of Palm Beach. The Lake Worth Lagoon is about a half-mile wide in the vicinity of the shoreline discharge. Further, near-shore currents are generally much lower than those in the center of a water body.

Because the manatee embayment is relatively shallow, and the shoreline discharge is directed vertically downward, the heated water spreads within the embayment and then discharges horizontally to LWL at relatively low velocity (see Figure 10.9-4 of the SCA and Figure FWC-TMA-12a-1). Because both the discharge and the ambient currents are low in

magnitude, there is no violation of model assumptions, and the model output is reasonable. In fact, the largest thermal plume occurs during slack tidal current, when there is no ambient current velocity.

FWC – TMA-12b. Section 2.1.1.2: Has the EQTP model been tested in Lake Worth to validate model output on the shape and areal extent of the warm water plume against actual measured conditions? If so, what were the results (please provide summary tables, figures, maps)? If not, how are the thermal models going to be verified with empirical data? Where has the model been tested that has a similar physiography and tidal conditions as Lake Worth?

RESPONSE: The model has not been tested specifically in Lake Worth Lagoon. The previous 316(a) studies ("Ecological Parameter Monitoring at the Riviera Plant", Applied Biology, Inc., September 1976) did not include any isothermal maps from thermal surveys. At that time, Units 1 and 2 were operational and a small, quickly dissipated thermal plume was described as "detectable", and as "< 8.0 meters", as was described in SCA Appendix 10.9, Section 3.1.2.

The original documentation of the model was presented at the 33rd Annual Meeting of the American Power Conference in Chicago, Illinois, which was held April 20-22, 1971. A copy of that presentation has been sent to FWC on April 23, 2009, under separate cover, as well as several other documents described below. A CD containing these documents is available to others upon request.

The model has been tested and confirmed at numerous plants in Florida. The plant with a discharge most similar the shoreline discharge to Lake Worth Lagoon is the repowered Fort Myers Plant. The Fort Myers Plant discharges to the Orange River which then discharges to the Caloosahatchee Estuary at relatively low velocity. FPL has sent to FWC copies of the Fort Myers Repowering Project Calculation Number 1 by Foster Wheeler Environmental Corporation, dated October 1998, and Chapter 5.0, Thermal Modeling of the Cooling System Assessment, attached to the Fort Myers Repowering Project Industrial Wastewater Facility Permit Application of February 1999. Although the final isothermal map is no longer available, the calculation demonstrates that the temperature predictions from the EQTP modeling compare favorably with those of the CE-QUAL-W2 modeling performed by ECT, Inc., and documented in the Cooling System Assessment.

Another plant with a somewhat similar configuration is the repowered Lauderdale Plant. The Lauderdale Plant discharges to an open cycle cooling pond with a surface area of approximately 185 acres. That cooling pond then discharges to the South Fork New River. From there, the discharged water works its way through a series of tidally affected interconnected canals (South Fork New River, North Fork New River, South New River Canal, and Dania Cut-Off Canal) back to the intake on the Dania Cut-Off Canal. In Chapter 5.0 of the SCA for that project (also sent to FWC under separate cover, along with the thermal modeling Appendix 10.5.2), the RECEIV-II model and the EQTP model [called the "Analytical Model 1(Patterson, 1971)" in Chapter 5.0] were both used to evaluate the cooling pond performance and the results were compared to the measured data (see the results in Table 5.1-8 compared to those in Table 5.1-4 for January and August).

FWC – TMA-13. Section 2.1.2.2. Regarding the use of siphon pipes to discharge warm water into the manatee embayment when the plant is not operating at full load, has this been automated so that there is always warm water flowing into the embayment or has it been a decision to switch those pumps on? If the latter, has that occurred primarily when ambient temperatures are approaching the MPP trigger of 61 F? Will future operation of these siphon pipes and hence the discharge into the manatee embayment be the same as in recent years?

RESPONSE: The use of the siphon pipes to discharge warm water in the manatee embayment area is currently not automated and the decision to place the siphon in service is based on ambient water and weather conditions and projected water temperatures. It is anticipated that the siphon pipes will continue to be operated in the same manner in the future.

FWC – TMA-14. Section 2.13, par. 2: The NOAA water temperature monitoring station used to select minimum and maximum temperatures is located on the ocean side of the barrier island; this does not necessarily reflect the conditions within Lake Worth which may show greater variation. Long-term temperature data should be re-evaluated based on sources of temperature data from within the lagoon proper to determine whether lower minimum or higher maximum values should be used in the model. If the NOAA temperatures are more extreme, then the model can be kept as is.

RESPONSE: FPL performed a search for temperature data in Lake Worth Lagoon. The USGS does not list any temperature-monitoring sites in Lake Worth Lagoon. EPA's STORET system, searched via the FDEP web site, indicates there are three water temperature recording sites in the vicinity – stations with ID Nos. 14 and 28010728 on the Blue Heron Boulevard Bridge, and 28010777 east of 53rd Street. The data period of record for these three stations is from November 1999 through October 2008. None of the STORET readings are outside the range reported in the SCA (58.5 to 91.6°F.)

SFWMD's DBHydro database lists several temperature-monitoring sites in Lake Worth Lagoon; these were identified in Subsection 3.3.4 of the SCA and their locations were shown on Figure 3.3.4-3 of the SCA. The period of record of these data is from July 2007 through April 2009. FPL has examined the records for those which report temperature data (LWL-2 through LWL-8). Only two data points show water temperatures less than 58.5°F; 53.2°F at LWL-2 and 52.5°F at LWL-4, both on February 5, 2009. Both of those stations are north of Lake Worth Inlet and so are affected by fresh water inflow from C-17. Because the RBEC vicinity is not so affected, those temperature extremes are not considered representative of the Site.

FPL has also examined water temperature data provided by FWC for the station identified as Riviera Beach Marina. The period of record for these data is December 1998 through March 2006. FWC provided the data as having not undergone QA/QC. FPL has plotted the data and removed spurious data points (e.g., water temperatures that change 16°F over a 1-hour period) prior to analysis. The overall minimum water temperature was then determined to be 60.2°F.

FPL records intake and discharge temperatures of the once-through cooling water system to satisfy the requirements of the NPDES permit. However, the permit only requires that monthly average and daily maximum discharge temperatures and the temperature differences between intake and discharge be reported. Thus the actual intake temperatures are not reported. Because the reported discharge temperatures and difference between intake and discharge temperatures are not synoptic, the intake temperatures cannot be calculated from them. Further, the NPDES permit only requires that the data be maintained for 3 years. For these reasons, Plant water temperature data are not useful for analyzing intake water temperatures.

Therefore, FPL concludes that the NOAA temperatures are the most extreme and the model can be kept as presented.

FWC – TMA-15. Section 2.2.1: What percent recirculation is used/assumed/predicted in the EQTP model of the thermal refuge? Assuming that the system will behave as a completely closed cycle system, when the intake and discharge units are separated by 500 ft of open water (along a shoreline), does not seem realistic. [Unlike the case at Canaveral where the thermal refuge is completely enclosed in the intake canal.] This would especially be the case when wind-driven or tidally-driven currents are pushing water to the south. How does this affect the results? Running a few different scenarios of % recirculation based on more realistic conditions would prove helpful.

RESPONSE: The EQTP model can only be run in two modes – open or closed cycle. In the closed cycle mode, 100-percent recirculation is assumed. In the open cycle mode, 0-percent recirculation is assumed. The model runs for the thermal refuge assumed the closed cycle mode; the runs for the normal plant operation shoreline discharge assumed the open cycle mode. In order to compensate for the fact that 100-percent recirculation will likely not be achieved; the refuge modeling was performed for extreme winter-time conditions (i.e., meteorology that would produce an ambient water temperature of 36.7°F, a water temperature far lower than any ever recorded in Lake Worth Lagoon).

FPL believes that the two simulations bracket the actual condition that occurs, which is somewhere between zero and full recirculation. The open cycle run, as shown on SCA Figure 10.9-11, represents no recirculation. The closed cycle run, which is shown on SCA Figure 10.9-13, represents complete recirculation. The assumption of recirculation results in a smaller but warmer (relative to temperature rise above ambient) plume.

Based on the aerial photographs taken during the manatee surveys (see Figure FWC-TMA-12a-1), it appears that the manatees congregate within the 71°F isotherm as shown on SCA Figure 10.9-11, the typical winter-time operation (open cycle run). Similarly, they appear to congregate within the 68°F isotherm as shown on the refuge in Figure 10.9-13. Because the refuge model assumes closed cycle operation, the thermal plume is skewed toward the north. However, the open cycle run is of very similar shape.

The existing Plant produces a thermal load of 2.78 billion Btus per hour when both units operate (SCA Appendix 10.9, Section 2.1.2.1), and half of that when only one unit operates. The 1 percent of that going out the shoreline discharge is therefore 27.8 million Btus per hour for two units operating, and 13.9 million Btus per hour for one unit operating. The thermal refuge heaters, at a capacity of 30 million Btus per hour, can produce approximately the same but slightly higher thermal loading than the existing Plant with two units operating, and about twice the thermal loading of the existing Plant when one unit is operating. Because the existing Plant is believed capable of sustaining manatees, and the refuge heaters can provide at least as much heat as the existing Plant, it is concluded that the refuge heater system will be adequate to sustain manatees.

FWC – TMA-16a. Section 3.1.2 (Surface Discharge Results): Can FPL provide a map and area of the surface discharge thermal plume under "worst case" conditions for manatee protection (i.e., smallest area)? (i.e., not slack tide)

RESPONSE: The assumption of slack tide only affects the modeling results of the off-shore discharge. The assumption with the shoreline discharge is that the currents associated with tidal movement do not significantly affect the size of the thermal plume.

The plume with the smallest area (worst case for manatee protection) is of course when the power plant is not operating and there is no heated water. FPL will honor the commitment in the Manatee Protection Plan (MPP) to endeavor to discharge significant heated water whenever the trigger temperature in the MPP is approached closely enough to anticipate that the discharge of heat is needed. Because the thermal load of the RBEC is the same as that of the existing Plant at full load conditions, the RBEC will be able to provide as much thermal load as the existing Plant can now provide.

FWC – TMA-16b. The description of the empirical data from ABI in 1974 is vague and gives no indication of how the plume results match to the model predictions; please clarify and elaborate.

RESPONSE: Applied Biology did not give quantitative results of their thermal surveys except to state that the off-shore discharge plume was not detectable (see SCA Appendix 10.9, Section 2.1.3.1) and that the shoreline surface discharge from Units 1 and 2 was a small, quickly dissipated (<8.0 meters from the discharge structure) thermal plume (see SCA Appendix 10.9, Section 3.1.2). That is, all the information they provided about the thermal plume was sufficient for EPA and the predecessor to FDEP at the time to issue NPDES Industrial Wastewater Facility Permits for the facility. Thus there are no quantitative thermal survey results to compare with the model results.

FWC – TMA-16c. Please provide a table of enclosed areas of water for isotherms given ambient water temperature of 58.5 F in winter (or whatever the new lower ambient temperature is selected for the model) and 91.6 F in summer (or whatever the new higher ambient temperature is selected for the model), as done in Table 10.9-1 in the thermal modeling study submitted for the Canaveral repowering site application.

RESPONSE: The requested information is presented for the manatee embayment area for the existing Riviera Plant for summer and winter in the following table:

Winter Case Based on SCA Figure 10.9-11 (Ambient Water Temperature = 58.5°F)	
Isotherm Water Temperature (°F)	**Enclosed Area (acres)**
59	31.5
60	21.1
61	16.2
62	13.0
63	10.6
64	8.7
65	7.1
66	5.8
67	4.6
68	3.5
69	2.6
70	1.7
71	0.9
72	0.2

Summer Case Based on SCA Figure 10.9-12 (Ambient Water Temperature = 91.6°F)	
Isotherm Water Temperature (°F)	**Enclosed Area (acres)**
92	27.0
93	17.4
94	13.3
95	10.6
96	8.7
97	7.1
98	5.8
99	4.7
100	3.7
101	2.9
102	2.1
103	1.4
104	0.8

FWC – TMA-16d. Please provide a table of area of water above 68 F in winter in relation to ambient temperatures ranging from 58 F (or whatever the new lower ambient temperature is selected for the model) to 68 F.

RESPONSE: The ambient temperature modeled was and still is 58.5°F. The requested table is provided as follows:

Area of Water above 68°F in Winter vs. Assumed Ambient Water Temperature	
Ambient Water Temperature (°F)	**Acres at or above 68°F**
58.5	3.5
59.5	4.6
60.5	5.8
61.5	7.1
62.5	8.7
63.5	10.6
64.5	13.0
65.5	16.2
66.5	21.1
67.5	31.6
68.5	Ambient exceeds 68°F

FWC – TMA-17a. Section 3.2 (Manatee Thermal Refuge Results): Can FPL provide a map and area of the surface discharge thermal plume under "worst case" conditions for manatee protection (i.e., smallest area)? (i.e., not slack tide)

RESPONSE: The modeling of the thermal refuge presented in the SCA Appendix 10.9 is a "worst-case" with respect to manatee protection. As described in the response to Comment FWC-TMA-12a, the shoreline discharge is not expected to be affected significantly by the minor currents along the Lake Worth Lagoon shoreline. The Riviera Plant's Industrial Wastewater Permit Manatee Protection Plan states that, if the ambient water temperature falls below 61°F, the Plant shall endeavor to operate in a manner that maintains the water temperature in an adequate portion of the manatee embayment area at or above 68°F. Because the thermal load of the electrical heater system serving the refuge is at least as large as that of the existing Plant at full load conditions, the electrical heater system will be able to provide at least as much thermal load as the existing Plant can now provide.

FWC – TMA-17b. Please provide a table of enclosed areas of water for isotherms given ambient water temperature of 58.5 F in winter (or whatever the new lower ambient temperature is selected for the model).

RESPONSE: The requested information is presented in the following table for an ambient water temperature of 36.7°F in winter as was used in the model of the thermal refuge:

Enclosed Areas of Isotherm Water for Ambient Water Temperature of 36.7°F in Winter for the Interim Manatee Refuge	
Isotherm Water Temperature (°F)	**Area (Acres) at or above Isotherm Water Temperature**
56	4.7
57	4.3
58	3.9
59	3.5
60	3.2
61	2.9
62	2.5
63	2.2
64	1.9
65	1.7
66	1.4
67	1.1
68	0.9
69	0.6
70	0.4

FWC – TMA-17c. Please provide a table of area of water above 68 F in winter in relation to ambient temperatures ranging from 58 F (or whatever the new lower ambient temperature is selected for the model) to 68 F.

RESPONSE: As shown in the response to Comment FWC-TMA-17b, there are 0.87 acres at or above 68°F when the ambient water temperature is 36.7°F (see SCA Appendix 10.9, Section 3.2). When the ambient temperature is above 36.7°F, FPL will produce the same isotherms as shown in SCA Figure 10.9-13 (and tabulated in the response to Comment FWC-TMA-17b) by reducing the amount of heat produced by the electrical heater system.

FWC – TMA-17d. Did FPL do any 3-D modeling of the interim refuge plume? Do they expect the area of the plume within the 68 F isotherm to relatively homogeneous in temperature over depth or might there be temperature stratification, such that only certain depths will provide sufficient temperatures for manatee thermoregulation?

RESPONSE: FPL did not do any 3-D modeling of the interim refuge plume. The water depth within the manatee embayment was assumed to be 4 to 6 feet, depending on the tidal stage. That assumption is based on the assumption that maintenance dredging of the area will be performed prior to installation of the electric heater system. Because the manatee embayment is protected from ambient currents, FPL expects the heated water to be homogeneous within that area as well as in the shallow near-shore area within the 68°F isotherm on SCA Figure 10.9-13. The bathymetric map (SCA Figure 3.3.4-9) indicates the water depth in that area is less than six feet.

FWC – TMA-17e. How quickly can FPL warm the interim thermal refuge to equilibrium state from a cold start? How will it be determined whether the ambient water temperature will be expected to drop below the trigger temperature?

RESPONSE: FPL has performed an estimate of how long it will take to bring a volume of water equivalent to 0.87 acres up to a temperature of at least 68°F, assuming the 30-million Btu per hour heater system is turned on when the ambient temperature drops below 61°F. The estimated time is 21 hours.

The time to warm the interim thermal refuge will be verified during the design verification and startup testing phase.

FWC – TMA-18. Section 4.0 or elsewhere in report: Please provide a table that shows the number of days per winter in which the ambient waters in Lake Worth fell below the 61 F trigger temperature denoted in the NPDES MPP, for each year going back at least 10 years. Please include in the table the number of days in which temperature was <68 F but > 61 F. This will provide a historical record to assist in foreseeing the range of thermal regimes that manatees have been exposed to in this region.

RESPONSE: Based on the data reported for Station LKFW1 (see SCA Appendix 10.9, Section 2.1.3), between July, 1984 and December, 2001, there were 122,866 measurements taken out of a possible 126,275, for a 97.3 % completion record. Of these data, only one reading was less than 61°F, and 266 readings were less than or equal to 68°F. Therefore, there was only one hour in 17 years in which the ambient water temperature was less than 61°F. There were 265 hourly readings between 61 and 68°F, which represents about 0.2 percent of the time, or on the order of 11 days in 17 years.

The data provided by FWC for the Riviera Beach Marina site covered six winters from 1999/2000 through 2004/2005. Data from the 1998/1999 winter were discarded due to QA/QC concerns. The remaining data consisted of 65,883 data points. Of these, there were 1,057 points which were less than 68°F and greater than 61°F, and there were 6 data points which were less than 61°F. The frequency of occurrence of the 1,057 points is about 1.6 % of the data, while the 6 data points represent about 0.009 % of the data.

MONITORING COMMENTS

FWC – MC-19. FPL needs to ground-truth model results in winter to check validity of assumptions, with existing or new data. Volume and 3-D shape of the thermal plume may have important implications for manatee carrying capacity. Water plume extension should also be monitored through on-site measurements (water column temperature profiles and aerial thermal images) under various conditions of tidal state.

RESPONSE: FPL assumes this comment is directed towards the shoreline discharge only. The EQTP model has been tested and confirmed that the effect of water mixing due to currents and tides does not significantly affect the shape and volume of the warm water plume at several other FPL plants, including the Fort Myers and Lauderdale Plants. The model was developed by Ebasco Services, Incorporated. The Ebasco model was utilized to determine estimated acreages of the thermal plumes; however, the shapes of the isotherms were based on potential flow analysis and best professional judgment. The areal distribution of manatees in the thermal plume as shown in Figure FWC-TMA-12a-1 indicates that the thermal contours are most likely correct. Because the Circulating

Water (CW) flow rate and temperature rises will not change from the existing Plant to the RBEC, the size and shape of the thermal plume at a given capacity factor will remain the same. Moreover, the thermal loading during the interim refuge phase is potentially at least as large as that of either the existing Plant or RBEC at full load; therefore, the interim refuge has the potential to support as many manatees as the existing Plant.

FWC – MC-20. It is important for FPL to test the ability of the new unit to create an effective thermal refuge well prior to the winter in which the plant is completely shutdown, because that provides time to monitor the plume, identify problems or deficiencies, and modify the system before it is needed. This test would include measuring and monitoring the thermal plume under a range of ambient temperatures to truth and refine the model. Such monitoring should continue into the three winters of the shutdown.

RESPONSE: FPL agrees it is important to test and validate that the manatee heating system will perform as designed prior to the winter in which the existing plant is shutdown. It is expected that the heating system will be installed and ready for startup and testing in the late summer/early fall of 2009. This will allow for sufficient time to verify and test the design and operation of the system prior to the time the system would be needed. Additionally, it will allow sufficient time to modify/alter the design or operation of the heating system, if required, prior to the winter of 2009-2010.

ATTACHMENT FWC-MP-2

SUBOCEANIC CONSULTANTS INCORPORATED
CIVIL, COASTAL AND OCEAN ENGINEERS - DIVERS

July 30, 2001

Florida Power & Light Company
700 Universe Boulevard
Juno Beach, FL 33408-0420

Attention: Ms. Jill Watson, Power Generation Business Unit

RE: Bathymetric Surveys of the Discharge Canal at the Riviera Beach Plant

Dear Ms. Watson:

Enclosed are the signed and sealed drawings of our bathymetric survey of the discharge canal at the Riviera Plant. Also enclosed are copies of the drawings on which I penciled in contours and recommended dredge cut boundaries. Please give me a call if we can be of further assistance.

Sincerely,

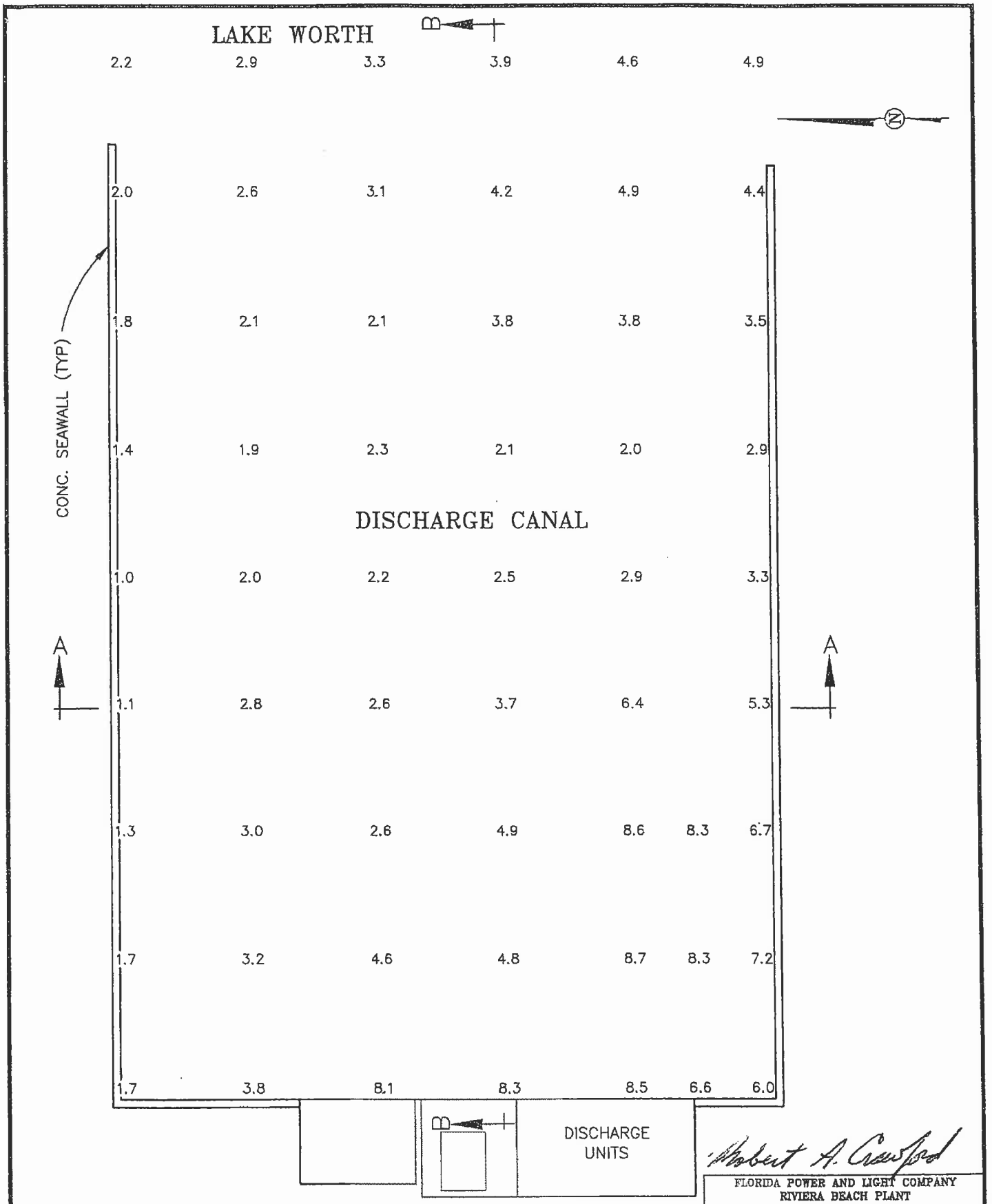
SUBOCEANIC CONSULTANTS, INC.

Robert A. Crawford

Robert A. Crawford, P.E.

c:\projects\FPL, Riviera Plant 7-30-01.wpd

4600 Enterprise Ave., Suite C, Naples, Florida 34104
Tel: (941) 261-2025 • Fax: (941) 261-2295



PLAN

SCALE: 1" = 20'

NOTE:

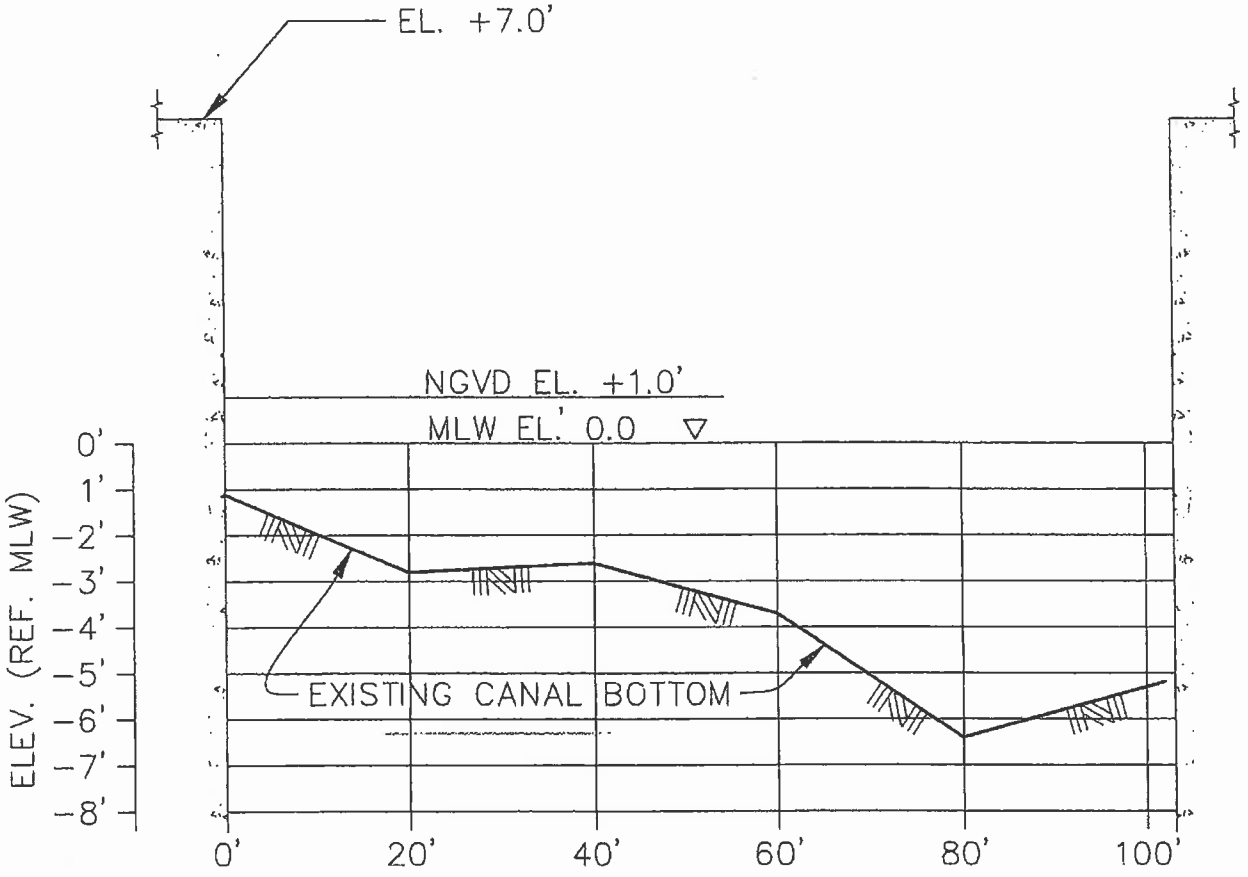
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Robert A. Crawford

FLORIDA POWER AND LIGHT COMPANY
RIVIERA BEACH PLANT
BATHYMETRIC SURVEY

SCI SUBOCEANIC CONSULTANTS INC. SCI
CIVIL, OCEAN, and COASTAL ENGINEERS – DIVERS
NAPLES FLORIDA

PROJECT	CHK	DATE	DWN	SHEET
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SECTION A–A

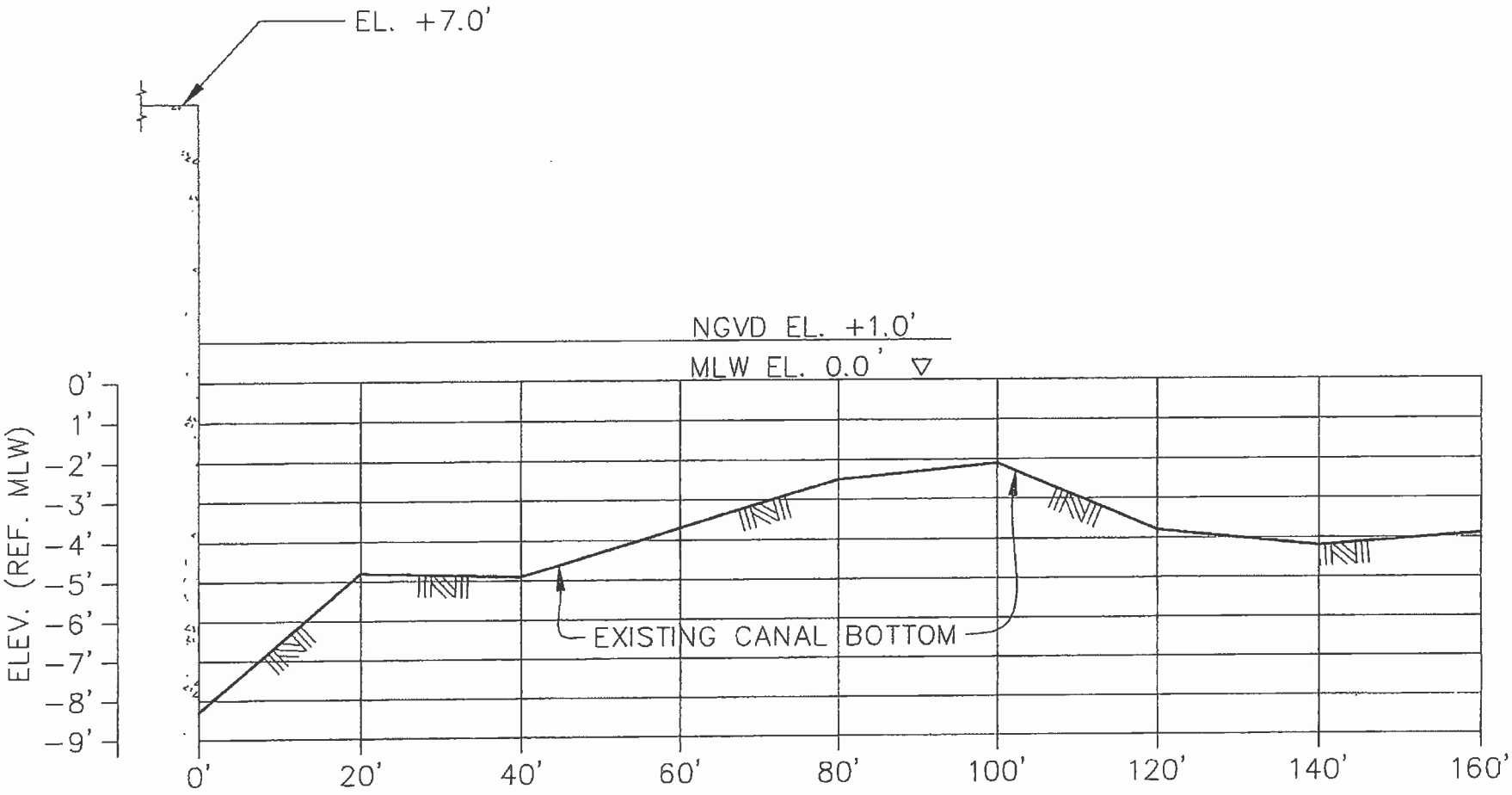
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VERT. 1" = 4'

Robert A. Crawford

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RIVIERA BEACH PLANT
BATHYMETRIC SURVEY

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NAPLES FLORIDA — SCI

PROJECT	CHK.	DATE	DWN	SHEET
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DWG. NO. 2001-22-1	SCALE: AS INDICATED			



SECTION B-B

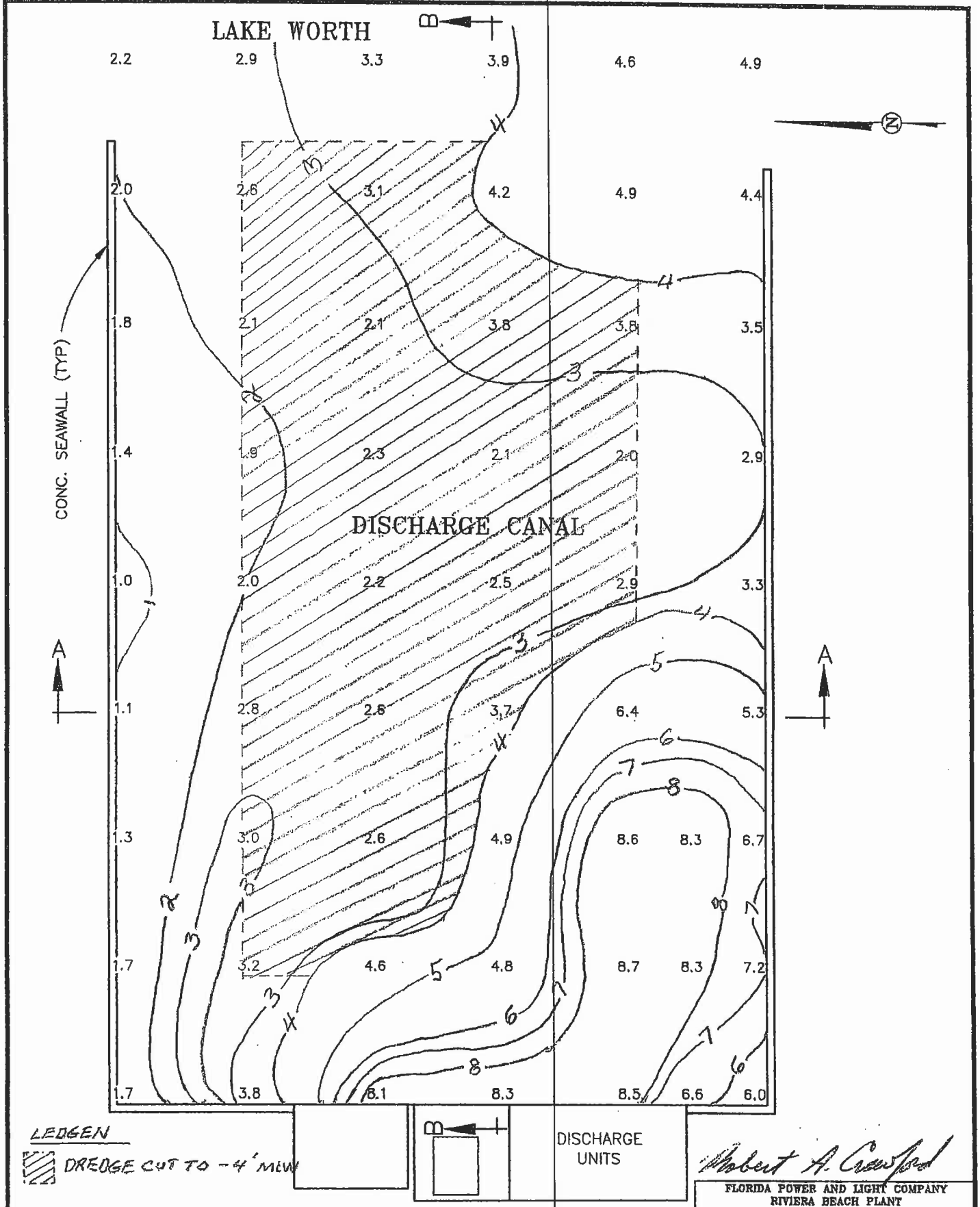
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VERT. 1" = 4'

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RIVIERA BEACH PLANT
BATHYMETRIC SURVEY

SCI SUBOCEANIC CONSULTANTS INC. SCI
CIVIL, OCEAN, and COASTAL ENGINEERS — DIVERS
NAPLES FLORIDA

PROJECT	CHK.	DATE	DWN	SHEET
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PLAN

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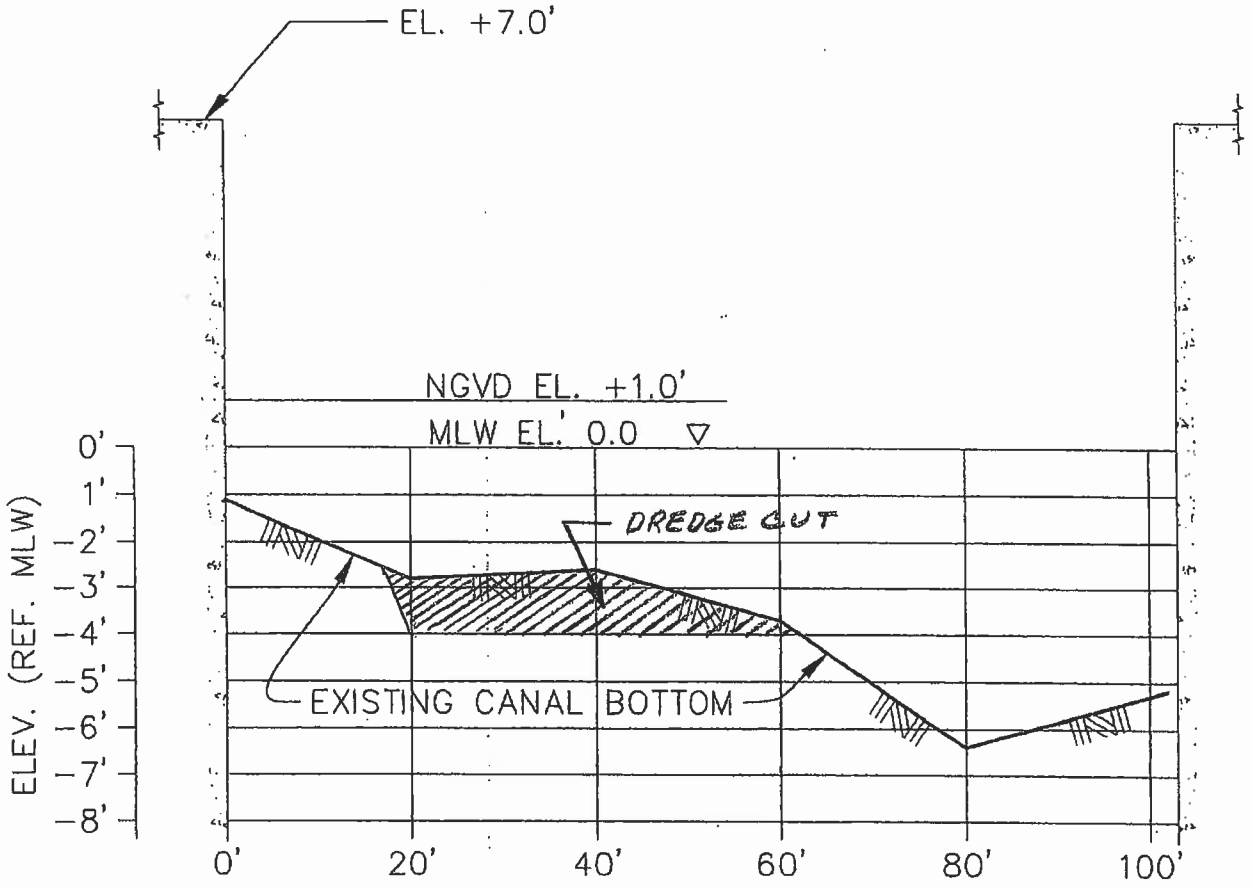
NOTE:

SOUNDINGS IN FEET
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PROJECT	CHK.	DATE	DWN	SHEET
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DWG. NO. 2001-22-1	SCALE: AS INDICATED			



SECTION A–A

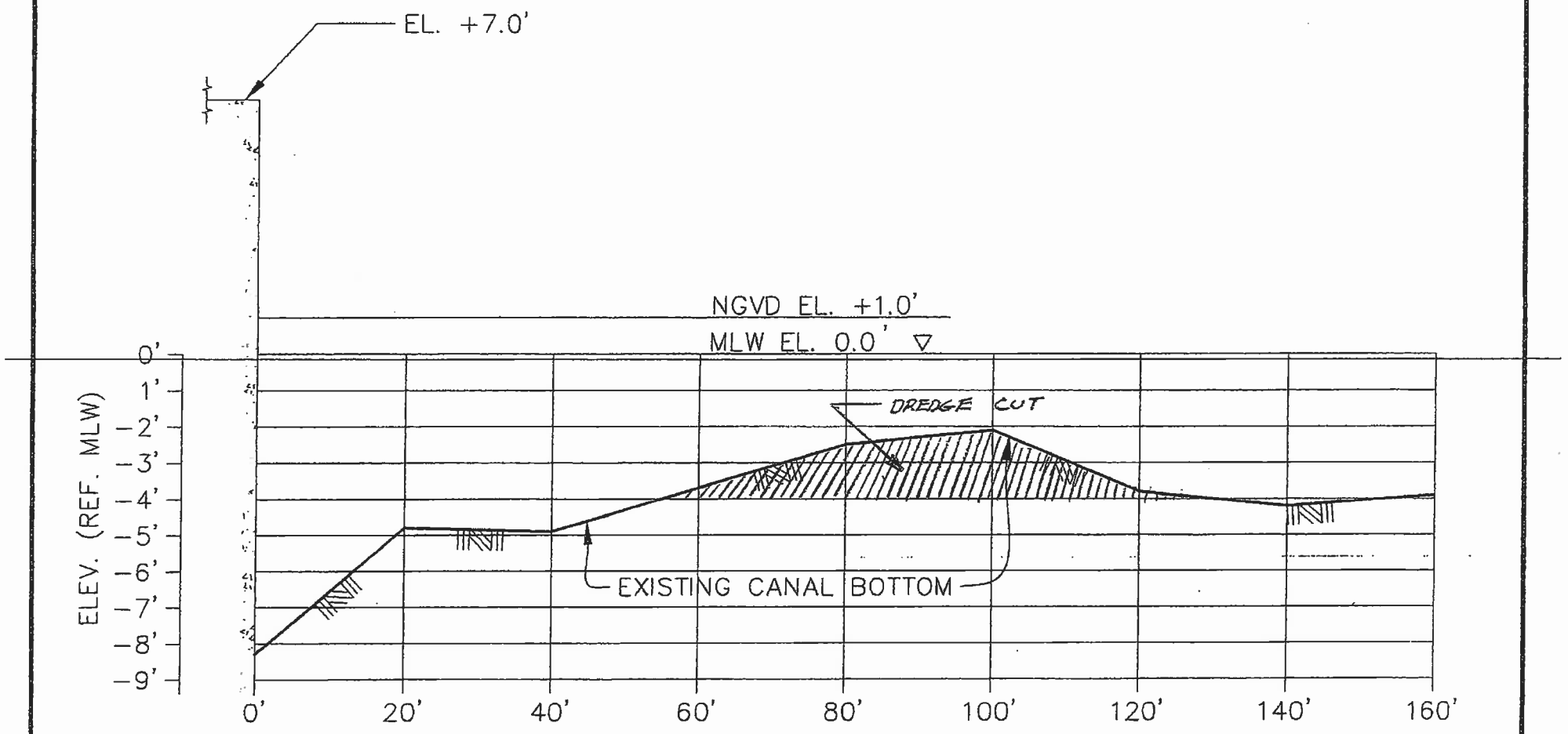
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VERT. 1" = 4'

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RIVIERA BEACH PLANT
BATHYMETRIC SURVEY

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NAPLES FLORIDA

PROJECT	CHK.	DATE	DWN	SHEET
2001-20	R.A.C.	7/13/01	G.F.D.	2 OF 3
DWG. NO. 2001-22-1	SCALE: AS INDICATED			



SECTION B–B

SCALE: HORZ. 1" = 20'
VERT. 1" = 4'

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NAPLES FLORIDA — SCI

PROJECT	CHK.	DATE	DRN	SHEET
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DWG. NO. 2001-22-1	SCALE: AS INDICATED			

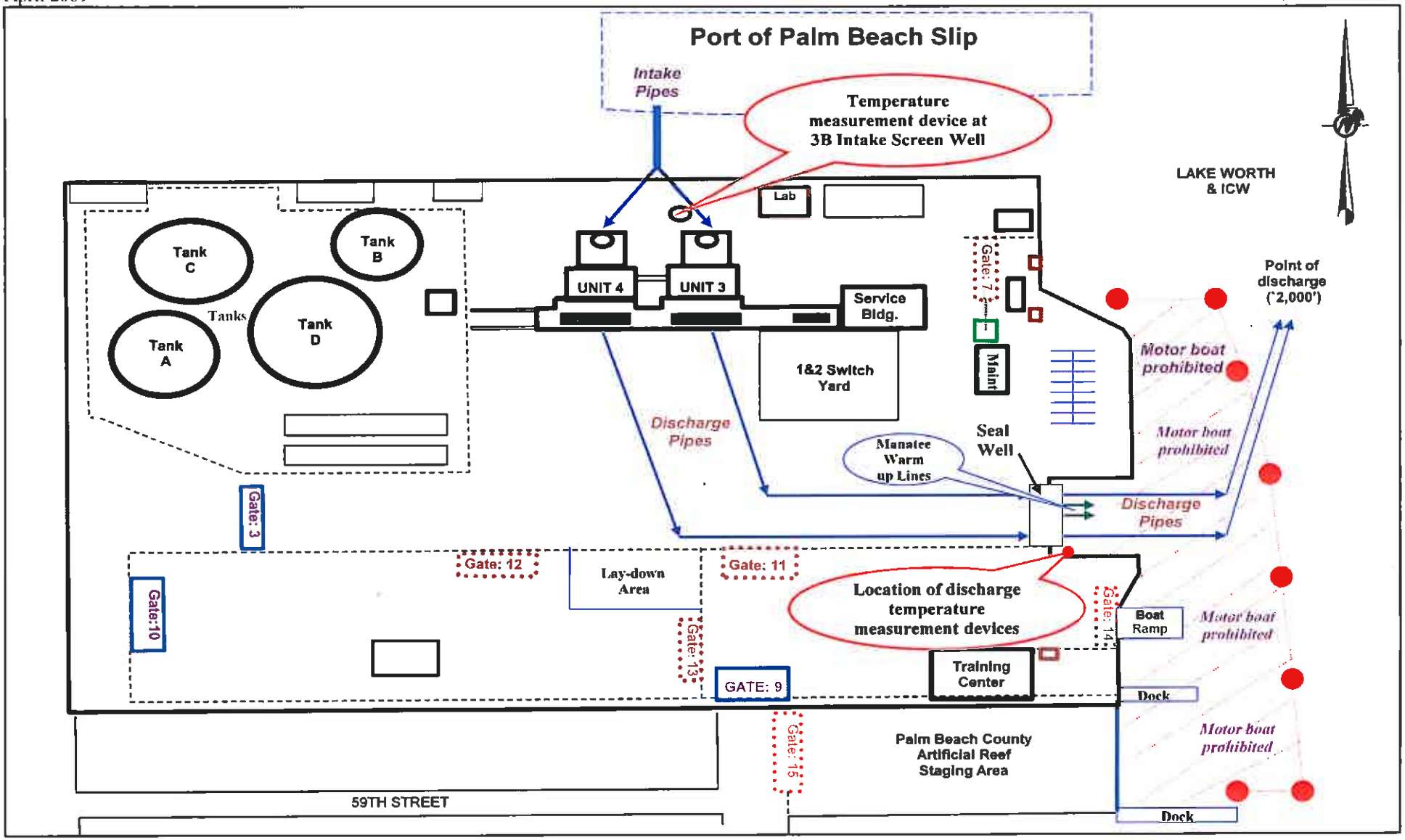


Figure FWC MP-3
Temperature Measurement Device Locations

Source: Golder, 2009.



Figure FWC - MP-6-1
Manatee Heating System
Conceptual Location of Pumps and Heaters

Source: Golder, 2009.

FPL.



Figure FWC – TMA-12a-1
Manatee Embayment at the FPL Riviera Plant

Source: Golder, 2009.

B. SOUTH FLORIDA WATER MANAGEMENT DISTRICT COMMENTS

SFWMD - 1. The proposed source of cooling water is the existing intake structure withdrawing from the Lake Worth Lagoon (Lagoon) near the Port of Palm Beach. Salinity data recorded at monitoring station LWL-6, located in the Lagoon approximately 1,500 feet east of the project site, indicates that the salinity of the Lagoon periodically falls below that of seawater, as defined by Section 1.8 of the Water Use Basis of Review (BOR). The Water Balance, Figure 4.5.0-1, appears to indicate an increase in withdrawals of approximately 159 million gallons per day from the Lagoon above the historical use from this source, as shown on Figure 3.3.4-10. Please clarify if the projected demand shown on Figure 4.5.0-1 represents average operating conditions or maximum (worst case) demands.

RESPONSE: The cooling water and screen wash flow rates from the Lake Worth Lagoon shown on Figure 4.5.0-1 of the Site Certification Application represents the maximum demand in gallons per minute. This represents a maximum flow of 599.33 million gallons per day.

SFWMD – 2. Water Use Permits 50-04187-W for landscape irrigation and 50-04188-W for bearing cooling and other incidental industrial uses will be incorporated into the Conditions of Certification. These uses share the Surficial aquifer system withdrawal facilities located near the western property boundary. Please provide a saline water intrusion evaluation for these withdrawals. In addition, please provide a saline water intrusion monitoring plan, pursuant to Section 3.4 of the BOR, which includes a minimum of one monitoring well to be located between the withdrawal facilities and the Lagoon.

RESPONSE: See Attachment SFWMD-2.

SFWMD – 3. Section 5.5 of Appendix 10.10 identifies potable water from the City of Riviera Beach (City) as the source for process and potable water. This section states: "While the converted Plant, on average, may use somewhat more water from this source than the existing Plant, the City has confirmed they have the water available." A letter from the City confirming there is sufficient potable and wastewater facility capacity was provided. Please submit a comparison of the existing vs. proposed demands for process and potable water. Please be advised that the City's application for renewal of their public water supply Water Use Permit is currently under review. Please be advised that the City's withdrawals from the Surficial aquifer system may be limited by Section 3.2.1.E of the BOR, which includes restrictions for allocating water by permit for water use withdrawals within the Northern Palm Beach County Service Area and Lower East Coast Service Areas 1, 2 or 3. Please be advised that, although the City has provided a letter stating that sufficient supply exists, this supply may not be adequate to meet increased process and potable water demands for the new plant. In addition, please note that potential increases in demand associated with the new plant have not been evaluated for compliance with the BOR as part of the SFWMD's review of the City's Water Use Permit application.

RESPONSE: The annual process and potable water usage for the Riviera Plant in 2007 was 55.62 million gallons. The estimated annual process and potable water usage for the Riviera Beach Energy Center is 53 million gallons per year to 60 million gallons per year.

SFWMD – 4. Section 5.2.1.1 states that water used during project construction will be obtained from the City and from the existing on-site wells. Please identify the quantity of water required for project construction activities.

RESPONSE: The average monthly quantity of water required during construction is estimated to be 200,000 gallons per month.

SFWMD – 5. In Appendix 10.9, the assumptions of slack tide for the offshore jet and no ambient water dilution for the shoreline surface discharge, thermal refuge are very conservative. It would be desirable if the thermal models were calibrated or at least monitoring data were used to demonstrate that the models are indeed very conservative. How was the projected plume defined, as shown on Figure 10.9-9, with respect to temperature? Does the shape indicate the jet direction? In addition, please provide a copy of the report prepared by Applied Biology in the 1970s concerning the extent of the thermal plume.

RESPONSE: FPL agrees that the assumption of slack tide for the offshore subsurface discharge is relatively conservative. The fact that Applied Biology could not detect the thermal plume attests to the conservatism of the assumption. However, such an event does occur approximately twice a day. Therefore, the predicted isotherms likely occur twice a day. The Koh and Fan model is an EPA-approved model which has been calibrated with laboratory experiments. There is no reasonable or safe way to physically measure the thermal plume from large-diameter high-velocity subsurface discharges such as this. The projected plume shown in SCA Figure 10.9-9 is the two-dimensional rendering of the three-dimensional plume between the location of the discharge and the location where the plume impinges the surface. In other words, the vertical dimension of the plume has been ignored. Another way of looking at it is that the plot shows the horizontal extent of the thermal plume plotted along the centerline of the plume trajectory. The horizontal extent is defined by the model as a plume width which represents temperature decay relative to the centerline of 1.414 standard deviations based on the assumed Gaussian distribution of the plume. The shape does indicate the direction of the plume.

The EQTP model is an energy balance model. FPL has performed extensive verification of the heat transfer predictions of the EQTP model using data from their Sanford Plant. Because the initial shoreline surface discharge is into the sheltered manatee embayment and then into the relatively shallow near-shore area, very little ambient water dilution is expected.

Because RBEC will not change the flow rates or temperature rises of either discharge, the associated thermal plumes will not be changed by the project. During the interval between the existing facility and RBEC, the temporary electric heater system will provide a similar amount of heat for manatee protection as do both the existing and the proposed facilities.

A copy of the report prepared by Applied Biology in 1976 is included as Attachment SFWMD-5.

ATTACHMENT SFWMD-2

FPL Riviera Beach Energy Center
Saline Water Intrusion Evaluation and Monitoring Plan

Water Use Permits:

- 50-04187-W for Landscape Irrigation and
- 50-04188-W for Bearing Cooling and other Incidental Industrial Uses

Existing Groundwater (Surficial Aquifer) Withdrawal Facilities:
Three wells located near the western property boundary, oriented on a line approximately north/south and 163 feet (ft) apart. The three wells are approximately 1,200 ft from the Lake Worth Lagoon shoreline. Ground surface elevation at the wells is about 14 feet above mean sea level (ft-msl). Figure SFWMD-2-1 shows the three wells on a conceptual site plan for the new Riviera Beach Energy Center (RBEC).

1) 6" X 100' X 225 gpm, cased to 84 ft.
2) 6" X 85' X 225 gpm, casing depth unknown.
3) 6" X 175' X 225 gpm casing depth unknown.

Coordinates of the three wells South to North (State Plane Feet):

1) X: 964561 Y: 884739
2) X: 964543 Y: 884879
3) X: 964543 Y: 885064

Surficial Aquifer Characteristics:
Aquifer Performance Tests (APTs) are not available at the site. Three APTs were identified from the DBHYDRO Database, each located between 5 and 7 miles from the site (Stations: PBCWW_TW-1, WPB_PW-1 and WPB_PW-2). Based on these tests the following aquifer parameters were selected for this analysis:

- Aquifer Thickness = 250 ft
- Storativity (Specific Yield) = 0.1 (Range from APT tests 0.1 to 0.2)
- Transmissivity from APT Studies:
  - Maximum = 100,000 ft^2/day
  - Minimum = 10,000 ft^2/day

Groundwater Hydrologic Gradient from Wells to Lake Worth Lagoon:
Three on-site monitoring wells have been sampled quarterly (14 times) from February 2005 through June 2008, as required by the Industrial Facility Wastewater Permit (FL0001546). The sampling protocol includes reporting the water level in each well in ft-msl. The wells are located approximately 700 ft, 800 ft, and 1,100 ft from the shoreline; and approximately 500 ft, 400 ft, and 100 ft from the production wells, respectively. The well that is located 700 ft from the shoreline and 500 ft from the production wells is least likely to be influenced significantly either by tides or by pumping from the wells. Therefore, this well was used to establish the regional hydrologic gradient toward Lake Worth Lagoon. The average water level in this well is 3.51 ft-msl; therefore, the gradient between the well and the Lagoon is 0.005 feet per foot (ft/ft). Based on this hydrologic gradient, the undisturbed water level at the production wells (1,200 ft from the shoreline) would be about 6.0 ft-msl. The standard deviation of the water level in all wells was about the same and averaged about 0.58 ft. Consequently, the undisturbed low-water level (5th percentile) at the production wells is about 5.0 ft-msl. This value was used as a conservative estimate of the water level before pumping.

Salinity Intrusion Analysis

The drawdown produced by the production wells was calculated using the Theis solution for unsteady flow to a well in a confined aquifer. The aquifer parameters discussed above were used in this calculation. The confined aquifer assumption is reasonable and appropriate because the drawdown is only a few feet and the aquifer thickness is 250 ft. The Theis solution was evaluated after 90-days of pumping at the maximum monthly allocation, or 0.127 million gallons per day (MGD). The analysis assumes no surface recharge, as required by Section 1.7.5.2 of the *Basis of Review* (BOR, SFWMD, October 14, 2008), which according to the BOR is equivalent to a 1 in 10 year drought condition. The calculated drawdown was subtracted from the undisturbed water levels and the final water levels between the wells and the Lake Worth Lagoon were plotted. Table SFWMD-2-1 shows the calculations and Figure SFWMD-2-2 shows the combined water levels between the wells and the shoreline.

The analysis shows that, under all reasonable conditions, a groundwater divide (mound of fresh water) greater than one foot higher than the potentiometric head at the saline source exists between the withdrawal point and the saline source (i.e., the Lake Worth lagoon shoreline).

Using the analysis for calculating the upward movement of saline water, as discussed in Section 3.4 of the Basis of Review (SFWMD, October 14, 2008), the safe yield of the three wells is 0.488 MGD, shown in Table SFWMD-2-2. This is significantly greater than the maximum daily allocation of 0.2 MGD. Therefore, sustained vertical movement of saline water is not expected, and no impact to the resource or other users will result from the requested surficial aquifer allocation.

Saline Water Intrusion Monitoring Plan

FPL will install a salinity monitoring well approximately 500 ft east of the production wells, at the approximate location shown in Figure SFWMD-2-1. The monitoring well will be 100 ft deep and will be open/screened from 80 to 100 ft. FPL will monitor water levels, conductivity, and temperature and chloride concentrations in the well quarterly. In addition, FPL will monitor conductivity, temperature, and chloride concentrations in the produced water from the production wells quarterly.

TABLE SFWMD-2-1

CALCULATED DRAWDOWN BY THE PRODUCTION WELLS USING THE THEIS SOLUTION- RBEC

Assumptions Theis Solution Transient Solution		Q= Tidal Range= Tidal Period =	0.127 MGD 2.6 ft 0.52083333 days						CJB/GMP 3/17/2009
Scenario 1 Pumping Rate - Q (ft^3/day) =	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0
Transmissivity - T (ft^2/day) =	100000.0	100000.0	100000.0	100000.0	100000.0	100000.0	100000.0	100000.0	100000.0
Storage Coeff - S =	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Radial distance from pumping well - r (ft) =	1.0	10.0	50.0	100.0	250.0	500.0	760.0	925.0	1200.0
Time since pumping began - t (days) =	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
u =	2.778E-09	2.778E-07	6.944E-06	2.778E-05	1.736E-04	6.944E-04	1.604E-03	2.377E-03	4.000E-03
Drawdown (u < 0.01) - s (feet) =	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Starting Head (feet) =	5.00	4.96	4.79	4.58	3.96	2.92	1.83	1.15	0.00
Tidal Impact =	0.7	0.7	0.7	0.8	0.9	1.2	1.6	1.9	2.6
Total Head (feet) =	4.74	4.76	4.64	4.45	3.85	2.83	1.75	1.07	0.00

TABLE SFWMD-2-1

CALCULATED DRAWDOWN BY THE PRODUCTION WELLS USING THE THEIS SOLUTION- RBEC

Assumptions Theis Solution Transient Solution			Q= 0.127 MGD Tidal Range= 2.6 ft Tidal Period = 0.52083333 days						CJB/GMP 3/17/2009
Scenario 2									
Pumping Rate - Q (ft^3/day) =	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0
Transmissivity - T (ft^2/day) =	75000.0	75000.0	75000.0	75000.0	75000.0	75000.0	75000.0	75000.0	75000.0
Storage Coeff - S =	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Radial distance from pumping well - r (ft) =	1.0	10.0	50.0	100.0	250.0	500.0	685.0	1000.0	1200.0
Time since pumping began - t (days) =	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
u =	3.704E-09	3.704E-07	9.259E-06	3.704E-05	2.315E-04	9.259E-04	1.738E-03	3.704E-03	5.333E-03
Drawdown - s (feet) =	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Starting Head (feet) =	5.00	4.96	4.79	4.58	3.96	2.92	2.15	0.83	0.00
Tidal Impact =	0.6	0.6	0.6	0.6	0.8	1.1	1.4	2.0	2.6
Total Head (feet) =	4.7	4.7	4.6	4.4	3.8	2.8	2.0	0.7	0.0

TABLE SFWMD-2-1

CALCULATED DRAWDOWN BY THE PRODUCTION WELLS USING THE THEIS SOLUTION- RBEC

Assumptions Theis Solution Transient Solution			Q= 0.127 MGD Tidal Range= 2.6 ft Tidal Period = 0.52083333 days						CJB/GMP 3/17/2009
Scenario 3									
Pumping Rate - Q (ft^3/day) =	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0
Transmissivity - T (ft^2/day) =	50000.0	50000.0	50000.0	50000.0	50000.0	50000.0	50000.0	50000.0	50000.0
Storage Coeff - S =	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Radial distance from pumping well - r (ft) =	1.0	10.0	50.0	100.0	250.0	500.0	725.0	1000.0	1200.0
Time since pumping began - t (days) =	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
u =	5.556E-09	5.556E-07	1.389E-05	5.556E-05	3.472E-04	1.389E-03	2.920E-03	5.556E-03	8.000E-03
Drawdown - s (feet) =	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1
Starting Head (feet) =	5.00	4.96	4.79	4.58	3.96	2.92	1.98	0.83	0.00
Tidal Impact =	0.4	0.4	0.4	0.5	0.6	0.9	1.2	1.9	2.6
Total Head (feet) =	4.5	4.6	4.5	4.3	3.8	2.8	1.8	0.7	0.0

TABLE SFWMD-2-1

CALCULATED DRAWDOWN BY THE PRODUCTION WELLS USING THE THEIS SOLUTION- RBEC

Assumptions Theis Solution Transient Solution			Q= 0.127 MGD Tidal Range= 2.6 ft Tidal Period = 0.52083333 days						CJB/GMP 3/17/2009
Scenario 4 Pumping Rate - Q (ft^3/day) =	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0
Transmissivity - T (ft^2/day) =	25000.0	25000.0	25000.0	25000.0	25000.0	25000.0	25000.0	25000.0	25000.0
Storage Coeff - S =	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Radial distance from pumping well - r (ft) =	1.0	10.0	50.0	100.0	250.0	500.0	750.0	1000.0	1200.0
Time since pumping began - t (days) =	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
u =	1.111E-08	1.111E-06	2.778E-05	1.111E-04	6.944E-04	2.778E-03	6.250E-03	1.111E-02	1.600E-02
Drawdown - s (feet) =	1.0	0.7	0.5	0.5	0.4	0.3	0.2	0.2	0.2
Starting Head (feet) =	5.00	4.96	4.79	4.58	3.96	2.92	1.88	0.83	0.00
Tidal Impact =	0.2	0.2	0.2	0.2	0.3	0.6	1.0	1.7	2.6
Total Head (feet) =	4.0	4.2	4.3	4.1	3.6	2.6	1.6	0.6	0.0

TABLE SFWMD-2-1

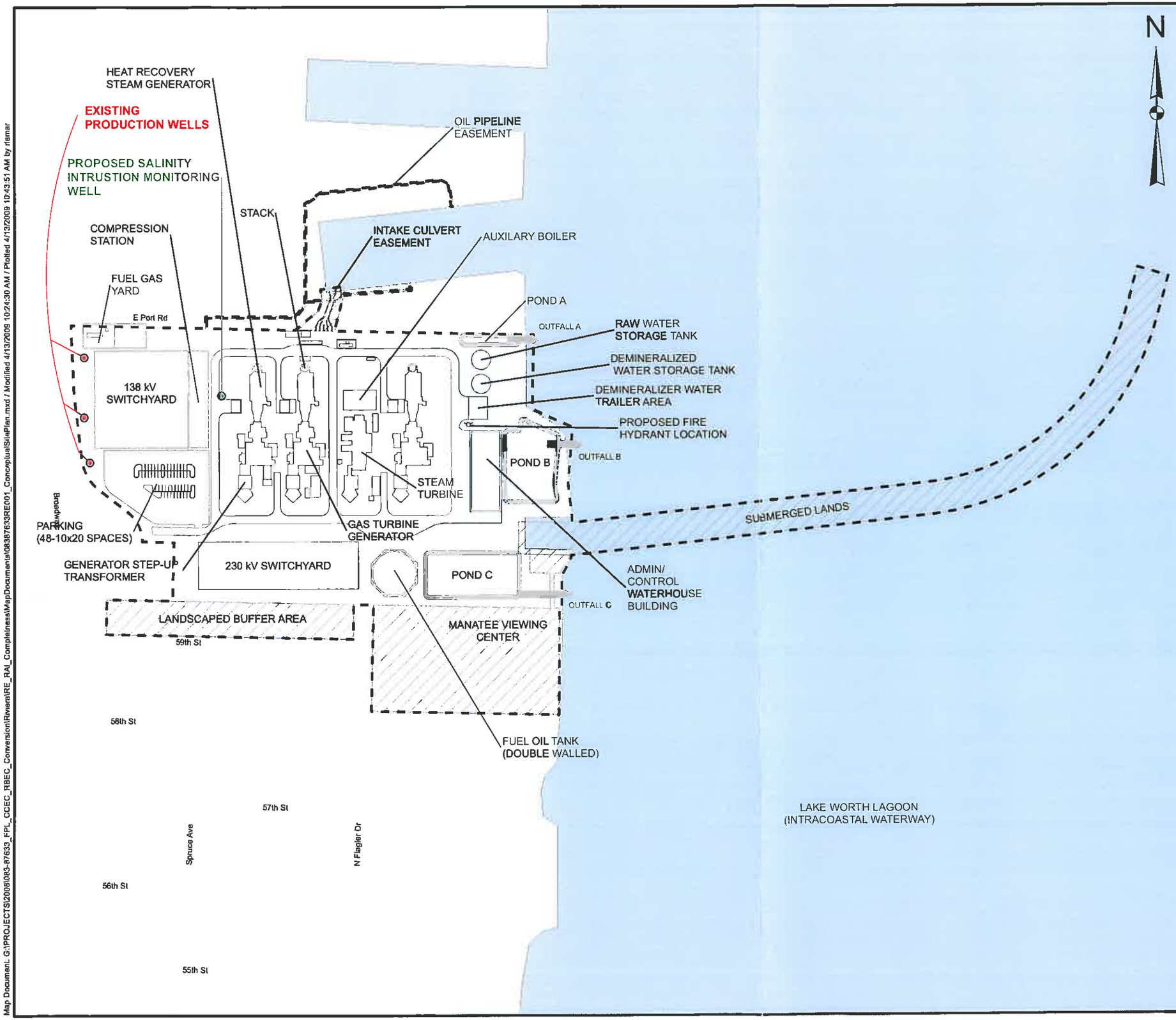
CALCULATED DRAWDOWN BY THE PRODUCTION WELLS USING THE THEIS SOLUTION- RBEC

Assumptions Theis Solution Transient Solution			Q= 0.127 MGD Tidal Range= 2.6 ft Tidal Period = 0.52083333 days						CJB/GMP 3/17/2009
Scenario 5									
Pumping Rate - Q (ft^3/day) =	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0	16979.0
Transmissivity - T (ft^2/day) =	10000.0	10000.0	10000.0	10000.0	10000.0	10000.0	10000.0	10000.0	10000.0
Storage Coeff - S =	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Radial distance from pumping well - r (ft) =	1.0	10.0	50.0	100.0	250.0	500.0	765.0	1000.0	1200.0
Time since pumping began - t (days) =	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
u =	2.778E-08	2.778E-06	6.944E-05	2.778E-04	1.736E-03	6.944E-03	1.626E-02	2.778E-02	4.000E-02
Drawdown - s (feet) =	2.3	1.7	1.2	1.0	0.8	0.6	0.5	0.4	0.4
Starting Head (feet) =	5.00	4.96	4.79	4.58	3.96	2.92	1.81	0.83	0.00
Tidal Impact =	0.0	0.0	0.0	0.1	0.1	0.2	0.6	1.3	2.6
Total Head (feet) =	2.7	3.3	3.6	3.6	3.2	2.3	1.3	0.4	0.0

TABLE SFWMD-2-2

ESTIMATED VERTICAL MOVEMENT OF SALINE WATER

Parameter	Value			
T (Minimum) =	10000 ft2/day			
Delta Rho/Rho =	0.025			
Thickness of Aquifer =	250 ft			
Undisturbed Water Level at Wells =	5.0 ft-msl			
Thickness of Fresh Water =	205 ft			
Land Surface Elevation =	14 ft-msl			
Well Number	1	2	3	**Safe Yield**
Total Depth (ft-bls)	100	85	175	**(MGD)**
Safe Yield of Well (MGD) =	0.204	0.261	0.024	**0.488**



LEGEND

- FPL Riviera Beach Energy Center (To Be Certified)
- Existing Production Wells
- Proposed Salinity Intrusion Monitoring Well

REFERENCES

1. FPL Riviera Beach Energy Center (to be certified), FPL, 2009.
2. Conceptual Site Plan, FPL drawing srw100002s1.dwg, 2008.
3. Stormwater, Boyle Engineering Corp. Post Development Detention Areas Siting Exhibit, 2008.
4. Production Well Locations, SFWMD, 2009.
5. Proposed Salinity Intrusion Well Location, Golder Associates Inc., 2009.

300 150 0 300 Feet

REV	DATE	DES	REVISION DESCRIPTION	GIS	CHK	RVW

PROJECT

FPL
RIVIERA BEACH ENERGY CENTER

TITLE

CONCEPTUAL SITE PLAN
WITH EXISTING PRODUCTION WELLS &
PROPOSED MONITORING WELL LOCATIONS

PROJECT No	083-87633	RE001_ConceptualSitePlan	
DESIGN	RCM	4/10/2009	SCALE AS SHOWN REV 0
GIS	NRL	4/13/2009	
CHECK	RCM	4/13/2009	SFWMD-2-1
REVIEW	KFK	4/13/2009	

FPL

Map Document: G:\PROJECTS\2008\083-87633_FPL_CCEC_RBEC_Conversion\Riviera\RE_RAI_Compleinesa\MapDocuments\083876

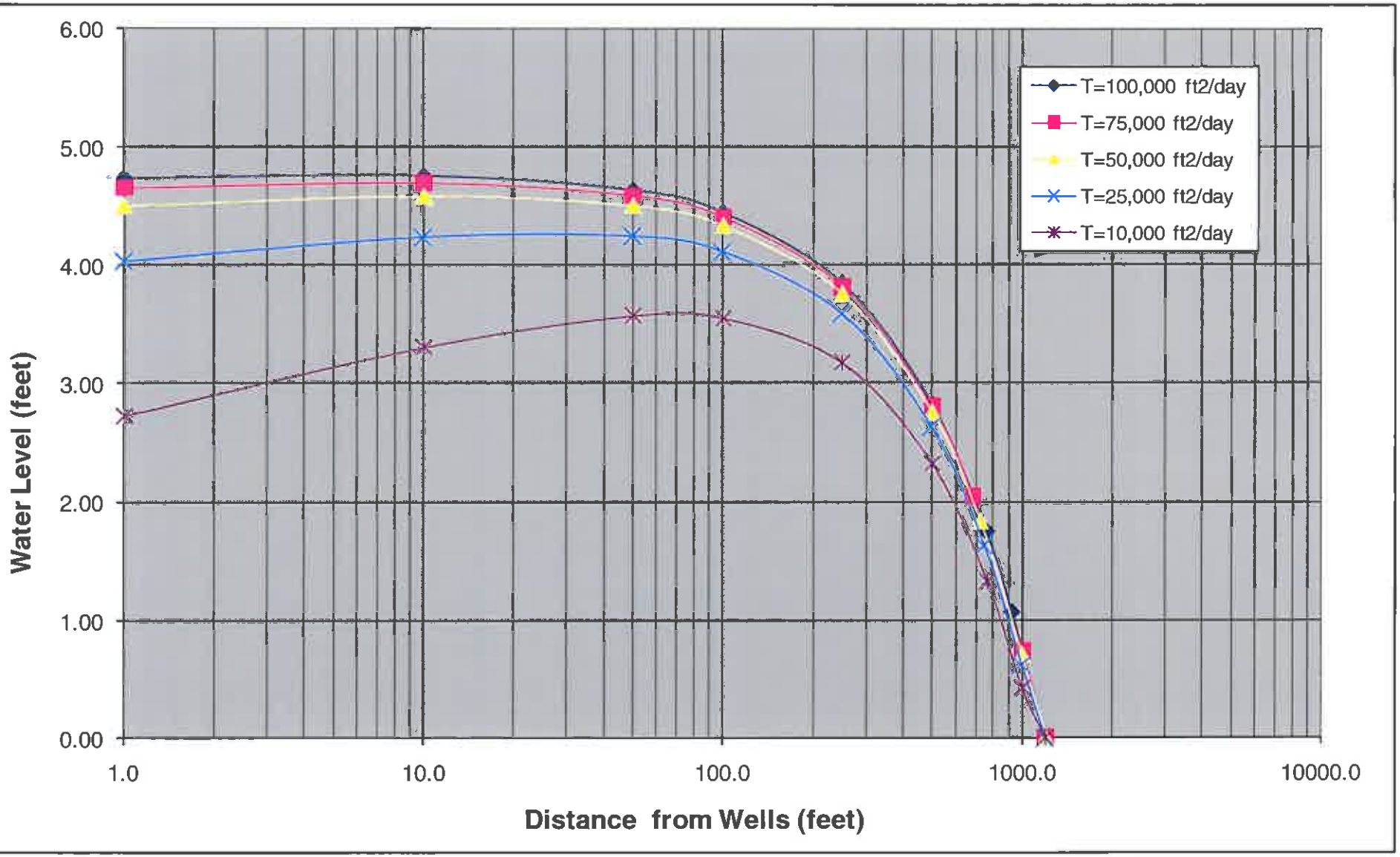


Figure SFWMD - 2-2
Composite Water Level Resulting from Pumping Q-0.127 MGD for 90 days
With No Recharge, Storage Coefficient of 0.10, and Transmissivity as Shown

Source: Golder, 2009.

FPL.

ATTACHMENT SFWMD-5

Ecological Parameter Monitoring at The Riviera Plant

Florida Power & Light Co. Miami, Florida September, 1976

APPLIED BIOLOGY, INC.
Ecological Consultants
5891 NEW PEACHTREE ROAD
ATLANTA, GEORGIA 30340

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1.0 INTRODUCTION AND SUMMARY

1.1 Rationale

In November, 1973, Applied Biology, Inc. contracted with Florida Power & Light Company to obtain data on the biological community around the Riviera Plant and to examine the impact of its operation upon the aquatic environment. Initial reconnaissance surveys were made and a quarterly sampling program was begun in February, 1974. In July of that year, monthly sampling replaced the quarterly program, and continued through October.

An enlarged program was designed and initiated in January, 1975. Biological study plans were reviewed on February 25, 1975 by representatives from the State of Florida Department of Pollution Control, U.S. Fish and Wildlife Service, National Oceanic & Atmospheric Administration and the Environmental Protection Agency to define a study program which would respond to 17-3 and 316a and 316b concerns. Recommendations and proposed changes which responded to state and federal agency concerns were then incorporated in the study plan, which ended in late December, 1975.

1.2 Study Parameters

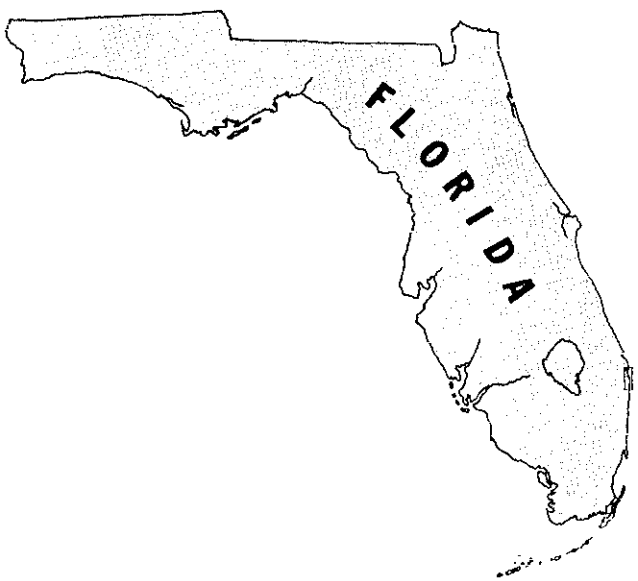
The sampling program was designed to include appropriate biological data recommended by EPA Region IV guidelines to evaluate whether the operation of the Riviera Plant interfered with the protection and propagation of a balanced, indigenous population of fish, shellfish and wildlife or caused substantial damage to the biological community of the adjacent waters. These biological data included:

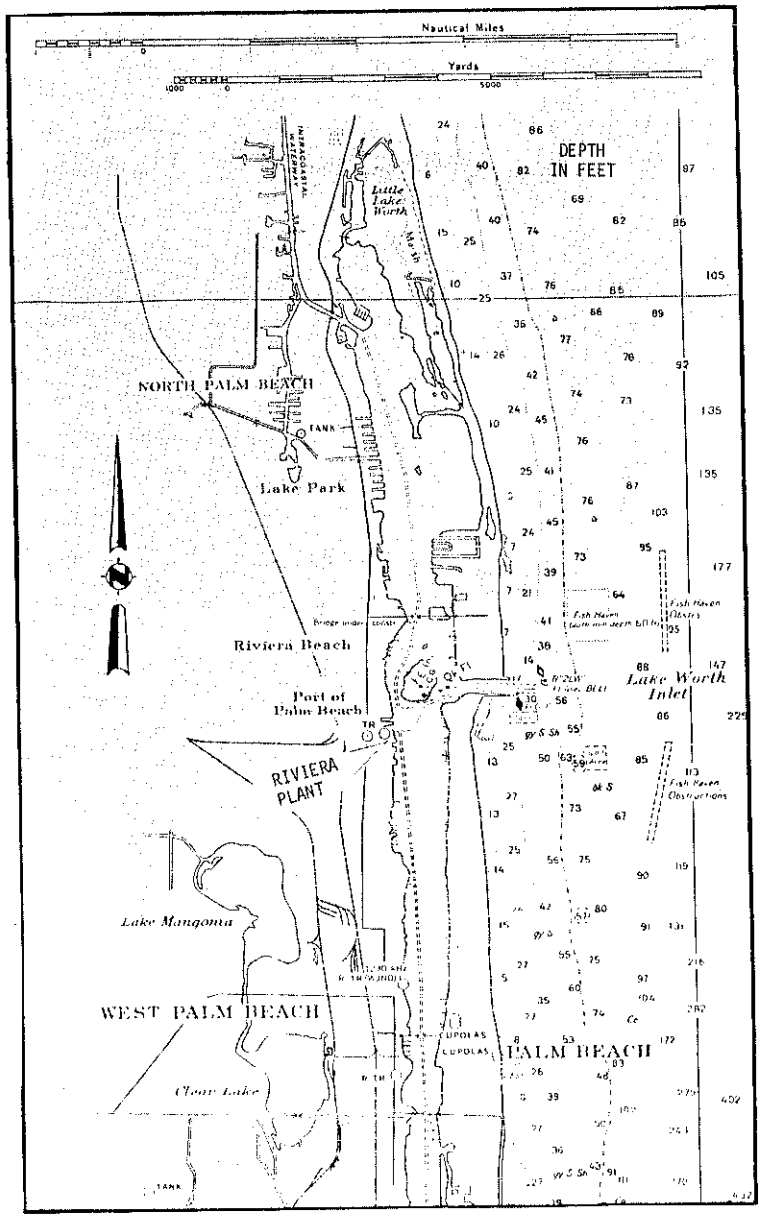
1. Impingement by the intake screens of fishes and shellfish.

2. Entrainment through the condenser cooling system of

   a. small and juvenile fishes
   b. eggs and larvae of fishes
   c. small invertebrates.

3. Effects of heated water discharge on the benthic macroinvertebrate community.





FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

RIVIERA PLANT AND VICINITY,
SOUTHEASTERN FLORIDA

APPLIED BIOLOGY, INC.

SEPTEMBER, 1976 FIGURE 1.0-1

1.3 Riviera Plant

The Riviera Plant is located in the city of Riviera Beach, Palm Beach County, Florida. The plant is situated opposite Lake Worth Inlet across the Intracoastal Waterway immediately south of the Port of Palm Beach (Figure 1.0-1).

The plant's four steam electric generating units may be described as follows:

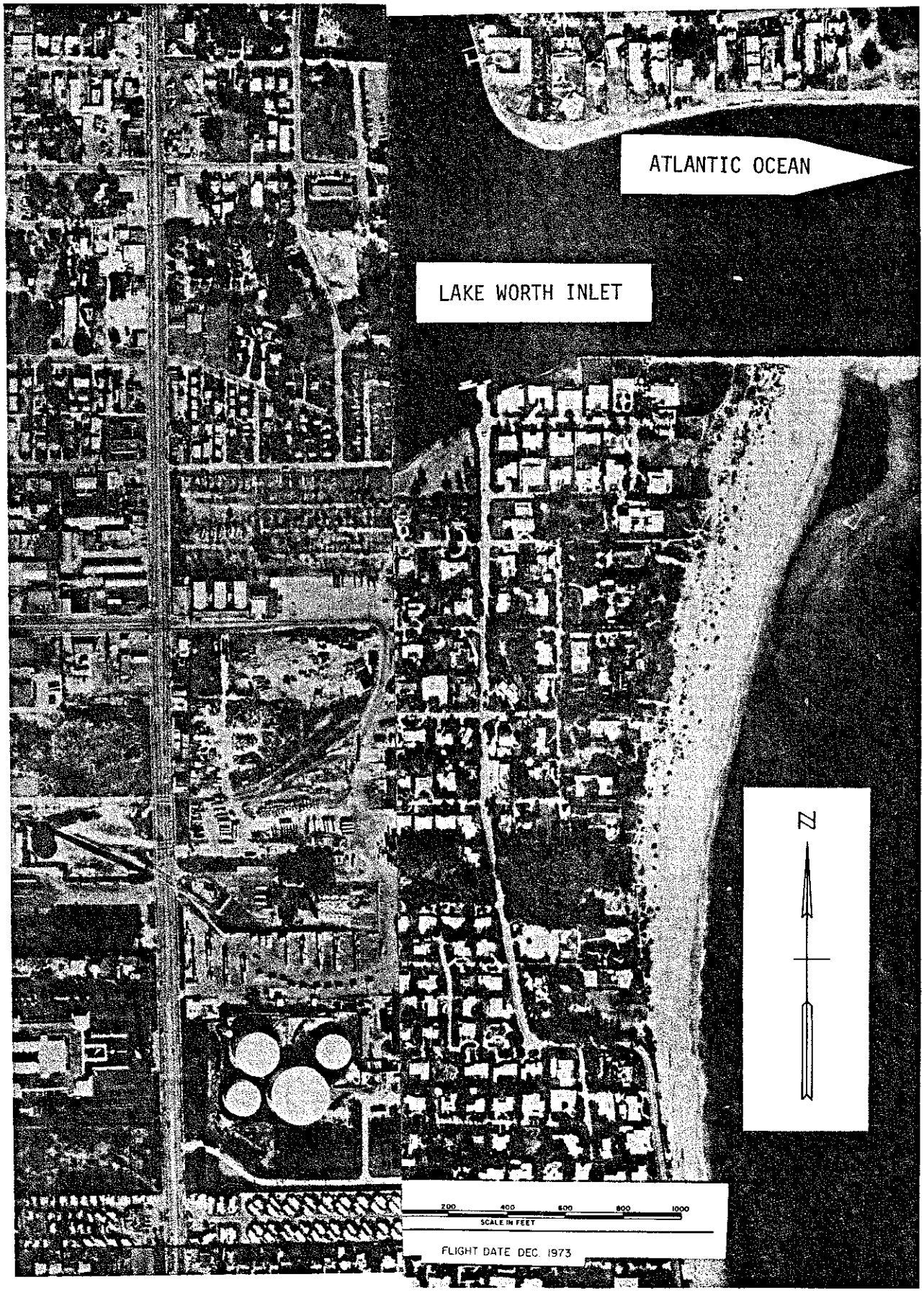
UNIT NUMBER	NET SUMMER PEAK CAPABILITY (Mw)	FLOW RATE PER MINUTE LITERS	GALLONS	YEAR ORIGINALLY PLACED IN SERVICE
1	45	227,125	(60,000)	1946
2	73	196,840	(52,000)	1953
3	287	741,940	(196,000)	1962
4	287	741,940	(196,000)	1963

Units 1 and 2 have condensing water intakes on Lake Worth at the east side of the plant property. A maximum of 112,000 gpm enters the units and is discharged into Lake Worth near the southern property line (Figure 1.0-2). Traveling screen wash water is returned to Lake Worth via a sluiceway which empties into Units 1 and 2 discharge canal.

Units 3 and 4 draw water through an intake structure located in the southwestern corner of the Port of Palm Beach Slip No. 2, adjacent to the plant property. These units conduct condensing water through two 2.29-meter (90 inch) diameter pipes which discharge warmed waters into the middle of Lake Worth, 5.06 meters (16.6 feet) below mean sea level (Figure 1.0-2). Debris from Units 3 and 4 traveling screens is retained in a containment basket and is disposed by commercial refuse removal.

1.4 Source Water

The Riviera Plant is located on the western shore of Lake Worth opposite Lake Worth inlet. The water around the plant is strongly influenced by the proximity of the Atlantic Ocean. When the tide is in the water is clear and salinity is generally about 30 $^{o}/_{oo}$. Outgoing tides are characterized by some turbidity and reduced salinity from Intracoastal water. During periods of heavy rainfall, freshwater runoff through the Intracoastal lowers the salinity to about 20 $^{o}/_{oo}$.


ATLANTIC OCEAN
LAKE WORTH INLET
N
200 400 600 800 1000
SCALE IN FEET
FLIGHT DATE DEC. 1973

Debris from Units 3 and 4 traveling screens is retained in a containment basket and is disposed of by commercial refuse removal.

1.3 Source Water

The Riviera Plant is located on the western shore of Lake Worth opposite Lake Worth inlet. The water around the plant is strongly influenced by the proximity of the Atlantic Ocean. The salinity is generally about 30 parts per thousand and the water is clear. Outgoing tides produce some turbulence with associated turbidity. During periods of heavy rainfall, freshwater runoff through the Intracoastal Waterway lowers the salinity to estuarine levels of about 20 $^{o}/_{oo}$.

1.4 Receiving Body of Water

The condenser cooling water from Units 1 and 2 is discharged east of the plant from the shore of Lake Worth. Units 3 and 4 discharge about 592 meters (1941 feet) offshore near the ships' channel for Port of Palm Beach.

1.5 Ecological Study

1.5.1 Description of Sampling Program

The purpose of this study was to determine the composition and abundance of the biological community in waters adjacent to the Riviera Plant and to evaluate the effects of plant operation on species habitat, population, distribution and life history.

Areas of study include:

1. impingement by the intake screens of:
   (a) fishes
   (b) shellfishes and other invertebrates

2. entrainment through the condenser cooling system of:
   (a) small and juvenile fishes
   (b) eggs and larvae of fishes
   (c) small invertebrates

1.5 Receiving Body of Water

The condenser cooling water from Units 1 and 2 is discharged east of the plant from the shore of Lake Worth. Units 3 and 4 discharge about 592 meters (1941 feet) offshore near the ships' channel for Port of Palm Beach.

1.6 Ecological Study

1.6.1 Description of Sampling Program

The purpose of this study was to determine the composition and abundance of the biological community in waters adjacent to the Riviera Plant and to evaluate the effects of plant operation on species habitat, population, distribution and life history.

1.6.2 Description of Sampling Methodology

Fish and Shellfish Impingement

Initial 24-hour impingement studies were conducted in March and April 1974. With the assistance of FP&L personnel sampling frequency was intensified to approximately twice per month beginning in July 1974 and continuing through December 1975. Specimens collected were identified to species, enumerated, measured and weighed.

Fish and Shellfish Entrainment

Monthly 24-hour samples were taken from January through December 1975. Two 363-micron mesh drift nets, 20.0 cm (7.9 inches) in diameter, were fished in the intake wells to collect larval fishes and fish eggs. A digital flowmeter was mounted in the mouth of the net to enable calculations of sample size based on the volume of water passing through the net. Analyses included identification, enumeration and measurement of specimens collected.

Benthic Macroinvertebrates

Three replicate Ponar grabs per designated station were taken quarterly in 1974 and monthly in 1975. Samples were preserved, stained, sorted, classified and enumerated. Voucher

specimens were retained. The remainder were used for dry-weight determinations. The data were statistically analyzed for density, biomass, index of diversity and equitability.

Macroinvertebrate Entrainment

Two 363-micron mesh drift nets, 20.0 cm in diameter, were fished monthly at the intake wells to sample entrained macroinvertebrates. Entrained macroinvertebrates were preserved, counted and identified to major taxonomic groups.

1.6.3 Results and Discussion

Fish and Shellfish Impingement

Impingement rates for fishes were generally low, averaging 1.6 individuals and 98 grams (3.5 ounces) per hour. Mojarra, jacks, puffers, and porcupinefishes accounted for over 50% of the impinged fishes. Few fishes of sport or commercial value, and no rare or endangered species, were found.

Edible shrimp and blue crabs were the predominant shellfishes impinged. Impingement rates were generally less than 40 individuals per 24-hour sample period. Blue crabs usually survive impingement and those impinged on the screens of Units 1 and 2 are returned to the water in a sluiceway which conducts nekton and water from the traveling screens to Lake Worth. Shellfish impinged on the screens of Units 3 and 4 are not returned to the water.

Fish and Shellfish Entrainment

Juvenile herring, anchovy, croakers and blennies comprised 68% of the drift net samples. The largest number of larval and juvenile fish appeared in April; eggs were numerous in April and December. Alternating tidal flows through the inlet appear to have swept pelagic fish eggs and larvae (herring, anchovy and croaker) into Lake Worth. Its suitability as a nursery area for larval and juvenile fishes is unknown.

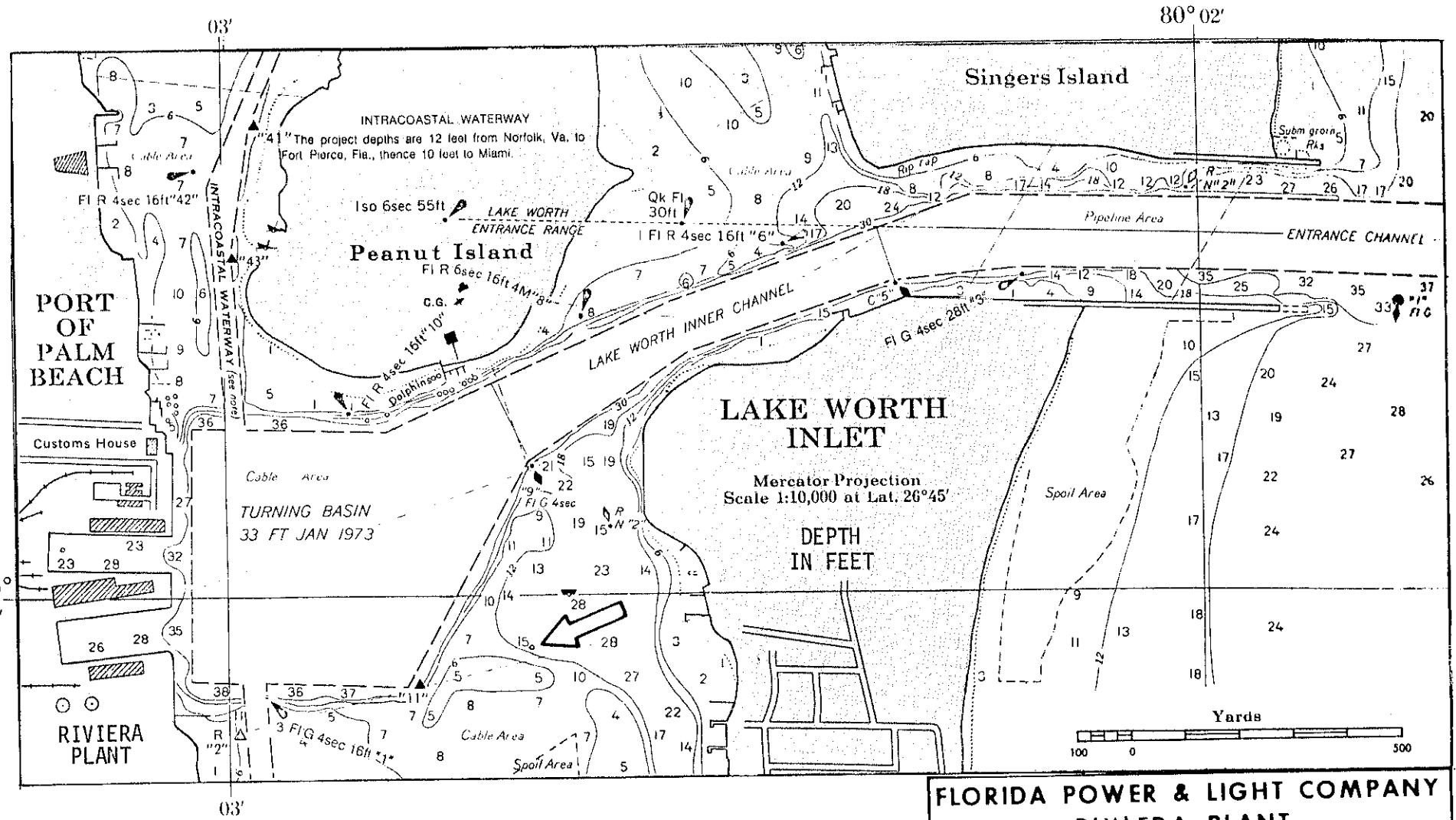
Benthic Macroinvertebrates

Benthic macroinvertebrate density in the discharge was slightly greater than in the intake area. Species diversity in the discharge area was slightly decreased. These differences were not statistically significant. Water temperature data taken during sampling showed no significant difference between intake and discharge areas probably due to rapid thermal plume dissipation. Depth and current velocity may be more important than thermal regime in accounting for the differences in the benthic community composition between the discharge and control areas.

Macroinvertebrate Entrainment

Copepods (small and non-commercial crustaceans) were the most frequently entrained invertebrate group. Crab and shrimp larvae ranked second and third, respectively. Generally the greatest numbers of specimens were collected by the bottom-set nets during night-time hours. The greatest amount of biomass collected during any one sampling period was less than three grams (0.1 ounce). Macroinvertebrate entrainment values were not considered to be detrimental to the invertebrate community or to commercial fisheries.





FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

RIVIERA PLANT AND VICINITY WITH
WATER DEPTHS IN FEET
(ARROW INDICATES THE OFFSHORE DISCHARGE)

APPLIED BIOLOGY, INC.
SEPTEMBER, 1976
FIGURE 2.0-1

2.0 Description of Habitat

The Riviera Plant is situated on the southwest corner of the Port of Palm Beach turning basin. The basin and channel, which are contiguous with the Atlantic Ocean, are maintained at a water depth of about 33 feet. Adjacent waters vary in depth between four and sixteen feet. The region is designated as Lake Worth Inlet (Figure 2.0-1) and is part of the Intracoastal Waterway.

The shoreline is about 85% bulkheaded for industrial and residential purposes. Vertical rocky walls characterize the edges of the turning basin and inlet channel. Short sections of beach that do exist (primarily around Peanut Island) are characterized by compacted sand, shell, rocks and debris. Immediately offshore from the plant, the bottom is predominantly compacted sand with some rocky areas and debris.

The aquatic vegetation which predominates in the habitat is drifting sargassum (Sargassum sp.) and large quantities are carried into the inlet by tidal action and easterly winds. In the vicinity of the plant, the compacted sand supports the sea grass (Halophila sp.) plus short tufts of red and green alga (Ceramium sp., Laurencia papillosa and Enteromorpha intestinalis). The walls of the onshore discharge structure are covered to the high water mark with Enteromorpha intestinalis and other filamentous algae.

The water around the plant is strongly influenced by the proximity of the Atlantic ocean and the salinity is generally about 30 $^{o}/_{oo}$. The water is clear and usually free of debris and rubbish. Outgoing tides are characterized by some turbidity and reduced salinity from Intracoastal water. During periods of heavy rainfall, freshwater runoff into the Intracoastal Waterway may lower the salinity to estuarine levels (less than 20 $^{o}/_{oo}$) but Lake Worth waters are usually marine.

3.1 Fish and Shellfish

3.1.1 Introduction

The purpose of the fisheries study was to determine whether the Riviera Plant operations interfered with the protection and propagation of a balanced indigenous population of fish and shellfish.

In order to assess plant impact, it was necessary to determine the taxonomic and ecological nature of the fish and shellfish fauna and the magnitude and significance of impingement and entrainment.

3.1.2 Impingement

3.1.2.1 Methods and Materials

Two twenty-four hour impingement studies were conducted in March and April 1974. With the assistance of FP&L personnel, sampling frequency was increased to about three 24-hour samples per month from July 1974 through December 1975. Specimens collected were identified to species, counted, measured to the nearest millimeter and weighed to the nearest gram. Nomenclature was in accordance with the American Fisheries Society (Bailey, et al., 1970). The majority of fishes were measured employing standard length (SL), the distance from the tip of the snout to the base of the tail. Total length (TL) was used to measure shrimp, spiny lobsters, squid and eels; body widths were taken for crabs and stingrays.

3.1.2.2 Results and Discussion

One hundred eighteen species of fishes were collected or observed in the vicinity of the Riviera Plant during the course of this study (Table 3.1-1).

The 24-hour impingement survey results are presented in Tables 3.1-2 through 3.1-48. Fish impingement rates were low. Calculations were made of total fishes collected during 1,128 sampling hours from the period of March 1974 through December 1975. The hourly average was 1.6 individuals per hour weighing 98 grams (3.5 ounces). Number of individuals and weights expressed per sample hour (Figure 3.1-1) demonstrated an impingement peak for October 1974 (Table 3.1-10). No similar peak was observed in October 1975, however, an increase in fish impingement frequency occurred in December of that year (Table 3.1-48). As each instance involved different species at different months it appeared that these impingement occurrences were random rather than seasonal migrations.

Mojarras (family Gerreidae) accounted for over 25% of the total number of fishes collected (Table 3.1-49). They are abundant fishes in eastern Florida along the sandy shorelines and in bays and estuaries. They are generally small, silvery fishes characterized by greatly protrusible mouths used for feeding on small organisms in the sand (Bohlke and Chaplin, 1968). Their generally small size,

unwillingness to take a baited hook, and the occurrence of more palatable species in the area limit their use as food for man.

Jacks (family Carangidae) comprised about 18% of the fishes collected. Most of the jacks collected were the smaller species such as the lookdown, moonfish, leatherjacket and bumper. A few crevalle jack, one African pompano, and one greater amberjack, important sport fishes, were also obtained. None of the commercially important Florida pompano were collected during the sampling periods.

Ten and one-half percent of the fishes collected during impingement sampling were puffers and porcupinefishes. These fishes are common in eastern Florida, particularly in shallow water over grass flats and around sea walls and pilings. Puffers and porcupinefish have little commercial value as food, however, some are dried and sold as regional curios.

Of the remaining fishes collected, no group or family comprised more than eight percent of the total fishes (Table 3.1-49). Fishes of sport or commercial importance included mullet (20 individuals), snappers (13), snook (1) and grouper (1). No spotted seatrout, an important sport species in Lake Worth, were collected. These 47 collections, made from April 1974 through December 1975, show extremely low levels of impingement of sport and commercial species.

Edible shrimp (Penaeus spp.) and blue crabs were the predominant shellfishes collected. These species comprised 34.7 and 42.5%, respectively, of the total macroinvertebrate impingement samples. Rates of impingement for both species were generally less than 40 individuals per 24-hour sample period (Figure 3.1-2). Maximum impingement of shrimp occurred in late August 1975 (Table 3.1-37) when 207 individuals were obtained. Maximum impingement of blue crabs was in October 1974 (Table 3.1-10) when 409 individuals were obtained. Crustaceans which are returned to the environment from traveling screen washings have demonstrated high percentage of survival.

Other commercially important crustaceans collected during 1974 and 1975 were 74 stone crabs and 6 spiny lobsters. These infrequent appearances by these species were random events which could not be related to breeding or migratory habits.

One hundred sixteen squid were collected during the course of impingement studies. Although of minor importance as a Florida commercial fishery, no landings were reported for Palm Beach County by Snell (1976).

3.1.3 Entrainment

3.1.3.1 Methods and Materials

Monthly drift net studies were initiated in January 1975. Two 200 cm diameter drift nets (363-micron-square mesh) were fished

simultaneously in the intake wells directly in front of the intake screens (Figure 3.1-3). The upper net was placed approximately one meter below the surface, and the lower net approximately one meter from the bottom. A digital flow meter (General Oceanics Model 2030) was mounted in the mouth of the nets and allowed flow and sample size determinations. Nets were fished for one hour at six hour intervals. Thus a sample period of 24 hours included two samples collected during the day and two during the night from both near-surface and near-bottom.

On several occasions portions of the sample were lost due to turbulence encountered within the intake wells. In these instances, the data have been normalized to allow comparisons between data taken from the 24 hour sampling periods. Sample size was calculated by dividing the total flow through the nets by the total flow through the plant.

Drift net samples were preserved in 5% formalin and returned to the laboratory for analysis which included identification, enumeration, and measurements of the fishes and fish eggs using a dissecting microscope (7-40X magnification). Fishes were measured by total length, and eggs by diameter, to the nearest tenth of a millimeter.

3.1.3.2 Results and Discussion

Seven hundred sixteen larval fishes and 20,942 fish eggs were collected during all 1974-1975 sampling periods (Table 3.1-50). The largest number of fishes (226 individuals) were collected in April. The largest numbers of eggs were collected in April and December when 3179 and 6044 eggs, respectively, were obtained. Adjusted to uniform sample sizes, this represents approximately 24 and 27%, respectively, of the total occurrence (Figure 3.1-4).

Herrings and anchovies (families Clupeidae and Engraulidae, respectively) comprised 31.4% of the total fishes collected (Table 3.1-50). Peak occurrence was in April, when 116 individuals were collected. Although not directly utilized by man,[1] they are important forage fishes which provide food for a number of other fishes, including sport and commercial species. These plankton feeders are abundant along Florida's east coast, often occurring in schools of thousands. The majority of the fish eggs, based on their small size and time of occurrence, are probably herring and anchovy.

The silversides (Atherinidae) are another important family of forage fishes which are common along the Florida coast. These fishes comprised 4.5% of the total number of individuals collected. The largest number (17) were collected in May.

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[1] commercially important species occur primarily north of the Riviera area.

Blennies (families Blenniidae and Clinidae) accounted for 25.6% of the total fishes collected. Blennies were collected during most of the sampling periods with the largest number of individuals (92) occurring in November (Table 3.1-50). These small fishes are not utilized by man, except for occasional appearance in aquariums. They may be of limited use as forage for larger fishes. Blennies are primarily shallow-water tropical fishes. They may be carnivorous or herbivorous, depending on the species (Bohlke and Chaplin, 1968).

Eighty-two croakers (family Sciaenidae) were collected during drift net sampling. The largest number (52) were collected in April. Croakers accounted for 11.4% of the total fishes collected (Table 3.1-50). Although these individuals were too small (< 6 mm TL) for accurate identification to species, most are probably the Atlantic croaker, based on the common occurrence of the adults in this area. Individuals of this species may reach a length of one foot and are popular pan fish. They are primarily bottom dwellers, feeding on fishes and crustaceans.

Approximately 3% of the total fishes collected were triggerfish and filefish (Balistidae). Twenty individuals were collected during all sampling periods combined (Table 3.1-50). These fishes are not utilized by man in this country, although some species (i.e., the queen triggerfish) are eaten in the Bahamas. Certain balistids

are reputed carriers of ciquatera, or fish poisoning. They occur in a wide variety of habitats: open water, reefs and grass flats, and all are carnivorous (Bohlke and Chaplin, 1968).

The balance of the fishes collected ("other fishes" in Table 3.1-50) comprised 24.3% of the total fishes collected. Many of these were fishes represented by just one or a few individuals per species. These include the ladyfish, pipefish, goby, searobin, jack, lizardfish and barracuda. Additionally, unidentified fishes were included in this category. Some of the fishes were damaged and/or decomposed precluding identification; for others, early life history stages have not been described.

The Atlantic Ocean, through Lake Worth Inlet, provides the source water for the Riviera Plant. Presumably, the majority of the fishes and fish eggs entrained by the plant were from the Atlantic (as opposed to the Intracoastal Waterway). Pelagic fish eggs and larvae survival in alternating tidal flows through the inlet and in the Intracoastal Waterway was conjectural.

3.1.4 Conclusions

1. One hundred eighteen species of fishes were collected or observed in the vicinity of the Riviera Plant. This is indicative of high diversity and is typical

for southeastern Florida oceanic areas.

2. Impingement rates for fishes were generally low. Mojarras, jacks, puffers and porcupinefishes were the predominant fishes impinged. Few fishes of sport or commercial importance were impinged. No rare or endangered fishes were found. Edible shrimp and blue crabs were predominant shellfishes collected. Shellfish impingement was generally less than 40 individuals per 24 hours.

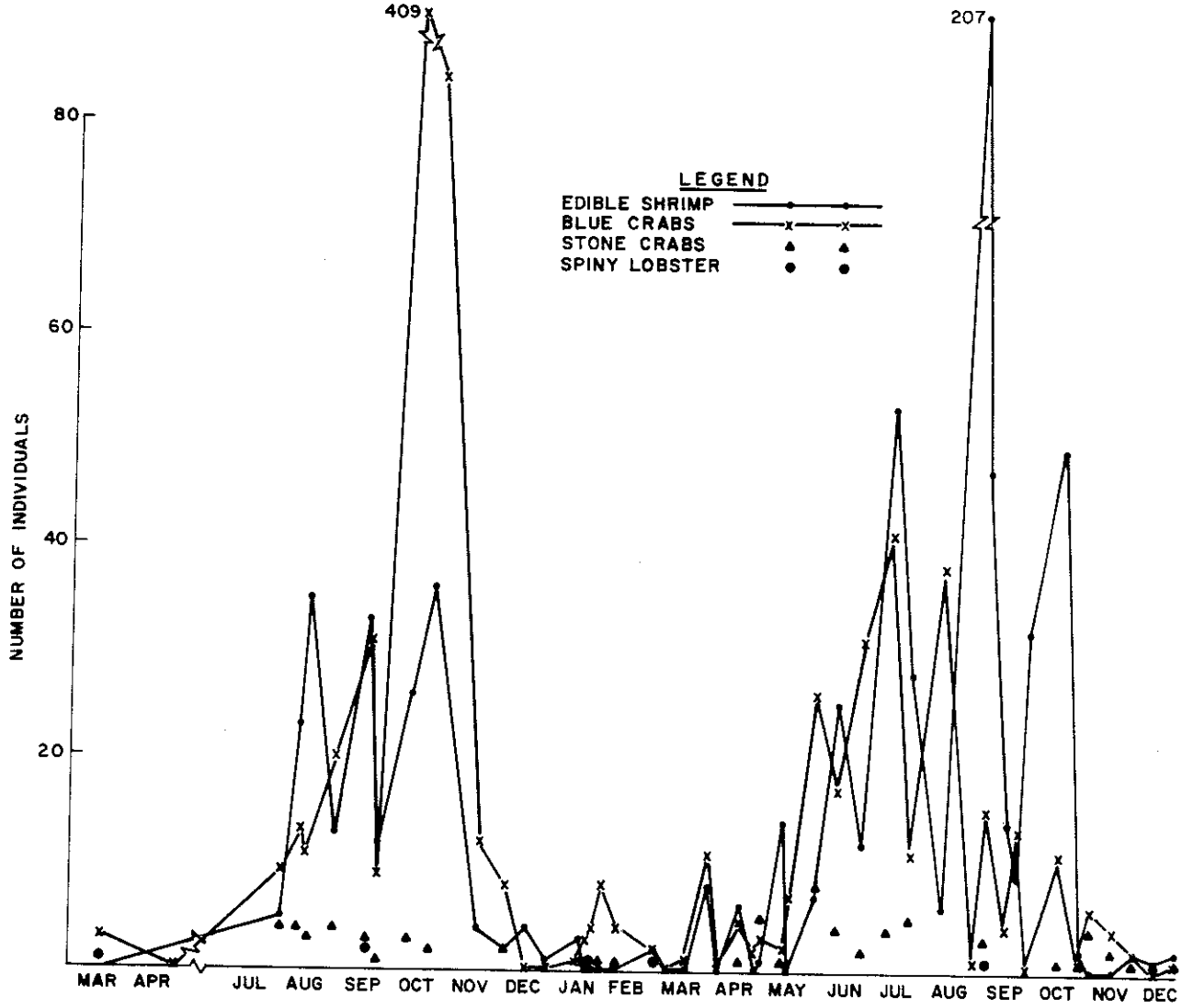
3. Herrings, anchovies, blennies and croakers were the predominant fishes entrained. The largest number of fishes was collected in April. The largest number of eggs was collected in April and December. Alternating tidal flows through the inlet appear to have swept pelagic fish eggs and larvae into Lake Worth. Its suitability as a nursery area for larval and juvenile fishes is unknown.

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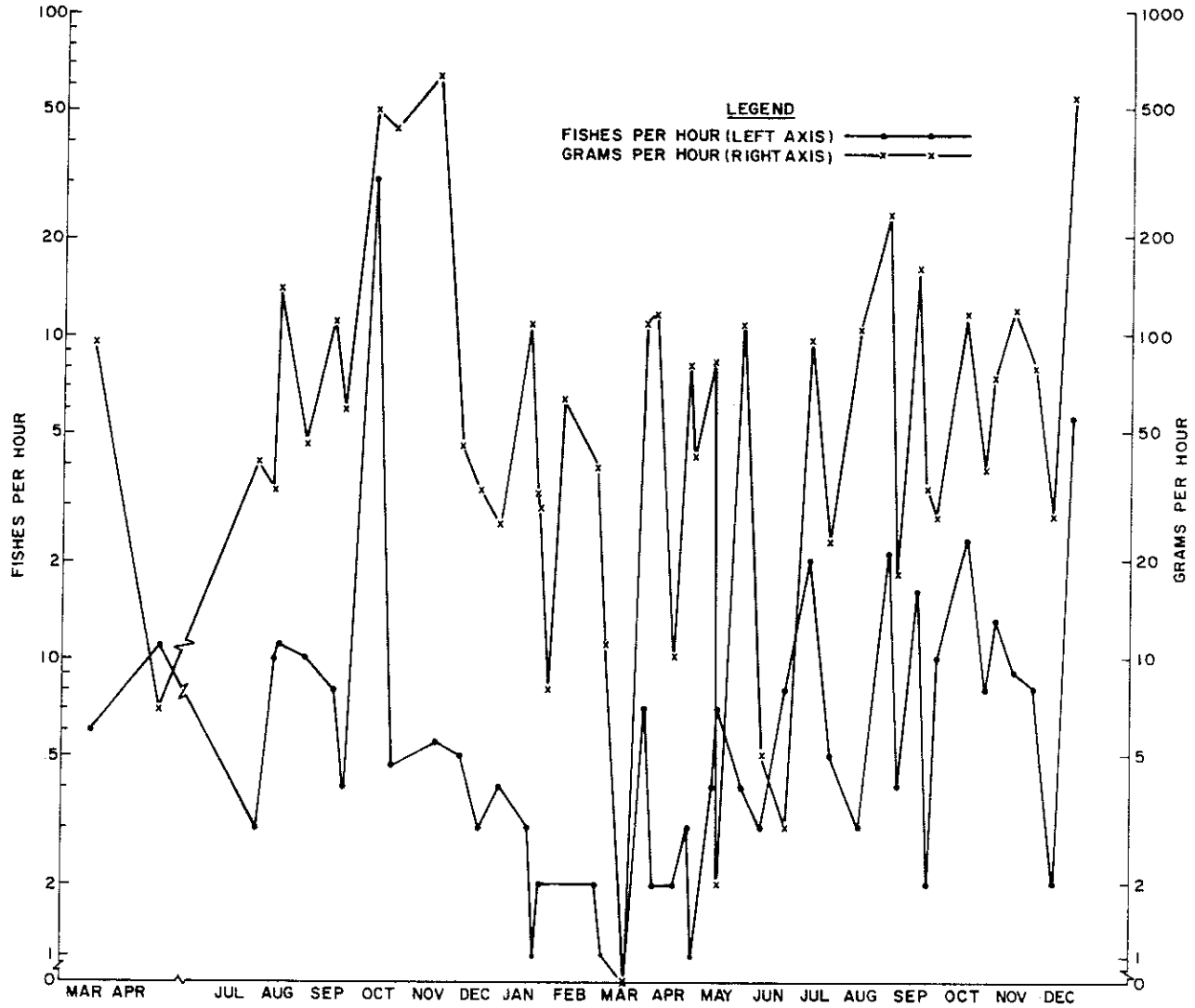
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FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

IMPINGEMENT OF SHELLFISHES
OF COMMERCIAL VALUE

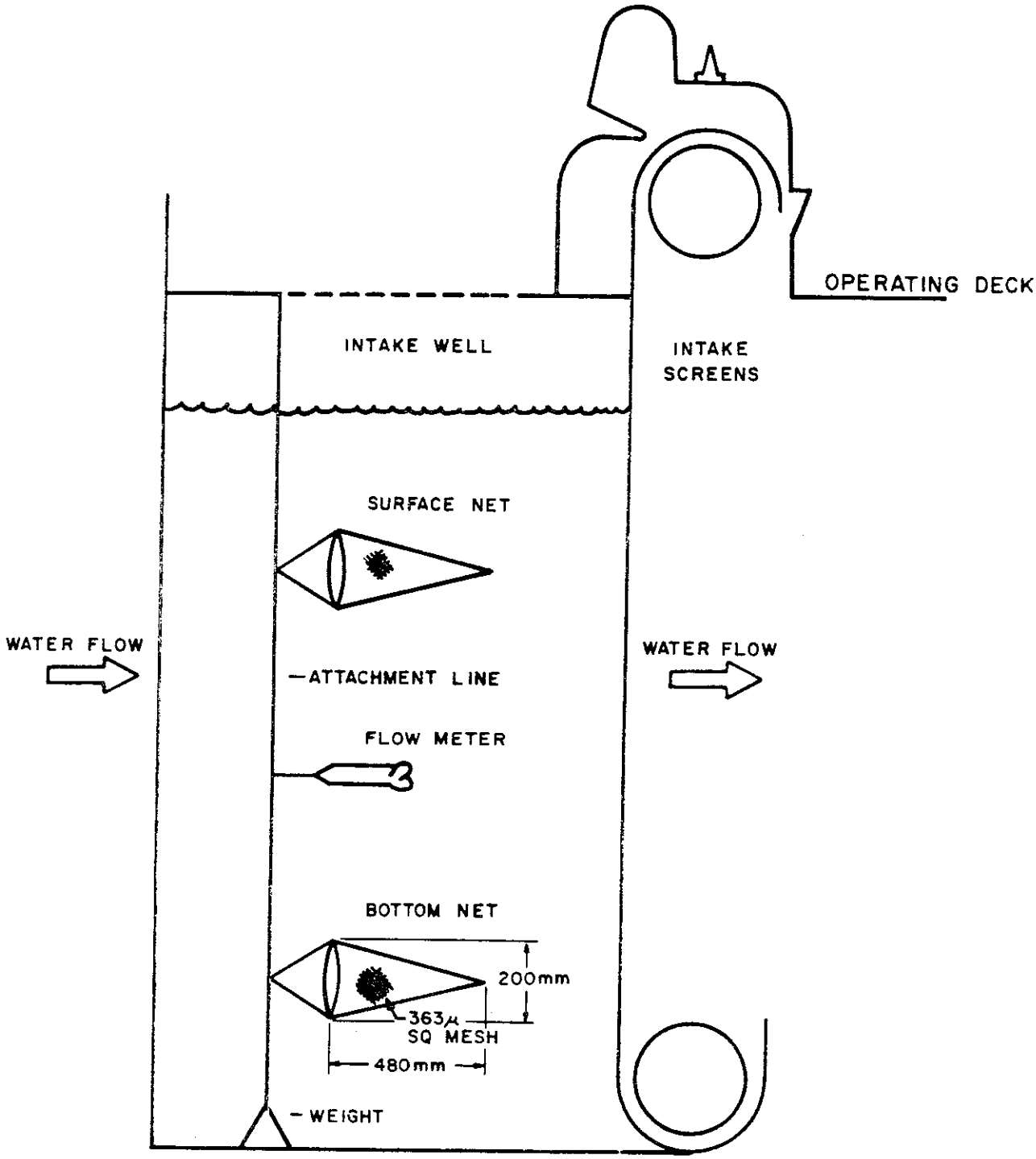
APPLIED BIOLOGY, INC
SEPTEMBER, 1976 FIGURE 3.1-1



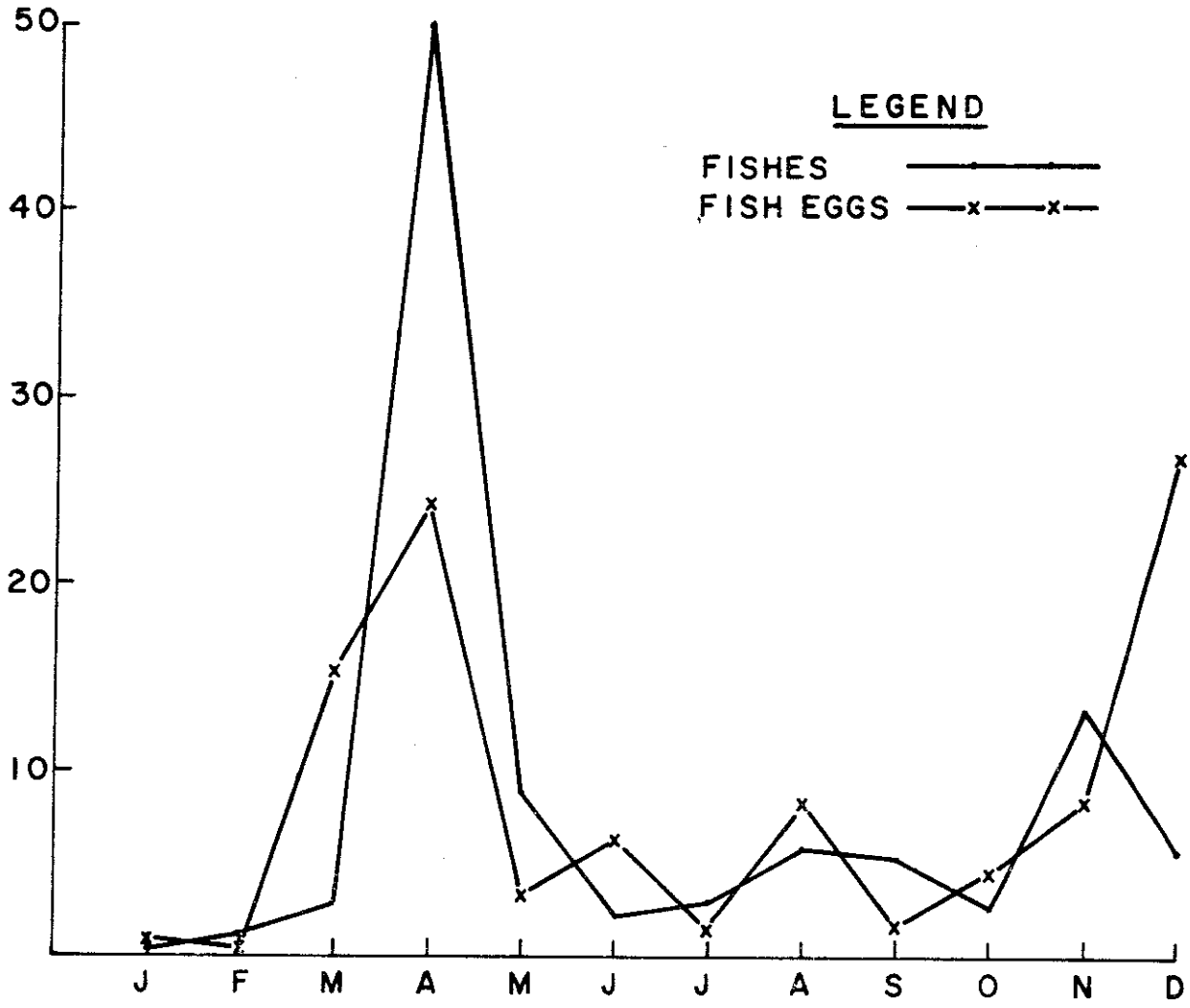
FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

RATES OF IMPINGEMENT,
FISHES AND GRAMS PER HOUR

APPLIED BIOLOGY, INC
SEPTEMBER, 1976 FIGURE 3.1-2



FLORIDA POWER & LIGHT COMPANY RIVIERA PLANT	
DIAGRAMMATIC VIEW OF THE DRIFT NETS IN THE INTAKE WELL	
APPLIED BIOLOGY, INC.	
SEPTEMBER, 1976	FIGURE 3.1-3



FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

DRIFT NETS: MONTHLY OCCURRENCE OF FISHES AND FISH EGGS CALCULATED AS A PERCENTAGE OF THE TOTAL FISHES AND FISH EGGS COLLECTED.

APPLIED BIOLOGY, INC.
SEPTEMBER, 1976 FIGURE 3.1-4

TABLE 3.1-1
FISH SPECIES COLLECTED OR OBSERVED IN
THE VICINITY OF THE RIVIERA PLANT, 1974-1975

Scientific Name	Common Name
Dasyatis americana	southern stingray
Dasyatis sayi	bluntnose stingray
Narcine brasiliensis	lesser electric ray
Elops saurus	ladyfish
Ophichthus gomesi	shrimp eel
Ophichthus sp.	snake eel
Brevoortia sp.	menhaden
Opisthonema oglinum	Atlantic thread herring
Sardinella anchovia	Spanish sardine
Anchoa mitchilli	bay anchovy
Anchoa sp.	anchovy
Synodus foetans	inshore lizardfish
Trachinocephalus myops	snakefish
Arius felis	sea catfish
Opsanus tau	oyster toadfish
Histrio histrio	sargassumfish
Ogococephalus radiatus	polka-dot batfish
Ophidion sp.	cusk eel
Hemirhamphus balao	balao
Strongylura sp.	needlefish
Hippocampus erectus	lined seahorse
Syngnathus sp.	pipefish
Centropomis undecimalis	snook
Diplectrum formosum	sand perch
Priacanthus arenatus	bigeye
Apogon binotatus	barred cardinalfish
Apogon pseudomaculatus	twospot cardinalfish
Phaeoptyx conklini	freckled cardinalfish
Rachycentron canadum	cobia
Alectis crinitus	African pompano
Caranx hippos	crevalle jack
Caranx lattus	horse-eye jack
Caranx ruber	bar jack
Chloroscombrus chrysurus	Atlantic bumper
Oligoplites saurus	leatherjacket
Selene vomer	lookdown
Seriola dumerili	greater amberjack
Trachurus lathami	rough scad
Vomer setipinnis	Atlantic moonfish
Coryphaena hippurus	dolphin
Lutjanus apodus	schoolmaster
Lutjanus griseus	gray snapper
Lutjanus synagris	lane snapper
Ocyurus chrysurus	yellowtail snapper
Lobotes surinamensis	tripletail
Diapterus plumieri	striped mojarra
Eucinostomus gula	silver jenny
Gerres cinereus	yellowfin mojarra
Anisotremus virginicus	porkfish
Haemulon album	margate
Haemulon aurolineatum	tomtate

(Continued)

TABLE 3.1-1 (continued)
FISH SPECIES COLLECTED OR OBSERVED IN
THE VICINITY OF THE RIVIERA PLANT, 1974-1975

Scientific name	Common Name
Haemulon carbonarium	Caesar grunt
Haemulon chrysargyraeum	smallmouth grunt
Haemulon flavolineatum	French grunt
Haemulon parrai	sailors choice
Haemulon plumieri	white grunt
Haemulon striatum	striped grunt
Archosargus probatocephalus	sheepshead
Diplodus argenteus	silver porgy
Lagodon rhomboides	pinfish
Micropogon undulatus	Atlantic croaker
Odontoscion dentex	reef croaker
Pempheris schomburgki	glassy sweeper
Kyphosis incisor	yellow chub
Chaetodipterus faber	Atlantic spadefish
Holacanthus bermudensis	blue angelfish
Holacanthus ciliaris	queen angelfish
Pomacanthus arcuatus	gray angelfish
Pomacanthus paru	French angelfish
Abudefduf saxatilis	sergeant major
Abudefduf taurus	night sergeant
Pomacentrus fuscus	dusky damselfish
Pomacentrus variabilis	cocoa damselfish
Bodianus rufus	Spanish hogfish
Hemipteronotus novacula	pearly razorfish
Sparisoma rubripinne	redfin parrotfish
Sparisoma viride	stoplight parrotfish
Mugil cephalus	striped mullet
Mugil curema	white mullet
Sphyraena barracuda	great barracuda
Sphyraena guachancho	guaguanche
Opistognathus macrognathus	spotfin jawfish
Astroscopus y-graecum	southern stargazer
Blennius sp.	blenny
Hypleurochilus sp.	blenny
Hypsoblennius hentzi	feather blenny
Labrisomus nuchipinnis	hairy blenny
Gobiosoma sp.	goby
Acanthurus chirurgus	doctorfish
Acanthurus sp.	surgeonfish
Trichiurus lepturus	Atlantic cutlassfish
Scorpaena grandicornis	plumed scorpionfish
Scorpaena sp.	scorpionfish
Prionotus tribulus	bighead searobin
Prionotus sp.	searobin
Bothus ocellatus	eyed flounder
Cyclopsetta fimbriata	spotfin flounder
Paralichthys sp.	flounder
Achirus lineatus	lined sole
Gymnachirus melas	naked sole
Symphurus sp.	tonguefish
Aluterus schoepfi	orange filefish
Aluterus scripta	scrawled filefish

(Continued)

TABLE 3.1-1 (continued)
FISH SPECIES COLLECTED OR OBSERVED IN
THE VICINITY OF THE RIVIERA PLANT, 1974-1975

Scientific name	Common name
Balistes capriscus	gray triggerfish
Cantherines pullus	orangespotted filefish
Canthidermis maculatus	rough triggerfish
Monacanthus ciliatus	fringed filefish
Monacanthus hispidus	planehead filefish
Monacanthus setifer	pygmy filefish
Lactophrys quadricornis	scrawled cowfish
Lactophrys triqueter	smooth trunkfish
Canthigaster rostrata	sharpnose puffer
Sphoeroides nephelus	southern puffer
Sphoeroides spengleri	bandtail puffer
Sphoeroides testudineus	checkered puffer
Chilomycterus schoepfi	striped burrfish
Diodon holocanthus	balloonfish
Diodon hystrix	porcupinefish

TABLE 3.1-2
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
13-15 March 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)[2]
	Units 1&2	Units 3&4[1]		
blue crab	3	0	15-20	15
spiny lobster	1	0	70	6
lined seahorse	1	0	135	16
eyed flounder	0	2	97-100	62
striped mullet	1	1	210-300	225
silver porgy	1	0	163	150
Atlantic spadefish	0	1	175	400
Southern stargazer	0	1	295	1000
polkadot batfish	0	1	100	40
Atlantic bumper	0	3	90-135	210
grunt	0	1	57	3
striped burrfish	0	1	185	200

[1]unit 4 pumps off line

[2]calculated from length/weight data

TABLE 3.1-3
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
25-26 April 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)[2]
	Units 1&2	Units 3&4[1]		
squid	9	30	50-60	130
edible shrimp	0	2	20-30	4
bandtail puffer	0	1	75	8
southern puffer	0	1	42	5
scrawled filefish	0	1	66	7
orange filefish	0	1	54	6
rough triggerfish	8	1	32-38	40
planehead filefish	8	0	34-37	40
sargassumfish	1	3	40-70	24
lined seahorse	1	2	100-180	48

[1]unit 4 pumps off line

[2]calculated from length/weight data

TABLE 3.1-4
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
29-30 July 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	3	2	35-83	8
squid	1	0	30	1
blue crab	4	5	12-50	46
stone crab	1	3	12-75	170
portunid crab	1	1	30-70	126
sea catfish	0	3	230-245	608
twospot cardinalfish	0	1	55	5
sailors choice	0	2	34-35	4
bluntnose stingray	0	1	190	333
sharpnose puffer	0	1	52	7

TABLE 3.1-5
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
10-11 August 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	11	12	40-120	61
squid	0	1	60	3
blue crab	7	6	15-127	111
horseshoe crab	0	2	185-230	2000
stone crab	1	3	17-26	14
portunid crab	1	0	75	65
bay anchovy	1	0	38	1
fringed filefish	3	0	29-32	4
sergeant major	1	0	110	67
sea catfish	0	2	195-295	476
sand perch	0	2	80-86	26
silver porgy	0	1	155	140
striped mojarra	0	1	50	3
yellowfin mojarra	0	12	45-73	63

TABLE 3.1-6
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
11-12 August 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	32	3	44-75	44
blue crab	8	3	8-96	81
stone crab	0	3	23-68	125
squid	0	15	141-201	153
scrawled filefish	1	0	65	4
silver jenny	1	5	36-70	21
Atlantic cutlassfish	0	2	804-1930	1257
leatherjacket	0	1	234	80
striped mullet	0	1	321	460
sea catfish	0	2	261-305	482
checkered puffer	0	7	102-193	1002
barred cardinalfish	0	1	42	2
bay anchovy	0	2	49	4
African pompano	0	1	39	1
margate	0	1	73	14
grunt	0	1	46	3
pipefish	0	1	29	15

TABLE 3.1-7
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
26-27 August 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	9	4	50-65	23
squid	0	2	70-72	8
blue crab	19	1	12-50	50
portunid crab	3	1	22-55	35
stone crab	0	4	28-65	168
horseshoe crab	0	2	178-210	1955
menhaden	4	0	42-66	11
filefish	1	0	53	8
gray triggerfish	1	0	52	7
silver jenny	0	4	62-82	37
sand perch	0	1	65	6
sea catfish	0	2	181-230	391
French grunt	0	1	80	16
sailors choice	0	1	51	3
tomtate	0	2	53-64	8
cowfish	0	1	150	108
checkered puffer	0	3	145-160	472
striped burrfish	0	3	38-48	30

TABLE 3.1-8
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
15-16 September 1974

Species	Number of Individuals		Range of Standard Lengths (mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	26	7	32-86	54
blue crab	31	10	20-100	270
portunid crab	7	0	15-35	13
spiny lobster	2	0	40-55	6
stone crab	0	3	25-50	51
horseshoe crab	0	1	168	849
squid	0	1	140	17
orangespotted filefish	1	0	39	3
gray triggerfish	1	0	35	4
mojarras	0	7	40-85	71
leatherjacket	0	1	145	27
Atlantic spadefish	0	1	225	450
sand perch	0	1	59	5
sea catfish	0	3	150-200	580
southern stargazer	0	1	330	1350
cowfish	0	1	165	132
striped burrfish	0	2	45-53	25

TABLE 3.1-9
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
22-23 September 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	12	0	41-72	16
blue crab	6	3	13-45	17
stone crab	0	1	85	126
horseshoe crab	0	1	198	1050
portunid crab	2	0	28-75	60
oyster toadfish	1	4	112-190	731
gray triggerfish	1	0	27	2
pipefish	1	0	85	1
sea catfish	0	3	195-280	685

TABLE 3.1-10
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
7-8 October 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	0	26	40-94	56
blue crab	38	371	18-101	1627
squid	0	8	40-160	93
stone crab	0	3	27-40	26
horseshoe crab	0	1	180	800
mantis shrimp	0	24	51-101	167
lookdown	0	18	13-59	24
Atlantic moonfish	0	62	19-48	73
Atlantic leatherjacket	0	19	29-148	64
jack	0	1	85	7
crevalle jack	0	1	160	109
Atlantic cutlassfish	0	12	64-805	1187
ladyfish	0	1	236	105
yellowfin mojarra	0	47	47-114	364
striped mojarra	0	277	35-154	1063
checkered puffer	0	23	91-153	1448
bandtail puffer	1	23	46-97	210
sand perch	0	8	61-93	75
lane snapper	0	8	45-70	33
gray snapper	0	1	47	4
spotfin jawfish	0	36	54-104	259

(continued)

TABLE 3.1-10
(continued)
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
7-8 October 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
glassy sweeper	0	2	163	28
gray triggerfish	8	8	32-85	82
yellowtail snapper	0	1	55	5
snook	0	1	67	5
smooth trunkfish	0	1	21	2
pipefish	0	1	250	7
lined seahorse	3	1	90-110	48
greater amberjack	0	1	65	8
searobin	0	1	155	49
goby	0	1	115	15
sharpnose puffer	0	1	42	3
scrawled cowfish	0	4	146-223	1017
southern stingray	0	4	205-430	2110
guaguanche	0	2	49-93	7
sargassumfish	2	1	30-50	18
southern stargazer	0	2	182-194	533
snake eel	0	8	340-675	421
cusk eel	0	6	168-205	280

TABLE 3.1-10
(continued)
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
7-8 October 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
tomtate	0	17	43-72	61
Caesar grunt	0	3	40-83	22
French grunt	0	2	48-55	6
striped grunt	0	1	62	5
white grunt	0	1	68	10
smallmouth grunt	0	1	59	3
naked sole	0	4	84-130	125
flounder	0	5	41-340	905
lined sole	0	15	24-97	99
hairy blenny	0	4	74-93	56
bay anchovy	0	4	38-90	13
pygmy filefish	11	14	25-55	36
orangespotted filefish	0	1	50	5
white mullet	0	9	108-170	272
pearly razorfish	0	4	58-72	19
surgeonfish	0	4	22-23	4
doctorfish	0	1	38	3
Atlantic thread herring	0	16	49-87	77
inshore lizardfish	0	2	126-300	267
snakefish	0	2	74-119	26
tonguefish	0	3	79-125	41
scorpionfish	0	6	40-160	259

(continued)

TABLE 3.1-11
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
20-21 October 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
edible shrimp	--	36	45-185	338
blue crab	--	84	15-150	7700
portunid crab	--	135	30-145	16000
stone crab	--	2	25-38	38
squid	--	9	80-152	66
horseshoe crab	--	2	170-230	2360
anchovy	--	1	71	4
menhaden	--	3	48-75	12
mojarra	--	24	34-95	101
eel	--	1	420	135
tonguefish	--	1	135	22
lookdown	--	6	28-55	25
moonfish	--	1	42	3
jack	--	2	36-37	3
Atlantic spadefish	--	3	27-90	43
puffer	--	3	60-165	530
checkered puffer	--	1	135	74
filefish	--	6	25-38	10
triggerfish	--	1	47	5
pipefish	--	26	255-280	331
lined seahorse	--	2	135-150	36

(continued)

TABLE 3.1-11 (continued)
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
20-21 October 1974

Species	Number of Individuals		Range of Standard Lengths (mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
ray	--	2	110-165	760
tomtate	--	1	50	4
stargazer	--	3	185-286	2850
porcupinefish	--	1	215	410
Atlantic cutlassfish	--	7	540-1105	4300
cusk eel	--	5	180-270	568
sargassumfish	--	4	25-70	39
cardinalfish	--	1	45	4
balao	--	2	86	46
needlefish	--	4	70-186	11
searobin	--	1	175	104
jawfish	--	1	85	12

[1]Units 1 & 2 off line

TABLE 3.1-12
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
18-19 November 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	2	10	15-150	510
arenaeus crab	0	1	120	111
edible shrimp	0	4	45-70	8
striped mojarra	0	11	50-150	930
eels	0	4	390-460	305
lookdown	0	36	120-230	11400
horse-eye jack	0	16	65-145	383
sea catfish	0	2	210-220	256
filefish	2	1	25-130	30
grunt	0	44	60-140	491
snapper	0	1	65	10
stargazer	0	2	175-188	361
porkfish	0	3	60-140	183
checkered puffer	0	2	90-120	129
Atlantic croaker	0	6	117-169	501
sargassumfish	0	1	43	7
scorpionfish	0	2	95-150	181

TABLE 3.1-13
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
4-5 December 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	2	6	28-64	82
stone crab	0	2	38-55	56
horseshoe crab	1	0	134	140
edible shrimp	0	2	85-135	25
non-edible shrimp	0	1	95	66
anchovy	1	0	43	2
mojarra	0	2	38-41	253
Atlantic bumper	3	4	170-215	788
pipefish	1	0	108	2
tomtate	0	1	74	12
great barracuda	1	0	144	27

TABLE 3.1-14
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
16-17 December 1974

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
porcellanid crab	--	1	13	4
edible shrimp	--	4	50-90	12
lookdown	--	1	210	198
Atlantic bumper	--	5	180-190	413
feather blenny	--	1	102	30
flyingfish	--	1	215	143

[1]units 1&2 off line

TABLE 3.1-15
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
30-31 December 1974

Species	Number of Individuals		Range of Standard Lengths (mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
edible shrimp	--	1	62	3
squid	--	1	75	4
snake eel	--	3	345-360	166
flounder	--	1	85	36
Atlantic bumper	--	4	143-185	306
checkered puffer	--	1	150	125

[1]units 1&2 off line

TABLE 3.1-16
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
13-14 January 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
edible shrimp	--	3	68-90	12
blue crab	--	1	50	5
stone crab	--	1	60	77
mantis shrimp	--	1	190	94
lookdown	--	2	172-195	426
gafftopsail catfish	--	1	455	1362
sheepshead	--	1	214	450
cusk eel	--	1	220	57
burrfish	--	1	190	290
puffer	--	1	95	41

[1]units 1&2 off line

TABLE 3.1-17
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
19-20 January 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4[1]		
blue crab	--	3	75-175	285
stone crab	--	1	65	76
portunid crab	--	1	79	75
squid	--	1	130	10
spiny lobster	--	1	95	19
Atlantic spadefish	--	1	260	608
bandtail puffer	--	1	118	46
burrfish	--	1	125	103

[1] units 1,2 and 4 off line

TABLE 3.1-18
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
23-24 January 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4[1]		
blue crab	--	4	185-194	493
lookdown	--	1	165	163
seahorse	--	2	90	13
checkered puffer	--	1	127	71
porgy	--	1	215	453

[1] units 1,2 and 4 off line

TABLE 3.1-19
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
28-29 January 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
blue crab	--	8	138-160	1580
speckled crab	--	3	22-87	68
horseshoe crab	--	1	244	1812
lined seahorse	--	3	75-95	7
jack	--	2	170-210	184

[1]units 1&2 off line

TABLE 3.1-20
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
6-7 February 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4[1]		
blue crab	--	4	55-65	67
stone crab	--	1	24	5
tomtate	--	2	101-102	45
cowfish	--	1	250	238
burrfish	--	1	170	280
croaker	--	1	390	960

[1] units 1,2 and 4 off line

TABLE 3.1-21
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
25-26 February 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
edible shrimp	--	2	45-65	7
blue crab	--	2	14-16	8
spiny lobster	--	1	135	77
lookdown	--	1	215	171
burrfish	--	1	138	147
porgy	--	1	260	592
blenny	--	1	110	32

[1] units 1 & 2 off line

TABLE 3.1-22
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
4-5 March 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4[1]		
searobin	0	1	215	233
bandtail puffer	0	1	102	31

[1] unit 4 off line

TABLE 3.1-23
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
17-18 March 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4[1]		
blue crab	0	1	172	135
horseshoe crab	0	3	140-158	2148

[1] unit 4 off line

TABLE 3.1-24
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
26-27 March 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4[1]		
edible shrimp	8	--	60-100	21
blue crab	11	--	100-175	1476
horseshoe crab	9	--	140-150	9988
portunid crab	1	--	60	45
eel	4	--	345-350	181
burrfish	3	--	120-170	454
sea catfish	1	--	240	227
batfish	1	--	198	341
southern stargazer	1	--	180	681
Atlantic bumper	1	--	215	227
striped mullet	1	--	320	454
lined sole	1	--	80	22
anchovy	1	--	45	1
sand perch	1	--	23	11
Atlantic thread herring	1	--	57	3

[1] units 3&4 not sampled

TABLE 3.1-25
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
3-4 April 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	0	2	155-160	362
spotted crab	0	1	103	84
stone crab	0	1	20	5
horseshoe crab	0	2	125-210	1251
stingray	1	0	162	597
stargazer	0	1	325	1816
checkered puffer	0	1	185	299
sharpnosed puffer	0	1	50	8
bandtail puffer	0	1	105	33

TABLE 3.1-26
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
15-16 April 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	0	6	43-70	10
blue crab	0	5	90-250	760
stone crab	0	1	22	3
horseshoe crab	0	2	120-180	1210
portunid crab	0	3	34-41	16
seahorse	0	1	70	3
burrfish	0	2	102-125	206
bandtail puffer	0	1	98	27
sargassumfish	0	1	34	3

TABLE 3.1-27
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
24-25 April 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	0	2	115-145	210
horseshoe crab	0	2	220-250	3600
checkered puffer	0	2	150-160	264
porgy	0	2	165-240	675
mojarra	0	1	140	75
southern stargazer	0	1	215	286
burrfish	0	1	250	471
sea catfish	0	1	245	156

TABLE 3.1-28
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
28-29 April 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	0	1	80	4
blue crab	0	3	59-132	164
stone crab	0	5	18-34	41
horseshoe crab	0	1	185	980
seahorse	0	1	61	3
southern stargazer	0	1	275	1010

TABLE 3.1-29
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
8-9 May 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	0	14	50-118	47
blue crab	0	2	55-61	21
stone crab	0	1	50	46
horseshoe crab	0	1	195	1041
squid	0	1	100	10
anchovy	0	1	54	4
filefish	0	2	44-48	8
stingray	0	1	330	924
tomtate	0	1	126	48
grouper	0	1	285	443
batfish	0	1	195	314
burrfish	0	1	141	148
puffer	0	1	128	84

TABLE 3.1-30
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
12-13 May 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4[1]		
blue crab	7	--	12-91	65
herring	2	--	50-54	8
filefish	11	--	15-48	19
seahorse	3	--	65-120	10

[1] units 3&4 off line

TABLE 3.1-31
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
27-28 May 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	12	14	26-84	284
edible shrimp	2	5	40-89	26
stone crab	0	8	14-55	84
portunid crab	0	4	18-60	51
lined seahorse	2	2	80-108	16
porcupinefish	0	2	252-280	1696
batfish	0	1	190	285
stargazer	0	1	255	565
sharpnose puffer	0	1	45	7

TABLE 3.1-32
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
9-10 June 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	5	20	47-112	25
blue crab	12	5	34-88	152
portunid crab	7	1	21-57	52
stone crab	0	4	16-84	130
squid	0	2	81-222	69
bandtail puffer	0	3	62-102	49
flounder	0	1	100	52
grunt	0	1	49	4
herring	0	1	54	3
mojarra	0	1	41	4

TABLE 3.1-33
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
24-25 June 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	27	4	27-111	322
edible shrimp	0	12	48-101	40
portunid crab	5	1	21-101	128
stone crab	0	2	30-54	63
Spanish sardine	11	4	47-57	42
sharpnose puffer	0	2	58-66	26
bandtail puffer	0	1	60	1

TABLE 3.1-34
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
7-8 July 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	12	41	36-85	106
blue crab	3	38	24-68	265
portunid crab	0	6	38-61	90
stone crab	0	4	20-47	57
squid	0	6	130-190	178
mojarra	0	24	26-48	31
anchovy	0	4	43-48	5
herring	0	3	50-55	9
sea catfish	0 0	2 3	47-50 280-362	5 1589
sharpnose puffer	0	2	44-46	10
bandtail puffer	0	1	34	3
tomtate	0	1	61	6
grunt	1	0	44	2
filefish	1	1	25-32	3
eel	0	1	430	67
lookdown	0	1	33	2
blenny	0	1	43	3
southern stingray	0	1	225	413
sand perch	0	1	74	9
balloonfish	0	1	340	136

TABLE 3.1-35
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
21-22 July 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	6	22	30-85	73
blue crab	4	7	21-60	55
stone crab	0	5	23-37	36
portunid crab	0	2	29-52	24
herring	0	3	53-58	11
sea catfish	0	2	173-215	342
lined seahorse	0	2	145-175	35
anchovy	0	1	46	1
eel	0	1	462	85
harry blenny	0	1	142	62
blenny	0	1	42	2
grunt	0	1	55	4
twospot cardinalfish	0	1	73	10

TABLE 3.1-36
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
7-8 August 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	26	12	34-64	244
edible shrimp	4	2	34-54	12
balloonfish	0	2	260-275	1760
horse-eye jack	0	1	255	435
checkered puffer	0	1	132	99
smooth trunkfish	0	1	155	138
scrawled filefish	1	0	58	4
filefish	1	0	25	2
sargassumfish	1	0	83	28

TABLE 3.1-37
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
27-28 August 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	0	207	17-39	392
blue crab	0	1	39	6
portunid crab	0	4	30-55	55
squid	0	2	140-145	40
grunt	0	18	40-80	101
yellowfin mojarra	0	7	34-75	35
mojarra	0	1	46	1
checkered puffer	0	6	125-195	1300
eel	0	5	340-605	700
sailors choice	0	3	130-170	266
blenny	0	2	54-72	14
sea catfish	0	4	44-280	700
sand perch	0	1	70	8
batfish	0	1	263	400
cowfish	0	1	170	300
porcupinefish	0	1	310	1800
seahorse	0	1	138	13

TABLE 3.1-38
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
2-3 September 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	19	28	38-81	103
blue crab	5	10	36-69	93
stone crab	0	3	20-53	54
squid	0	2	67-78	9
spiny lobster	0	1	182	165
mojarra	0	2	49-60	13
flounder	1	1	198-220	237
grunt	1	1	47-61	10
anchovy	0	1	48	1
filefish	0	1	107	57
checkered puffer	0	1	133	107

TABLE 3.1-39
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
15-16 September 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	6	8	46-88	39
blue crab	1	3	20-48	24
checkered puffer	0	28	145-161	3725
jack	1	4	23-36	4
lane snapper	1	0	104	33
plumed scorpionfish	1	0	107	62
mojarra	0	1	36	2
pipefish	0	1	233	8
puffer	0	1	45	3

TABLE 3.1-40
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
20-21 September 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	4	9	16-71	56
edible shrimp	3	6	42-82	23
sea catfish	1	0	234	215
filefish	0	1	26	2
scrawled cowfish	0	1	205	264
checkered puffer	0	1	215	321

TABLE 3.1-41
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
29-30 September 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	12	20	54-100	68
portunid crab	0	3	53-58	67
squid	0	5	80-130	57
jack	0	9	34-50	19
mojarra	0	8	37-68	33
grunt	0	2	69-75	22
checkered puffer	1	0	150	145
filefish	0	1	287	227
stingray	0	1	200	181
Spanish sardine	0	1	55	5
sand perch	0	1	63	6

TABLE 3.1-42
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
13-14 October 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	39	10	46-80	94
blue crab	8	3	33-62	79
portunid crab	3	5	25-62	133
stone crab	0	1	51	46
horseshoe crab	0	1	162	780
squid	0	2	98-101	11
gray triggerfish	13	1	31-56	72
checkered puffer	0	8	116-165	885
scrawled filefish	5	1	51-136	68
planehead filefish	5	2	28-50	34
tomtate	2	4	80-105	121
mojarra	0	2	42-45	7
	0	1	200	216
saragassumfish	0	3	42-84	67
striped burrfish	0	1	215	482
balloonfish	1	0	45	11
triggerfish	1	0	76	22
mullet	1	1	112-213	188
pipefish	1	0	120	2
Atlantic bumper	0	1	180	96
hairy blenny	0	1	100	23
Atlantic cutlassfish	1	0	640	459

TABLE 3.1-43
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
26-27 October 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	0	2	55-64	4
blue crab	0	1	58	13
stone crab	0	1	24	6
horseshoe crab	0	2	180-194	1894
portunid crab	0	1	58	31
mud crab	0	1	68	96
squid	0	14	60-162	95
mojarras	0	9	42-92	48
checkered puffer	0	2	132-156	176
southern stargazer	0	1	190	202
bigeye	0	1	285	416
flounder	0	1	104	42
Atlantic bumper	0	1	47	4
reef croaker	0	1	69	8
leatherjacket	0	1	71	4
rough scad	0	1	112	22

TABLE 3.1-44
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
4-5 November 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	0	6	43-160	509
stone crab	4	0	20-34	31
speckled crab	0	2	90-105	93
horseshoe crab	0	2	210-220	1476
squid	0	1	850	5
tomtate	8	0	60-98	128
mojarra	0	3	41-55	9
cusk eel	0	3	162-175	146
mullet	0	2	101-103	31
checkered puffer	2	0	140-165	226
plumed scorpionfish	0	2	85-104	77
pipefish	1	2	245-294	39
Atlantic moonfish	0	1	68	7
goby	0	1	58	5
sea catfish	0	1	253	251
stingray	1	0	200	402
lane snapper	1	0	150	88
searobin	1	0	255	337
cardinalfish	1	0	75	13

TABLE 3.1-45
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
13-14 November 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
blue crab	2	2	23-106	87
stone crab	1	1	17-25	11
portunid crab	2	0	19-27	7
mullet	0	5	110-125	147
tomtate	0	2	80-95	40
checkered puffer	0	3	105-190	395
balloonfish	0	2	36-58	27
plumed scorpionfish	1	1	94-118	101
Atlantic cutlassfish	0	2	910-1100	1500
lesser electric ray	0	1	140	275
porgy	0	1	65	10
Atlantic bumper	0	1	195	120
Spanish sardine	0	1	68	7
flounder	0	1	210	184

TABLE 3.1-46
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
25-26 November 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	2	0	38-66	6
blue crab	0	2	52-78	35
portunid crab	2	0	28-46	19
stone crab	0	1	36	16
cobia	0	4	113-163	94
croaker	0	2	241-310	679
pinfish	0	2	48-55	10
planehead filefish	1	0	30	4
fringed filefish	0	1	45	4
gray triggerfish	0	1	80	14
eel	0	1	470	72
flounder	0	1	221	237
blenny	0	1	66	8
sea catfish	0	1	235	223
tomtate	0	1	116	29
southern stargazer	0	1	220	342
checkered puffer	0	1	133	92
leatherjacket	0	1	86	6
Atlantic bumper	0	1	158	61

TABLE 3.1-47
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
10-11 December 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2	Units 3&4		
edible shrimp	1	0	44	4
stone crab	1	0	17	5
portunid crab	4	1	26-79	80
squid	1	2	220-295	218
checkered puffer	0	2	118-124	136
bandtail puffer	0	1	98	34
polka-dot batfish	0	1	220	378
bighead searobin	0	1	172	103

TABLE 3.1-48
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
22-23 December 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
edible shrimp	--	2	65-70	6
stone crab	--	1	18	2
blue crab	--	1	56	11
portunid crab	--	5	31-50	40
Atlantic bumper	--	90	125-145	7473
porkfish	--	5	35-125	137
bandtail puffer	--	5	90-108	358
checkered puffer	--	2	117-145	134
sharpnose puffer	--	1	48	5
tomtate	--	3	58-85	21
sergeant major	--	3	38-125	142
shrimp eel	--	3	394-440	187
lined sole	--	2	54-96	47
spotfin flounder	--	1	180	123
bar jack	--	2	48-62	22
crevalle jack	--	1	275	533
blenny	--	1	67	7
freckled cardinalfish	--	2	36-37	2
two-spot cardinalfish	--	1	45	3
scorpionfish	--	2	95-120	134
sailors choice	--	1	65	7
snook	--	1	430	1350

(continued)

TABLE 3.1-48
(continued)
RESULTS OF IMPINGEMENT AT THE RIVIERA PLANT
22-23 December 1975

Species	Number of Individuals		Range of Standard Lengths(mm)	Weight (gms)
	Units 1&2[1]	Units 3&4		
porcupine fish	--	1	370	1350
scrawled cowfish	--	1	145	116
polka-dot batfish	--	1	215	438
scrawled filefish	--	1	195	143
cocoa damselfish	--	1	49	6

[1]Sample from units 1 & 2 compiled with sample from units 3 & 4

TABLE 3.1-49
NUMBER OF INDIVIDUALS COLLECTED DURING IMPINGEMENT STUDIES,
AND TOTAL PERCENT COMPOSITION, RIVIERA, 1974-1975

SPECIES	13-15 MAR	25-26 APR	29-30 JUL	10-11 AUG	11-12 AUG	26-27 AUG	15-16 SEP	22-23 SEP	7-8 OCT	20-21 OCT	18-19 NOV	4-5 DEC	16-17 DEC	30-31 DEC	13-14 JAN	19-20 JAN	23-24 JAN	28-29 JAN	6-7 FEB	25-26 FEB	4-5 MAR	17-18 MAR	26-27 MAR	3-4 APR
edible shrimp	-	2	5	23	35	13	33	12	26	36	4	2	4	1	3	-	-	-	-	2	-	-	8	-
blue crabs	3	-	9	13	11	20	31	9	409	84	12	8	-	-	1	3	4	8	4	2	-	1	11	2
stone crabs	-	-	4	4	3	4	3	1	3	2	-	2	-	-	1	1	-	-	1	-	-	-	-	1
portunid crabs	-	-	2	1	-	4	7	2	-	135	-	-	-	-	-	1	-	-	-	-	-	-	1	-
horseshoe crabs	-	-	-	2	-	2	1	1	1	2	-	1	-	-	-	-	-	1	-	-	-	3	9	2
spiny lobster	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-
squid	-	39	1	1	15	2	1	-	8	9	-	-	-	1	-	1	-	-	-	-	-	-	-	-
other invertebrates	-	-	-	-	-	-	-	-	24	-	1	1	1	-	1	-	-	3	-	-	-	-	-	1
total invertebrates	4	41	21	44	64	45	78	25	471	268	17	14	5	2	6	7	4	12	5	5	0	4	29	6
herrings, anchovies	-	-	-	1	2	4	-	-	20	4	-	1	-	-	-	-	-	-	-	-	-	-	2	-
pipefishes, seahorses	1	3	-	-	1	-	-	1	5	28	-	1	-	-	-	-	2	3	-	-	-	-	-	-
jacks	3	-	-	-	2	-	1	-	102	9	52	7	6	4	2	-	1	2	-	1	-	-	1	-
snappers	-	-	-	-	-	-	-	-	10	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
mojarras	-	-	-	13	6	4	7	-	324	24	11	2	-	-	-	-	-	-	-	-	-	-	-	-
grunts	1	-	2	-	2	4	-	-	25	1	47	1	-	-	-	-	-	-	2	-	-	-	-	-
drums, croakers	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	1	-	-	-	-	-
mullets	-	-	-	-	1	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
flounders	2	-	-	-	-	-	-	-	24	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-
triggerfishes, filefishes	-	19	-	3	1	2	2	1	42	7	3	-	-	-	-	-	-	-	-	-	-	-	-	-
puffers, porcupinefishes	1	2	1	-	7	6	2	-	48	5	2	-	-	1	2	2	1	-	1	1	1	-	3	3
other fishes	6	4	5	6	5	4	7	8	118	35	11	1	2	3	3	1	1	-	1	2	1	-	8	2
total fishes	14	26	8	23	27	24	19	10	727	113	133	13	8	9	7	3	5	5	5	4	2	0	16	5

CONTINUED ON FOLLOWING PAGE

TABLE 3.1-49
(CONTINUED)
NUMBER OF INDIVIDUALS COLLECTED DURING IMPINGEMENT STUDIES,
AND TOTAL PERCENT COMPOSITION, RIVIERA, 1974-1975

SPECIES	15-16 APR	24-25 APR	28-29 APR	8-9 MAY	12-13 MAY	27-28 MAY	9-10 JUN	24-25 JUN	7-8 JUL	21-22 JUL	7-8 AUG	27-28 AUG	2-3 SEP	15-16 SEP	20-21 SEP	29-30 SEP	13-14 OCT	26-27 OCT	4-5 NOV	13-14 NOV	25-26 NOV	10-11 DEC	22-23 DEC	TOTAL COMPOSITION
edible shrimp	6	-	1	14	-	7	25	12	53	28	6	207	47	14	9	32	49	2	-	-	2	1	2	34.7
blue crabs	5	2	3	2	7	26	17	31	41	11	38	1	15	4	13	-	11	1	6	4	2	-	1	42.5
stone crabs	1	-	5	1	-	8	4	2	4	5	-	-	3	-	-	-	1	1	4	2	1	1	1	3.5
portunid crabs	3	-	-	-	-	4	8	6	6	2	-	4	-	-	-	3	8	1	-	2	2	5	5	10.1
horseshoe crabs	2	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	-	-	-	-	1.7
spiny lobster	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	0.3
squid	-	-	-	1	-	-	2	-	6	-	-	2	2	-	-	5	2	14	1	-	-	3	-	5.5
other invertebrates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	1.7
total invertebrates	17	4	10	19	7	45	56	51	110	46	44	214	68	18	21	40	72	22	15	8	7	10	9	100.0
herrings, anchovies	-	-	-	1	2	-	1	15	7	4	-	-	1	-	-	1	-	-	-	1	-	-	-	3.8
pipefishes, seahorses	1	-	1	-	3	4	-	-	-	2	-	1	-	1	-	-	1	-	3	-	-	-	-	3.5
jacks	-	-	-	-	-	-	-	-	1	-	1	-	-	5	-	9	1	3	1	1	2	-	93	17.7
snappers	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	0.7
mojarras	-	1	-	-	-	-	1	-	24	-	-	8	2	1	-	8	3	9	3	-	-	-	-	25.7
grunts	-	-	-	1	-	-	1	-	2	1	-	21	2	-	-	2	6	-	8	2	1	-	9	8.0
drums, croakers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	0.6
mullet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	5	-	-	-	1.1
flounders	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	1	-	1	1	-	3	2.0
triggerfishes, filefishes	-	-	-	2	11	-	-	-	2	-	2	-	1	-	1	1	28	-	-	-	3	-	1	7.5
puffers, porcupinefishes	3	3	-	2	-	3	3	3	4	-	3	7	1	29	1	1	10	2	2	5	1	3	9	10.5
other fishes	1	4	1	3	-	2	-	-	9	6	2	14	-	1	2	2	5	2	10	6	10	2	16	18.9
total fishes	5	8	2	9	16	9	7	18	49	13	8	51	9	38	4	24	56	18	30	21	20	5	131	100.0

TABLE 3.1-50

DRIFT NETS, NUMBER OF FISHES
AND FISH EGGS COLLECTED,
RIVIERA, 1975

Category	Range of Total Lengths or Egg Diameters (mm)	Dates Sampled and Number of Individuals Collected												Total by Category	Percent Composition by Category
		29-30 JAN	26-27 FEB	27-28 MAR	25-26 APR	29-30 MAY	29-30 JUN	30-31 JUL	27-28 AUG	20-21 SEP	29-30 OCT	24-25 NOV	28-29 DEC		
herrings and anchovies	1.9-16.0	--	8	6	116	39	--	7	17	23	5	--	4	225	31.4
croakers	1.8- 6.2	--	--	8	52	6	--	1	6	1	2	6	--	82	11.4
blennies	1.6- 4.1	--	18	--	1	3	--	4	15	6	8	92	36	183	25.6
triggerfish and filefish	2.2- 4.2	--	2	--	--	10	5	--	1	--	--	2	--	20	2.8
silversides	4.0-11.2	--	--	--	1	17	--	6	--	2	--	6	--	32	4.5
other fishes	1.0-10.1	8	--	2	56	25	15	13	13	22	2	14	4	174	24.3
total fishes	1.0-16.0	8	28	16	226	100	20	31	52	54	17	120	44	716	100.0
fish eggs	0.5- 3.5	320	120	2506	3179	1092	1590	472	2127	468	886	2138	6044	20942	100.0
Flow through the plant (x 1,000,000 gallons)		282	288	370	625	652	664	610	635	628	538	624	561	--	--
Flow through the nets (x 1000 gallons)		58	57	17	25	73	54	63	52	55	32	53	40	--	--
Sample size (%)		0.02	0.02	0.005	0.004	0.01	0.008	0.01	0.008	0.009	0.006	0.008	0.007	--	--

3.2.3 Results and Discussion

Benthic Macroinvertebrates

Typically, the bottom of Lake Worth was inhabited by representative species of three major invertebrate phyla: the Annelida (worms), the Arthropoda (crabs and their relatives) and the Mollusca (snails and bivalves). Other phyla such as Echinodermata, Sipuncula, and Rhynchocoela occurred but were of less importance in terms of the number of representative species (Tables 3.2-1 through 3.2-3). No rare or endangered species and few commercial species were encountered.

Preliminary investigations conducted in 1974 at the Riviera Plant revealed no perceptable thermal plume associated with the offshore discharge for units #3 and #4, but a small, quickly dissipated (<8.0 meters from the discharge structure) plume was detectable for the discharge from the peaking units #1 and #2. A reduction in benthic population densities was found in the discharge region, but diversity appeared to be unaffected.

Since the concluded effects of the thermal discharge on the diversity of the benthic community were based on familial identifications only, the possibility existed that such data was insufficiently sensitive to show any changes in the community. To this end samples were taken during 1975 in the proximity of the intake and discharge of units #1 and #2. Observation of the discharge currents revealed the tendency for the plume to be diverted sharply toward the south during flood tide and to closely

hug the shoreline. During ebb tide the discharge current was less noticeable and appeared to be diverted only slightly to the north.

Based on these observations, the discharge samples were taken at the mouth of the discharge canal to ensure the sample station's location within the plume. The control station was located in the region of the intake structure since the complexities of tidal flow greatly reduced the possibility of the thermal discharge having any effect on the benthic community. The major physical difference between the two stations, other than those unique to the discharge, was water depth, the intake (control) station having approximately twice the water depth as the discharge station during any tidal stage. The sediment of both stations exhibited similar composition of compacted sand, shell hash, detritus and refuse.

The reduction in population density in the discharge region noted in the 1974 study was not evident in 1975 (Table 3.2-3). Diversity of the discharge samples showed a tendency toward an increase although it must be noted that statistical testing with two way analysis of variance revealed no significant difference between stations or months ($\alpha = 0.05$). This trend of statistical insignificance was also found when the total number of species were treated although the intake samples contained almost twice the number of species as the discharge in June (Figure 3.2-5). Both stations showed a decrease in the number of species toward the end of the summer months.

Only diversity and equitability values showed statistically significant differences between stations. A decrease was seen in these values (Figures 3.2-6 and 3.2-7) over the sampling period. Both the mean diversity and the equitability values of the discharge station were lower than at the intake station in every month.

Sediment temperature at different depths react to temperature cycles and trends and as such may be used as an indicator of thermal history in much the same way as the benthic community may indicate biological conditions (Gerchakov, 1973). Sediment temperature at both the intake and discharge were almost identical and followed a similar trend (Figure 3.2-8). Water temperature at the discharge was much warmer although the trend was similar. Since units #1 and #2 are peaking units with only the circulating pumps running at night and the samples were taken during the afternoon, the reason for the apparent difference between the water and sediment temperature becomes obvious. Statistically, the temporal variation in sediment temperature was significant. Thus, the lack of a difference in thermal regime even proximate to the plant cannot be used to account for the significantly different intake and discharge station communities.

In summary, the most immediately apparent differences of depth and current velocity may be more important than thermal regime in accounting for

the differences in the benthic community composition between the discharge and control areas. The proximity of the intake (control) station to the ocean inlet and to the commercial shipping docks may facilitate an increased recruitment, while the higher, constant current velocity at the discharge may inhibit such recruitment and limit community development to those species that are better adapted to high current velocities.

Invertebrate Entrainment

A total of 13 different kinds of organisms were entrained by operation of the Riviera Plant (Table 3.2-4). Of these, 12 kinds were crustaceans or crustacean larvae. The largest individuals entrained were the shrimp larvae (up to 10 mm) but the kind entrained in the largest number were copepods (1-3mm). All of these small organisms are important food sources for small fishes. The biomass represented by the largest number of individuals taken on a single date (59,840) was less than three grams.

The number of entrained invertebrates taken during sampling periods ranged from 11,380 to 59,840 individuals (Table 3.2-4). These numbers can be extrapolated to between 1.5 and 10 million entrained organisms per sampling day. This loss of this number of organisms daily would probably not harm the invertebrate community or commercial fisheries significantly. In most cases, bottom nets captured more individuals than surface nets with generally more captures taking place at night than in the day.

Several species of copepods combined to constitute between 45.2% and 92.1% of the entrained individuals by month and over 73% of the total entrained individuals for the year. Most of these species were planktonic, but a few were benthic species.

Many of the copepod and amphipod species were those usually found in the open sea (neritic) and not in inshore waters. The relative proximity of the Gulf Stream was probably responsible for this. While most of the entrained species were the same ones found in the grab sampling effort, the entrained amphipods were almost entirely different and were composed mainly of the neritic species Hyperia and the encrusting species Caprella and Hemiaegina. Very few of the grab sample amphipod species were entrained. This was generally true of the other kinds of organisms as well, nearly all of the entrained species being planktonic.

Several commercially valuable species were entrained including blue crab larvae (Callinectes spp.), shrimp larvae (Penaeus spp.) and a small number of Florida lobster larvae (Panulirus argus). Inspection of several representative samples revealed an estimated maximum of 33% of the entrained shrimp larvae to be commercially valuable. The greatest number of shrimp larvae were entrained in May and from August to November. The latter period approximates the period when penaeid shrimp larvae stop entering and begin leaving the estuarine nursery grounds (Williams, 1965; Calder, et al., 1974). Greatest blue crab impingement occurred from July to October which also approximates the breeding season of that species (Williams, 1965).

an estimated maximum of 60% of the entrained crab larvae from July to October were blue crab although this percentage was much lower in other months. Lobster larvae were encountered only in May. The percentage of the entrained individuals that survived passage through the plant is not known. A 70% annual survival rate has been suggested as "representative" (Clark and Brownell, 1973).

3.2.4 Diversity and Equitability (EPA, 1973)

Diversity indices are an additional tool for measuring the quality of the environment and the effect of induced stress on the structure of a community of macroinvertebrates. Their use is based on the generally observed phenomenon that undisturbed environments support communities having large numbers of species with no individual species present in overwhelming abundance. If the species in such a community are ranked on the basis of their numerical abundance, there will be relatively few species with large numbers of individuals and large numbers of species represented by only a few individuals. Many forms of stress tend to reduce diversity by making the environment unsuitable for some species or by giving other species a competitive advantage.

There are two components of species diversity: the number of species (species richness) and the distribution of individuals among the species (species eveness). The inclusion of this latter component renders the diversity index independent of sample size.

The Shannon-Weaver index of diversity ($\bar{d}$) (Lloyd, Zar and Karr, 1968) calculates mean diversity and is recommended by the EPA (1973):

$$\bar{d} = \frac{C}{N} \left(N \log_{10} N - \Sigma\, n_i \log_{10} n_i\right)$$

where: $C = 3.321938$ (converts base 10 log to base 2)

N = total number of individuals

n_i = total number of individuals of the ith species.

Mean diversity as calculated above is affected both by species richness and evenness and may range from 0 to 3.321928 log N.

To evaluate the component of diversity due to the distribution of individuals among the species (equitability), compare the calculated $\bar{d}$ with a hypothetical maximum $\bar{d}$ based on an arbitrarily selected distribution. This hypothetical maximum would occur when all species are equally abundant. Since this phenomenon is quite unlikely in nature, Lloyd and Ghelardi (1964) proposed the term "equitability" and compared $\bar{d}$ with a maximum based on the distribution obtained from MacArthur's (1947) "broken stick" model. The MacArthur model results in distribution quite frequently observed in nature--one with a few abundant species and increasing numbers of species represented by only a few individuals. Sample data are not expected to conform to the MacArthur model, since it is only

being used as a measure against which the distribution of abundance is compared. Equitability values may range from zero to one except in rare cases where the distribution in the sample is more equitable than in the MacArthur model.

Equitability is computed by:

$$e = \frac{s'}{s}$$

s = number of taxa in the sample

s'= hypothetical maximum number of taxa in the sample based on a table devised by Lloyd and Ghelardi (1964).

When Wilhm (1970) evaluated diversity indices calculated from data collected by numerous authors, he found that in unpolluted water, $\bar{d}$ was generally less than one. However, data collected from southeastern United States waters by EPA biologists has shown that where degradation is at slight to moderate levels, $\bar{d}$ lacks the sensitivity to demonstrate differences. Equitability, on the contrary, is very sensitive to demonstrate differences. Equitability levels below 0.5 have not been encountered in southeastern waters known to be unaffected by oxygen-demanding wastes and in such waters, e generally ranged from 0.6 to 0.8. Even slight levels of degradation have been found to reduce equitability below 0.5 and generally to a range of 0.0 to 0.3.

3.2 Benthos

3.2.1 Introduction

Macroinvertebrates are animals large enough to be seen by the unaided eye and can be retained by a U.S. Standard No. 30 sieve (28 meshes per inch, 0.595 mm openings ; EPA, 1973). They live at least part of their life cycles within or upon available substrata in a body of water or water transport system.

The major taxonomic groups of marine macroinvertebrates are polychaete worms, molluscs, crustaceans, echinoderms and coelenterates. The major groups found in fresh water are insects, oligochaete worms, molluscs, flatworms, and crustaceans. Estuarine areas, which lie at the interface of marine and riverine habitats, may contain a mixture of the two fauna. Macroinvertebrates may occupy a diverse variety of micro-habitats and substrata within these ecosystems (sand, mud, vascular plants, logs, debris, etc.).

Benthic macroinvertebrates may also occupy virtually all levels of the trophic structure of an ecosystem and include omnivorous, herbivorous, and carnivorous species. They may be deposit or detritus feeders, parasites, scavengers, grazers or predators. As important members of the food web, their well-being is reflected in the well-being of higher forms such as fish (EPA, 1973).

A community of macroinvertebrates in an aquatic ecosystem is very sensitive to external stress. Because of their limited mobility and relatively long life span, their community characteristics are a function of environmental conditions during the recent past. Thus they serve as useful indicators of environmental perturbation (EPA, 1973).

Macroinvertebrate community characteristics are controlled primarily by the substratum (Scott, 1958). Salinity and temperature are also important determinants of macroinvertebrate distribution.

3.2.2 Materials and Methods

Benthic Macroinvertebrates

The collection and analysis of benthic macroinvertebrates was accomplished through the use of materials and methods recommended by Standard Methods (APHA, 1971), Holme and McIntyre (1971), the U.S. Environmental Protection Agency (1973) and NESP (1975).

During the 1974 preliminary study, the benthic macroinvertebrate community around the Cape Canaveral Plant was sampled with an Ekman grab (Figure 3.2-1). This device samples a 6" x 6" (0.0232 m^2) area of the bottom through the use of mechanical jaws which snap shut when triggered by a messenger weight. Samples were taken at four stations; the intake area, the two immediate discharge areas and a control station located along the western shore of Lake Worth 1.0 km south of the plant (Figure 3.2-2).

Three replicate grabs were taken at each station. Samples were preserved in 10% formalin and were sorted by hand and identified to family in the laboratory. Sampling was performed in April, May, August, and October of 1974. Results of all sampling efforts were pooled by station and reported as density of individuals per station.

The 1975 study was modified significantly based on experience gained from the 1974 preliminary study. A Ponar grab having a maximum jaw opening of 9" x 9" (0.05 m^2) was used to take the samples (Figure 3.2-3). Although it operates in much the same way, the Ponar grab is heavier than the Ekman grab and is better suited for sampling sandy substrata (Flannagan, 1970). Samples taken with the Ponar grab show lower coefficience of variation than those taken with the Ekman.

Beginning in March, 1975, three replicate grabs were taken at each of two sampling stations at quarterly intervals (Figure 3.2-4). Sediment temperature was recorded as soon as the sample was "on deck" using a laboratory thermometer. The same instrument was used to measure surface water temperature.

Individual replicate samples were washed through a U.S. Standard #30 mesh sieve to remove fine sand and detritus. Samples were first narcotized for four hours in 6% magnesium chloride ($MgCl_2$) solution, then fixed in 10% buffered formalin for 24-48 hours. After laboratory sorting was done

by hand, specimens were transferred to 70% ethanol for identification to the lowest possible taxon and for storage.

Standing crop biomass was measured by drying the samples at 105°C for four hours, then weighing them on a Mettler H32 analytical balance (EPA, 1973). Computational methods included determination of population density per m^2, Shannon-Weaver index of diversity ($\bar{d}$) and the equitability component (EPA, 1973; NESP, 1975). Diversity and equitability are mathematical indicators used in measuring the quality of the environment (See Section 3.2.4).

Invertebrate Entrainment

The number of invertebrates entrained by operation of the Riviera Plant was estimated by placing two 22.8 cm diameter, 363 micron mesh drift nets in the intake canal for two non-consecutive hours during both day and night (eight net-hours of sampling per 24 hour period). These nets were fitted with General Oceanics Model 2030 flowmeters to calculate the flow of water, in gallons, moving through the nets. One drift net was fixed at one-half meter depth while the other was fixed at one-half meter above the bottom of the intake canal. Sampling was performed monthly from January to December, 1975. In the laboratory, the invertebrate types in large samples were counted under a dissecting microscope by taking aliquots of the sample and extrapolating that number to determine the count for the entire sample. In small samples, every organism was counted.

3.2.5 Conclusions

1. Compared with the intake area, the macroinvertebrate density of the discharge area of the Riviera Plant was increased while diversity was decreased. None of these differences were statistically significant, however.

2. No statistically significant difference was found in the temperature of intake and discharge areas. It was, therefore, concluded that any differences between these areas was probably due to water depth and current velocity rather than temperature.

3. Copepods constituted 73% of all invertebrates taken in dirft net entrainment studies. Some commercial species of crabs and shrimps were entrained by the plant but not in exceptional numbers. Entrainment ranged from 1.5 to 10 million individuals per sampling day. These entrainment rates are not considered to be detrimental to the invertebrate community or to commercial fisheries.

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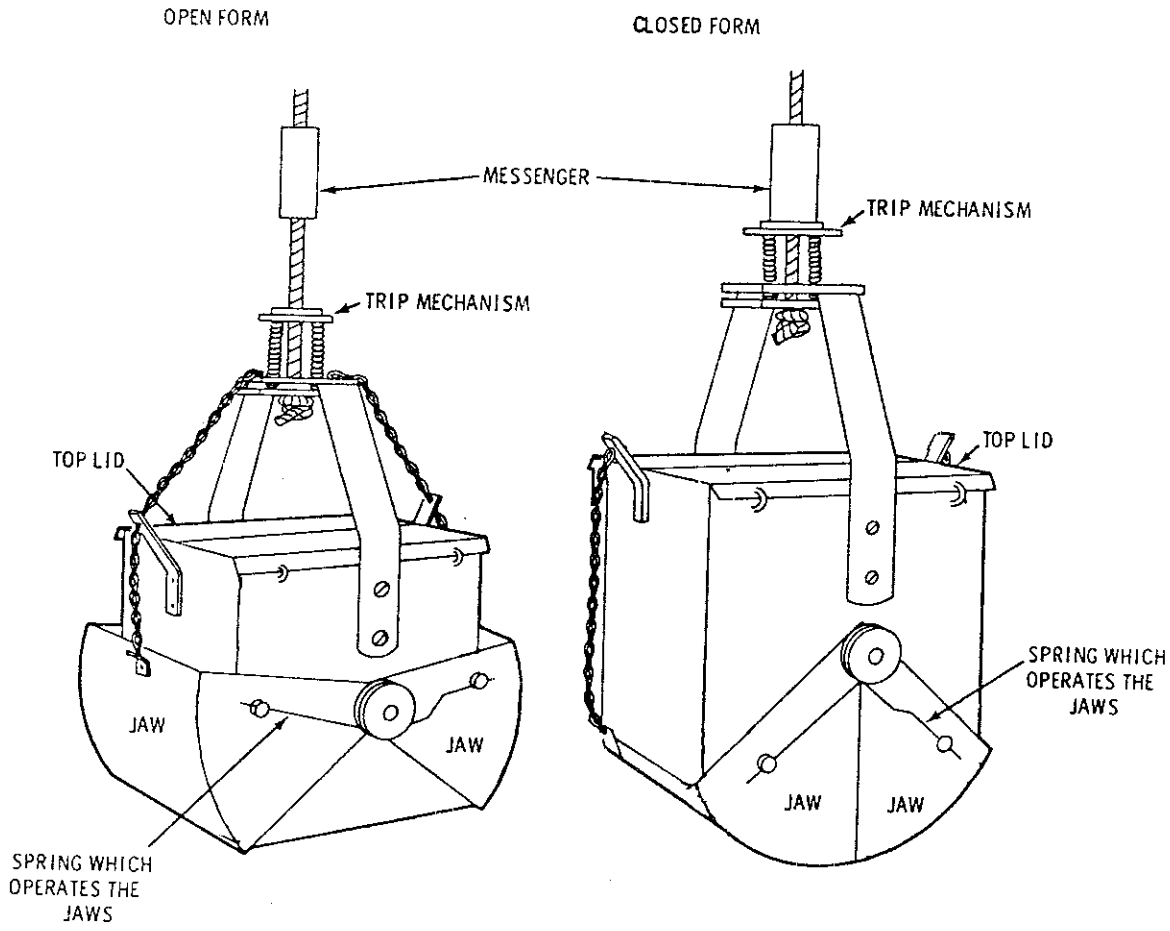
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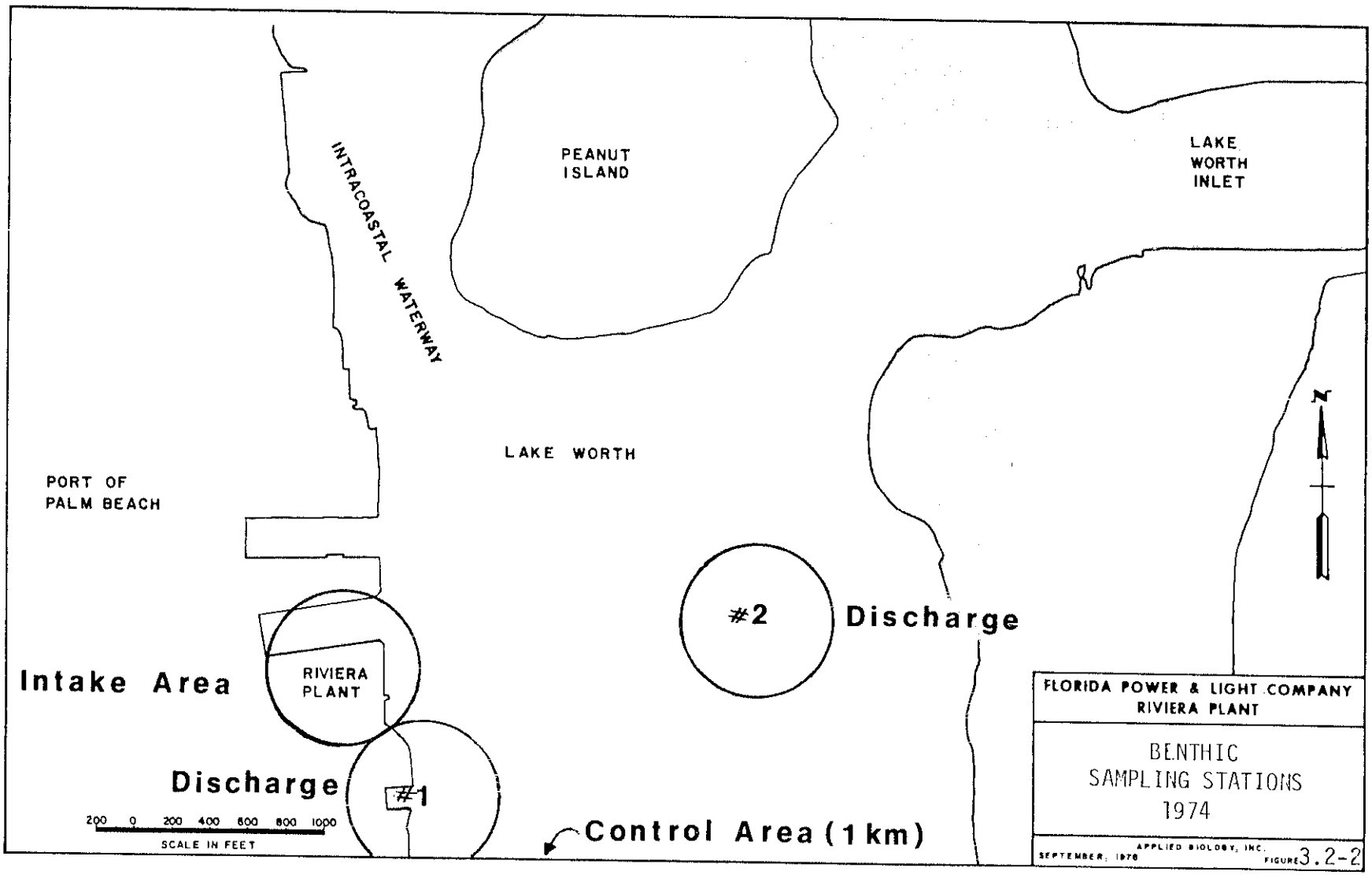


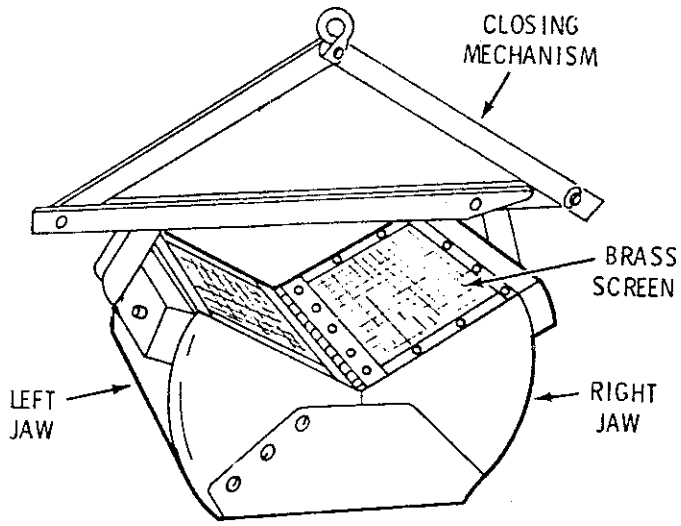
FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

EKMAN GRAB

APPLIED BIOLOGY, INC.
SEPTEMBER, 1976

FIGURE 3.2-1

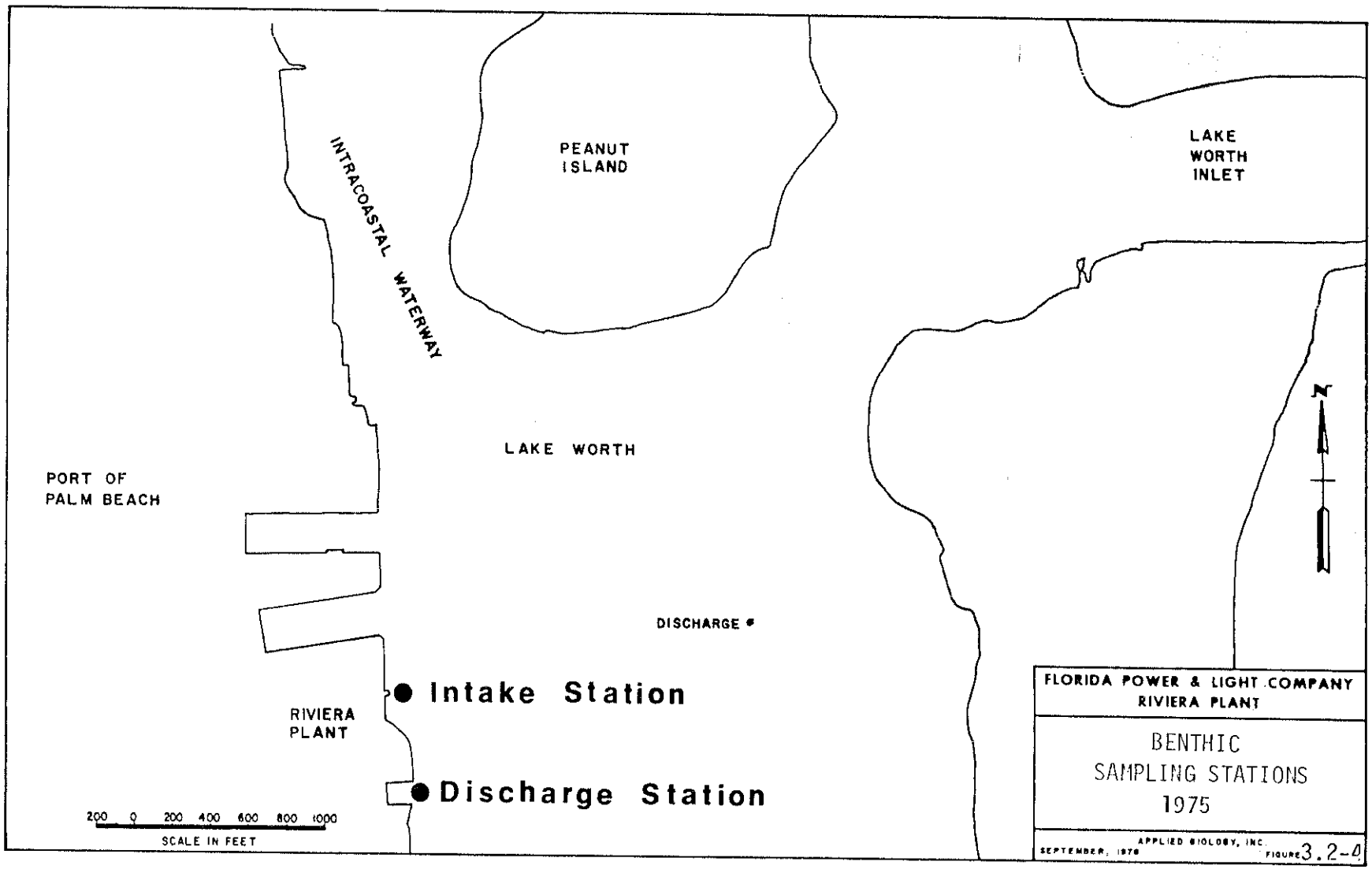

INTRACOASTAL WATERWAY
PEANUT ISLAND
LAKE WORTH INLET
LAKE WORTH
PORT OF PALM BEACH
RIVIERA PLANT
Intake Area
Discharge
#1
#2
Discharge
Control Area (1 km)
200 0 200 400 600 800 1000
SCALE IN FEET
N
FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT
BENTHIC
SAMPLING STATIONS
1974
APPLIED BIOLOGY, INC.
SEPTEMBER, 1976
FIGURE 3.2-2

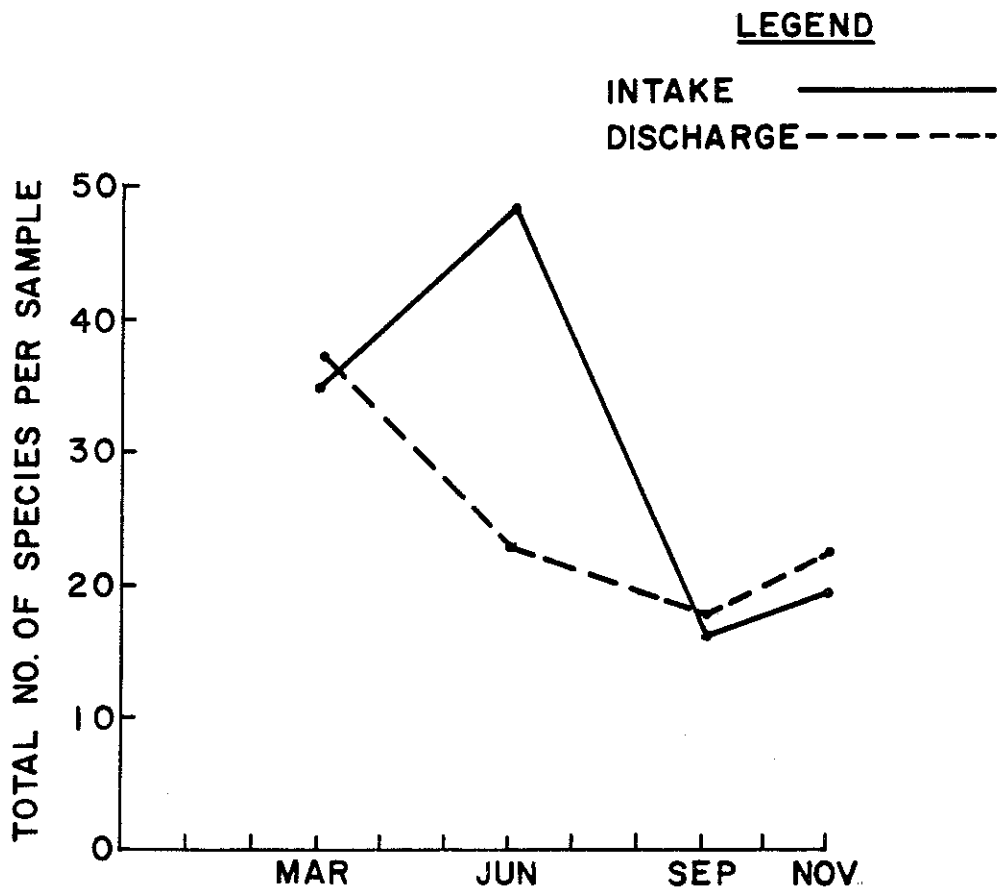


FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

PONAR GRAB

APPLIED BIOLOGY, INC.
SEPTEMBER, 1976
FIGURE 3.2-3

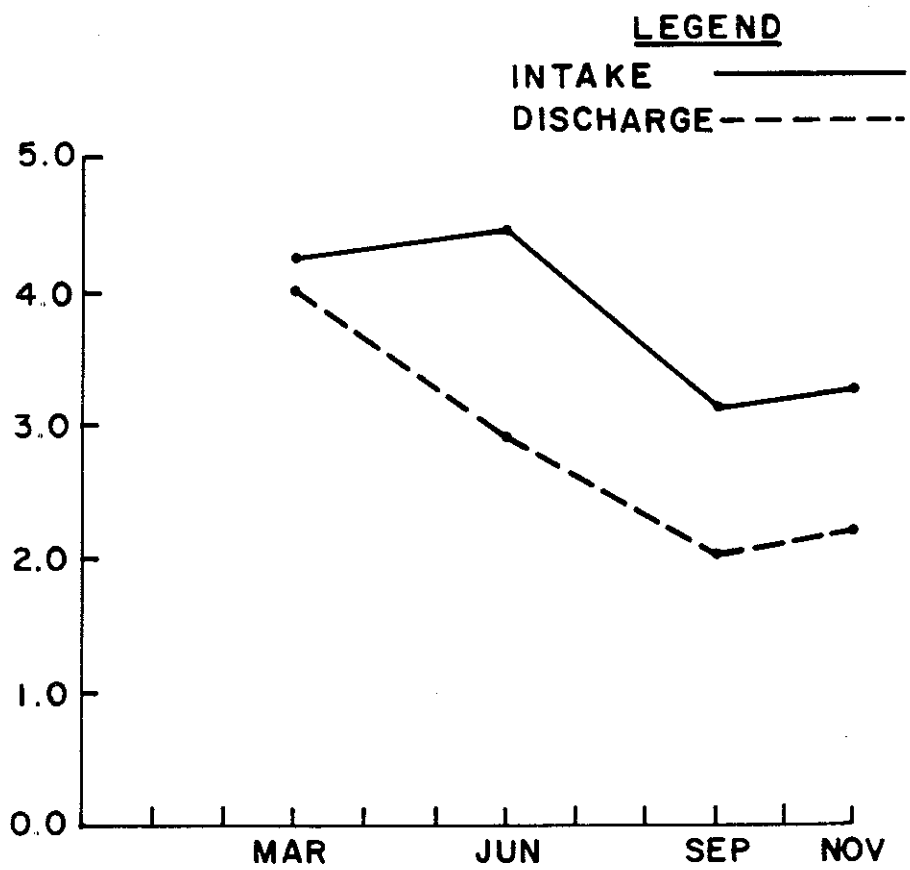

PEANUT
ISLAND
INTRACOASTAL WATERWAY
LAKE
WORTH
INLET
LAKE WORTH
PORT OF
PALM BEACH
DISCHARGE
Intake Station
RIVIERA
PLANT
Discharge Station
200 0 200 400 600 800 1000
SCALE IN FEET
N
FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT
BENTHIC
SAMPLING STATIONS
1975
APPLIED BIOLOGY, INC.
SEPTEMBER, 1976
FIGURE 3.2-4



FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

SEASONAL CHANGES IN TOTAL NUMBER OF BENTHIC MACROINVERTEBRATE SPECIES 1975

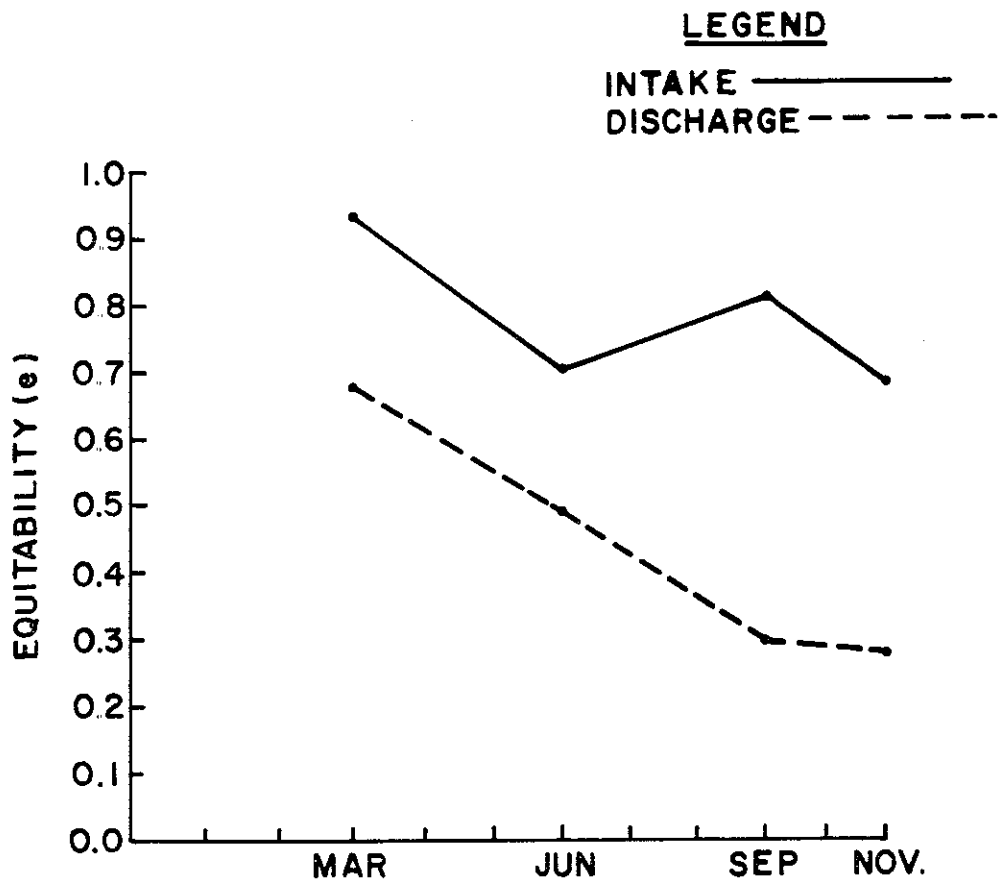
APPLIED BIOLOGY, INC
SEPTEMBER, 1976
FIGURE 3.2-5



FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

COMPARISON OF DIVERSITY INDICES
AT BENTHIC MARCOINVERTEBRATE
SAMPLING STATIONS
1975

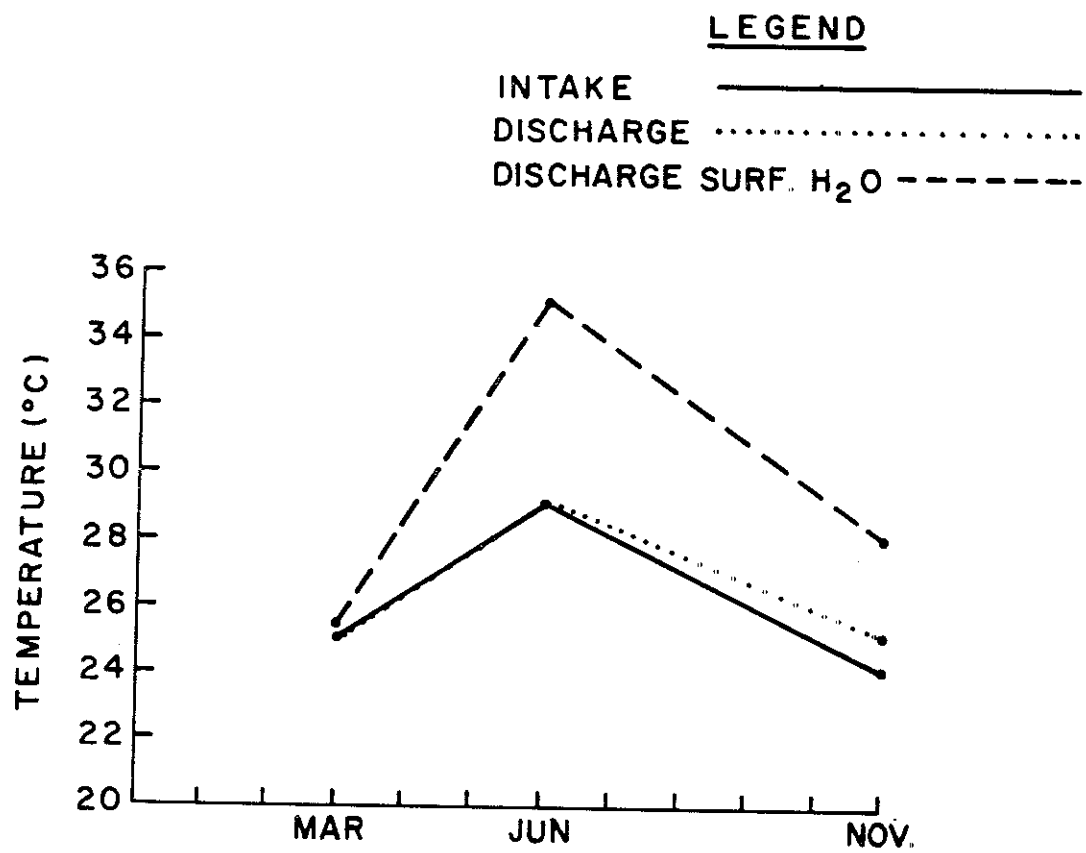
APPLIED BIOLOGY, INC.
SEPTEMBER, 1976 FIGURE 3.2-6



FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

COMPARISON OF EQUITABILITY VALUES
AT BENTHIC MACROINVERTEBRATE
SAMPLING STATIONS
1975

APPLIED BIOLOGY, INC.
SEPTEMBER, 1976 FIGURE 3.2-7



FLORIDA POWER & LIGHT COMPANY
RIVIERA PLANT

COMPARISON OF SEDIMENT TEMPERATURES AND SURFACE WATER TEMPERATURES AT BENTHIC MACROINVERTEBRATE SAMPLING STATIONS 1975

APPLIED BIOLOGY, INC
SEPTEMBER, 1976
FIGURE 3.2-8

TABLE 3.2-1
RESULTS OF BENTHIC MACROINVERTEBRATE
SAMPLING PROGRAM
RIVIERA PLANT, 1974

CLASS	FAMILY	INTAKE	DISCHARGE #1	DISCHARGE #2	CONTROL
Polychaeta (marine worms)	Aricidae	1	4	9	10
	Cirratulidae	1	-	1	-
	Eunicidae	5	4	-	4
	Flabelliferidae	1	3	2	2
	Maldanidae	1	2	-	-
	Nereidae	3	4	7	7
Phylum Annelida Subtotal		12	17	19	23
Gastropoda (snails)	Atyidae	1	2	-	4
	Bullidae	-	5	-	1
	Caecidae	2	17	-	4
	Mitridae	-	2	-	-
	Olividae	12	6	4	14
	Retusidae	-	-	1	2
Pelecypoda (bivalves)	Lyonsiidae	-	18	-	-
	Mytilidae	-	1	-	-
	Solemyacidae	16	2	1	7
	Tellinidae	21	10	12	52
	Veneridae	1	6	-	-
Phylum Mollusca Subtotal		54	69	18	84
Crustacea					
mysids	Mysidae	3	3	1	-
cumaceans	Diastylidae	-	-	-	1
tanaids	Tanaidae	46	64	1	2
isopods	Anthuridae	5	11	-	41
amphipods	Aoridae	123	613	7	275

Table 3.2-1
(continued)

CLASS	FAMILY	INTAKE	DISCHARGE #1	DISCHARGE #2	CONTROL
Crustacea					
amphipods	Caprellidae	-	1	2	-
	Corophiidae	5	74	-	79
	Gammaridae	4	41	20	27
	Lysianassidae	-	-	-	2
crabs	Portunidae	1	3	-	-
	Xanthidae	9	5	-	-
Phylum Arthropoda Subtotal		196	815	31	427
Total Individuals		261	901	68	534
Total Number of Grabs		12	21	12	12
Total Area Sampled (m^2)		0.279	0.488	0.279	0.279
Individuals /m^2		935	1846	244	1914

TABLE 3.2-2

RESULTS OF BENTHIC SAMPLING AT THE INTAKE
RIVIERA PLANT, 1975

Species	March	June	September	December
Class Anthozoa				
sea anemones *Actinothoe* sp.	-	6	-	-
Phylum Rhynchocoela				
nemertines	4	18	-	-
Phylum Nematoda				
nematodes	30	30	-	-
Class Polychaeta				
worms *Glycera americana*	17	24	-	6
Glycera dibranchiata	1	-	-	-
Axiothella mucosa	8	36	-	6
Lepidametria commensalis	2	3	-	-
Megalomma bioculatum	3	-	-	-
Fabricia sp.	27	18	-	-
Branchiomma nigromaculata	2	-	-	-
Chone duneri	7	-	-	-
Tharyx sp.	6	18	-	-
Scoloplos rubra	9	30	-	6
Thelepus setosus	28	-	-	-
Platynereis dumerilli	6	6	-	-
Polydora sp.	4	6	-	-
Syllidae sp. A.	2	-	-	-
Syllidae sp. B.	3	-	-	-
Nerine agilis	4	6	-	-
Prionospio heterobranchia	3	30	-	18
Pectinaria gouldii	3	-	-	-
Lumbrineris sp.	14	114	-	-
Onuphidae larvae	1	-	-	-
Capitella capitata	23	12	12	6
Eunice filamentosa	2	42	-	-
Stauronereis sp.	1	-	-	-
Sabella sp.	1	-	-	-
Polyophthalmus pictus	-	12	-	6
Class Pelecypoda				
bivalves *Solemya occidentalis*	100	64	-	-
Glysymeris undata	5	-	-	-
Tellina sp.	4	36	6	-
Macoma sp.	19	12	-	-
Cymatoica undulata	4	-	-	-
Chione intrapurpurea	7	18	6	-

TABLE 3.2-2

RESULTS OF BENTHIC SAMPLING AT THE INTAKE
RIVIERA PLANT, 1975
(CONTINUED)

Species		March	June	September	December
	Chione cancellata	5	64	18	18
	Brachidontes exustus	1	-	-	-
	Ervilia rostratula	12	18	-	6
	Gemma gemma	5	36	-	-
	Lyonsia hyalina floridana	1	-	-	-
	Crassinella martinicensis	1	12	-	-
	Nuculana sp.	-	24	-	-
	Circomphalus callimorphus	-	6	-	-
	Cardiomya costellata	-	6	-	-
	Parastarte triquetra	-	-	6	-
Class Gastropoda					
snails	*Nassarius albus*	3	-	-	-
	Caecum pulchellum	2	-	12	6
	Acteocina conaliculata	5	-	12	18
	Volvulella recta	2	-	-	-
	Atys caribaea	-	12	-	-
	Bulla occidentalis	-	-	18	12
	Haminoea antillarum	1	6	-	-
	Olivella floralia	6	72	24	6
	Cerithium muscarum	1	12	-	-
	Cardulus tetrodon	-	6	-	-
	Dentalium laqueatum	1	-	-	-
Phylum Sipuncula					
sipunculids	*Aspidisiphon* sp.	43	84	18	12
	Phascolion sp.	9	6	-	-
Class Crustacea					
ostracods	*Sarsiella americana*	23	414	-	-
	Cylindroleberis mariae	1	78	-	-
barnacles	*Balanus eburneus*	3	-	-	-
cumeaceans	*Cyclaspis varians*	1	30	-	-
tanaids	*Leptochelia savignyi*	10	72	6	36
	Leptochelia rapax	-	-	-	6
isopods	*Xenanthura brevitelson*	4	6	6	12
amphipods	*Cerapus* sp.	1	156	108	144
	Microdeutopus gryllotalpa	2	-	-	-
	Leucothoe spinicarpa	1	-	-	-
	Bathyporeia sp.	-	42	-	-

TABLE 3.2-2

RESULTS OF BENTHIC SAMPLING AT THE INTAKE
RIVIERA PLANT, 1975
(CONTINUED)

Species	March	June	September	December
Lysianopsis alba	-	6	-	-
Corophium tuberculatum	-	-	6	6
mysids *Mysidopsis bigelowi*	-	6	-	-
shrimp *Penaeus* sp. (post larvae)	-	-	-	12
Palaemonetes	1	6	6	-
crabs Paguridae	1	-	-	-
Rhithropenopeus harrisii	2	-	-	-
Class Ophiuroidea				
brittle stars *Ophiophragmus filograneus*	1	-	-	-
Phylum Chordata				
lancelets *Amphioxus* sp.	6	-	3	-
Mean density/m^2	3170	10755	1679	2151
Total species	35	48	16	19
Diversity ($\bar{d}$)	4.23	4.48	3.16	3.24
Equitability (e)	0.93	0.69	0.81	0.68

TABLE 3.2-3

RESULTS OF BENTHIC SAMPLING AT THE INTAKE
RIVIERA PLANT, 1975

Species	March	June	September	December
Class Anthozoa				
sea anemones *Actinithoe* sp.	-	-	-	6
Phylum Rhynchocoela				
nemertines	5	-	-	-
Phylum Nematoda				
nematodes	30	36	186	144
Class Polychaeta				
worms *Glycera americana*	4	-	-	-
Axiothella mucosa	7	9	-	-
Lepidametria commensalis	2	-	6	-
Chone duneri	1	-	-	-
Tharyx sp.	-	-	-	6
Scoloplos rubra	29	-	-	-
Thelepus setosus	4	-	12	-
Syllidae sp. A	3	-	36	18
Syllidae sp. B	-	-	-	42
Nerine agilis	3	-	-	-
Prionospio heterobranchia	7	-	-	-
Pectinaria gouldii	1	-	-	-
Lumbrineris sp.	7	18	-	18
Capitella capitata	2	-	336	273
Eunice filamentosa	3	-	-	-
Podarke obscura	1	-	-	-
Polyophthalmus pictus	3	-	-	-
Sphaerodorudae	-	-	12	42
Branchiomma nigromaculata			6	6
Eteone sp.	-	-	-	6
Class Pelecypoda				
bivalves *Solemya occidentalis*	29	27	-	-
Glysymeris undata	4	9	-	-
Tellina sp.	8	18	-	-
Macoma sp.	22	-	-	-
Chione intrapurpurea	8	-	-	-
Chinoe cancellata	15	72	-	-
Ervilia rostratula	55	-	-	-
Gemma gemma	21	-	-	-
Togelus divisus	3	-	-	-
Parastarte triquetra	1	18	-	-

TABLE 3.2-3

RESULTS OF BENTHIC SAMPLING AT THE INTAKE
RIVIERA PLANT, 1975
(CONTINUED)

Species		March	June	September	December
Class Gastropoda					
snails	*Caecum pulchellum*	4	702	18	3
	Actoecina canaliculata	1	-	-	-
	Haminoea antillarum	-	-	-	12
	Olivella floralia	25	189	-	-
	Cerithium muscarum	2	27	-	-
	Bulla occidentalis	-	-	30	-
	Polinices lacteus	2	-	-	-
	Mitrella lunata	-	18	-	-
	Cerodrillia perryae	1	-	-	-
	Ishniochiton sp.	1	-	-	-
Phylum Sipuncula					
sipunculids	*Aspidisiphon* sp.	16	-	-	-
	Phascolion sp.	4	-	-	-
Class Arachnida					
sea spiders		-	-	6	12
Class Crustacea					
ostracods	*Sarsiella americana*	138	45	-	-
	Cylindroleberis mariae	3	18	-	-
copepods	*Harpacticus* sp.	1	-	-	-
cumaceans	*Cyclaspis varians*	29	18	-	-
	Oxyurostylis smithi	1	-	-	-
tanaids	*Leptochelia savignyi*	172	135	84	306
	Leptochelia rapax	-	-	36	30
isopods	*Xenanthura brevitelson*	13	9	6	12
amphipods	*Cerapus* sp.	15	18	1356	1812
	Microdeutopus gryllotalpa	4	-	-	-
	Leucothoe spinicarpa	7	18	-	-
	Bathyporeia sp.	10	9	-	-
	Lysianopsis alba	1	-	-	-
	Corophium tuberculatum	1	27	48	90
	Ampelisca vadorum	1	-	-	-
	Monoculodes edwardsi	1	9	-	-
	Caprellidae	1	-	-	-
	Melita fresnelli	1	-	24	12
shrimp	*Palaemonetes* sp.	1	-	-	-
crabs	Paguridae	-	-	-	6
	Portunidae	-	-	-	6
	Rhithropanopeus harrisii	1	-	6	42

TABLE 3.2-3

RESULTS OF BENTHIC SAMPLING AT THE INTAKE
RIVIERA PLANT, 1975
(CONTINUED)

Species	March	June	September	December
Class Holothuroidea sea cucumbers *Leptosynapta* sp.	1	9	-	-
Phylum Chordata lancelets *Amphioxus* sp.	3	-	-	-
Mean density/m^2	4660	9170	13887	19981
Total species	37	23	17	22
Diversity ($\bar{d}$)	4.05	2.93	2.04	2.20
Equitability (e)	0.67	0.48	0.29	0.27

TABLE 3.2-4

RESULTS OF INVERTEBRATE DRIFT NET SAMPLING
RIVIERA PLANT, 1975

Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Worms	---	---	---	---	---	---	---	40	---	---	40	---
Ostracods	---	---	220	880	---	---	---	---	---	---	---	---
Cladocerans		2640	7700	---	---	---	---	2200	---	---	660	3080
Copepods	27,280	14,960	19,360	27,280	13,200	10,780	12,320	18,920	15,400	49,280	36,960	36,960
Cumaceans	---	40	80	40	---	---	---	---	---	40	---	40
Tanaids	40	80	---	---	---	---	---	40	---	---	---	40
Isopods	---	---	---	---	---	---	---	---	---	---	---	40
Amphipods	1260	1680	80	440	200	40	---	---	200	120	160	1120
Mysids	---	80	---	---	---	---	---	---	---	---	---	40
Shrimp larvae	960	1280	960	880	5520	360	440	1040	3320	1400	1120	840
Crab larvae	2640	3080	6160	3640	2640	80	4620	4400	14,960	7920	880	2280
Lobster larvae	---	---	---	---	80	---	---	---	---	---	---	---
Arrow worms	80	120	400	600	2480	120	80	240	200	1080	320	---
TOTAL	32,260	23,960	34,960	33,760	24,120	11,380	17,460	26,880	34,080	59,840	40,140	44,440
Flow Through Plant (x 1,000,000 gallons)	282	288.	370	625	652	664	610	635	628	538	624	561
Flow Through Nets (x 1000 gallons)	58	57	17	25	73	54	63	52	55	32	32	40
Sample Size (%)	0.02	0.02	0.005	0.004	0.01	0.008	0.01	0.008	0.009	0.006	0.008	0.007

C. FDEP SITING COORDINATION OFFICE

FDEP-SCO-1. To what extent has FPL evaluated the feasibility of processes to capture CO_2 from any of its plants in Florida? Provide any reviews conducted or plans to conduct assessments regarding the availability of deep confined geological strata within a reasonable distance (e.g. <200 kilometers) of the plant site for possible future CO_2 storage.

RESPONSE: As presented in the SCA in Chapter 4.0 and in detail in Appendix 10.8, "Climate Change and FPL's Greenhouse Gas Strategy", conversion of the existing generating units at the Riviera Plant to a modern, highly efficient, lower-emission next-generation clean energy center using the latest combined cycle technology, with the use of natural gas as the primary fuel, will reduce carbon emissions as carbon dioxide (CO_2) in two ways. First, the maximum CO_2 emission rate with RBEC will be about one-half the maximum CO_2 emission rate of the existing Plant. By maximizing the megawatt output per unit of fuel consumed, the carbon emissions are minimized for each megawatt generated. Second, RBEC will be among the most efficient natural gas-fired generating units in FPL's system. As a result, RBEC will displace generation that would otherwise be produced by less efficient units in FPL's system, thereby reducing system CO_2 emissions. This is a significant reduction in carbon emissions from FPL's system as a direct result of the RBEC.

FDEP-SCO-2. The Siting Office requests that FPL make a good faith effort to comply with the new statutory requirements, including those below from 403.5115(6), F.S:

(a) A good faith effort shall be made by the applicant to provide direct written notice of the filing of an application for certification by United States mail or hand delivery no later than 45 days after filing of the application to all local landowners whose property, as noted in the most recent local government tax records, and residences are located within the following distances of the proposed project:

1. Three miles of the proposed main site boundaries of the proposed electrical power plant.
2. One-quarter mile for a transmission line corridor that only includes a transmission line as defined by s. 403.522(22).
3. One-quarter mile for all other linear associated facilities extending away from the main site boundary except for a transmission line corridor that includes a transmission line that operates below those defined by s. 403.522(22).

(b) No later than 60 days from the filing of an application for certification, the applicant shall file a list with the department's Siting Coordination Office of landowners and residences that were notified.

RESPONSE: FPL provided direct written notice of the filing of the Site Certification Application by United States mail on March 13, 2009, to 58,516 local landowners and residences located within 3 miles of the proposed main site boundaries of the proposed electrical power plant. On March 26, 2009, FPL submitted to the Department's Siting Coordination Office a list of landowners and residences that were notified.

FDEP-SCO-3. Please confirm that all state and local permits/authorizations for the existing Riviera Plant are included in Appendices 10.3 through 10.11 of the Site Certification Application.

RESPONSE: Attachment FDEP-SCO-3 contains the following additional local permits/authorizations for the existing Riviera Plant, which were inadvertently not included with the filing of the Site Certification Application:

- Annual Storage Tank Registration (FDEP)
- Hazardous Material Certificate of Registration (DOT)
- Operating Permits for Lift station #1, Lift station #2, & Lift station #3 (Dept. of Health)
- Industrial Waste Operating Permit (Dept. of Health)
- Hazardous Waste Generator Operating Permit (Dept. of Health)

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
STORAGE TANK REGISTRATION PLACARD

2008-2009

FACILITY ID: 8630532

PLACARD NO: 305237

PLACARD ISSUED: 06/18/2008
PLACARD EXPIRES: 06/30/2009

FACILITY: FP & L RIVIERA BEACH POWER PLT
200-300 BROADWAY
RIVIERA BEACH FL 33404 - 7704
PALM BEACH COUNTY

TANK SYSTEMS REGISTERED: 10

FACILITY TYPE: Bulk Product Terminal Facility

STCM ACCOUNT: 35629

ACCOUNT OWNER: FL POWER & LIGHT CO-POWER GEN DIV

Mary Jean Yon, Director
Division of Waste Management
Department of Environmental Protection

FLORIDA DEPARTMENT OF HEALTH

STATE OF FLORIDA
DEPARTMENT OF HEALTH

230171

OPERATING PERMIT
INDUSTRIAL WASTE

Permit Number 50-70-00241

PALM BEACH COUNTY HEALTH DEPARTMENT

Phone 561-355-3070

Issued To: Fl. Power & Light Company
200-300 Broadway

Riviera Beach FL 33404

Fee $ 325.00
Issued 12/01/08

Mailed To: Fl. Power & Light Company
Gary Mohcrief
200 - 300 Broadway
Riviera Beach FL 33404

Expires 12/31/09
Audit Control No. I035490

Notice: This Permit is valid as of the issue date and will expire at 12:00am on the expiration date. Failure to comply with all regulations pertaining to this program could result in the Operating Permit being revoked and service terminated..

DISPLAY IN A CONSPICUOUS PLACE

DH-4114 (5/08)

FLORIDA DEPARTMENT OF HEALTH

STATE OF FLORIDA
DEPARTMENT OF HEALTH

211497

OPERATING PERMIT
HAZARDOUS WASTE GENERATOR

Permit Number 50-73-00828

PALM BEACH COUNTY HEALTH DEPARTMENT

Phone 561-355-3070

Issued To: Florida Power & Light
200-300 Broadway

Riviera Beach, FL 33404

Fee $ 65.00
Issued 09/03/2008
Zone 02

Mailed To: Florida Power & Light
200-300 Broadway
ATTN: Gary Moncrief
Riviera Beach, FL 33404

Expires 12/31/2009
Audit Control No. I036528

Notice: This Permit is valid as of the issue date and will expire at 12:00am on the expiration date. Failure to comply with all regulations pertaining to this program could result in the Operating Permit being revoked and service terminated..

DISPLAY IN A CONSPICUOUS PLACE

FLORIDA DEPARTMENT OF HEALTH

STATE OF FLORIDA
DEPARTMENT OF HEALTH

231811

OPERATING PERMIT
LIFT STATION

PALM BEACH COUNTY HEALTH DEPARTMENT

Permit Number 50-LS-04362

Phone 561-355-3070

Issued To: Riviera Beach Power Plant LS #1
200-300 Broadway

Rlviera Beach, FL 33404

Fee $ 200.00
Issued 03/04/09

Mailed To: Riviera Beach Power Plant LS #1
200-300 Broadway

Riviera Beach, FL 33404

Expires 3/31/2010
Audit Control No. I040544

Notice: This Permit is valid as of the issue date and will expire at 12:00am on the expiration date. Failure to comply with all regulations pertaining to this program could result in the Operating Permit being revoked and service terminated..

DISPLAY IN A CONSPICUOUS PLACE

FLORIDA DEPARTMENT OF HEALTH

STATE OF FLORIDA
DEPARTMENT OF HEALTH

231810

OPERATING PERMIT
LIFT STATION

PALM BEACH COUNTY HEALTH DEPARTMENT

Permit Number 50-LS-04363

Phone 561-355-3070

Issued To: Riviera Beach Power Plant LS #2
200-300 Broadway

Riviera Beach, FL 33404

Fee $ 200.00
Issued 03/04/09

Mailed To: Riviera Beach Power Plant LS #2
200-300 Broadway

Riviera Beach, FL 33404

Expires 3/31/2010
Audit Control No. I040546

Notice: This Permit is valid as of the issue date and will expire at 12:00am on the expiration date. Failure to comply with all regulations pertaining to this program could result in the Operating Permit being revoked and service terminated..

DISPLAY IN A CONSPICUOUS PLACE

FLORIDA DEPARTMENT OF HEALTH

STATE OF FLORIDA
DEPARTMENT OF HEALTH

231809

OPERATING PERMIT
LIFT STATION

PALM BEACH COUNTY HEALTH DEPARTMENT

Permit Number 50-LS-04364

Phone 561-355-3070

Issued To: Riviera Beach Power Plant LS #3
200-300 Broadway

Riviera Beach, FL 33404

Fee $ 200.00
Issued 03/04/09

Mailed To: Riviera Beach Power Plant LS #3
200-300 Broadway

Riviera Beach, FL 33404

Expires 3/31/2010
Audit Control No. I040548

Notice: This Permit is valid as of the issue date and will expire at 12:00am on the expiration date. Failure to comply with all regulations pertaining to this program could result in the Operating Permit being revoked and service terminated..

DISPLAY IN A CONSPICUOUS PLACE

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION FOR REGISTRATION YEAR(S) 2008-2009

Registrant: FLORIDA POWER & LIGHT COMPANY
Attn: TOMEY TUTTLE
700 UNIVERSE BLVD JES/JB
JUNO BEACH, FL 33408-0420

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CFR Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S.C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 062608 552 006Q Issued: 06/26/2008 Expires: 06/30/2009

Record Keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with PHMSA; and
(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, PHH-62, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, 1200 New Jersey Avenue, SE, Washington, DC 20590, telephone (202) 366-4109.

D. CITY OF RIVIERA BEACH

CRB-1. All lights shall be shielded in such a way as to direct the lighting toward the earth's surface and away from reflective surfaces.

RESPONSE: Comment acknowledged.

CRB-2. Light fixtures or lamps shall be shielded/shaded in such a manner as to direct incident rays away from all adjacent properties.

RESPONSE: Comment acknowledged.

CRB-3. Facilities which may require floodlighting may not arrange the lighting in such a way that lighting will be directed toward roadways, onto property or into the night sky.

RESPONSE: Comment acknowledged.

CRB-4. All fixtures must meet the City's building code requirements.

RESPONSE: Comment acknowledged.

CRB-5. A Storm Water Pollution Plan must be submitted and the energy center must comply with all storm water management requirements imposed by the City.

RESPONSE: FPL will submit the Storm Water Pollution Plan to the City 60 days prior to start of construction of RBEC.

CRB-6. The City's Utility District shall have full access to the site to conduct periodic inspections to ensure compliance with the District's regulations.

RESPONSE: FPL will provide the necessary access to the City of Riviera Beach's Utility District to inspect any connections to the City's municipal water systems.

E. DEPARTMENT OF STATE

DOS – 1. A review of the application indicates that the immediate FPL Riviera Beach Energy Center (RBEC) property, including an area of potential effect was subjected to a limited level of cultural resource review in November 2008 by Janus Research of Tampa, Florida for Golder Associates. We note that no significant cultural resources (archaeological sites, buildings or structures) were identified within the RBEC, but the review did not appear to include the construction parking area west of US 1.

It is the opinion of this agency and we concur with the findings of Janus Research that it is unlikely that significant cultural resources will be encountered within the RBEC. However, the construction parking area was not investigated and the area of potential effect evaluation did not address indirect affects – such as noise, lights and emissions - to cultural resources within at least a half-radius from the RBEC site; or possible deeply buried cultural deposits within the plant site that the standard archaeological field methodology will not discover.

We request that the applicant address any potential indirect affects and historic properties or properties otherwise of significance for review by this agency; and develop and present a unexpected cultural resources discoveries training plan for demolition and construction contractors and project managers for review and approval by this agency.

RESPONSE: With the assistance of Golder/Janus Research, FPL has conducted an indirect effects evaluation for the RBEC Project. The methodology in conducting this evaluation was coordinated with DHR and consisted of two phases: 1) Janus Research conducted a field investigation that evaluated the potentially eligible, eligible, or National Register-listed buildings within a 1/2-mile radius of the RBEC site boundaries, 2) Janus Research with the assistance of Golder and FPL evaluated the potential affects (i.e., such as noise, lights and emissions) of the RBEC project to the identified buildings. The results of the evaluation determined that no adverse impacts are expected to affect the 13 potentially eligible, eligible, or National Register-listed resources identified within the 1/2-mile radius of the RBEC site. The findings of the indirect effects evaluation (e.g., field notes, photos, and conclusions) were also submitted separately to DHR on April 23, 2009, for review and determination and are included as Attachment DOS-1.

An Unanticipated Discovery Plan and Contractor Training will be prepared in coordination with DHR prior to starting demolition.

DOS – 2. In addition, we request that the construction parking area be subjected to standard archaeological field investigations, including subsurface testing. We note that U.S. Highway 1 is parallels the western boundary of the RBEC property. Any alterations or changes to the linear roadway resource must be addressed in a supplemental cultural resource assessment.

RESPONSE: With the assistance of Golder/Janus Research, FPL conducted a standard archaeological field investigation, including subsurface testing for the construction laydown area west of U.S. Highway 1 that meets the requirements of Chapter 1A-46. The results of the evaluation determined that no archeological materials were identified. The findings from the evaluation (e.g., field notes, photos, and conclusions) were also submitted separately to DHR on April 23, 2009, and are included as Attachment DOS-1.

Upon determination of final plans and if roadway improvements on U.S Highway 1 are required as part of the RBEC project, Golder/Janus Research will assist FPL in conducting the appropriate evaluation of cultural resources for the necessary roadway improvements.

DOS – 3. Lastly, if new transmission line corridors or replacement transmission lines will be constructed in association with the RBEC that have not previously been surveyed, they will need to be investigated to determine if cultural resources are present and if such resources could be adversely impacted.

RESPONSE: No new transmission line corridors will be constructed in association with the RBEC Project. All replacement transmission lines are located in corridors that have previously been surveyed; however, a new cultural resources survey is conducted with each new permit to identify any potential changes. As noted on page 4-3 of the Site Certification Application, any individual permits or approvals required for those specified transmission related activities will be obtained separately from the Power Plant Siting Act certification process.

ATTACHMENT DOS-1

Janus Research

Memo

To: Frederick Gaske, DHR/SHPO
From: Kathleen S. Hoffman, Janus Research
Adam M. Schieffer, Janus Research
Cc: Bob McCann, Golder Associates
Kerri Kitchen, Golder Associates
Jacquelyn Lorne, FPL
Date: 4/22/2009
Re: FPL Riviera Power Plant: Archaeological testing of the 'Construction Laydown & Parking Area' and 'Manatee Viewing Center' and evaluation of indirect effects on cultural resources within a one-half mile radius of the Riviera Plant Site
Supplemental Report 2

Florida Power & Light Company (FPL) is seeking approval of the Riviera Beach Energy Center (RBEC) Project under the Florida Electrical Power Plant Siting Act (PPSA), Chapter 403, Part II, Florida Statutes (F.S.). The Site Certification Application (SCA) was filed with the Florida Department of Environmental Protection (FDEP) pursuant to Chapter 62-17, Florida Administrative Code (F.A.C.). The Project for which FPL seeks certification includes dismantlement of the existing Plant and construction of the converted Plant, the construction laydown and parking area, certain transmission-related activities, and the viewing center.

The existing FPL Riviera Plant Site is located primarily within the City of Riviera Beach with a small portion in the City of West Palm Beach on approximately 46 acres southwest of the Lake Worth Inlet and Peanut Island, and across the Intracoastal Waterway from Palm Beach, Florida. The Site includes approximately 39 acres bounded on the west by U.S. Highway 1, on the north by Port of Palm Beach, on the south by 59th Street, and on the east by Lake Worth Lagoon (Intracoastal Waterway) and approximately 7 acres located to the west of U.S. Highway 1 where transmission lines are located.

FPL has operated a power plant at the Site since the mid-1940s. Units 1 and 2 went into service in 1946 and 1953, respectively. Both units have been permanently retired and removed from the Site. The commercial in-service dates for Units 3 and 4 were 1962 and 1963, respectively, and they have remained in service since those dates.

Previous RBEC Cultural Resource Studies and Reports

A previously submitted report, the *Cultural Resource Review for the FPL Riviera Plant* (Janus Research 2008; Division of Historical Resources [DHR] Project File No.: 2008-

06617)(Attachment 1) consisted of a desktop analysis and reconnaissance survey of the FPL Riviera Plant Site. This memorandum serves as an addendum to this previously submitted report.

Subsequent to the cultural resource review in 2008, Janus Research conducted a desktop analysis of proposed additional work areas associated with the RBEC in December 2008 and January 2009 which is detailed in a supplemental report entitled, *FPL Riviera Power Plant: Desktop Analysis for the Proposed FPL Construction Support Area (on East Side of U.S. Highway 1) and Construction Laydown and Parking Area (on West Side of U.S. Highway 1) Supplemental Report 1*. Please note that these areas are currently referred to as the 'Construction Laydown & Parking Area' and the 'Manatee Viewing Center' (Attachment 2).

The current technical memorandum addresses the subsurface archaeological testing of the Construction Laydown & Parking Area and Manatee Viewing Center and the secondary cumulative effects (i.e. noise, light, and emissions) on cultural resources within a one-half mile radius of the Riviera Plant Site requested by the DHR/State Historic Preservation Office (SHPO) in March 2009 (DHR Project No.: 2009-1061)(Attachment 3). The location of the one-half mile radius from the Riviera Plant Site is illustrated in Attachments 2 and 4.

This study was conducted in support of Chapter 403 and in compliance with Chapter 267, *Florida Statutes*. Principal Investigators meet the *Secretary of the Interior's Professional Qualification Standards* (48 FR 44716) for archaeology, history, architecture, architectural history, or historic architecture. Archaeological investigations were conducted under the direction of Clifford J. Jenks, M.A. Historic resource investigations were conducted under the direction of Amy Groover Streelman, M.H.P.

Archaeological Survey of the Construction Laydown & Parking Area and the Manatee Viewing Center

Archaeological field methods included judgmental subsurface testing, pedestrian survey, and a visual inspection of exposed ground to identify evidence of archaeological sites. Subsurface testing employed conventional shovel testing throughout the investigation. During the current survey, a total of nine shovel tests were judgmentally excavated (six within the Construction Laydown & Parking Area and three within the Manatee Viewing Center). Shovel tests were circular and roughly 50 cm (20 in) in diameter. They were dug to a minimum depth of 1 m (39 in), unless excavation was inhibited by subsurface obstructions including solid limestone and concrete. All excavated soil was screened through ¼-in hardware cloth suspended from portable wooden frames.

Standard archaeological methods for recording field data were followed throughout the project. The identification number, location, stratigraphic profile, and soil descriptions were recorded for every shovel test performed. The location of each shovel test was recorded on aerial photographs, and labels indicating the shovel test number were placed next to the shovel test location. Field conditions were noted on aerial maps (Attachment 5), and representative photographs are included in Attachment 6.

Archaeological Site Potential
Supplemental Report 1 included background research regarding the history of the area and its environmental setting, a search of the Florida Master Site File (FMSF) for previously recorded cultural resources, and a detailed explanation of archaeological site probability. Consequently, this information is not repeated here.

As discussed in Supplemental Report 1, the Construction Laydown & Parking Area is located in an area that was previously surveyed for archaeological and historic resources by Janus Research in 2003 (FMSF Survey No. 12392) and no cultural material or historic resources were identified within this area (DHR Project File No.: 2003-7856; Attachment 7). In addition, the Manatee Viewing Center is located in an area that was previously surveyed for archaeological and historic resources in 2003 by R. Christopher Goodwin and Associates (FMSF Survey No. 10954) and no cultural materials or historic resources were identified within this area (DHR Project File No.: 2004-11008; Attachment 8).

While located near the Lake Worth Lagoon, the Construction Laydown & Parking Area and Manatee Viewing Center are located in areas of low elevation, lack hammock or hardwood vegetation, and exhibit soils indicative of disturbance and/or land modification. These factors, coupled with the fact that no archaeological sites were identified within either area during previous archaeological survey, suggests a low potential for finding intact archaeological sites.

Construction Laydown & Parking Area
The Construction Laydown & Parking Area is located in an existing transmission line corridor containing numerous buried utilities including a fiber optic line, electric cable line, natural gas pipeline, high pressure oil pipeline, and water pipeline. A pedestrian survey of the area mapped the location of these flagged utilities and noted the presence of many flowers indicative of secondary growth and disturbance including beggars' ticks and lantana. No cultural materials were identified on the sandy surface of the transmission line corridor.

In order to avoid the locations of the buried utilities running east-west along the northern and southern portions of this area, as well as those running north-south in the vicinity of U.S. Highway 1 and the FEC Railway Corridor, a line of six judgmental shovel tests was conducted at 50-m intervals along an east-west transect in the center of the Construction Laydown & Parking Area.

These six shovel tests exhibited moderate disturbance with mottled brown and grayish sand (approximately 0-32 cmbs) underlain by brown sand mottled with brownish orange sand (approximately 32-110 cmbs). No cultural material was identified within any of the shovel tests.

Manatee Viewing Center
The northern portion of the Manatee Viewing Center consisted of a small manicured area of grass, planted palms, and concrete walkway. The pedestrian survey of the area identified numerous grates, utility covers, and an unmarked sprinkler system. Avoiding the utilities, one judgmental shovel test was excavated within this area. This shovel test contained highly disturbed soil and shell fill inhibited by solid limestone and fill at a depth of approximately 50 cm below surface [cmbs]. No cultural material was identified within this shovel test.

The pedestrian survey of the southern portion of the Manatee Viewing Center identified active construction and large piles of construction debris within the eastern third of the area, as well as scattered Australian pines. Additionally, the western portion of this area contained construction pilings, as well as an open grassy area with palm trees, banyan trees, Brazilian Pepper, and secondary flowers including beggars' ticks. Several utilities, including a sewage pipeline and natural gas pipeline, were flagged within the northern and western portions of the project area. Two shovel tests were conducted within this portion of the Manatee Viewing Center. The first shovel test was conducted in the western portion of the area in the vicinity of the large Banyan tree and secondary growth and resulted in a stratigraphic profile consisting of mottled gray and brown sand with fill from approximately 0-101 cmbs. The second test was excavated in the eastern portion of the area, contained highly disturbed brown sand and fill, and was inhibited by solid white concrete and rock fill at a depth of approximately 20 cmbs. No cultural material was identified within either of these shovel tests.

Impact Analysis

Introduction and Proposed Project

FPL proposes to convert the existing Riviera Plant [i.e., two nominal 300-megawatt (MW) conventional dual-fuel fired generating units and support facilities] into a modern, highly efficient, lower-emission next-generation clean energy center using the latest combined cycle technology. The converted Plant will be located wholly within the existing Plant Site boundaries. The conversion will result in increased power generation without using additional land and water sources. The converted Plant will be more energy efficient than the existing Plant and will provide cleaner energy to FPL's customers. The converted Plant will use at least 33 percent less fuel than the existing Plant, for an equivalent amount of electricity production. Moreover, it will be capable of producing over 100 percent more power (i.e., 1,250 MW vs. current 600 MW). The existing Riviera Plant is expected to be renamed the Riviera Beach Energy Center (RBEC), with an in-service date for the converted Plant of June 2014. Once the RBEC is constructed, the Manatee Viewing Center open to the public will be built in the southern portion of the Site.

Method

The impact analysis included a field evaluation to identify buildings or districts within a one-half mile radius from the RBEC site that are listed or eligible for listing in the *National Register of Historic Places* (National Register). This radius was developed based on the project description and the anticipated design components of the project. The evaluation considered the potential effect that emissions, noise, light, traffic (traffic increase or type of traffic to and from the Energy Center during normal operating hours) from the RBEC will have upon the buildings identified (within the one-half mile radius). Representative photographs of resources were taken and their locations noted on a map. FMSF forms will not be completed. The summary of the emissions, noise, light, and traffic impacts are excerpted from the analysis conducted by Golder Associates and presented in the SCA (FPL 2009). In addition, information was requested from FPL regarding potential effects provided to FPL from residents of any eligible, or National Register-listed buildings or districts. To date, no comments regarding potential impacts have been provided to FPL.

A search of the FMSF, Geographic Information Systems (GIS) data, and information available from the City of West Palm Beach Neighborhood Services Division website (www.wpb.org/neighborhoods/historic.htm) was utilized during the background research phase in order to identify existing historic resources within the Area of Potential Effects (the one half-mile radius from the Site). In addition, an architectural historian and historical technician conducted a reconnaissance survey in order to determine if any unrecorded historic resources within the APE were potentially eligible for inclusion in the National Register. All historic resources within the APE were visually inspected, and the identified significant properties within the APE were photographed and marked on aerial photographs (Attachment 4).

Reconnaissance Survey Results

The following National Register–listed or –eligible historic resources were identified within the APE, and their locations are illustrated in Attachment 4. Representative photographs of the historic resources are included by recorded number in Attachment 9.

Northwood Harbor Historic District (Recorder #1)

This historic district is locally listed by the City of West Palm Beach, and is considered potentially eligible for inclusion in the National Register based on the architecture and developmental history related to the northern area of West Palm Beach. This district is roughly bound by Broadway to the west, Flagler Drive to the east, 45th Street to the south, and 59th Street to the north. The Northwood Harbor neighborhood reflects the residential architectural styles popular between 1925 and 1956, including the Mission Revival and Vernacular styles. This district is immediately south of the plant site; the northern boundary of the historic district is approximately 37 feet from the Plant Site.

5511 N Dixie Hwy (8PB4461; Recorder #2)

This residential building has not been evaluated by DHR/SHPO, but the previous surveyor stated it may be potentially eligible for inclusion in the National Register on an individual basis due to its architectural significance as an early twentieth century Bungalow. It is also located within the boundaries of the Northwood Harbor Historic District. A clear view of the entire structure from the public right-of-way was obscured by overgrown foliage. This resource is located approximately 1,143 feet south of the Plant Site.

FEC Railroad (8PB13773; Recorder #3)

This linear historic resource is considered historically significant due to its association with the transportation and development of Southeast Florida. However, the National Register eligibility of linear historic resources typically cannot be fully assessed due to the limited physical segments that are located within project APEs. For past projects, DHR/SHPO has agreed to accept this inconclusive determination of eligibility, particularly when it is known that the project improvements will have no effect on the railroad. This resource is located approximately 1,444 feet west of the Plant Site.

595 W 4th Street (8PB12930; Recorder #4)

This simple Masonry Vernacular building that dates from circa-1946 was determined eligible for the National Register by DHR/SHPO in 2004. The residence is historically significant based on its associations with Edward Rodgers, an educator, lawyer, and the first African-American

county prosecutor and judge in Palm Beach County. According to Mr. Rodgers, during the Civil Rights era, important community activities took place at this house. This building is located approximately 2,286 feet west of the Plant Site.

601 W 4th Street (8PB12931; Recorder #5)
This unadorned Masonry Vernacular building that dates from circa-1946 was determined eligible for the National Register by DHR/SHPO in 2004. The residence is historically significant based on its associations with Henry McKinney, president and editor of The Florida News, an African-American newspaper and significant information outlet for the Riviera Beach community. This building is located approximately 2,389 feet west of the Plant Site.

Old Dixie Highway (8PB13330; Recorder #6)
This linear historic resource is considered historically significant due to its association with the transportation and development of Southeast Florida, as well as the eastern United States. However, like the FEC Railway, the National Register eligibility of linear historic resources typically cannot be fully assessed due to the limited physical segments that are located within project APEs. For past projects, DHR/SHPO has agreed to accept this inconclusive determination of eligibility, particularly when it is known that the project improvements will have no effect on the resource. This resource is located approximately 1,598 feet west of the Plant Site.

Spanish Courts, 1195 Avenue C (8PB8285; Recorder #7), Spanish Courts, 1124 Broadway (8PB8289; Recorder #8), Spanish Courts, 57 E 12th Street (8PB8247; Recorder #9)
The three recorded properties are part of a National Register–eligible Spanish Courts complex. They are significant in the areas of architecture and entertainment/recreation. The properties include the Depression/New Deal-era tourist court at 1124 Broadway, which is comprised of 21 Spanish Eclectic style cottages and an office, and two historic residences, 1195 Avenue C and 57 E 12th Street. The tourist court and two residences were constructed by Raymond and Ellen Gordon. They designed the tourist court along the main thoroughfare of Broadway (U.S. Highway 1) in order to attract middle class tourists vacationing in Florida. The Gordons lived in 57 E 12th Street, and their brother and sister-in-law lived in the residence at 1195 Avenue C. The three properties are north of the Plant Site; the two residences are approximately 2,537 feet from the Site and the tourist court is approximately 2,314 feet from the Site.

Peanut Island Coast Guard Station (8PB10952; Recorder #10), Peanut Island Coast Guard Station Boat Storage Facility (Recorder #11), Peanut Island Coast Guard Station Resource Group (8PB6291; Recorder #12), Kennedy Bunker (Recorder #13)
These properties are part of a National Register–eligible resource group (8PB6291) located on Peanut Island, an island situated in the Intracoastal Waterway. Peanut Island was created from spoil, when the inlet was cut between the present northern end of Palm Beach and the southern end of Singer Island. Within the APE for this project, the Coast Guard Station, Boat Storage Facility, and Kennedy Bunker are present. These structures are significant in the areas of military, maritime history, and architecture.

The Coast Guard Station and Boat Storage Facility were constructed in the mid-1930s, as part of a national movement to build standard lifesaving stations throughout the coastal United States. In

addition, the station was used during the World War II era for the defense of the coast. The station proved to be nationally significant in the 1960s when the Kennedy Bunker was constructed as a fallout shelter for President John F. Kennedy. President Kennedy had a home nearby in Palm Beach, and this shelter was meant to house him and up to 25-30 additional people. This resource group is located to the northeast of the Plant Site. The Coast Guard Station is approximately 2,711 feet from the Plant Site; the Boat Storage Facility is approximately 2,432 feet from the Plant Site; and the Kennedy Bunker is approximately 2,581 feet from the Plant Site.

Impact Assessment Results

Air Emissions

The use of natural gas, as well as the use of combustion controls and air pollution control equipment, will minimize air emissions and comply with applicable standards (FPL 2009:4-10). A source impact analysis was conducted for the existing Plant and RBEC (three combustion turbines (CTs), heat recovery steam generator (HRSG), fuel heater, and gas compressors) using the American Meteorological Society and EPA Regulatory Model to determine if predicted concentrations from air emissions will meet the Ambient Air Quality Standard (AAQS) (FPL 2009:6-7, 6-8). Compared to the existing Plant operations, the RBEC will exhibit more than a 90-percent reduction of air pollutants in tons per year (TPY). While the amount of nitrogen dioxide (NO_2) and carbon monoxide (CO) concentrations predicted for the RBEC are higher than those predicted for the existing Plant, the total predicted concentrations are largely due to background concentrations and still comply with the AAQS (FPL 2009:6-7). The results of this analysis demonstrate that the project's impacts will be well below the ambient air quality standards that are designed to protect the health, safety and welfare of the public and are not expected to adversely impact any significant historic properties.

Noise Levels

The construction and operational noise level predictions for the RBEC were developed using the Computer Aided Noise Abatement (Cadna A) computer model. The models of noise impact generated by the computer simulation, suggest that noise levels (both construction-related and operational) are not expected to adversely impact any significant historic properties.

The majority of the sources of noise that will be generated by the RBEC during operation are contained within enclosures that serve to reduce noise levels (FPL 2009:6-13). Baseline ambient sound levels values (both day time and nighttime) for the existing Plant were calculated for when the plant was both on line and off line. The predicted maximum impact sound levels of the RBEC calculated by the computer simulation (55dBA [A-weighted decibels] or less in the vicinity of all significant historic resources) indicate that the operation of the RBEC will result in lower sound levels than the baseline ambient noise levels of the existing Plant (FPL 2009:6-13).

For noise levels resulting from construction, baseline ambient sound levels values for the existing Plant (on line, during the day) were used as the construction activities will take place within a 12-hour workday. With the exception of one monitoring station, the intermittent sound levels that are predicted to occur during construction are either at, or below, the existing conditions (FPL 2009:5-19). The lone increase occurs at a monitoring site in the southeast portion of the Plant Site and is likely due to the proximity of the station to the source locations of

the construction equipment (FPL 2009:5-20). The resulting values for three other monitoring sites in the vicinity of the monitoring site with the increased noise level, which are adjacent to and therefore more representative of expected impacts to the closest Historic Property, the Northwood Harbor Historic District, suggest that the construction will likely result in noise levels at, or below, the existing conditions.

Lighting

New lighting will be provided for the RBEC and Manatee Viewing Center as required. Lighting will be required both in order to meet Occupational Safety and Health Administration (OSHA) regulations but also for security (FPL 2009:6-16). The lighting of the RBEC will result in less of an impact than the existing Plant due to the lower profile of the RBEC and due to the fact that light pollution will be addressed using guidelines available from the Illuminating Engineering Society of North America (FPL 2009:6-17). Factors considered regarding lighting will include minimizing upward light, turning off lighting not required for security between 11:00 pm and sunrise, careful selection of mounting heights and physical locations, and minimizing glare (FPL 2009 6-17). Based on this information, it is anticipated that the RBEC will result in lower lighting impacts than the existing Plant, and that no adverse impacts are anticipated to any significant historic properties.

Vehicle Traffic

Based on the intersection capacity/level of service analysis conducted using Highway Capacity Software (HCS+ Version 5.2) the traffic resulting from the construction of the RBEC will temporarily affect area roadways during the duration of the construction process (FPL 2009:5-16). However, based on the intersection capacity/level of service analysis, the signalized access driveway intersection will continue to operate adequately during the peak level of the construction period (FPL 2009:5-17). Several roadway improvements to U.S. Highway 1, as well as signal timing adjustments, have been proposed to further accommodate construction traffic and keep the intersection operating at an acceptable level of service (FPL 2009:5-17). Upon determination of final plans and if roadway improvements to U.S. Highway 1 are required as part of the RBEC Project, Golder Associates and Janus Research will assist FPL in conducting the appropriate evaluation of cultural resources for the necessary roadway improvements.

The number of employees at the converted Plant will be comparable to the current level of employees and the number of traffic trips is not expected to increase. Therefore, operations traffic resulting from the RBEC workforce is expected to be comparable with current conditions (FPL 2009:6-16). Therefore, the traffic resulting from the RBEC is not expected to adversely impact any significant historic properties.

Visual Impacts

Janus Research, in conjunction with Golder Associates, conducted a visual impact assessment of the significant historic resources and the proposed Plant Site improvements to determine the visibility of the RBEC project from the National Register–listed and –eligible historic resources. Based on a request from Ms. Laura Kammerer, Compliance Review Supervisor with the DHR/SHPO, photographs were taken from the significant historic resources toward the existing Plant Site in order to gain an understanding of the possible visual impacts to the current setting. In evaluating the visual impacts that the proposed project improvements may have on the

significant historic resources, it is important to note that the current stacks, which are the tallest structures on the Plant Site, are currently 300 feet in height. The proposed improvements will result in the reduction in the height of the stacks from 300 feet in height to 150 feet in height (Attachment 10). At this time, the current stacks are visible from a number of the significant historic resources within the APE, but this did not preclude them from being listed or considered eligible for inclusion in the National Register. Therefore, the proposed improvements that include the reduction of the height of the stacks will lessen the visual impacts on the significant historic resources. It should also be noted that with the exception of the Northwood Harbor Historic District, the remaining historic resources are sited over 1,000 feet from the current Plant Site.

Northwood Harbor Historic District (Recorder #1)
The northern boundary of this historic district is approximately 37 feet from the existing Plant Site, and currently a landscaped buffer exists between the northern district boundary and the Plant Site. When looking north from the district towards the Plant Site the stacks are presently visible. However, the proposed improvements will result in a 150 foot reduction in the height of the stacks, thus lessening the visual impact the Plant has on the setting of the historic district. Based on the proposed improvements, it does not appear that there will be an adverse effect to the historic district and the characteristics that contribute to its architectural and historical significance. Photographs of current views from the district towards the Plant Site are included in Attachment 11.

5511 N Dixie Hwy (8PB4461; Recorder #2)
This residence is a contributing resource within the Northwood Harbor Historic District and was identified as an individually significant resource by a previous surveyor based on its architecture. It is located 1,143 feet to the south of the current Plant Site. This building's primary facade faces east, and does not face towards the current Plant Site. As noted in the previous description of the visual impacts to the historic district, the proposed improvements will result in a 150 foot reduction in the height of the stacks, thus lessening the visual impact the Plant has on the surrounding environment. Based on the proposed improvements, it does not appear that there will be an adverse effect to this residence and the characteristics that contribute to its architectural significance. A photograph of the current view from the building towards the Plant Site is included in Attachment 11.

FEC Railroad (8PB13773; Recorder #3)
This linear historic resource is historically significant based on its associations with the transportation and development of Southeast Florida. In previous studies, it has been determined that major modifications to this resource type, such as removing the historic tracks or realigning the original railroad corridor, would be necessary in order to result in an adverse effect. This resource type's significance is not dependent upon the views to and from it. The FEC Railroad is approximately 1,444 feet west of the Plant Site. The proposed improvements will result in a 150 foot reduction in the height of the stacks, thus lessening the visual impact the plant has on the surrounding environment. Based on the proposed improvements, there will be no adverse effect to this resource. A Photograph of the current view from the FEC Railroad towards the Plant Site is included in Attachment 11.

595 W 4th Street (8PB12930; Recorder #4)
This simple Masonry Vernacular building is historically significant based on its associations with Edward Rodgers, an educator, lawyer, and the first African-American county prosecutor and judge in Palm Beach County. This building is located approximately 2,286 feet west of the Plant Site, and the primary façade faces away from the Plant Site. As previously noted, the proposed improvements will result in a 150 foot reduction in the stacks' height, thus lessening the visual impact the plant has on the surrounding environment. Based on the proposed improvements, it does not appear that there will be an adverse effect to this residence and the characteristics that contribute to its historical significance. A photograph of the current view from the building towards the Plant Site is included in Attachment 11.

601 W 4th Street (8PB12931; Recorder #5)
This Masonry Vernacular building is historically significant based on its associations with Henry McKinney, president and editor of The Florida News, an African-American newspaper. This building is located approximately 2,389 feet west of the Plant Site, and the primary façade faces the Plant Site. As previously noted, the proposed improvements will result in a reduction in the stacks' height, thus lessening the visual impact the plant has on the surrounding environment. Based on the proposed improvements, it does not appear that there will be an adverse effect to this residence and the characteristics that contribute to its historical significance. A photograph of the current view from the building towards the Plant Site is included in Attachment 11.

Old Dixie Highway (8PB13330; Recorder #6)
This linear historic resource is historically significant based on its associations with the transportation and development of Southeast Florida, as well as the eastern United States. In previous studies, it has been determined that major modifications to this resource type would be necessary in order to result in an adverse effect. This resource type's significance is not dependent upon the views to and from it. The Old Dixie Highway is approximately 1,598 feet west of the Plant Site. The proposed improvements will result in a reduction in the stacks' height, thus lessening the visual impact the plant has on the surrounding environment. Based on the proposed improvements, there will be no adverse effect to this resource. A photograph of the current view from the Old Dixie Highway towards the Plant Site is included in Attachment 11.

Spanish Courts, 1195 Avenue C (8PB8285; Recorder #7), Spanish Courts, 1124 Broadway (8PB8289; Recorder #8), Spanish Courts, 57 E 12th Street (8PB8247; Recorder #9)
The three recorded properties are part of a National Register-eligible Spanish Courts complex and are significant in the areas of architecture and entertainment/recreation. The three properties are north of the Plant Site; the two residences are approximately 2,537 feet from the site and the tourist court is approximately 2,314 feet from the site. The properties' primary façades, including the tourist court buildings, do not face the Plant Site. The reduction in the stacks' height will lessen the visual impact the plant has on the surrounding environment. Based on the proposed improvements, it does not appear that the improvements will have an adverse effect to the Spanish Courts complex and the characteristics that contribute to its architectural and historical significance. Photographs of the current views from the buildings towards the Plant Site are included in Attachment 11.

Peanut Island Coast Guard Station (8PB10952; Recorder #10), Peanut Island Coast Guard Station Boat Storage Facility (Recorder #11), Peanut Island Coast Guard Station Resource Group (8PB6291; Recorder #12), Kennedy Bunker (Recorder #13)

These properties are part of a National Register-eligible resource group (8PB6291) located on Peanut Island, an island situated in the Intracoastal Waterway. Within the APE for this project, the Coast Guard Station, Boat Storage Facility, and Kennedy Bunker are present. These structures are significant in the areas of military, maritime history, and architecture. This resource group is located to the northeast of the Plant Site. The Coast Guard Station is approximately 2,711 feet from the Plant Site; the Boat Storage Facility is approximately 2,432 feet from the Plant Site; and the Kennedy Bunker is approximately 2,581 feet from the site. The properties' primary façades do not directly face the Plant Site. The reduction in the stacks' height will lessen the visual impact of the plant on the view from Peanut Island and the significant properties. Based on the proposed improvements, it does not appear that the improvements will have an adverse effect to the resource group and the characteristics that contribute to its architectural and historical significance. Photographs of the current views from the buildings towards the Plant Site are included in Attachment 11.

References Cited

Florida Power & Light Company
2009 Riviera Beach Energy Center Site Certification Application, Volume 1.

Janus Research
2003 A Cultural Resource Assessment Survey of the Community Redevelopment Area County: Palm Beach. Manuscript on file, Florida Department of State, Division of Historical Resources, Tallahassee.
2008 Cultural Resource Review of the FPL Riviera Beach Plant. Manuscript on file, Florida Department of State, Division of Historical Resources, Tallahassee.
2009 FPL Riviera Power Plant: Desktop Analysis for the Proposed FPL Construction Support Area (on East Side of U.S. Highway 1) and Construction Laydown and Parking Area (on West Side of U.S. Highway 1) Supplemental Report 1. Manuscript on file, Janus Research, Tampa.

R. Christopher Goodwin & Associates
2004 Phase I Cultural Resources Survey and Archaeological Inventory of the Onshore Florida Portion of the Proposed Seafarer US Pipeline System Project in Palm Beach County, Florida. Manuscript on file, Florida Department of State, Division of Historical Resources, Tallahassee.

Attachment 1:

SHPO Concurrence Letter for 2008 Riviera Plant Survey

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Ms. Kathleen Hoffman, Ph.D.
Janus Research
1300 N. Westshore Blvd., Suite 100
Tampa, Florida 33607

November 21, 2008

Re: DHR Project File No.: 2008-06617
Received by DHR: October 20, 2008
Cultural Resource Review for the FPL Riviera Plant

Dear Dr. Hoffman:

Our office received and reviewed the above referenced survey report in accordance with Chapters 267, 373, and 403 of the *Florida Statutes*, as well as pertinent local ordinances, for possible adverse impact to cultural resources (any prehistoric or historic district, site, building, structure, or object) listed, or eligible for listing, in the National Register of Historic Places (NRHP).

In September 2008, Janus Research conducted an archaeological and historical survey of the proposed FPL Riviera Plant Conversion project area on behalf of Florida Power & Light Company and Golder Associates. Janus Research identified seven previously unrecorded historic structures, six of which constitute a historic resource group, within the project area during the investigation.

Janus Research determined that the FPL Riveira Plant Complex Resource Group (8PB13944) does not appear to be eligible for listing on the NRHP based on lack of distinctive architecture, extensive alterations to historic structures, and a large number of non-historic buildings within the district.

Furthermore, Janus Research determined that the three historic buildings (8PB13945 – 8PB13947), two historic fuel oil tanks (8PB13948 – 8PB13949), and one historic water tower (8PB13951) that make up the resource group do not appear to be individually eligible for listing on the NRHP. One additional historic building (8PB1350) appears to be ineligible for listing on the NRHP based on its common form and lack of significant historic associations.

Janus Research determined that the proposed development will have no effect on cultural resources listed, or eligible for listing, in the NRHP, or otherwise of historical, archaeological, or architectural value. Janus Research recommends no further investigation of the subject parcel.

Based on the information provided, our office concurs with these determinations and finds the submitted report complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code.*

For any questions concerning our comments, please contact April Westerman, Historic Preservationist, by electronic mail at amwesterman@dos.state.fl.us, or by phone at (850) 245-6333. We appreciate your continued interest in protecting Florida's historic properties.

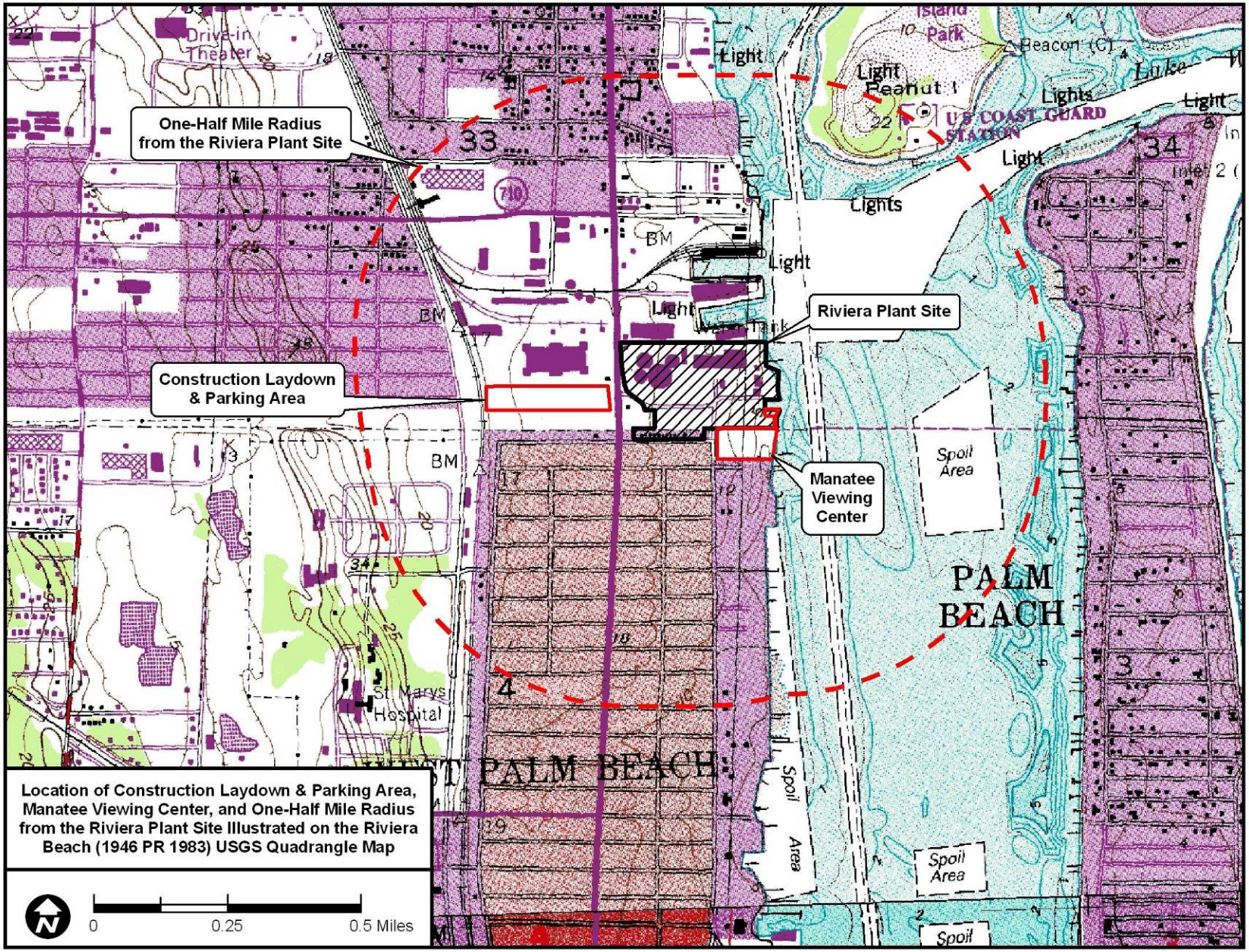
Sincerely,

Frederick P. Gaske

Frederick P. Gaske, Director, and
State Historic Preservation Officer

Attachment 2:

Locations of the Construction Laydown & Parking Area, Manatee Viewing Center, and One-Half Mile Radius from the Riviera Plant Site Illustrated on the Riviera Beach (1946 PR 1983) USGS Quadrangle Map



Location of Construction Laydown & Parking Area, Manatee Viewing Center, and One-Half Mile Radius from the Riviera Plant Site Illustrated on the Riviera Beach (1946 PR 1983) USGS Quadrangle Map

Attachment 3:

March 2009 SHPO Letter Requesting Archaeological Testing and Impact Assessment

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

March 16, 2009

Mr. Michael P. Halpin, P.E.
Siting Administrator
Florida Department of Environmental Protection
2600 Blair Stone Road, Suite 649, MS #48
Tallahassee, Florida 32399-2400

Re: DHR Project No.: 2009-1061
Date Received by DHR: February 13, 2009
FPL Riviera Beach Energy Center
Application for Site Certification
Palm Beach County

Dear Mr. Halpin:

Our office reviewed the referenced siting application in accordance with Chapters 403 and 267, *Florida Statutes*, for possible impact to historic properties listed, or eligible for listing, in the National Register of Historic Places, or otherwise of historical, architectural or archaeological significance. The State Historic Preservation Officer/Division of Historical Resources advises and assists state agencies and applicants to identify historic properties, assessing effects upon them, and considering alternatives to avoid or minimize adverse effects.

A review of the application indicates that the immediate FPL Riviera Beach Energy Center (RBEC) property, including an area of potential effect was subjected to a limited level of cultural resource review in November 2008 by Janus Research of Tampa, Florida for Golder Associates. We note that no significant cultural resources (archaeological sites, buildings or structures) were identified within the RBEC, but the review did not appear to include the construction parking area west of US 1.

It is the opinion of this agency and we concur with the findings of Janus Research that it is unlikely that significant cultural resources will be encountered within the RBEC. However, the construction parking area was not investigated and the area of potential effect evaluation did not address indirect affects – such as noise, lights and emissions - to cultural resources within

at least a half-radius from the RBEC site; or possible deeply buried cultural deposits within the plant site that the standard archaeological field methodology will not discover.

We request that the applicant address any potential indirect affects and historic properties or properties otherwise of significance for review by this agency; and develop and present a unexpected cultural resource discoveries training plan for demolition and construction contractors and project managers for review and approval by this agency.

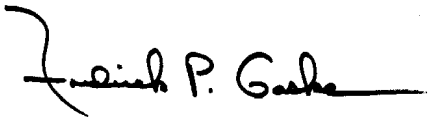
In addition, we request that the construction parking area be subjected to standard archaeological field investigations, including subsurface testing. We note that U.S. Highway 1 is parallels the western boundary of the RBEC plant property. Any alterations or changes to the linear roadway resource must be addressed in a supplemental cultural resource assessment.

Lastly, if new transmission line corridors or replacement transmission lines will be constructed in association with the RBEC that have not previously been surveyed, they will need to be investigated to determine if cultural resources are present and if such resources could be adversely impacted.

Therefore, until completion of the requested investigations and submission of investigation reports for review and comment, and a commitment from FPL to develop an approved contractor training plan, this agency cannot complete our comments for this application.

If you have any questions concerning our comments, please contact Laura Kammerer, Deputy State Historic Preservation Officer for Review and Compliance, by telephone at 850-245-6333, or by electronic mail at lkammerer at dos.state.fl.us. Thank you for your interest in protecting Florida's historic properties.

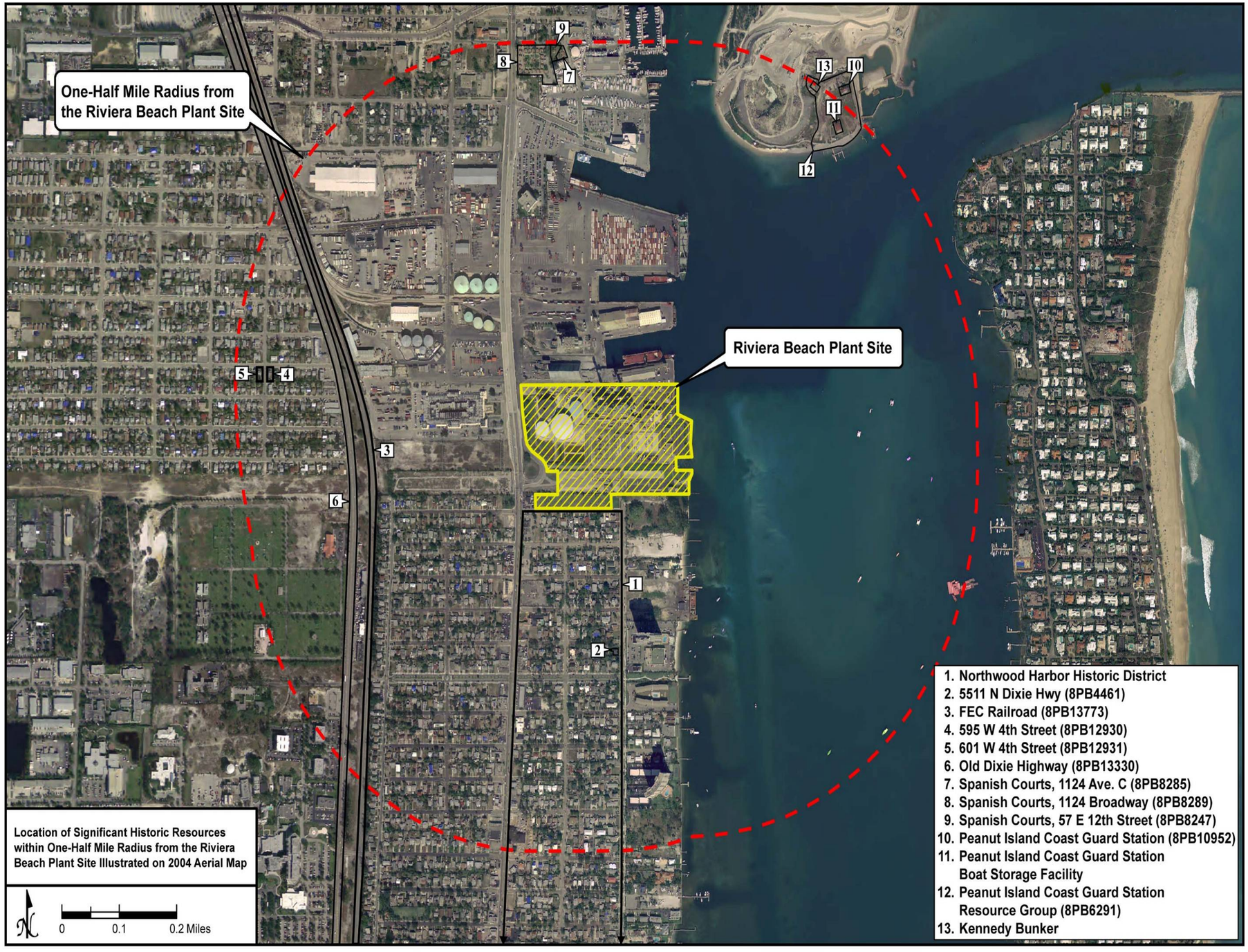
Sincerely,



Frederick P. Gaske, Director, and
State Historic Preservation Officer

Attachment 4:

Identified Historic Properties and
One-Half Mile Radius from the Riviera Plant Site
Illustrated on a 2004 Aerial Photograph


One-Half Mile Radius from the Riviera Beach Plant Site
Riviera Beach Plant Site
1
2
3
4
5
6
7
8
9
10
11
12
13
Location of Significant Historic Resources within One-Half Mile Radius from the Riviera Beach Plant Site Illustrated on 2004 Aerial Map
N
0
0.1
0.2 Miles
1. Northwood Harbor Historic District
2. 5511 N Dixie Hwy (8PB4461)
3. FEC Railroad (8PB13773)
4. 595 W 4th Street (8PB12930)
5. 601 W 4th Street (8PB12931)
6. Old Dixie Highway (8PB13330)
7. Spanish Courts, 1124 Ave. C (8PB8285)
8. Spanish Courts, 1124 Broadway (8PB8289)
9. Spanish Courts, 57 E 12th Street (8PB8247)
10. Peanut Island Coast Guard Station (8PB10952)
11. Peanut Island Coast Guard Station Boat Storage Facility
12. Peanut Island Coast Guard Station Resource Group (8PB6291)
13. Kennedy Bunker

Attachment 5:

Locations of Shovel Tests and Current Conditions Illustrated on Field Aerial Maps

Active Construction in the Eastern third of the Southern Portion of the Manatee Viewing Center

Transmission Line Corridor is Scattered with Secondary Floral Growth including Lantana and Beggars' Ticks

Port Buildings

FEC Railroad Corridor and Berm

Electric

Gas Pipeline

Fiber Optics

4 5 6 7 8 9

High-Pressure Oil Pipeline

Water Pipeline

Gas Pipeline
Water Pipeline

Cabbage Palms with Secondary Growth

Construction

US Highway 1

Security Entrance

Manicured Grass with Buried Sprinkler System and Planted Palm Trees (Highly Disturbed at least 50cm Deep)

1

Construction Access Road

Gas Pipeline

Waste Water Pipeline

2

3

Construction Pilings and Australian Pine

Brazilian Pepper

Palm and Banyan Trees

Negative Shovel Test

Buried Utilities

Construction Laydown and Parking Area

Manatee Viewing Center

N

0 50 100 150 Meters

Attachment 6:

Representative Photographs of the Construction Laydown & Parking Area and the Manatee Viewing Center



Construction Laydown & Parking Area from Shovel Test 5, facing East



View of FEC Railway Corridor in the Vicinity of the Western Boundary of the Construction Laydown & Parking Area from Shovel Test 4, facing West



Representative Photograph of Utility Marker within the Construction Laydown & Parking Area, facing Northwest



Representative Photograph of Utility Markers (Posts and Flags) within the Construction Laydown & Parking Area near US Highway 1, facing North



Manicured Area within the Northern Portion of Manatee Viewing Center, facing Northeast



Manicured and Paved Area within the Northern Portion of Manatee Viewing Center, facing Northeast



Profile of Shovel Test 1 within the Northern Portion of Manatee Viewing Center Illustrating Fill and Mottled Soil, facing Southeast



Grassy Area of Shell Fill near Banyan Tree within the Southern Portion of Manatee Viewing Center, facing East



Area of Active Construction, Machinery, and Pilings within the Southern Portion of Manatee Viewing Center, facing East



Construction Debris within the Southern Portion of Manatee Viewing Center, facing South



Construction Debris, Grassy Area, Sandy Access Road, and Banyan Tree within the Southern Portion of Manatee Viewing Center, facing West



Profile of Shovel Test 2 within the Southern Portion of Manatee Viewing Center Illustrating Fill and Mottled Soil, facing South

Attachment 7:

SHPO Letter for FMSF Survey No. 12392

FLORIDA DEPARTMENT OF STATE
Glenda E. Hood
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. Kenneth W. Hardin, President and CEO
Janus Research
2935 1st Avenue North
St. Petersburg, Florida 33713

September 12, 2003

Re: DHR Number: 2003-7856 / Date Received by DHR: June 28, 2003
U.S. Department of Housing and Urban Development
Cultural Resource Assessment Survey of the Riviera Beach Community Redevelopment Area
Riviera Beach, Palm Beach County

Dear Mr. Hardin:

Our office received and reviewed the referenced cultural resource assessment survey in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, and implementing regulations in 36 CFR Part 800, for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places* (NRHP). The State Historic Preservation Officer is to advise Federal agencies as they identify historic properties (listed or eligible for listing, in the *NRHP*. We find the report complete and sufficient, in accordance with 1A-46, *Florida Administrative Code*.

Results of the archaeological survey investigations resulted in the evaluation of one previously recorded archaeological site, the Riviera Site (8PB30) and no previously unrecorded archaeological resources within the Riviera Beach Community Redevelopment Area (CRA). The testing completed during this survey failed to locate any surviving evidence of the large oyster shell mound originally reported in 1914. The small remnant of the Riviera Site, a "trace of relatively undisturbed shell midden consists of a small triangular-shaped area along the eastern edge of the Spanish Courts tourist courts." "This small remnant is not considered eligible for listing in the NRHP under Criterion D due to its extremely small size and the sparse and relatively unexceptional nature of the archaeological assemblage". This office concurs with this determination and finds the Riviera Site not eligible for the National Register, or otherwise of archaeological or historical significance.

The architectural resources portion of the survey resulted in the identification of 302 properties (8PB7699, 8PB12210-12451, 8PB12463-12517, 8PB12797-12799). Only one of the properties was previously recorded (8PB11641). Three historic tourists courts: Hibiscus Court (8PB12397), Winter Haven Court (8PB12398) and Miramar Tourist Court (8PB12429); and one small historic district: East 21st Street Historic District (8PB12290, 8PB12292-12296, and 8PB2298) located during the survey are

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☐ Director's Office (850) 245-6300 • FAX: 245-6435
☐ Archaeological Research (850) 245-6444 • FAX: 245-6436
☑ Historic Preservation (850) 245-6333 • FAX: 245-6437
☐ Historical Museums (850) 245-6400 • FAX: 245-6433
☐ Palm Beach Regional Office (561) 279-1475 • FAX: 279-1476
☐ St. Augustine Regional Office (904) 825-5045 • FAX: 825-5044
☐ Tampa Regional Office (813) 272-3843 • FAX: 272-2340

considered potentially eligible for listing in the NRHP.

Based on the information provided, our office concurs with the determination regarding the three tourist courts considered potentially eligible for listing in the NRHP. However, we disagree that the East 21st Street District is eligible for listing in the *NRHP*. In addition, we concur that the remaining properties identified are not eligible for inclusion in the NRHP.

We look forward to consulting with the stakeholders and the interested parties during the evaluation of potential effects on the historic properties identified as eligible for listing in the *NRHP* noted above, and the identification of measures to avoid or minimize adverse effects to those historic properties.

If you have any questions concerning our comments, please contact Laura Kammerer, Historic Preservationist Supervisor, at (850) 245-6333, or my electronic mail at lkammerer@dos.state.fl.us. Your interest in protecting Florida's historic properties is appreciated.

Sincerely,

Janet Snyder Matthews, Ph.D., Director, and
State Historic Preservation Officer

Attachment 8:

SHPO Letter for FMSF Survey No. 10954

10954

FLORIDA DEPARTMENT OF STATE
Glenda E. Hood
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Ms. Heidi R. Post
R. Christopher Goodwin & Associates, Inc.
309 Jefferson Highway
New Orleans, LA 70121

December 8, 2004

Re: DHR Project File No. 2004-11008 (2003-6710)/ Received by DHR: November 8, 2004
Phase I Cultural Resources Survey and Archaeological Inventory of the Onshore Florida Portion of the Proposed Seafarer US Pipeline System Project, Palm Beach County, Florida

Dear Ms. Post:

Our office received and reviewed the above referenced survey report in accordance with Section 106 of the *National Historic Preservation Act of 1966* (Public Law 89-665), as amended in 1992; *36 C.F.R., Part 800: Protection of Historic Properties*; and Chapter 267, *Florida Statutes*, for assessment of possible adverse impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places (NRHP)*.

From February 2002 to February 2003, R. Christopher Goodwin & Associates, Inc. conducted an archaeological and historical survey of the Onshore Florida portion of the proposed Seafarer US pipeline project area on behalf of Seafarer US Pipeline System, Inc. No cultural resources were identified within the project area during the investigation.

It is the opinion of R. Christopher Goodwin & Associates, Inc. that the proposed development will have no effect on cultural resources listed or eligible for listing in the *NRHP*, or otherwise of historical, architectural or archaeological value. R. Christopher Goodwin & Associates, Inc. recommends no further investigation of the subject parcel.

Based on the information provided, our office concurs with these determinations and finds the submitted report complete and sufficient in accordance with Chapter 1A-46, *Florida Administrative Code.*

If you have any questions concerning our comments, please contact Ron Grayson, Historic Sites Specialist, by phone at (850) 245-6333, or by electronic mail at rigrayson@dos.state.fl.us. Your continued interest in protecting Florida's historic properties is appreciated.

Sincerely,

Laura L. Kammerer, Deputy SHPO

for Frederick Gaske, Director, and
State Historic Preservation Officer

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

☐ Director's Office (850) 245-6300 • FAX: 245-6435
☐ Archaeological Research (850) 245-6444 • FAX: 245-6436
☑ Historic Preservation (850) 245-6333 • FAX: 245-6437
☐ Historical Museums (850) 245-6400 • FAX: 245-6433
☐ Palm Beach Regional Office (561) 279-1475 • FAX: 279-1476
☐ St. Augustine Regional Office (904) 825-5045 • FAX: 825-5044
☐ Tampa Regional Office (813) 272-3843 • FAX: 272-2340

Attachment 9:

Representative Photographs of Historic Resources



415 58th Street, Representative Contributing Resource within the Northwood Harbor Historic District (Recorder #1), facing North (Please Note Existing Plant in the background)



Streetscape of 54th Street within the Northwood Harbor Historic District (Recorder #1), facing Southwest



512 and 522 53rd Street, Representative Contributing Resources within the Northwood Harbor Historic District (Recorder #1), facing Southeast



412 and 414 54th Street Representative Contributing Resources within the Northwood Harbor Historic District (Recorder #1), facing Southwest



5511 N. Dixie Highway (8PB4461, Recorder #2), Contributing Resource within the Northwood Harbor Historic District and Considered Individually Eligible by Surveyor, facing Southwest



FEC Railroad (8PB13773, Recorder #3) from 49th Street Crossing, facing Northwest



595 W 4th Street (8PB12930, Recorder #4), facing Southwest



601 W 4th Street (8PB12931, Recorder #5), facing Southwest



Old Dixie Highway (8PB13330, Recorder #6) from 54th Street, facing South



Spanish Courts, 1195 Avenue C (8PB8285, Recorder #7), facing Northwest



Spanish Courts, 1124 Broadway (8PB8289, Recorder #8), facing East



Spanish Courts, 57 E 12th Street (8PB8247, Recorder #9), facing Southwest



Peanut Island Coast Guard Station (8PB10952, Recorder #10), facing North



Coast Guard Station Boat Storage Facility (Recorder #11), facing Northeast



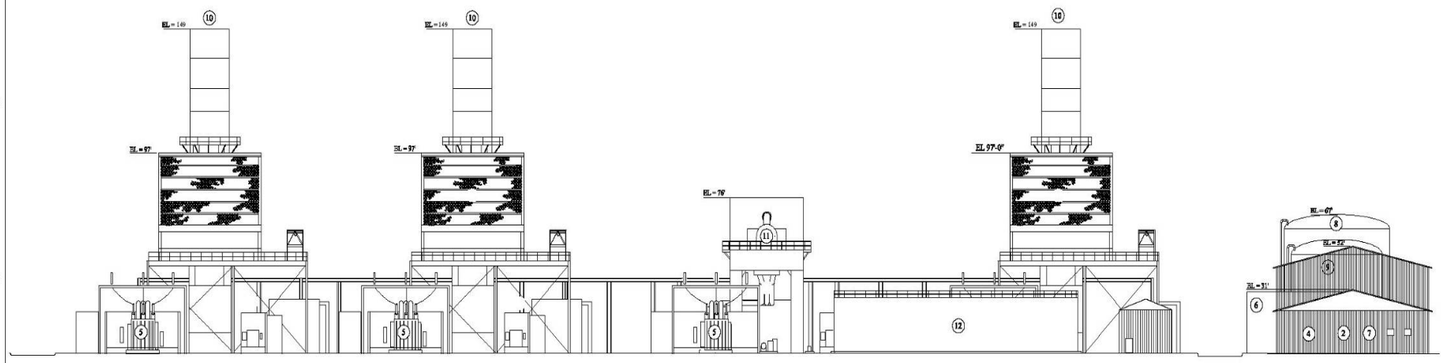
Peanut Island Coast Guard Station Resource Group (8PB6291, Recorder #12), facing Northeast



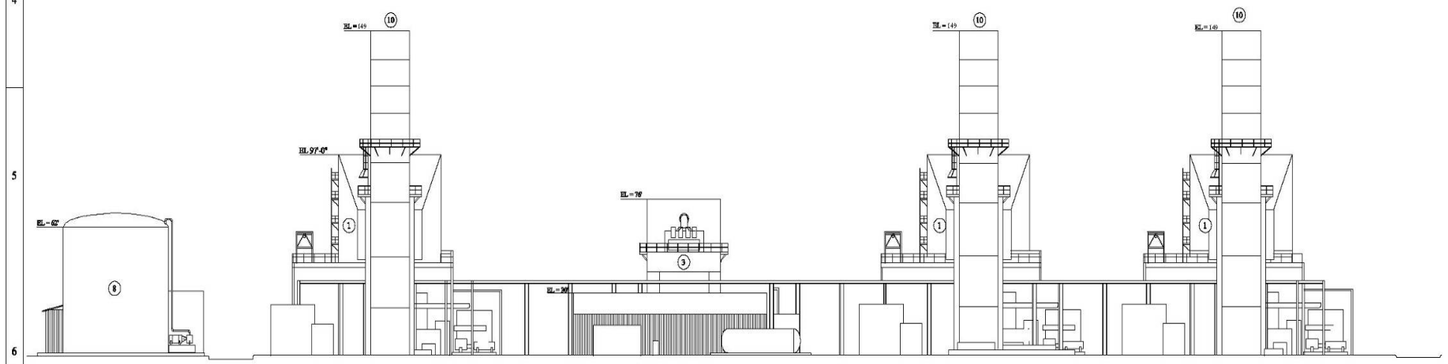
Kennedy Bunker (Recorder #13), facing Northwest (Kennedy Bunker is Located at the Background with the White Sign to the Right)

Attachment 10:

Profile Views of the RBEC included in the SCA Application



SOUTH ELEVATION
LOOKING NORTH



NORTH ELEVATION
LOOKING SOUTH

SCALE
SCALE IN FEET

GENERAL NOTES

1. ALL SIZES AND ELEVATIONS ARE APPROXIMATE.
2. ANTICIPATED STACK HEIGHT NOT TO EXCEED 200'; DETORMINED BY ENVIRONMENTAL REGULATIONS.
3. ALL ACREAGES AND LOCATIONS OF STRUCTURES WITHIN THE SITE PLAN ARE APPROXIMATE AND CONCEPTUAL. THE ACREAGES AND LOCATIONS OF STRUCTURES WITHIN THE SITE PLAN MAY BE MODIFIED PURSUANT TO THE POWER PLANT SITING ACT, SECTION 403.501, FLORIDA STATUTES.
4. BUILDING PERMITS.
   ELECTRICAL POWER GENERATING FACILITIES ARE EXEMPT PER SECTION 403.510 AND 403.511, FLORIDA STATUTES AND SECTION 102.2(F), 2004 FLORIDA BUILDING CODE.

LEGEND

1. HEAT RECOVERY STEAM GENERATOR
2. ADMINISTRATION BUILDING
3. STEAM TURBINE
4. WAREHOUSE BUILDING
5. GENERATOR STEP-UP TRANSFORMER
6. DEMINERALIZER WATER TRAILER AREA
7. CONTROL ROOM
8. RAW WATER STORAGE TANK
9. DEMINERALIZED WATER STORAGE TANK
10. STACK
11. STEAM TURBINE GENERATOR
12. FUEL OIL TANK (DOUBLE WALLED)

REFERENCE DRAWINGS

1. SITE RELATED WORK - 3x1 COMBINED CYCLE - 501G
   GENERAL ARRANGEMENT - PLAN
   D013455-SRWL00001 SH01
2. SITE RELATED WORK - 3x1 COMBINED CYCLE - 501G
   EAST/WEST ELEVATION
   D013455-SRWL00005 SH01

PRELIMINARY
NOT FOR CONSTRUCTION

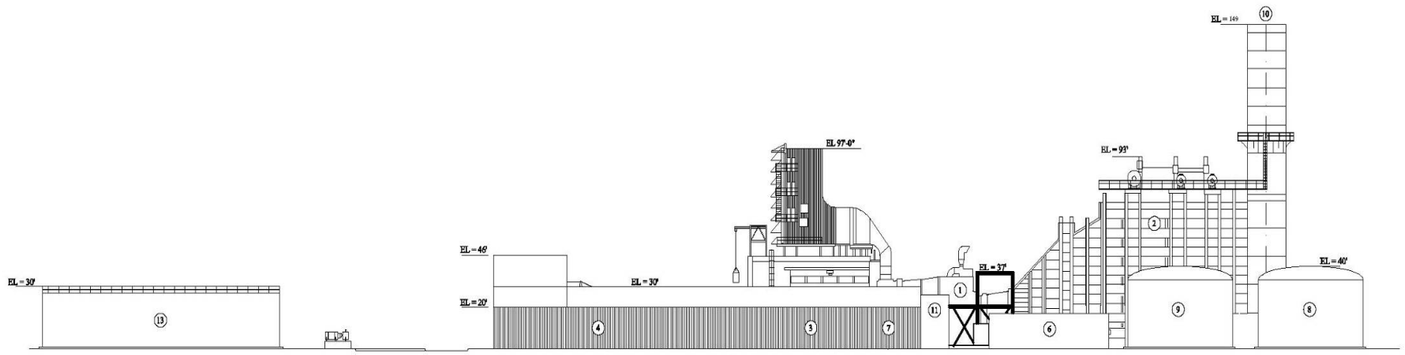
NO	REVISIONS	DATE	DRWN	CHK	ENGR	APPR
A	REVISE PER COMMENT					

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FPL

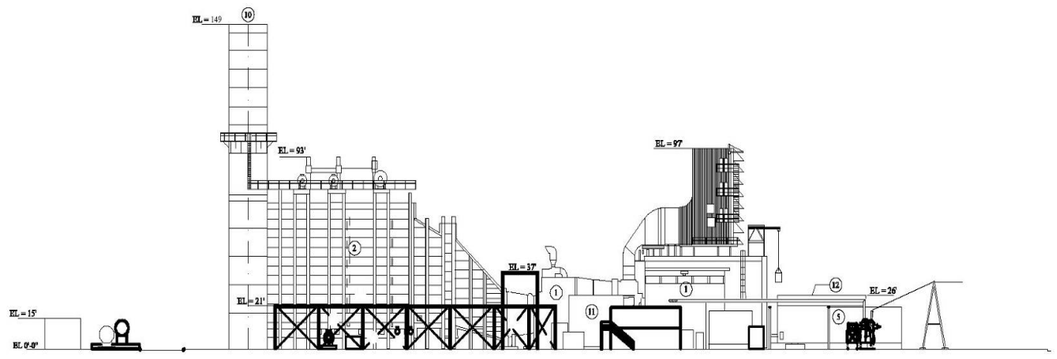
FIGURE 4.2.0-2
NORTH-SOUTH PROFILE OF COMBUSTION TURBINES AND HRSGS
RIVIERA BEACH ENERGY CENTER

DRAWN	DESIGNED	CHECKED	CHECKED
C.ROBINSON			
APPROVED	CLIENT DRAWING NUMBER	SIZE	REV
APPROVED	D013455-SRWL00004	01	A



EAST ELEVATION

LOOKING WEST



WEST ELEVATION

LOOKING EAST

30 0 15 30 45 60

SCALE

SCALE IN FEET

LEGEND

1. GAS TURBINE AND GENERATOR
2. HEAT RECOVERY STEAM GENERATOR
3. ADMINISTRATION BUILDING
4. WAREHOUSE BUILDING
5. GENERATOR STEP-UP TRANSFORMER
6. DEMINERALIZER WATER TRAILER AREA
7. CONTROL ROOM
8. RAW WATER STORAGE TANK
9. DEMINERALIZED WATER STORAGE TANK
10. STACK
11. CT TURBINE ENCLOSURE
12. COMBUSTION TURBINE SFC
13. FUEL OIL TANK (DOUBLE WALLED)

GENERAL NOTES

1. ALL SIZES AND ELEVATIONS ARE APPROXIMATE.
2. ANTICIPATED STACK HEIGHT NOT TO EXCEED 200; DETERMINED BY ENVIRONMENTAL REGULATIONS.
3. ALL ACREAGES AND LOCATIONS OF STRUCTURES WITHIN THE SITE PLAN ARE APPROXIMATE AND CONCEPTUAL. THE ACREAGES AND LOCATIONS OF STRUCTURES WITHIN THE SITE PLAN MAY BE MODIFIED PURSUANT TO THE POWER PLANT SITING ACT, SECTION 403.501, FLORIDA STATUTES.
4. BUILDING PERMITS:
   ELECTRICAL POWER GENERATING FACILITIES ARE EXEMPT PER SECTION 403.510 AND 403.511, FLORIDA STATUTES AND SECTION 102.1(f), 2004 FLORIDA BUILDING CODE.

REFERENCE DRAWINGS

1. SITE RELATED WORK - 3x1 COMBINED CYCLE - 501G GENERAL ARRANGEMENT - PLAN D013455-SRWL00001 SH01
2. SITE RELATED WORK - 3x1 COMBINED CYCLE - 501G NORTH/SOUTH ELEVATION D013455-SRWL00004 SH01

PRELIMINARY

NOT FOR CONSTRUCTION

NO	ISSUE FOR DRAWING / REVISIONS	DATE	DSNR	CHK	DSGN	APPR
A						

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FPL

FIGURE 4.2.0-3
EAST-WEST PROFILE OF COMBUSTION TURBINES AND HRSGS
RIVIERA BEACH ENERGY CENTER

DRAWN	DATE	CHECKED	CHECKED	
C JOHNSON	04/08/05			
APPROVED	CAD/DRAWING NUMBER		SHEET	REV
APPROVED	D013455-SRWL00003		01	A

Attachment 11:

Representative Photographs from Significant Historic Properties towards the Plant Site/Current Stacks



419 58th Street located within the Northwood Harbor Historic District, facing North with the Current Stacks in the Background



Landscaped Buffer Area North of 59th Street, which is the Northern Boundary of the Northwood Harbor Historic District, facing North



Houses on 57th Street located within the Northwood Harbor Historic District, facing North with the Current Stacks in the Background



View of Current Stacks from the side elevation of 5511 N. Dixie Highway with Current Stacks in the Background, facing North



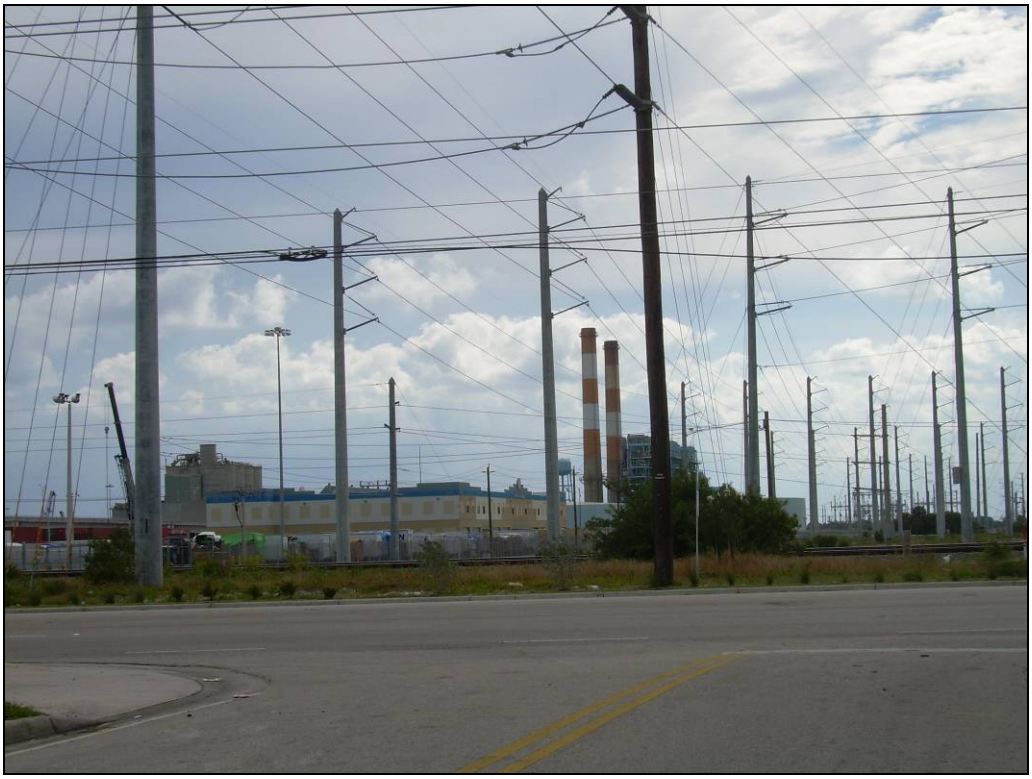
View of Current Stacks from the FEC Railroad Corridor, facing Northeast



View of Current Stacks from 595 W 4th Street, facing East



View of Current Stacks from 601 W 4th Street, facing East



View of Current Stacks from Old Dixie Highway, facing East



View of the Current Stacks from the Courtyard of Spanish Courts, facing Southeast



View of Current Stacks from Peanut Island, facing Southwest (Note that the Port of Palm Beach is located to the right of the Plant Site)