

# Final MTI Data Report: Turkey Point Nuclear Power Plant (U)

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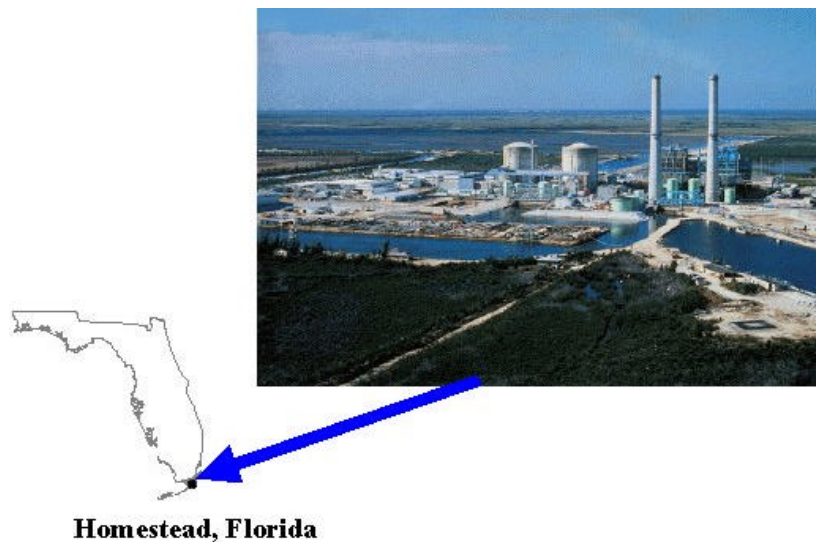
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## INTRODUCTION

During the period from September 2000 to April 2002, surface water temperature data was collected at the Turkey Point Nuclear Power Plant near Homestead, FL (Figure 1). This effort was led by the Savannah River Technology Center (SRTC) with the assistance of local plant personnel. Permission for setting up the monitoring sites was granted by Florida Power & Light, which owns the plant site. This work was done in support SRTC's ground truth mission for the US Department of Energy's Multispectral Thermal Imager (MTI) satellite (Garrett, et al, 1999). Data described in this report are available from the authors (contact information provided at the end of report).



**Homestead, Florida**  
*Figure 1. The location of the Turkey Point Nuclear Power Plant.*

## SURFACE WATER TEMPERATURE MEASUREMENTS

The Turkey Point Nuclear Power Plant utilizes an extensive canal system (shown on the cover and in Figures 2 and 3) to cool heated discharge water. Plant personnel operate three sites for permanent water temperature measurements: "Intake" (Figure 4), "Discharge" (Figure 5), and "Hotel 1" (Figure 6). These sites utilize platinum resistance probes housed in polyvinyl chloride (PVC) tubes for protection. SRTC set-up three additional sites to augment the plant water temperature measurements: "A", "B", and "C" shown in Figure (7). Figures 8 and 9 show typical installations at the "A", "B", and "C" sites.

Data described in this report are available from the authors.



*Figure 2. Looking east over cooling canals toward the plant site with Biscayne Bay in the distance.*



*Figure 3. Looking south along the extensive network of cooling canals.*





*Figure 4. "Intake Site", The water temperature is located within the PVC pipe that extends into the water..*



*Figure 5. "Outfall" Site, looking south along the extensive network of The water temperature sensor is located within the PVC pipe that extends into the water.*

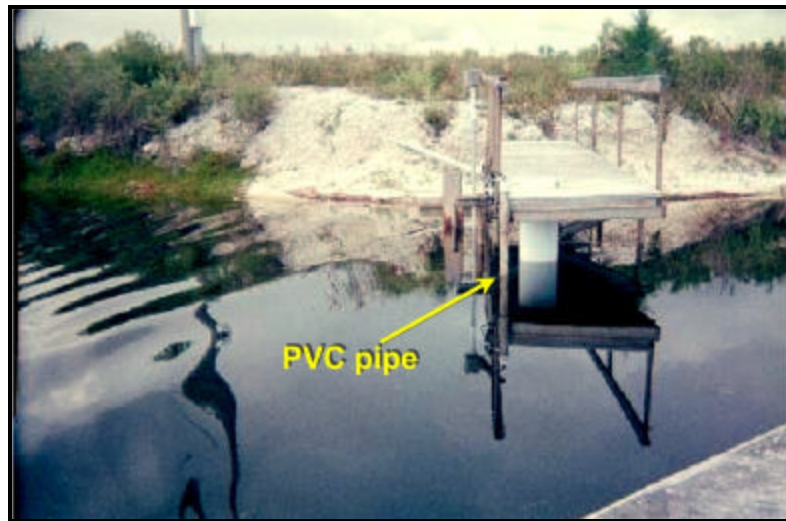


Figure 6. The "Hotel 1" site. The water temperature sensor is located within the PVC pipe that extends into the water.

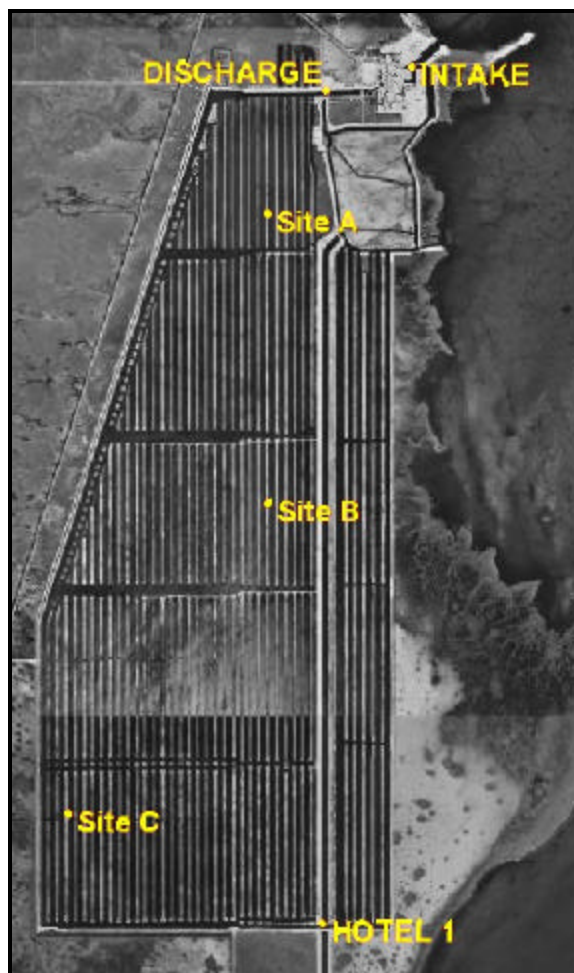


Figure 7. Location of water temperature monitoring sites.





Figures 8 and 9. Typical installations for sites "A", "B" and "C" are shown. The image on the right is a downward looking view of the protective case, which houses the sensor, suspended over a small anchor.

Surface water temperature measurements were made with the StowAway® TidbiT® (Figure 10) manufactured by Onset Computer ([www.onsetcomputer.com](http://www.onsetcomputer.com)). Sensors were suspended within a protective case approximately in the middle of the 1 m (approximate average depth) water column. Data collection was fairly good except for periods where sensors were damaged by resident wildlife, i. e. American Crocodiles (Figure 11).



Figure 10. The StowAway TidbiT (front view, left, and rear view, right).



Figure 11. Photograph of an American Crocodile in a cooling canal.

Hand-held GPS coordinates for each site are as follows:

| Site    | WGS 84                         |
|---------|--------------------------------|
| Intake  | N 25° 25.347'<br>W 80° 20.624' |
| Outfall | N 25° 25.991'<br>W 80° 20.275' |
| Hotel 1 | N 25° 21.429'<br>W 80° 20.338' |
| A       | N 25° 25.348<br>W 80° 20.624'  |
| B       | N 25° 23.758'<br>W 80° 20.630' |
| C       | N 25° 22.053                   |

## DATA DESCRIPTION

The following information in Table I describes surface water temperature data within the file ABCall.xls. All times are local Eastern Time (Standard or Daylight). Turkey Point plant personnel have compiled daily plant operating and meteorological data summaries corresponding to each month of the collection campaign.

Table I. Description of Data Nomenclature

| <b>SURFACE WATER TEMPERATURES</b> |  |
|-----------------------------------|--|
| <b>Name</b>                       | <b>Description (All temperatures °C)</b>     |
| “A”                               | Water temperature in the upper canal system  |
| “B”                               | Water temperature in the middle canal system |

## PLANT OPERATING DATA

| Name           | Description   |
|----------------|---|
| “JULIAN”       | Julian date   |
| “UNIT 1 MW”    | Power level of Unit 1 in megawatts  |
| “MAX OUTLET T” | (3 <sup>rd</sup> Column) Unit 1 maximum outlet water temperature during the day of record |
| “UNIT 2 MW”    | Power level of Unit 2 in megawatts  |
| “MAX OUTLET T” | (5 <sup>th</sup> Column) Unit 2 maximum outlet water temperature during day of record     |
| “UNIT 3 MW”    | Power level of Unit 3 in megawatts  |
| “MAX OUTLET T” | (7 <sup>th</sup> Column) Unit 3 maximum outlet water temperature during day of record     |
| “UNIT 4 MW”    | Power level of Unit 4 in megawatts  |
| “MAX OUTLET T” | (9 <sup>th</sup> Column) Unit 4 maximum outlet water temperature during day of record     |
| “PTF CWP OUT”  | Number of cooling water pumps (fossil) not operating                                      |
| “PTN CWP OUT”  | Number of cooling water pumps (nuclear) not operating                                     |
| “FLOW”         | Cooling water flow rate/gpm   |

## METEOROLOGICAL DATA

|             |   |
|-------------|---|
| “JULIAN”    | Julian data                             |
| “HOURLY”    | Time in Eastern Standard Time           |
| “DISCHARGE” | Plant discharge water temperature in °F |
| “INTAKE”    | Plant intake water temperature in °F    |

|            |   |
|------------|---|
| “HOTEL 1”  | Water temperature (°F) at the end point in the canal system before water is transported back to the plant |
| “WIND SPD” | Wind speed in MPH   |
| “WIND DIR” | Wind direction in degrees   |
| “AIR TEMP” | Air temperature in °F   |
| “RH”       | Relative humidity in %  |
| “PRESSURE” | Barometric pressure (Note: This data is rarely available)   |
| “COVER”    | Solar radiation in langley per hour   |

Note: “NR” means “NOT REPORTED” in the data files

## DATA QUALITY ASSURANCE

All surface water temperature collected by SRTC data were reviewed for accuracy. Erroneous data were deleted and left as “blanks” in the data files.

## EXAMPLE DATA

An example surface-water temperature plot of quality assured data is shown in Figure 12. An example of plant data is shown in Figure 13.

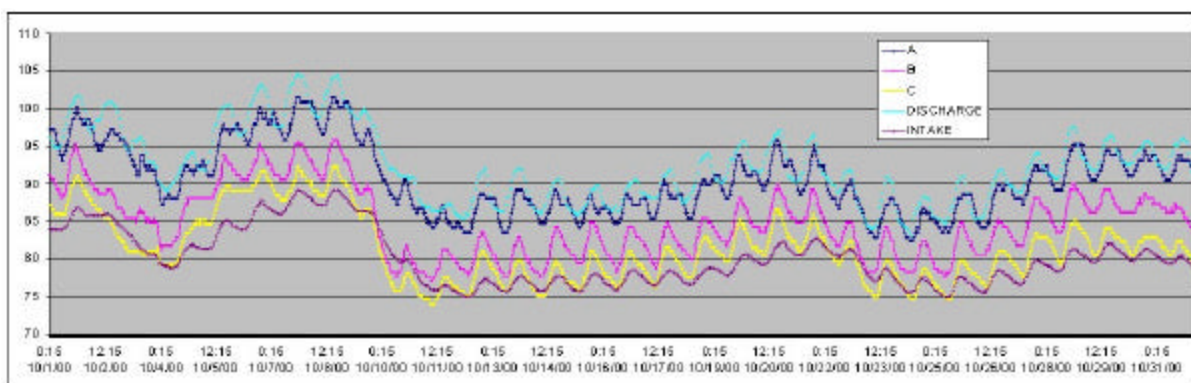


Figure 12. Time series plot of water temperature (°F) data collected at sites “A”, “B”, “C”, “Discharge” and “Intake” (“Hotel 1” data not available) in October 2000.

| JULIAN | UNIT 1 MW         | MAX OUTLET T | UNIT 2 MW | MAX OUTLET T | UNIT 3 MW | MAX OUTLET T | UNIT 4 MW | MAX OUTLET T | PTF CWP OUT | PTN CWP OUT | FLOW      |
|--------|-------------------|--------------|-----------|--------------|-----------|--------------|-----------|--------------|-------------|-------------|-----------|
| 275    | 6,877             | 100          | 6,227     | 100          | 17,820    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 276    | 7,415             | 99           | 6,173     | 99           | 17,782    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 277    | 3,708             | 94           | 6,444     | 94           | 17,949    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 278    | 0                 | 82           | 6,990     | 95           | 18,023    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 279    | 5,923             | 98           | 7,369     | 98           | 17,874    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 280    | 8,045             | 100          | 7,109     | 101          | 17,741    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 281    | 6,845             | 102          | 6,125     | 101          | 17,663    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 282    | 6,437             | 102          | 5,614     | 101          | 17,679    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 283    | 3,912             | 96           | 4,736     | 95           | 17,772    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 284    | 0                 | 84           | 5,103     | 90           | 18,056    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 285    | 0                 | 79           | 3,744     | 84           | 18,295    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 286    | 4,080             | 89           | 5,734     | 88           | 18,182    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 287    | 3,908             | 90           | 6,244     | 88           | 18,185    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 288    | 1,599             | 84           | 5,492     | 88           | 18,198    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 289    | 0                 | 79           | 4,999     | 89           | 18,185    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 290    | 4,953             | 90           | 1,035     | 82           | 18,171    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 291    | 5,007             | 91           | 0         | 78           | 18,154    | NR           | 0         | NR           | 1           | 4           | 690,583   |
| 292    | 5,407             | 91           | 0         | 80           | 18,154    | NR           | 0         | NR           | 1           | 4           | 690,583   |
| 293    | 5,029             | 93           | 0         | 81           | 18,088    | NR           | 0         | NR           | 1           | 4           | 690,583   |
| 294    | 4,953             | 94           | 0         | 82           | 19,010    | NR           | 0         | NR           | 1           | 4           | 690,583   |
| 295    | 4,240             | 95           | 2,719     | 91           | 17,996    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 296    | 3,242             | 93           | 0         | 82           | 17,948    | NR           | 0         | NR           | 0           | 4           | 759,333   |
| 297    | 4,219             | 91           | 2,776     | 91           | 18,075    | NR           | 2,014     | NR           | 0           | 0           | 1,728,000 |
| 298    | 5,093             | 90           | 0         | 78           | 18,187    | NR           | 3,903     | NR           | 0           | 0           | 1,728,000 |
| 299    | 4,518             | 91           | 3,742     | 91           | 18,209    | NR           | 7,686     | NR           | 0           | 0           | 1,728,000 |
| 300    | 4,829             | 91           | 14        | 79           | 18,176    | NR           | 12,580    | NR           | 0           | 0           | 1,728,000 |
| 301    | 4,573             | 92           | 0         | 81           | 18,099    | NR           | 17,625    | NR           | 0           | 0           | 1,728,000 |
| 302    | 4,550             | 95           | 3,155     | 94           | 18,066    | NR           | 17,633    | NR           | 0           | 0           | 1,728,000 |
| 303    | 4,426             | 95           | 0         | 83           | 18,742    | NR           | 18,178    | NR           | 0           | 0           | 1,728,000 |
| 304    | 5,658             | 95           | 0         | 82           | 18,012    | NR           | 17,500    | NR           | 0           | 0           | 1,728,000 |
| 305    | 4,846             | 93           | 3,090     | 90           | 18,036    | NR           | 17,630    | NR           | 0           | 0           | 1,728,000 |
|        | NR - NOT REPORTED |              |           |              |           |              |           |              |             |             |           |

Figure 13. An example of the plant data for October 2000. See Table I “Plant Operating Data” for a description.

## ACKNOWLEDGEMENTS

Special thanks to Ralph Heistand and Kirk Dudley of Florida Power & Light for assisting with sensor deployment and recovery. Eliel Villa-Aleman of WSRC provided aerial imagery of the cooling canal system.

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