United States Environmental Protection Agency
Region 2
Clean Water Division
290 Broadway
New York, New York 10007

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PREPA San Juan PERMIT No. PR0000698

This Fact Sheet sets forth the principle facts and technical rationale that serve as the legal basis for the requirements of the accompanying draft permit. The draft permit has been prepared in accordance with Clean Water Act (CWA) section 402 and its implementing regulations at Title 40 of the *Code of Federal Regulations* (CFR), Parts 122 through 124, and the final Water Quality Certificate (WQC) issued by the Puerto Rico Environmental Quality Board (EQB) pursuant to CWA section 401 requirements.

Pursuant to 40 CFR 124.53, the Commonwealth of Puerto Rico must either grant a certification pursuant to CWA section 401 or waive this certification before the U.S. Environmental Protection Agency (EPA) may issue a final permit. On November 1, 2017, EQB provided in the WQC that the allowed discharge will not cause violations to the applicable water quality standards at the receiving water body if the limitations and monitoring requirements in the WQC are met. In accordance with CWA section 401, EPA has incorporated the conditions of the final WQC into the draft permit. The WQC conditions are discussed in this Fact Sheet and are no less stringent than allowed by federal requirements. Additional requirements might apply to comply with other sections of the CWA. Review and appeals of limitations and conditions attributable to the WQC were made through the applicable procedures of the Commonwealth of Puerto Rico and not through EPA procedures.

PART I. BACKGROUND

A. Permittee and Facility Description

The Puerto Rico Electric and Power Authority (PREPA) has applied for renewal of the National Pollutant Discharge Elimination System (NPDES) permit for the San Juan Power Plant. PREPA (referred to throughout as the Permittee) is discharging pursuant to NPDES Permit No**.** PR0000698.The Permittee submitted Application Form 1 and Form 2C and 2F dated September 29, 2011**,** and applied for an NPDES permit to discharge treated wastewater from PREPA San Juan Power Plant, San Juan, PR, called the facility. The facility is classified as a major discharger by EPA in accordance with the EPA rating criteria.

The Permittee owns and operates a steam electric generation facility. Attachment A of this Fact Sheet provides a map of the area around the facility and a flow schematic of the facility.

PREPA San Juan is an onshore steam electric power generation facility located in the municipality of San Juan, next to the Puerto Nuevo piers on the southwest shore of San Juan Bay. The PREPA San Juan facility was initially constructed in 1950 and consists of six generating units, four oil-fired generating units of 100 MW (Units 7-10) and two combine cycle's units of 232 MW (Units 5-6), with a total generating capacity of 864 MW.

The facility water sources are the San Juan Bay and city water from the Puerto Rico Aqueduct and Sewer Authority (PRASA). Cooling water, wastewater, and stormwater are discharged to San Juan Bay through three separate outfalls.

The main uses (continuous basis) of water at the facility include once-through cooling, sea water screen washing, recirculating cooling, boiler makeup and water for equipment cleaning and maintenance. Minor uses (intermittent) of water include: hydrostatic testing, sanitary uses, and miscellaneous in-plant operations. Wastewaters are also generated as cooling tower blowdown, condensate, demineralized water ("demi water"), and reverse osmosis (RO) plant discharges. Stormwater is also discharged through each of the outfalls.

Outfall 001: Outfall 001 is composed primarily of once-through cooling water from San Juan Bay. The maximum 749.8 MGD of seawater is pumped through the surface condensers to condense steam once it is used by the power generators. No chemicals are added to this water stream.

There are three separate water intake and screen systems. The intakes are located in the Puerto Nuevo Bay, a small bay in the southeast corner of the San Juan Bay. Prior to use in the condensers, the water passes through fixed and traveling screens to remove trash and other debris. Units 9 and 10 have four traveling screens, with an array of four pumps, rated at 236 gallons per minutes (GPM) each. A total of 944 GPM, or 1.36 MGD, provide the backwash water to clean the traveling screens.

Units 7 and 8 have four traveling screens, with an array of two screen wash pumps each rated at 590 GPM. These provide the backwash water to clean the traveling screen and withdraw water from the internal channel. These pumps are not included in the design intake flow because the screen wash water is recycled back through the screen and does not place any additional demand on the withdrawal. These screen are washed separately with seawater and the wash stream is discharged through Outfall 001. No chemicals or substances are added to this operation.

Outfall 001 also receives blowdown from six recirculating cooling towers at the facility. These cooling towers are used to provide cooling water for miscellaneous equipment throughout the facility. Makeup water (approximately 342,720 gallons per day) is fresh water from PRASA. The cooling towers operate at approximately 3 cycles. Most of the makeup water evaporates in the system. When the conductivity level in the recirculating water increase to a specific level, a volume of water is drained from the cooling tower basis and discharged to Outfall 001 via the once-through seawater canal. The blowdown can contain water treatment chemicals which are required to minimize fouling, corrosion, and biological growth in the cooling system.

Periodically, the boilers must discharge condensate (condensed steam) to the drainage system. This discharge can occur when there is a saltwater leak in the boiler condensers or during startup when the condensate is below the specifications for condensate return. The volume of these discharges could be up to approximately 107,250 gallons per boiler. The frequency is variable, although it can be estimated as once a month. The condensate is discharged through Outfall 001.

Miscellaneous water use in the facility is discharged to any of three Oil Water Separators (OWS-3, -4, and -5) prior to discharge to Outfall 001. The water uses included miscellaneous clean up, rinsing, flushing, and other minor operations. Although the volume of the water is not measured, the daily use is estimated to be approximately 10,000 gallons.

Stormwater from the facility also flows through the OWS prior to reaching the discharge point. The estimated maximum stormwater runoff volume discharged through Outfall 001 is 0.39 MG, based on a historical maximum of 6.79 inches of rainfall in a 24-hour period and the drainage area.

Outfall 002: The outfall consists of the wastewater treatment plant (WWTP) effluent, condensate water and stormwater. The WWTP is the primary wastewater effluent in the Outfall 002 discharge. The WWTP handles wastes from the regeneration of the demi water plant, boiler drainage, occasional hydrostatic testing water, stormwater, equipment maintenance and cleaning water, cooling tower blowdown, boiler chemical cleaning water, combustion turbines compressor washing, cleaning-in-place of the RP and some laboratory waste water.

The demi water plan consists of ion exchange resins that are used to remove dissolved solids from RO permeate to provide high quality boiler makeup water. Periodically, the resin beds must be regenerated with acid and caustic to remove absorbed ions. The acid and caustic wastes, which contain high levels of dissolved solids, are sent to a holding tank prior to the metals precipitation unit at the WWTP.

Also, an RO plant is used as a pretreatment for the demi water plant. The waste produced after the cleaning of the RO membranes with caustic and citric acid are sent to the WWTP.

Steam is used in non-contact heat exchangers to heat fuel oil system that is fed to the boilers. The condensate from these heat exchangers is sent to the once-through cooling towers and discharged. About 0.03 MGD of this condensate flows to OWS-2 that connects to Outfall 002.

Condensate water is also used as hydrostatic test water. Whenever a boiler is repaired, it is hydrostatically tested to ensure there are no leaks. Part, or all, of this water is discharged to a holding tank and then to the WWTP if the boiler fails the test. The volume of the discharge is approximately 5,000 to 20,000 gallons. A similar operation may occur when a boiler that is out of service is filled with water until it can be restarted. After this “wet storage”, the water could be drained to the WWTP.

Equipment maintenance and cleaning are done with both demi water and PRASA water. The wastewater that are generated include: fan wash water, laboratory drains, spent battery acid, air preheater cleanings, boiler chemical cleanings, boiler fireside cleanings, external boiler wash water, and power block floor wash water. The volume and frequencies of these wastes are variable but a typical daily flow of 0.6 MGD was estimated. Because these operations contain metals, they are sent to the WWTP for metals precipitation and neutralization.

The WWTP consists of three holding tanks. Two of these (Tank 1 and Tank 2) receive demineralization regeneration wastes, stormwater, and sludge ponds supernatant water. The water in these tanks is sent to two parallel treatment units for metals precipitation, consisting of mixing, flocculation, coagulation, and sedimentation chambers. Effluent from the unit is filtered through multimedia pressure filters and discharged to the final effluent holding tank. In the final effluent holding tank, the pH is adjusted with caustic and sulfuric acid before being discharged to Outfall 002. Typically, the WWTP discharge occurs two times a week, although it may vary depending on operational requirements. The third tank (Tank 3) receives water from equipment maintenance and cleaning wastes. The water in this tank is sent to a small treatment tank. In this tank, the water is mixed with polymers and caustic and then sent to a sludge pond for metals precipitation.

The capacity of the WWTP is 0.86 MGD. Although, a typical flow rate through the unit is 0.4 MGD, higher flows are often experienced as a result of inventory buildup, high regeneration waste volumes, or other periods of high wastewater flows.

Stormwater from drainage area 2 is directed to OWS-1 and OWS-2, then discharged to Outfall 002. Estimated maximum daily stormwater volume reaching Outfall 002 is 1.45 MG, based on the historical maximum of 6.79 inches of rainfall in a 24-hour period and the size of the drainage area.

Outfall 003: Outfall 003 receives steam condensate from the fuel heating system, utility water (floor and equipment drain), occasional fuel oil tanks hydrostatic test water, condensate water, and stormwater.

Periodically, the fuel oil tanks are hydrostatically tested. Each of the ten tanks is tested ever ten to twelve years. The maximum water volume used for a tank test is 2.1 million gallons. Usually PRASA water is used for the test.

Approximately 0.01 MGD of miscellaneous utility water is discharged to this outfall via OWS-7. This water includes miscellaneous cleanup, rinsing, flushing and other minor operations. Although the volume of this water is not measured, daily use is estimated to be approximately 10,000 gallons.

Approximately 0.05 MGD of condensate from the units 7 and 8 fuel heater condensate cooling tower are discharged to Outfall 003 through OWS-10.

Stormwater from the Outfall 003 drainage area is directed to OWS-7 and OWS-10. The maximum stormwater runoff flow to Outfall 003 was estimated to be 3.07 MG, based on a historical maximum of 6.70 inches of rain in a 24-hour period and the size of the drainage area.

Summary of Permittee and Facility Information

Permittee	Puerto Rico Electric Power Authority (PREPA)
Facility contact, title, phone	Luisette X. Rios Castañer Environmental Compliance Supervisor Water Quality Department, Environmental Protection and Quality Assurance Division Telephone: 787-521-4966 E-mail: l-rios@aeepr.com
Permittee (mailing) address	PO Box 364267, San Juan, PR 00936
Facility (location) address	PR No 28, Puerto Nuevo, PR 00934
Type of facility	Steam Electric Generating Facility SIC Code: 4911 – Electric Services NAICS Code: 221112 – Fossil Fuel Electric Power Generation
Pretreatment program	N/A
Facility maximum daily flow	749.8 MGD
Facility design flow	N/A
Facility classification	Major

B. Discharge Points and Receiving Water Information

Wastewater is discharged from Outfall 001, 002 and 003 to the San Juan Bay, a water of the United States.

The draft permit authorizes the discharge from the following discharge point(s):

Outfall	Effluent description	Outfall latitude	Outfall longitude	Receiving water name and classification
001	- Non-contact condenser cooling water (all units) - Screenwash water (units 7-10) - Cooling tower basin drain for cleaning (all units) - Service water cooling tower blowdown - Utility water – floor/equipment drains (units 5-10) - Condensate water (units 5-10) - Rejected water from the reverse osmosis system - Backwash water of the new ultrafiltration systems - Stormwater runoff	18°, 25', 48" N	66°, 6', 26" W	San Juan Bay, Class SC
002	- Wastewater treatment plant effluent - Steam condensate from fuel line heating system - Stormwater runoff	18°, 25', 47" N	66°, 6', 27" W	San Juan Bay, Class SC
003	- Steam condensate from fuel line heating system (units 7 & 8; service tanks 9 &10) - Utility water – floor/equipment drains (units 5-8) - Reserve and service fuel oil tank hydrostatic test water - Condensate water - Stormwater	18°, 25', 48" N	66°, 6', 26" W	San Juan Bay, Class SC

As indicated in the Puerto Rico Water Quality Standards (PRWQS) Regulations, the designated uses for Class SC receiving waters include:

- Primary contact recreation use from the zone subject to the ebb and flow of tides (mean sea level) to 3 miles seaward,
- Secondary contact recreation from 3 miles seaward to 10.35 miles seaward,
- Propagation and preservation of desirable species, including threatened or endangered species**.**

CWA section 303(d) requires the Commonwealth of Puerto Rico to develop a list of impaired waters, establish priority rankings for waters on the list, and develop TMDLs for those waters. The San Juan Bay has been determined to have water quality impairments for one or more of the designated uses as determined by section 303(d) of the CWA. Total maximum daily loads (TMDLs) have been developed and approved by EPA for fecal coliforms.

C. Mixing Zone/Dilution Allowance

A mixing zone or dilution allowance has not been authorized for the discharger.

D. Compliance Orders/Consent Decrees

EPA Consent Decree Civil Action No. 93-2527-CCC: This consent decree has been in effect since 1999. The construction of all projects under Section VI, Part 1, Paragraph 2 of the Consent Decree, regarding PREPA-San Juan have been completed. PREPA has maintained compliance with all continuous requirements of the CD.

EPA Administrative Compliance Order – Docket No. CWA-02-2010-3119. PREPA received the referenced Administrative Compliance Order (ACO) on March 2, 2010. PREPA submitted the Compliance Plan requested by the ACO on March 31, 2010 with a compliance schedule not to exceed 180 days. On October 6, 2010, PREPA submitted a Compliance Plan Status stating that all the activities were completed on or before September 17, 2010.

E. Summary of Basis for Effluent Limitations and Permit Conditions - General

The effluent limitations and permit conditions in the permit have been developed to ensure compliance with the following, as applicable:

1) NPDES regulations (40 CFR Part 122)
2) Secondary Treatment Standards (40 CFR 133)
3) Steam Electric Power Generating Facility Effluent Limitation Guidelines (40 CFR Part 423)
4) Puerto Rico Water Quality Standards (May 2016)
5) Clean Water Action §316(b) regulations (CWA §316)

PART II. RATIONALE FOR EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

CWA section 301(b) and 40 CFR 122.44(d) require that permits include limitations more stringent than applicable technology-based requirements where necessary to achieve applicable water quality standards. In addition, 40 CFR 122.44(d)(1)(i) requires that permits include effluent limitations for all pollutants that are or may be discharged at levels that cause, have the reasonable potential to cause, or contribute to an exceedance of a water quality criterion, including a narrative criterion. The process for determining reasonable potential and calculating water quality-based effluent limits (WQBELs) is intended to protect the designated uses of the receiving water, and achieve applicable water quality criteria. Where reasonable potential has been established for a pollutant, but there is no numeric criterion for the pollutant, WQBELs must be established using (1) EPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting the state's narrative criterion, supplemented with other relevant information, as provided in 40 CFR 122.44(d)(1)(vi).

The effluent limitations and permit conditions in the permit have been developed to ensure compliance with all federal and state regulations, including PRWQS. The basis for each limitation or condition is discussed below.

A. Effluent Limitations – Outfall 001

The permit establishes both Technology-based Effluent Limitations (TBELs) and WQBELs for several pollutants and the basis for these limitations are discussed below**.**

1. **Dissolved Oxygen.** The effluent limitation is based on the water quality criterion for Class SC waters as specified in Rule 1303.2 of PRWQS, and the WQC.
2. **Enterococci.** A requirement to monitor and report enterococci has been established in the permit as specified by the WQC.
3. **Flow:** An effluent limitation for flow has been established in the permit. Monitoring conditions are applied pursuant to 40 CFR 122.21(j)(4)(ii) and the WQC.
4. **Narrative Effluent Limitations.**
    a. **Color.** A narrative effluent limitation for color has been established based on Rule 1303.2 of the PRWQS and the WQC. As required by the WQC, monitoring for color shall occur at the effluent and the receiving water body.
    b. **Oil and Grease.** A narrative condition for oil and grease has been established based on Rule 1303.1 of the PRWQS and the WQC.
    c. **Solids and Other Matter:** A narrative condition for solids and other matter has been established based on Rule 1303.1 of the PRWQS and the WQC.
    d. **Suspended, Colloidal or Settleable Solids.** A narrative condition for suspended, colloidal or settleable solids has been established based on Rule 1303.1 of the PRWQS and the WQC.
    e. **Taste and Odor Producing Substances.** A narrative effluent limitation for taste and odor producing substances has been established based on Rule 1303.2 of the PRWQS and the WQC.
5. **pH.** The effluent limitation for pH is on the water quality criterion for Class SC based on Rule 1303.2 of the PRWQS and the WQC.
6. **Sulfates (SO_4).** The effluent limitation for sulfates is based on the water quality criterion for Class SC estuarine waters as specified in Rule 1303.2 of the PRWQS and the WQC.
7. **Temperature.** The effluent limitation for temperature is based on the WQC.
8. **Temperature, Net.** The effluent limitation for the difference between the intake water temperature and the discharge temperature is based on the WQC.
9. **Turbidity.** The effluent limitation for turbidity is based on Rule 1303.2 of the PRWQS.
10. **Whole Effluent Toxicity (WET):** CWA section 101(a) establishes a national policy of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. Specifically, CWQ section 101(a)(3) and PRWQS Rule 1303(l) prohibit the discharge of toxic pollutants in toxic amounts. Federal regulations at 40 CFR 122.44(d) also require that where the permitting authority determines, through the analysis of site-specific WET data, that a discharge causes, shows a reasonable potential to cause, or contributes to an excursion above a water quality standard, including a narrative water quality criterion, the permitting authority must establish effluent limits for WET. To satisfy requirements of the CWA, its implementing regulations, and the PRWQS, a reasonable potential analysis for WET was conducted for this discharge.

    PRWQS do not provide a numeric criterion for toxicity. Therefore, consistent with the recommendations of section 2.3.3 of EPA's *Technical Support Document* (TSD) *for Water Quality-Based Toxics Control* (EPA-505-2-90-001), values of 0.3 acute toxic unit (TUa) and 1.0 chronic toxic unit (TUc) were used to interpret the narrative water quality criteria for WET established in PRWQS Rule 1303(i). The toxicity data collected in quarterly in 2008 indicates the test results as "passing" for both discharges. As such, no WET testing limitation have been established in the permit. However, as the existing WET data is over 10 years old, the permit does establish monitoring requirements and an action level for acute WET to determine unacceptable toxicity.

B. Effluent Limitations Summary Table - Outfall Number 001:

Parameter	Units	Effluent limitations					
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
Arsenic	ug/l	Daily maximum	1.1	1.4	-	-	WQBEL
Copper	ug/l	Daily maximum	-	3.1	-	-	WQBEL
Color	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Dissolved Oxygen	mg/l	Continuous	5.9	Shall not contain less than 4.0	-	Shall not contain less than 4.0	WQBEL
Enterococci	colonies/ 100mgl	Monthly average	-	-	-	M/R	WQBEL
Fecal Coliforms	colonies/ 100ml %	Monthly average % can't exceed 400 col/100ml	602 100	200 20	-	-	WQBEL
Flow	m^3/day MGD	Continuous	748.8	3.298×10^6 871.3	-	2.839×10^6 750	WQBEL
Mercury	ug/l	Daily maximum	0.008	0.051	-	-	WQBEL
Nickel	ug/l	Daily maximum	4.8	8.2	-	-	WQBEL
Oil & Grease	mg/l	Daily average Daily maximum	10 15	2.6 2.6	-	*See narrative effluent limitations*	WQBEL
Pentachlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
pH	SU	Continuous	8.2	7.3-8.5	-	7.3-8.5	WQBEL
Phenol		Daily maximum	-	Monitor only	-	-	WQBEL
Silver	ug/l	Daily maximum	-	2.0	-	-	WQBEL
Solids and other matter	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Sulfates (SO_4)	mg/l	Daily maximum	-	MR	-	2,800	WQBEL
Sulfides (undissociated H_2S)	ug/l	Daily maximum	-	MR	-	-	WQBEL
Surfactants as MBAS	ug/l	Daily maximum	-	MR	-	-	WQBEL
Suspended, Colloidal or Settleable Solids	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Taste and odor producing substances	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL

Parameter	Units	Effluent limitations					
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
Temperature	F° C°	Continuous	105.8 41	103 39.4	-	No more than four days per year the discharge will exceed 103°F (39.4°C).	WQBEL
Temperature, Difference between intake and discharge	F° C°	Daily maximum	-	18 10	-	18 10	WQBEL
Total Suspended Solids, net	mg/l	Daily maximum	19	20	-	-	WQBEL
Turbidity	NTU	Daily maximum	4	10	-	10	WQBEL
Whole Effluent Toxicity, acute	TUa	Daily maximum	-	-	-	Action level of 0.3	WQBEL
Zinc	ug/l	Daily maximum	-	81	-	85.62	WQBEL
2-Methyl-4,6-Dinitrophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4-Dinitrophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4,6-Trichlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL

Notes, Footnotes and Abbreviations

Note: Dashes (--) indicate there are no effluent data, no limitations, or no monitoring requirements for this parameter.

1 – Wastewater data from DMRs dated October 1, 2012 through September 30, 2017.

C. Effluent Limitations – Outfall 002

The permit establishes both Technology-based Effluent Limitations (TBELs) and WQBELs for several pollutants and the basis for these limitations are discussed below**.**

1. **Copper.** The effluent limitations and compliance schedule for copper is based on Rule 1303.1 of the PRWQS and the WQC.
2. **Cyanide.** The effluent limitation for cyanide is based on Rule 1303.1 of the PRWQS and the WQC.
3. **Dissolved Oxygen.** The effluent limitation for dissolved oxygen is based on Rule 1303.2 of the PRWQS and the WQC.
4. **Enterococci.** The monitoring and reporting requirements for enterococci are based on the WQC.
5. **Flow.** The effluent limitation for flow is based on the WQC.
6. **Lead.** The effluent limitation for lead is based on Rule 1303.1 of the PRWQS and the WQC.
7. **Mercury.** The effluent limitation for mercury is based on Rule 1303.1 of the PRWQS and the WQC.
8. **Narrative Effluent Limitations:**
    a. **Color.** A narrative effluent limitation for color has been established based on Rule 1303.2 of the PRWQS and the WQC. As required by the WQC, monitoring for color shall occur at the effluent and the receiving water body.
    b. **Oil and Grease.** A narrative condition for oil and grease has been established based on Rule 1303.1 of the PRWQS and the WQC.
    c. **Solids and Other Matter:** A narrative condition for solids and other matter has been established based on Rule 1303.1 of the PRWQS and the WQC.

d. **Suspended, Colloidal or Settleable Solids.** A narrative condition for suspended, colloidal or settleable solids has been established based on Rule 1303.1 of the PRWQS and the WQC.

e. **Taste and Odor Producing Substances.** A narrative effluent limitation for taste and odor producing substances has been established based on Rule 1303.2 of the PRWQS and the WQC.

9. **Nickel.** The effluent limitation and compliance schedule for nickel is based on Rule 1303.1 of the PRWQS and the WQC.

10. **pH.** The effluent limitation for pH are based on Rule 1303.2 of the PRWQS and the WQC.

11. **Selenium.** The effluent limitation for selenium is based on the Rule 1303.1 of the PRWQS, the WQC, and the R2 Anti-backsliding Policy.

12. **Temperature.** The effluent limitations for temperature are based on Rule 1303.1 of PRWQS and the WQC.

13. **Zinc.** The effluent limitations for zinc are based on Rule 1303.1 of the PRWQS, the WQC, and the R2 Anti-backsliding Policy.

11. **Whole Effluent Toxicity (WET):** CWA section 101(a) establishes a national policy of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. Specifically, CWQ section 101(a)(3) and PRWQS Rule 1303(l) prohibit the discharge of toxic pollutants in toxic amounts. Federal regulations at 40 CFR 122.44(d) also require that where the permitting authority determines, through the analysis of site-specific WET data, that a discharge causes, shows a reasonable potential to cause, or contributes to an excursion above a water quality standard, including a narrative water quality criterion, the permitting authority must establish effluent limits for WET. To satisfy requirements of the CWA, its implementing regulations, and the PRWQS, a reasonable potential analysis for WET was conducted for this discharge.

    PRWQS do not provide a numeric criterion for toxicity. Therefore, consistent with the recommendations of section 2.3.3 of EPA's *Technical Support Document* (TSD) *for Water Quality-Based Toxics Control* (EPA-505-2-90-001), values of 0.3 acute toxic unit (TUa) and 1.0 chronic toxic unit (TUc) were used to interpret the narrative water quality criteria for WET established in PRWQS Rule 1303(i). The toxicity data collected in quarterly in 2008 indicates the test results as "passing" for both discharges. As such, no WET testing limitation have been established in the permit. However, as the existing WET data is over 10 years old, the permit does establish monitoring requirements and an action level for acute WET to determine unacceptable toxicity.

D. Effluent Limitations Summary Table – Outfall Number 002:

Parameter	Units	Effluent limitations					
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
Arsenic	ug/l	Daily maximum	<1	Monitor only	-	-	WQBEL
Color	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Copper	ug/l	Daily maximum	17	3.1	10	3.73	WQBEL
Cyanide	ug/l	Daily maximum	1.8	1.0	-	1.0	WQBEL
Dissolved oxygen	mg/l	Continuous	5.9	Shall not contain less than 4.0 mg/l	-	Shall not contain less than 4.0 mg/l	WQBEL
Enterococci	colonies/ 100mgl	Monthly average	-	-	-	M/R	WQBEL

Parameter	Units	Effluent limitations					
		Averaging period	**Highest Reported Value [1]**	**Existing limits**	**Interim limits**	**Final limits**	**Basis**
Fecal Coliforms	colonies/ 100ml %	Monthly average % can't exceed 400 col/100ml	99278 100	200 20	-	-	WQBEL
Flow	m^3/day MGD	Continuous	- 0.66	-	-	3.3697 0.89	WQBEL
Lead	ug/l	Daily maximum	16.6	8.1	-	8.52	WQBEL
Mercury	ug/l	Daily maximum	0.049	0.051	-	0.051	WQBEL
Nickel	ug/l	Daily maximum	119	8.28	38.6	8.28	WQBEL
Oil and Grease	mg/l	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Pentachlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
pH	SU	Continuous	8.5	7.3-8.5	-	7.3-8.5	WQBEL
Phenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Selenium	ug/l	Daily maximum	<77	71	-	71.1	WQBEL
Solids and other matter	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Sulfates	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Surfactants as MBAs	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Suspended, Colloidal or Settleable Solids	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Taste and Odor Producing Substances	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Temperature	F° C°	Continuous	95 35	90 32.2	-	90 32.2	WQBEL
Whole Effluent Toxicity, acute	TUa	Daily maximum	-	-	-	Action level of 0.3	WQBEL
Zinc	ug/l	Daily maximum	111	81	-	85.62	WQBEL
2-Chlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4-Dichlorophenol	ug/l	Daily maximum	3	Monitor only	-	-	WQBEL
2,4-Dimethyphenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2-Methyl-4,6-Dinitrophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4-Dinitrophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4,6-Trichlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL

Notes, Footnotes and Abbreviations

Note: Dashes (--) indicate there are no effluent data, no limitations, or no monitoring requirements for this parameter.

1 – Wastewater data from DMRs dated October 1, 2012 through September 30, 2017.

E. Effluent Limitations – Outfall 003

The permit establishes both Technology-based Effluent Limitations (TBELs) and WQBELs for several pollutants and the basis for these limitations are discussed below**.**

1. **Copper.** The effluent limitations and compliance schedule for copper are based on Rule 1303.1 of the PRWQS and the WQC.
2. **Dissolved Oxygen.** The effluent limitations for dissolved oxygen are based on Rule 1303.2 of the PRWQS and the WQC.
3. **Enterococci.** The monitoring and reporting requirements for enterococci are based on the WQC.
4. **Flow.** The flow limitations are based on the WQC.
5. **Lead.** The effluent limitations for lead are based on Rule 1303.1 of the PRWQS, the WQC, and the R2 Anti-backsliding Policy.
6. **Nickel.** The effluent limitation for nickel is based on Rule 1303.1 of the PRWQS and the WQC.
7. **Narrative Effluent Limitations:**
    a. **Color.** A narrative effluent limitation for color has been established based on Rule 1303.2 of the PRWQS and the WQC. As required by the WQC, monitoring for color shall occur at the effluent and the receiving water body.
    b. **Oil and Grease.** A narrative condition for oil and grease has been established based on Rule 1303.1 of the PRWQS and the WQC.
    c. **Solids and Other Matter:** A narrative condition for solids and other matter has been established based on Rule 1303.1 of the PRWQS and the WQC.
    d. **Suspended, Colloidal or Settleable Solids.** A narrative condition for suspended, colloidal or settleable solids has been established based on Rule 1303.1 of the PRWQS and the WQC.
    e. **Taste and Odor Producing Substances.** A narrative effluent limitation for taste and odor producing substances has been established based on Rule 1303.2 of the PRWQS and the WQC.
8. **pH.** The effluent limitation for pH is based on Rule 1303.2 of the PRWS and the WQC.
9. **Temperature.** The effluent limitation for temperature is based on Rule 1303.1 of the PRWQS and the WQC.
10. **Turbidity.** The effluent limitation for turbidity is based on Rule 1303.2 of the PRWQS and the WQC.
11. **Whole Effluent Toxicity.** CWA section 101(a) establishes a national policy of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. Specifically, CWQ section 101(a)(3) and PRWQS Rule 1303(l) prohibit the discharge of toxic pollutants in toxic amounts. Federal regulations at 40 CFR 122.44(d) also require that where the permitting authority determines, through the analysis of site-specific WET data, that a discharge causes, shows a reasonable potential to cause, or contributes to an excursion above a water quality standard, including a narrative water quality criterion, the permitting authority must establish effluent limits for WET. To satisfy requirements of the CWA, its implementing regulations, and the PRWQS, a reasonable potential analysis for WET was conducted for this discharge.

    PRWQS do not provide a numeric criterion for toxicity. Therefore, consistent with the recommendations of section 2.3.3 of EPA's *Technical Support Document* (TSD) *for Water Quality-Based Toxics Control* (EPA-505-2-90-001), values of 0.3 acute toxic unit (TUa) and 1.0 chronic toxic unit (TUc) were used to interpret the narrative water quality criteria for WET established in PRWQS Rule 1303(i). As there is no existing WET data for the facility, the permit establishes monitoring requirements and an action level for acute WET to determine unacceptable toxicity.
12. **Zinc.** The effluent limit for zinc is based on Rule 1303.1 of the PRWQC, the WQC, and the R2 Anti-backsliding Policy.

F. Effluent Limitations Summary Table – Outfall Number 003:

Parameter	Units	Effluent limitations					
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
Arsenic	ug/l	Daily maximum	-	1.4	-	-	WQBEL
Color	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Copper	ug/l	Daily maximum	17.4	3.1	10	3.73	WQBEL
Dissolved Oxygen	mg/l	Continuous	5.2	Shall not contain less than 4.0 mg/l	-	Shall not contain less than 4.0 mg/l	WQBEL
Enterococci	colonies/ 100mgl	Monthly average	-	-	-	M/R	WQBEL
Fecal Coliform	colonies/ 100ml %	Monthly average % can't exceed 400 col/100ml	2805 100	200 20	-	-	WQBEL
Flow	m^3/day MGD	Continuous	- 2.89	1,931 0.51	-	1,931 0.51	WQBEL
Lead	ug/l	Daily maximum	27.6	8.1	-	8.52	WQBEL
Mercury	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Nickel	ug/l	Daily maximum	27	8.2	-	8.28	WQBEL
Oil and Grease	mg/l	Daily maximum Daily average	6 6	15 10	-	*See narrative effluent limitations*	WQBEL
Pentachlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
pH	SU	Continuous	9	7.3-8.5	-	7.3-8.5	WQBEL
Phenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Sulfates	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Sulfides (undissociated H^2S)	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Surfactants as MBAs	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
Solids and other matter	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Suspended, Colloidal or Settleable Solids	--	Continuous	--	--	--	*See narrative effluent limitations*	WQBEL
Taste and odor producing substances	-	Continuous	-	-	-	*See narrative effluent limitations*	WQBEL
Temperature	F° C°	Continuous	109.9 43.3	90 32.2	-	90 32.2	WQBEL

Parameter	Units	Effluent limitations					
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
Turbidity	NTU	Daily maximum	6	10	-	10	WQBEL
Whole Effluent Toxicity, acute	TUa	Daily maximum	-	-	-	Action level of 0.3	WQBEL
Zinc	ug/l	Daily maximum	120	81	-	85.62	WQBEL
2-Chlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4-dichlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4-Dimethylphenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2-Methyl-4,6-Dinitrophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4-Dinitrophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL
2,4,6-Trichlorophenol	ug/l	Daily maximum	-	Monitor only	-	-	WQBEL

Notes, Footnotes and Abbreviations

Note: Dashes (--) indicate there are no effluent data, no limitations, or no monitoring requirements for this parameter.

1 – Wastewater data from DMRs dated October 1, 2012 through September 30, 2017.

E. Effluent Limitations – Internal Outfall IWS 601

The permit establishes both Technology-based Effluent Limitations (TBELs) and WQBELs for several pollutants and the basis for these limitations are discussed below**.**

1. **126 Priority Pollutants.** The effluent limitation for the 126 priority pollutants is based on the ELGs at 40 CFR 423.12.
2. **Chlorine, Free Available and Chlorine, Free Residual.** The ELGs at 40 CFR 423.13 establish effluent limitations for free available chlorine and free residual chlorine. However, EPA has not included effluent limitations for these parameters in the permit because neither chlorine nor water treatment chemicals are presently added to the condenser once-through cooling water system. PREPA is required to notify EPA and receive EPA approval prior to the usage of any chlorine or water treatment chemicals.
3. **Chromium.** The ELGs at 40 CFR 423.13 establish effluent limitations for total chromium. However, EPA has not included effluent limitations for this parameter in the permit because no water treatment chemicals are used at the facility which contain chromium. PREPA is required to notify EPA and receive EPA approval prior to the usage of any water treatment chemicals containing chromium.
4. **Flow.** The effluent limitation for flow is based on the existing facility operations.
5. **Narrative Effluent Limitations:**
    a. **PCBs.** A narrative condition for polychlorinated biphenyl compounds has been established based on 40 CFR Part 423. There shall be no discharge of PCBs.
6. **pH.** The effluent limitation for pH is based on the ELGs at 40 CFR 423.12.
7. **Zinc.** The ELGs at 40 CFR 423.12 establish effluent limitations for total zinc. However, EPA has not included effluent limitations for this parameter in the permit because no water treatment chemicals are used at the facility which contain zinc. PREPA is required to notify EPA and receive EPA approval prior to the usage of any water treatment chemicals containing zinc.

F. Effluent Limitations Summary Table – Internal Outfall IWS 601

Parameter	Units	Effluent limitations					
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
126 Priority Pollutants	ug/l	Daily maximum	-	No detectable amount except for chromium and zinc	-	No detectable amount except for chromium and zinc	TBEL
Flow	MGD	Daily maximum Daily average	0.094 -	0.5 0.2	-	0.5 0.2	TBEL
PCBs	--	--	--	--	--	*See narrative effluent limitations*	TBEL
pH	SU	Continuous	8.8	6.0-9.0	-	6.0-9.0	TBEL

Notes, Footnotes and Abbreviations

Note: Dashes (--) indicate there are no effluent data, no limitations, or no monitoring requirements for this parameter.

1 – Wastewater data from DMRs dated October 1, 2012 through September 30, 2017.

E. Effluent Limitations – Internal Outfall IWS 602, 603, 604, 605

The permit establishes both Technology-based Effluent Limitations (TBELs) and WQBELs for several pollutants and the basis for these limitations are discussed below**.**

1. **Flow.** The flow limitation is based on the existing facility operations.
2. **Oil and Grease.** The effluent limitation for oil and grease is based on the ELGs at 40 CFR 423.12.
3. **Total Suspended Solids.** The effluent limitation for total suspended solids is based on the ELGs at 40 CFR 423.12.
4. **Narrative Effluent Limitations:**
    a. PCBs. A narrative condition for polychlorinated biphenyl compounds has been established based on 40 CFR Part 423. There shall be no discharge of PCBs.
5. **pH.** The effluent limitation for pH is based on the ELGs at 40 CFR 423.12.

F. Effluent Limitations Summary Table – Internal Outfall IWS 602, 603, 604 and 605

Parameter	Units	Effluent limitations					
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
Flow	MGD	Daily maximum	0.42	Monitor only	-	Monitor only	TBEL
Oil and grease	mg/l	Daily maximum Daily average	3 3	20 15	-	20 15	TBEL
Total Suspended Solids	mg/l	Daily maximum Daily average	160 160	50 30	-	50 30	TBEL

Parameter	Units	Effluent limitations						
		Averaging period	Highest Reported Value [1]	Existing limits	Interim limits	Final limits	Basis
PCBs	--	--	--	--	--	*See narrative effluent limitations*	TBEL
pH	SU	Continuous	8.1	6.0-9.0	-	6.0-9.0	TBEL

Notes, Footnotes and Abbreviations

Note: Dashes (--) indicate there are no effluent data, no limitations, or no monitoring requirements for this parameter.

1 – Wastewater data from DMRs dated October 1, 2012 through September 30, 2017.

G. Monitoring Requirements

NPDES regulations at 40 CFR 122.48 require that all permits specify requirements for recording and reporting monitoring results. The Part III of the Permit establishes monitoring and reporting requirements to implement federal and state requirements. The following provides the rationale for the monitoring and reporting requirements for this facility.

1. **Influent Monitoring Requirements**

   This facility is subject to temperature monitoring requirements are the intake.

2. **Effluent Monitoring Requirements**

   Effluent monitoring frequency and sample type have been established in accordance with the requirements of 40 CFR 122.44(i) and recommendations in EPA's TSD. Consistent with 40 CFR Part 136 monitoring data for toxic metals must be expressed as total recoverable metal. Internal monitoring limitations are established in the permit and describe above.

H. Compliance with Federal Anti-Backsliding Requirements and Puerto Rico's Anti-Degradation Policy

Federal regulations at 40 CFR 131.12 require that state water quality standards include an anti-degradation policy consistent with the federal policy. The discharge is consistent with the anti-degradation provision of 40 CFR 131.12, 72 Federal Register 238 (December 12, 2007, pages 70517-70526) and EQB's *Anti-Degradation Policy Implementation Procedure* in Attachment A of PRWQS. In addition, CWA sections 402(o)(2) and 303(d)(4) and federal regulations at 40 CFR 122.44(l) prohibit backsliding in NPDES permits. Further, the Region 2 Antibacksliding Policy provides guidance regarding relaxation of effluent limitations based on water quality for Puerto Rico NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit with some exceptions where limitations may be relaxed. The effluent limitations in the permit are at least as stringent as the effluent limitation in the existing permit, with the exception of the effluent limitations listed below. The effluent limitations for these pollutants are less stringent than those in the existing permit.. This relaxation of effluent limitations is consistent with the anti-backsliding requirements of CWA section 401(0), 40 CFR 122.44(l), EPA Region 2's Anti-backsliding Policy dated August 10, 1993, and Puerto Rico's Anti-Degradation Policy Implementation Procedure established in PRWQS.

Outfall 001.

Arsenic, Copper, Fecal Coliforms, Mercury, Nickel, Silver, Zinc. PR EQB's analysis of the existing effluent data did not indicate reasonable potential and that an effluent limitation is not needed to ensure that applicable water quality standards are met in the receiving water. This new information is sufficient basis to relax these requirements based on the R2 Anti-backsliding Policy.

Oil and Grease, Total Suspended Solids. The numeric oil and grease and total suspended solids effluent limitations have been removed from Outfall 001 because the narrative oil and grease and total suspended solids effluent limitations are sufficient to ensure compliance with applicable water quality standards. This is a sufficient basis to remove the numeric effluent limitations based on the R2 Anti-backsliding Policy.

Pentacholorphenol, Phenol, Sulfide (undisassociated H_2S), Surfactants as MBAs, 2-Methyl-4,6-Dinitrophenol, 2,4-Dinitrophenol, 2,4,6-Trichlorophenol. PR EQB's analysis of the existing effluent data did not indicate reasonable potential. Additionally, some these monitoring requirements were based on guidance that is now outdated. This new information is sufficient basis to remove the monitoring requirements for these parameters based on the R2 Anti-backsliding Policy.

Outfall 002.

2-Chlorophenol, 2,4-Dichlorophenol, 2,4-Dimethyphenol, 2-Methyl-4,6-Dinitrophenol, 2,4-Dinitrophenol, 2,4,6-Trichlorophenol, Arsenic, Pentachlorophenol, Phenol, Sulfates, Surfactants as MBAs. PR EQB's analysis of the existing effluent data did not indicate reasonable potential. Additionally, some of these monitoring requirements were based on guidance that is now outdated. This new information is sufficient basis to remove the monitoring requirements for these parameters based on the R2 Anti-backsliding Policy.

Fecal Coliforms. PR EQB's analysis of the existing effluent data did not indicate reasonable potential and that an effluent limitation is not needed to ensure that applicable water quality standards are met in the receiving water. This new information is sufficient basis to relax these requirements based on the R2 Anti-backsliding Policy.

Selenium. PR EQB's analysis of the existing effluent quality did not indicate reasonable potential for selenium. As such, an effluent limitation based on Rule 1303.1 of the PRWQS is sufficient to ensure that water quality standards are met. This new information, under the R2 Anti-backsliding Policy is the basis for establishing an effluent limitation of 71.14 ug/l, rather than the 71.0 ug/l effluent limitation established in the previous permit.

Zinc. PR EQB's analysis of the existing effluent quality did not indicate reasonable potential for zinc. As such, an effluent limitation based on Rule 1303.1 of the PRWQS is sufficient to ensure that water quality standards are met. The new information, under the R2 Anti-backsliding Policy, is the basis for establishing an effluent limitation of 85.62 ug/l, rather than the 81.00 ug/l effluent limitation established in the previous permit.

Outfall 003.

2-Chlorophenol, 2,4-dichlorophenol, 2,4-Dimethylphenol, 2-Methyl-4,6-Dinitrophenol, 2,4-Dinitrophenol, 2,4,6-Trichlorophenol, Pentachlorophenol, Phenol, Sulfates, Sulfide (undissociated H_2S), Surfactants as MBAs. PR EQB's analysis of the existing effluent data did not indicate reasonable potential. Additionally, some of these monitoring requirements were based on guidance that is now outdated. This new information is sufficient basis to remove the monitoring requirements for these parameters based on the R2 Anti-backsliding Policy.

Arsenic, Fecal Coliforms, Mercury. PR EQB's analysis of the existing effluent data did not indicate reasonable potential and that an effluent limitation is not needed to ensure that applicable water quality standards are met in the receiving water. This new information is sufficient basis to relax these requirements based on the R2 Anti-backsliding Policy.

Lead. An analysis of the existing effluent quality did not indicate reasonable potential for lead. As such, an effluent limitation based on Rule 1303.1 of the PRWQS is sufficient to ensure that water quality standards are met. The new information, under the R2 Anti-backsliding Policy, is the basis for establishing an effluent limitation of 8.52 ug/l, rather than the 8.1 ug/l effluent limitation established in the previous permit.

Oil and Grease. The numeric oil and grease effluent limitation has been removed from Outfall 001 because the narrative oil and grease effluent limitations is sufficient to ensure compliance with applicable water quality standards. This is a sufficient basis to remove the numeric effluent limitations based on the R2 Anti-backsliding Policy.

Zinc. PR EQB's analysis of the existing effluent quality did not indicate reasonable potential for zinc. As such, an effluent limitation based on Rule 1303.1 of the PRWQS is sufficient to ensure that water quality standards are met. The new information, under the R2 Anti-backsliding Policy, is the basis for establishing an effluent limitation of 85.62 ug/l, rather than the 81.00 ug/l effluent limitation established in the previous permit.

PART III. RATIONALE FOR STANDARD AND SPECIAL CONDITIONS

A. Standard Conditions

In accordance with 40 CFR 122.41, standard conditions that apply to all NPDES permits have been incorporated by reference in Part IV.A.1 of the permit and expressly in Attachment B of the permit. The Permittee must comply with all standard conditions and with those additional conditions that are applicable to specified categories of permits under 40 CFR 122.42 and specified in Part IV.A.2 of the Permit.

B. Special Conditions

In accordance with 40 CFR 122.42 and other regulations cited below, special conditions have been incorporated into the permit. This section addresses the justification for special studies, additional monitoring requirements, Best Management Practices, Compliance Schedules, and/or special provisions for POTWs as needed. The special conditions for this facility are as follows:

1. **Special Conditions from the Water Quality Certificate**

   In accordance with 40 CFR 124.55, EPA has established Special Conditions from the WQC in the permit that EQB determined were necessary to meet PRWQS. The Special Conditions established in this section are only those conditions from the WQC that have not been established in other parts of the permit.

2. **Best Management Practices (BMP) Plan**

   The Permittee is not required to develop a BMP Plan in the permit on the basis of 40 CFR 122.2 and 122.44(k).

3. **Stormwater Pollution Prevention Plan (SWPPP)**

   The permittee must develop and implement a Storm Water Pollution Prevention Plan (SWPPP) This plan shall be developed to prevent or minimize the potential for release of pollutants to the waters of the United States through plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from material sludge. The Plan shall be prepared in accordance with good engineering practice. The permittee must implement all provisions of the Plan as a condition of the NPDES permit.

4. **Compliance Schedules**

   The Permittee's effluent data indicate that the facility might not be able to consistently comply with the final effluent limitation for copper and nickel at Outfall 002 and for copper at Outfall 003 and for therefore, a schedule of compliance has been authorized in the permit in accordance with 40 CFR 122.47 the WQC, which includes interim deadlines for progress or reports of progress toward compliance with the conditions of the permit.

   The compliance schedule for Outfall 002 establishes an interim effluent limitation for EDP+3 years for copper and nickel. At EDP+3 years+ 1 day, the final effluent limitations are effective. The compliance schedule for Outfall 003 establishes an interim effluent limitation for EDP +3 years for copper. At EDP+3 years+ 1 day, the final effluent limitations are effective. This schedule is provided in consideration of the time it would require for the Permittee to undertake steps needed to modify or install treatment facilities, operations, or other required measures.

5. **CWA 316(b) Determination Preliminary Assessment of Best Technology Available (BTA)**

The CWA 316(b) preliminary assessment of Best Technology Available is included in Appendix B. The permit includes a schedule of submittals in compliance with the Clean Water Act §316(b) Existing Facilities Final Rulemaking, 40 CFR 125.94.

6. Chemical Usage

The permittee is permitted to use chemicals to control biofouling in the service cooling towers, or for fire protection foam, provided that they meet the following conditions:

a. The discharge shall not cause a violation of any permit limit or cause or contribute to an exceedance of any applicable water quality standard for the receiving water.

b. Notification to the EPA of the optimum product dosage necessary to ensure no deleterious effects to the effluent aquatic toxicity. PREPA shall also document that adequate process controls are in place to ensure that excessive levels of the chemical products are not subsequently discharged.

c. The EPA may request that PREPA perform toxicity testing of the outfall discharges, or pilot test waste streams, to ensure that the use of chemicals does not contribute to effluent toxicity.

d. The EPA has prohibited the discharge of plastic pellets or rockets utilized in Condenser Cleaning Systems.

e. The EPA has included a requirement that PREPA use best management practices to prevent and minimize any discharges of fire protection foam.

f. The EPA has included a procedure for pilot testing of materials and chemicals to ensure that permit limitations are met at all times.

   The EPA recommends the following pollution prevention practices during future chemical usage pilot tests:

   - Utilize alternative firefighting foam products that exhibit high biodegradability, and that do not contain flourosurfactants;
   - Conduct pilot tests in bermed areas away from storm drain inlets, drainage facilities or water bodies;
   - Configure the discharge area with a sump to allow collection and disposal of foam to the sanitary sewer system; and
   - Discharge foam waste to a sanitary sewer to the maximum extent practicable.

PART IV. COMPAIANCE WITH APPLICABLE PROVISIONS OF OTHER FEDERAL LAWS OR EXECUTIVE ORDERS

A. Coastal Zone Management Act

Under 40 CFR 122.49(d), and in accordance with the Coastal Zone Management Act of 1972, as amended, 16 *United States Code* (U.S.C.) 1451 *et seq*. section 307(c) of the act and its implementing regulations (15 CFR Part 930), EPA may not issue an NPDES permit that affects land or water use in the coastal zone until the Permittee certifies that the proposed activity complies with the Coastal Zone Management Program in Puerto Rico, and that the discharge is certified by the Commonwealth of Puerto Rico to be consistent with the Commonwealth's Coastal Zone Management Program. The Puerto Rico Planning Board issued a determination, dated January 18, 2000, that the discharge is consistent with the Puerto Rico Coastal Management Program. As this activity has been permitted in the past, a reopener clause has been established that allows the permit to be modified or revoked based on a consistency determination requested by the permittee as part of this renewal process.

B. Endangered Species Act

Under 40 CFR 122.49(c), EPA is required pursuant to section 7 of the Endangered Species Act (ESA), 16 U.S.C. 1531 *et seq*. and its implementing regulations (50 CFR Part 402) to ensure, in consultation with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) that the discharge authorized by the permit is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.

The ESA requires the Regional Administrator to ensure, in consultation with the Secretary of the Interior or Commerce, that any action authorized by EPA is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.

In a May 2000 memo to the Regions, EPA Headquarters provided guidance to the Regions in making a determination as to whether a final permit may be issued while waiting for consultation to be concluded. As part of this permit action, if consultation has not been completed by final permit issuance and EPA has concluded that permit issuance is consistent with section 7 prior to the conclusion of consultation, EPA will re-issue the final permit before consultation is concluded and will document this decision in the Administrative Record. At the time consultation is completed, EPA may decide that changes to the permit are warranted after permit issuance based on the results of the consultation. Therefore, a reopener provision to this effect has been included in the Permit Part IV.A.1.b. EPA initiated the consultation on _________.

C. Environmental Justice

EPA has performed an Environmental Justice (EJ) Analysis for the discharge in accordance with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Population and Low-Income Populations*, and EPA's Plan EJ 2014. EJ is the right to a safe, healthy, productive and sustainable environment for all, where "environment" is considered in its totality to include the ecological, physical, social, political, aesthetic and economic environments. In the NPDES permitting program, the public participation process provides opportunities to address EJ concerns by providing appropriate avenues for public participation, seeking out and facilitating involvement of those potentially affected, and including public notices in more than one language where appropriate. The facility is in an area characterized as a Community of Concern and therefore is subject to the EJ requirements. As a result, the EPA has taken steps to minimize the impacts on the Community of Concern affected by the discharge. These steps include:

1) providing public notice in both English and Spanish of the availability of the draft permit for public comment,
2) ensuring that all supporting documents will be available in a repository at the EPA Caribbean Environmental Protection Division in San Juan, Puerto Rico,
3) If a public hearing is held, bi-lingual EPA staff will be made available to meet with the community before and after the public meeting,
4) If determined necessary, EPA will have simultaneous translation at the public hearing and public availability session to facility the participation of both English and Spanish speaking participants.

EPA is committed to taking all necessary actions to minimize potential adverse effects on San Juan from the San Juan Power Plant. A detailed discussion of the EJ Analysis is provided in the Administrative Record and is available for review upon request.

D. National Historic Preservation Act

Under 40 CFR 122.49(b), EPA is required to assess the impact of the discharge authorized by the permit on any properties listed or eligible for listing in the National Register of Historic Places (NRHP) and mitigate any adverse effects when necessary in accordance with the National Historic Preservation Act, 16 U.S.C. 470 et seq. EPA's analysis indicates that no soil disturbing or construction-related activities are being authorized by approval of this permit; accordingly, adverse effects to resources on or eligible for inclusion in the NHRP are not anticipated as part of this permitted action.

E. Magnuson-Stevens Fishery Conservation and Management Act

Under 40 CFR 122.49, EPA is required to ensure that the discharge authorized by the permit will not adversely affect Essential Fish Habitat (EFH) as specified in section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), 16 U.S.C. 1801 *et seq*. EPA is currently in the process of initiating a discussion/consultation with National Marine Fisheries Service regarding this permit action. Therefore, a reopener provision to this effect has been included in Part I.C.4 and 5 of the draft NPDES permit.

PART V. PUBLIC PARTICIPATION

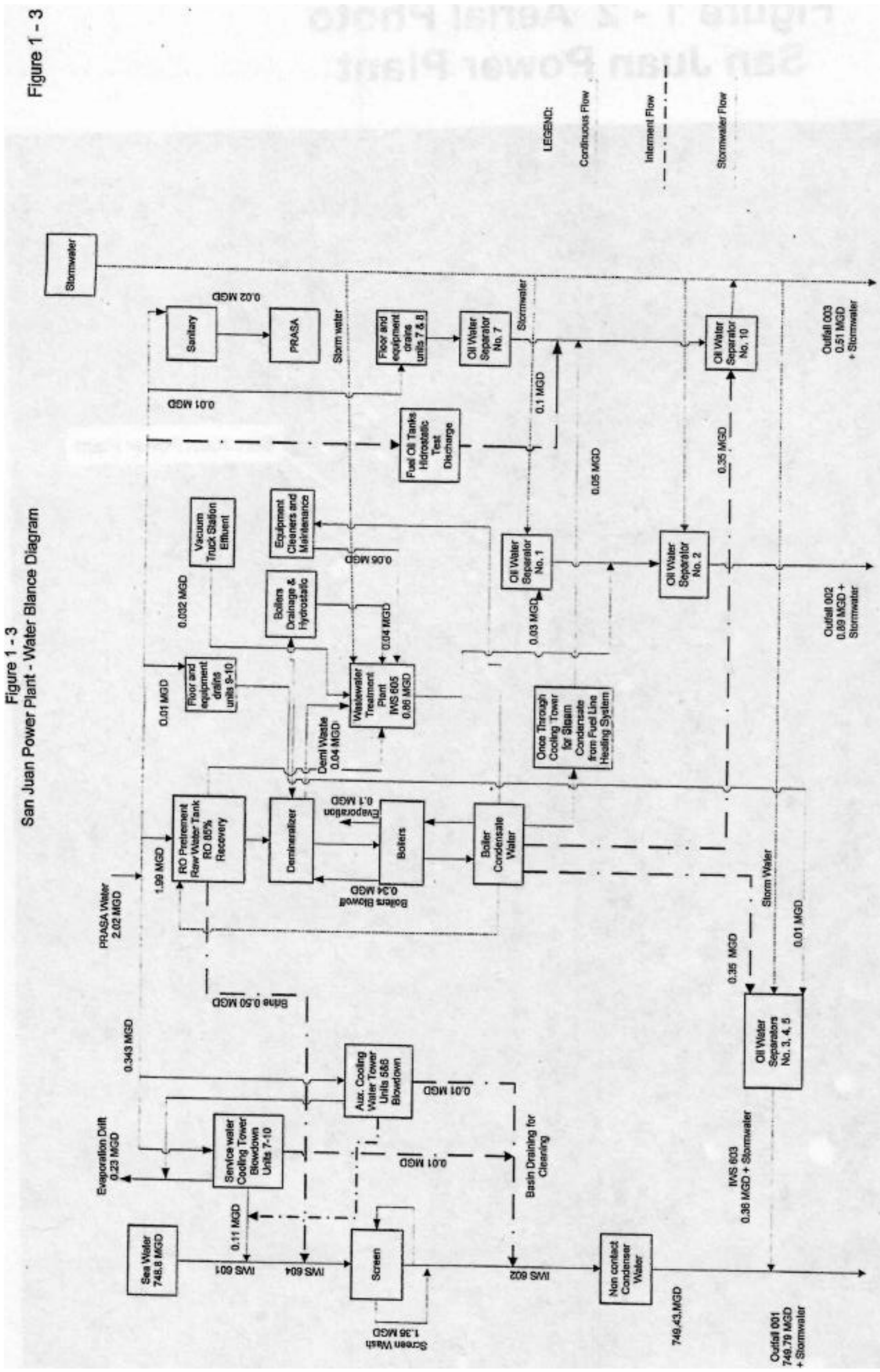
The procedures for reaching a final decision on the draft permit are set forth in 40 CFR Part 124 and are described in the public notice for the draft permit, which is published in *El Vocero.* Included in the public notice are requirements for the submission of comments by a specified date, procedures for requesting a hearing and the nature of the hearing, and other procedures for participation in the final agency decision. EPA will consider and respond in writing to all significant comments received during the public comment period in reaching a final decision on the draft permit. Requests for information or questions regarding the draft permit should be directed to

Sieglinde Pylypchuk
EPA Region 2, Clean Water Division
Permit Writer Phone: 212-637-4133
Permit Writer Email: pylypchuk.sieglinde@epa.gov

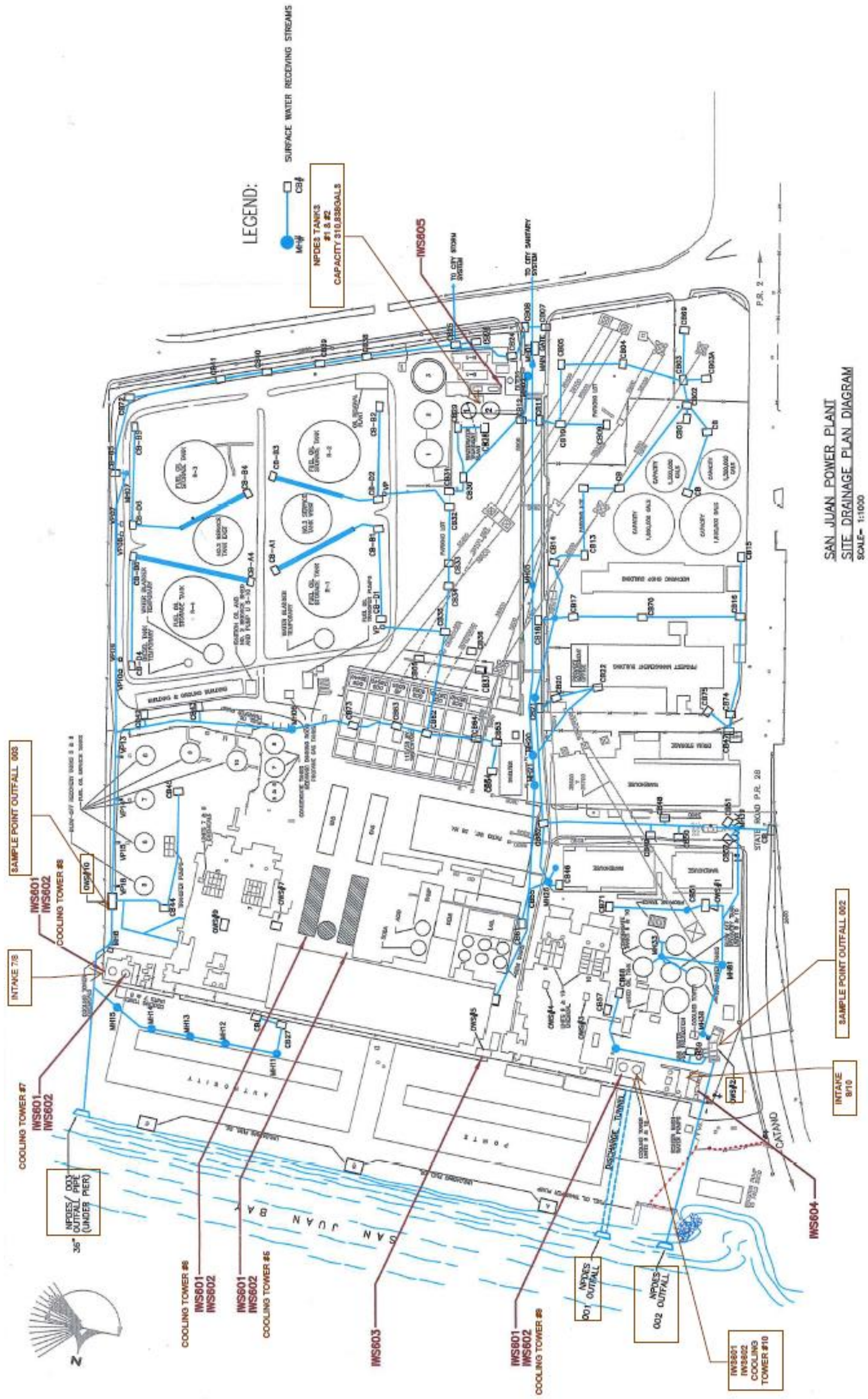
A copy of the draft permit is also available on EPA's website at https://www.epa.gov/npdes-permits/puerto-rico-npdes-permits

ATTACHMENT A — FACILITY MAP AND FLOW SCHEMATIC

The facility map and flow schematic are attached as provided by the discharger in the application.



A facility map identifying monitoring locations, as provided by the discharger, is attached.



ATTACHMENT B — CWA 316(B) PRELIMINARY ASSESSMENT OF BEST TECHNOLOGY AVAILABLE (BTA)

Puerto Rico Electric Power Authority San Juan Power Plant (SJPP) Preliminary Assessment of Best Technology Available (BTA)

Prepared for:
EPA Region II

Prepared By:
Tetra Tech, Inc.
10306 Eaton Place, Suite 340
Fairfax, VA 22030

Under EPA Contract: EP-C-11-009
Work Assignment 3-21

July 18, 2014

1. Contents

Exhibits

Introduction

To meet Clean Water Act (CWA) section 316(b) requirements, a facility must employ cooling water intake structures (CWISs) that "reflect the Best Technology Available (BTA) for minimizing adverse environmental impact." The San Juan Power Plant (SJPP), a 468 MW combined cycle power plant discharging to San Juan Bay owned by the Puerto Rico Electric Power Authority (PREPA), is subject to the Existing Facility Rule, which establishes BTA requirements that the facility must achieve. This document provides a preliminary assessment of compliance at SJPP in support of the Environmental Protection Agency (EPA) Region II's efforts to make a BTA determination for this facility.

This document complements the draft permit language and decision document that will accompany the draft National Pollutant Discharge Elimination System (NPDES) permit for SJPP. Through the permit and its requirements, SJPP will submit several documents that will inform the BTA determination. Using currently available information, this document makes a preliminary assessment of BTA, but ultimately EPA Region II will be the arbiter of what constitutes BTA. Additionally, subsequently submitted information may alter the analysis herein.

Intake and Unit History

Units 1 through 4 (20 MW each) were constructed in 1950, including an intake tunnel located between the two cargo warehouses and about 400 ft northeast of outfall 001. When the original Units 5 and 6 (44 MW each) were constructed, the Unit 1-4 intake tunnel downstream of the traveling screens was extended to serve these units as well. When Units 7 and 8 (100 MW each) were constructed, a new intake and tunnels were constructed about 500 ft northeast of the original Unit 1-4 intake. At a point downstream of the new traveling screens, the intake tunnel for Units 7 and 8 was connected to the end of the existing Unit 1-4 intake tunnel at Unit 6. When Units 1-4 were permanently retired and demolished in the 1970s, their intake structure and tunnel were closed. Units 5 and 6 then received cooling water from the Unit 7 and 8 intake and traveling screens. When Units 9 and 10 were constructed, a separate intake and tunnel of similar design to the Unit 7 and 8 intake was constructed about 300 ft southwest of outfall 001, located on the other side of a pier that extends about 400 ft out into the Bay which provides a physical barrier that minimizes recirculation of the outfall 001 thermal discharge. The original Units 5 and 6 were deactivated in 1996. These units were repowered in 2008 as combined cycle with a total steam generating capacity that increased from 88 MW to of 134 MW and a total combined cycle generating capacity of 468 MW. Note that the "Consolidated ENSR 1997 SJPP Report" (Appendix A of URS 2008) states that the intake for Units 1 through 6 is closed off and not in operation but will be reopened to accommodate repowered Units 5 and 6.[1] However, more recent documents (PREPA 2011) indicate that this has not happened and that the current and planned configuration is that Units 5 and 6 receive intake water through the Unit 7 and 8 intake.[2] Given that the intake previously identified as the "Unit 7 and 8 intake" now serves Units 5 through 8, this report will refer to this intake as the "Units 5 through 8 intake."

Intake Technology

The Units 5 through 8 intake structures and tunnels consist of one coarse bar trash rack in front of each tunnel, two 400 ft long rectangular tunnels; four Beaudrey dual flow screens, pump wells and circulating water pumps.

[1] This indicates that the closed intake and tunnel for Units 1-4 remain available as a future intake or as a passageway for installation of fish return conduits.

[2] This change may be due to the fact that Units 5 and 6 were repowered as combined cycle units and therefore used less water than anticipated in 1997.

The dual flow vertical traveling screens consist of a screen structure with the faces of the screen turned parallel to the approach flow. Traveling screens use smooth wire mesh panels and are cleaned by a high pressure spray wash. The fish and debris laden spray wash waster for the Units 5, 6, 7, and 8 intake screens flows into a trough and is passed through a fixed trash rack (i.e., a vertical grate with about 3/4-inch wide slot openings) where most debris and impinged organisms are captured and periodically removed manually. After passing through the fixed trash rack, the wash water is then discharged back to the intake channel in front of the traveling screens. There is no indication that removed fish are returned to the Bay. Traveling screens are rotated continuously. The fish and debris laden spray wash water for the Units 9 and 10 intake screens is passed through a flat grate, having approximately ½-inch slotted openings, where most debris and impinged organisms are captured and periodically removed manually. After passing through the flat grate, the wash water is then discharged into the combined cooling water discharge tunnel which discharges into San Juan Bay through Outfall 001.The Units 9 and 10 intake structure and tunnel design is similar to that of Units 7 and 8. Exhibit 1 presents a summary of the design data and distinguishing characteristics of each intake.

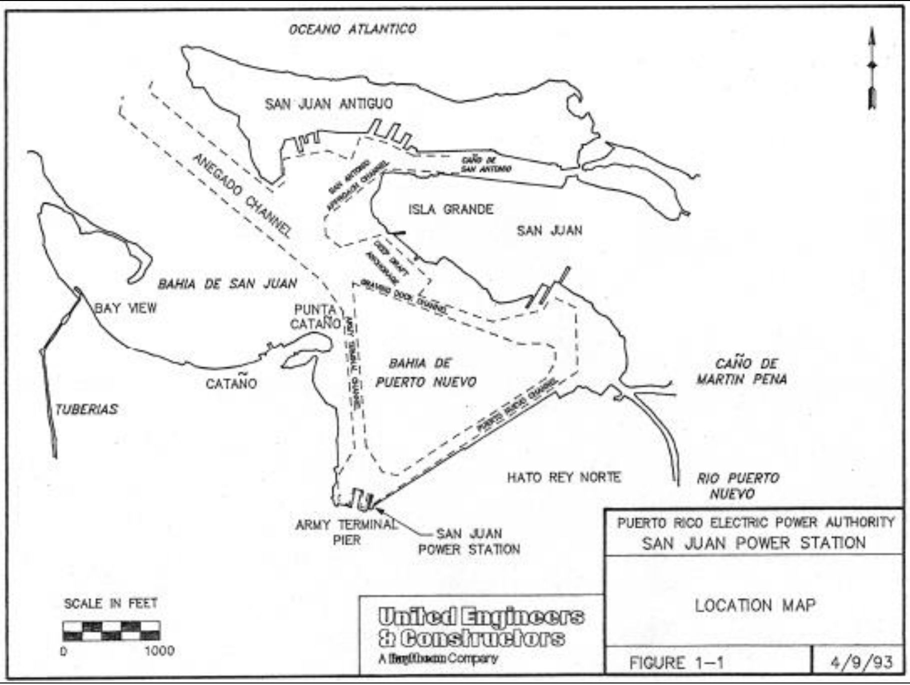
Exhibit 1. Design Data for the Two Cooling Water Intake Systems

	Units 5 through 8 Intake	Units 9 and 10 Intake
Baffle at Intake	None	Extends 2 ft from water surface
Bar Racks	0.5 in. wide; spaced 5 in. center to center	0.5 in. wide; spaced 5 in. center to center
Tunnel length[a] (ft)	510	600
Traveling Screen Type	Dual flow; double entry/single exit	Dual flow; double entry/single exit
Screen Mesh Size	3/8-in	¼-in
Number of Screens	4	4
Screen size[b] (sprocket to sprocket)	8.3 ft wide by 34 ft tall	4 ft wide by 29.25 ft tall
Screen Wetted Depth at MSL	Not Provided	14.25 ft
Screen Wash Pump Capacity Each/Total	580 / 1,160 gpm 0.84 / 1.67 mgd	236 / 944 gpm 0.34 / 1.36 mgd
Screen Wash Water Destination	Screen inlet	Outfall 001 tunnel
Design Intake Flow	446.4 mgd[c]	303.8 mgd

[a] Tunnel length is from intake to pumps.
[b] Screen width provided is the width of the screen unit parallel to the screen. Total screen width available for screening is twice the value shown.
[c] Does not include screen wash water which is returned to screen inlet.

Cooling water is withdrawn from the Bahia de Puerto Nuevo section of San Juan Bay. Figure 2 provides a location map as provided by PREPA. Units 7, 8, 9, and 10 each is served by a single fixed speed pump with a design cooling water flow of 105,000 gpm (151.2 MGD) and Units 5 and 6 each is served by a single fixed speed pump with a design cooling water flow of 50,000 gpm (72 MGD). Each pair of units (5 and 6, 7 and 8, 9 and 10) share a single spare pump.

Exhibit 2. San Juan Power Plant Location Map



2. BTA for Impingement Mortality (IM)

This section includes a description of the BTA for Impingement Mortality (IM) and compliance alternatives.

How BTA for IM is Determined

Under the Existing Facility Rule, a facility subject to the rule must select one of the seven compliance alternatives for impingement mortality described at 40 CFR 125.94(c) and listed below:

3. Operate a closed-cycle recirculating system as defined at § 125.92.
4. Operate a cooling water intake structure that has a maximum through-screen design intake velocity of 0.5 feet per second (fps).
5. Operate a cooling water intake structure that has a maximum through-screen intake velocity of 0.5 fps.
6. Operate an offshore velocity cap as defined at § 125.92 that is installed before effective date of the rule.
7. Operate a modified traveling screen that the Director determines meets the definition at § 125.92.
8. Operate any other combination of technologies, management practices and operational measures that the Director determines is the best technology available for impingement reduction.
9. Achieve the specified impingement mortality performance standard.

Under the compliance schedule set forth in this permit, SJPP will develop and submit the appropriate information related to compliance with impingement mortality requirements. Included in these submittals is a document in which SJPP will select its preferred approach for achieving compliance with the impingement mortality requirements (see § 122.21(r)(6)). Once a BTA determination has been reached by EPA Region II, SJPP would be required to implement this approach; these requirements could include the installation of new technologies, adjustments to existing technologies, or other activities. Consistent with the Existing Facility Rule, the compliance deadlines for impingement mortality and entrainment have been synchronized; requirements for both will go into effect after EPA Region II reaches a BTA determination for entrainment.[3]

Preliminary Review

For impingement mortality, the current configuration at SJPP does not meet BTA as defined by the Existing Facility Rule. SJPP will be required to select one of seven compliance alternatives, which are reviewed in this document along with a preliminary, predictive assessment of BTA. This section reviews the technological and biological aspects of determining BTA.

Technology

The existing traveling screens include few of the features of the modified traveling screen technology that is considered BTA technology for impingement mortality under alternative 5 listed above. While the screens are rotated continuously and contain smooth wire mesh, there is no indication that they include collection buckets designed to minimize turbulence, nor do they use a low pressure spray wash to gently remove fish. More importantly, impinged fish are not returned to the source water.

For the final rule, EPA defined entrainment mortality as the death of those organisms passing through a sieve with a maximum opening dimension of 0.56 inches.[4] The traveling screens for Units 9 and 10 use a slightly smaller ¼ inch square mesh size with a maximum opening dimension of 0.35 inches. Thus, a small portion of entrainable organisms, as defined by EPA, may be converted to impinged organisms at the Units 9 and 10 traveling screens.[5] However, entrainment reduction benefits for this small component cannot be assigned unless a functional fish return is installed that returns fish to the source water rather than the outfall 001 discharge tunnel. SJPP estimates that use of ¼ in screens may reduce entrainment by 2.5% based on the size and distribution of larvae (URS 2008), but such a reduction can only be accepted if impinged fish are safely return to the source water.

As discussed in section 3.5.1.1, the facility employs closed-cycle cooling for a small volume of cooling water that is estimated to be equivalent to approximately 2.3% of the total cooling water flow volume.

Biology

Historical fish community surveys in the vicinity of SJPP have not been conducted; however, several studies have been completed in San Juan Bay and adjacent tributaries. Commonly-encountered fishes in the western portion of the bay include: Megalops atlantica (tarpon), Lebistes reticulatus (guppy), Lepomis macrochirus (bluegill), Elops saurus (ladyfish), Eleotris pisonis (spinycheek sleeper), and Ictalurus punctatus (channel catfish) (Stoner and Goenaga 1987). Raytheon (1997) surveyed adult fish in the SJPP study area from November 1993 through December 1994 and collected a total of 38 taxa. Dominant species varied by area and collection method but included whitemouth croaker (Micropogonias furnieri), thread herring (Opisthonema oglinum), Atlantic anchoveta (Cetengraulis edentulus), and Guachanche barracuda (Sphyraena guachancho).

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[3] This synchronization prevents a facility from implementing a given impingement mortality option, only to discover a few years later that entrainment requirements are also needed and an entirely different approach would have been more appropriate. Synchronization might delay selection and implementation of technologies for compliance with the impingement mortality requirements.

[4] The value of 0.56 inches is the diagonal dimension of 3/8 inches square mesh. EPA also considered ½ inch by ¼ inch (diagonal 0.53 inch) as performing similar to 3/8 inches square mesh.

[5] This may be just a small portion, as many of the entrainable organisms consist of fish larvae and eggs that are too small to be captured on a ¼ inch screen. Those entrainable juvenile fish and crustacean that are impinged might also be less fragile and more amenable to surviving impingement than larvae and eggs.

Commercially and recreationally important species occur in San Juan Bay, but data documenting the catches, particularly for recreational species, are lacking. Cummings and Matos-Caraballo (2004) found that commercial landings of grunts (Haemulidae), snappers (Lutjanidae), and spiny lobsters totaled over one million pounds in 2003 and, in the case of spiny lobsters, had a value of 1.3 million dollars for Puerto Rico. Recreational species, such as mojarras, checkered puffers, and crabs (Callinectes spp.) are commonly taken by anglers (USEPA 2000). Other species, including jacks (Carangidae), croakers (Sciaenidae), snook, and tarpon also inhabit the bay but are generally found in lower abundances (Raytheon 1997).

Nine species listed as rare, threatened, or endangered by the federal government (US Fish and Wildlife Service) or the Commonwealth are known to occur in the San Juan Bay estuary (Exhibit 3). West Indian manatee (Trichechus manatus manatus) and sea turtles (leatherback sea turtle [Dermochelys coriacea], hawksbill sea turtle [Eretmochelys imbricata and green sea turtle [Chelonia mydas]; Vicente 1996] are the most likely species to come in contact with the SJPP intake; however, the lack of adequate habitat in the area, particularly seagrasses and macroalage, likely limits occurrences to occasional transient individuals. Studies by National Marine Fisheries Service, Raytheon, and PREPA between 1993 and 1995 confirm the absence of sea turtles and manatees at the SJPP intake (ENSR 1997a).

Exhibit 3. Threatened and endangered species in the vicinity of the San Juan Power Plant

Scientific Name	Common Name	Status*
Trichechus manatus manatus	West Indian Manatee	**FE,CE**
Caretta caretta	Loggerhead Turtle	**FT,CE**
Chelonia mydas	Green Turtle	**FT**
Dermochelys coriacea	Leatherback Turtle	**FE,CE**
Eretmochelys imbricata	Hawksbill Turtle	**FE,CE**
Lepidochelys olivacea	Olive Ridley Turtle	**FT,CE**
Sterna dougallii	Roseate Tern	**FE,CE**
Falco peregrinus	Peregrine Falcon	**FT,CE**
Agelaius xanthomus	Yellow-Shouldered Blackbird	**FE,CE**
Sterna antillarum	Least Tern	**CT**
Dendrocygna arborea	West Indian Whistling Duck	**CT**
Nomonyx dominicus	Masked Duck	**CT**
Fulica caribaea	Caribbean Coot	**CT**
Charadrius alexandrinus	Snowy Plover	**CT**
Oxyura jamaicensis	Ruddy Duck	**CT**

*FE- Federal endangered; FT-Federal threatened; CE-Commonwealth endangered; CT-Commonwealth threatened

PREPA cites “significant water quality degradation” in San Juan Bay and suggests that shipping activities, including dredging maintenance, in Puerto Nuevo Bay contributes to a diminished fish community in the vicinity of SJPP. As a result, they conclude that few taxa are susceptible to impingement at SJPP and refer to the 2007 study, where only 25 of the 65 taxa documented in the vicinity of SJPP were impinged. However, studies noting degraded water quality conditions in San Juan Bay are limited to historic data in PREQB (1992). More recently, USEPA (2007) rated the overall water quality in San Juan Bay as “Fair”, with approximately 20 percent of the Bay’s water rated as “Good” and 60 percent rated “Fair.” In reference to biological conditions, PREPA acknowledges a lack of fish community data and notes that the most recent survey of fishes was conducted in 1993-1994 (see Raytheon 1997).

Historic Data

Historic evaluations of impingement mortality are limited to a 1993-94 study conducted by Raytheon (1997). A summary of the study is presented below.

Impingement sampling occurred over a 24-hour period (three 8-hour intervals) during six events in December 1993 and February, April, June, August, October 1994. A ⅛-inch mesh net was used to collect impinged invertebrates and fishes, which were subsequently identified and enumerated.

The total number of fish impinged comprised 23 species from 13 phyla and ranged from 1/day (December 1993) to 51/day (April 1994) (Exhibit 4). Engrualidae and Gerreidae were the most commonly impinged families and were represented by Anchoa parva (little anchovy) and Anchoviella sp. and Diapterus rhombeus (rhomboid mojarra) and Eucinostomus argenteus (silver mojarra), respectively.

Exhibit 4. Taxonomy of Marine Fish from Impingements at San Juan, December 1993 to October 1994

Phyla	Taxa	Common Name	Number per Day						
			Dec-93	Feb-94	Apr-94	Jun-94	Aug-94	Oct-94	Average
Acanthuridae	*Acanthurus* sp.	Doctorfish	0	0	1	0	0	0	0.17
Albulidae	*Albula vulpes* (leptocephalus)	Bonefish	0	2	3	0	0	0	0.83
Bothidae	*Citharichthys* sp.	Left-eye flounder	0	0	1	0	0	0	0.17
Carangidae	*Caranx* sp.		0	0	0	1	0	0	0.17
	Selene vomer		0	0	0	1	0	0	0.17
Clupeidae	*Chirocentrodon bleekerianus*	Dogtooth herring	0	6	2	0	0	0	1.33
Engraulidae	*Anchoa hepsetus*		0	4	0	0	0	0	0.67
	Anchoa parva	Little anchovy	0	12	8	1	1	1	3.83
	Anchoviella sp.	Anchovy	0	12	13	0	0	0	4.17
Gerreidae	*Diapterus rhombeus*	Rhomboid mojarra	0	0	1	2	4	3	1.67
	Eucinostomus argenteus	Silver mojarra	0	0	12	0	0	1	2.17
	Eucinostomus rhombeus		0	0	0	1	0	0	0.17
	Gerres cinereus		0	0	0	0	0	1	0.17
Gobiidae	*Bathygobius soporator*		0	0	0	0	0	1	0.17
	Dormitator maculatus	Fat sleeper	0	0	1	0	0	0	0.17
	Gobiidae	Gobiid post larva	0	2	5	0	0	0	1.17
Ophichthidae	*Myrophis punctatus*	Speckled worm eel	1	0	0	0	0	1	0.33
Sparidae	*Archosargus rhomboidalis*		0	0	0	1	0	0	0.17
	Sparidae	Sparid post-larva	0	0	1	0	0	0	0.17
Syngnathidae	*Oosthetus lineatus*	Opossum pipefish	0	0	1	0	0	0	0.17
	Syngnathus pelagicus	Sargassum pipefish	0	0	1	0	0	0	0.17
Tetraodontidae	*Sphoeroides spengleri*	Bandtail puffer	0	0	1	0	0	1	0.33
Trichiuridae	*Trichiurus lepturus*	Atlantic cutlassfish	0	2	0	0	1	0	0.50
Total			1	40	51	7	6	9	19

Note: During Dec '93, Feb '94, and Oct '94 only Units 7&8 were sampled.
During Apr, Jun, and Aug '94 both Units 7&8 and 9&10 were sampled.

Table from ENSR (1997). See Raytheon (1997) for original data.

Source: URS 2008

Current Data

The most current impingement mortality data were collected and reported in PREPA (2007). A summary of the study is presented below.

A contemporary impingement survey was conducted once per month from January through June 2007. Collections were made over a 24-hour period using ¼-inch square mesh nets in the screen wash sluice at Units 9 and 10 and directly from the collection basket at Units 7 and 8. Debris loading at Units 7 and 8 necessitated a change to two 4-hour hour subsamples (one during the day and one at night) at Units 7 and 8. All fish and shellfish were sorted, identified, enumerated, measured, weighed, and assessed as live, dead, or injured.

A total of 114 fish (biomass – 1,932.6 grams) from 27 taxa and 255 shellfish (biomass – 2,676.9 grams) from nine taxa were collected during 184 hours of impingement sampling (Exhibit 4). Shellfish accounted for approximately 68 percent of the total abundance of impinged organisms and 58 percent of the biomass. The vast majority of impinged specimens were less than 60 mm in total length or carapace width. Pink shrimp

(Farfantepenaeus duorarum) were the most abundant shellfish (26 percent) and swimming crabs (Callinectes spp.) accounted for the greatest biomass (66 percent). Silver jenny (Eucinostomus gula) were the most commonly impinged fish, comprising 18 percent, while Atlantic cutlassfish (Trichiurus lepturus) accounted for the greatest biomass (20 percent).

Exhibit 5. Summary of fish and shellfish collected during impingement sampling at San Juan Power Plant, 2007

Common Name	Scientific Name	Total Collected	Relative Abundance by Number - Total Catch (%)	Relative Abundance by Number - Fish vs. Inverts (%)	Total Biomass (g)	Relative Abundance by Biomass - Total Catch (%)	Relative Abundance by Biomass - Fish vs. Inverts (%)
Fish							
Shortfinger anchovy	* *Anchoa lyolepis*	1	0.3%	0.9%	10.1	0.2%	0.5%
Common anchovy	* *Anchoa sp.*	13	3.5%	11.4%	13	0.3%	0.7%
Anchovy	* *Anchoviella sp.*	3	0.8%	2.6%	8.1	0.2%	0.4%
Cardinalfish	*Apogon sp.*	1	0.3%	0.9%	2.9	0.1%	0.2%
Ground croaker	*Bairdiella ronchus*	5	1.4%	4.4%	47.3	1.0%	2.4%
Striped croakers	*Bairdiella sp.*	1	0.3%	0.9%	27.2	0.6%	1.4%
Horse eye jack	*Caranx latus*	1	0.3%	0.9%	2	0.04%	0.1%
Bigeye jacks	*Caranx sp.*	2	0.5%	1.8%	2.2	0.05%	0.1%
Dogtooth herring	* *Chirocentrodon bleekerianus*	6	1.6%	5.3%	7.3	0.2%	0.4%
Atlantic bumper	*Chloroscombrus chrysurus*	7	1.9%	6.1%	17.2	0.4%	0.9%
Unidentified herring	Clupeidae	1	0.3%	0.9%	0.2	0.00%	0.01%
Rhomboid mojarra	* *Diapterus rhombeus*	3	0.8%	2.6%	7.2	0.2%	0.4%
Anchovy	* Engraulidae	1	0.3%	0.9%	0.3	0.01%	0.02%
Silver jenny	**Eucinostomus gula*	21	5.7%	18.4%	109.5	2.4%	5.7%
Mojarra	* Gerreidae	1	0.3%	0.9%	3.2	0.1%	0.2%
Yellowfin mojarra	* *Gerres cinereus*	10	2.7%	8.8%	221.6	4.8%	11.5%
Moray eels	Muraenidae	1	0.3%	0.9%	115.8	2.5%	6.0%
Snake eels	Ophichthidae	1	0.3%	0.9%	43.6	0.9%	2.3%
Atlantic thread herring	*Opisthonema oglinum*	1	0.3%	0.9%	62.9	1.4%	3.3%
Barbu	*Polydactylus virginicus*	1	0.3%	0.9%	37.2	0.81%	1.9%
Atlantic moonfish	*Selene setapinnis*	3	0.8%	2.6%	2.6	0.1%	0.1%
Lookdown	*Selene vomer*	15	4.1%	13.2%	13.8	0.30%	0.7%
Common puffers	*Sphoeroides sp.*	1	0.3%	0.9%	27.8	0.6%	1.4%
Checkered puffer	*Sphoeroides testudineus*	1	0.3%	0.9%	36.5	0.8%	1.9%
Barracuda	*Sphyraena sp.*	2	0.5%	1.8%	710.4	15.4%	36.8%
Puffers	Tetraodontidae	1	0.3%	0.9%	16.8	0.4%	0.9%
Atlantic cutlassfish	*Trichiurus lepturus*	10	2.7%	8.8%	385.9	8.4%	20%
	Fish Subtotal	**114**	**30.9%**	**100.0%**	**1932.6**	**41.9%**	**100.0%**
Shellfish							
Swimming crabs	* *Callinectes spp.*	59	16.0%	23.1%	1754	38.1%	65.5%
Pink shrimp	* *Farfantepenaeus duorarum*	66	17.9%	25.9%	180.8	3.9%	6.8%
Caribbean spiny lobster	* *Panulirus argus*	1	0.3%	0.4%	191	4.1%	7.1%
Porcelain crab	*Petrolisthes sp.*	32	8.7%	12.5%	21.4	0.5%	0.8%
Porcelain crab	Porcellanidae sp.	50	13.6%	19.6%	37.3	0.8%	1.4%
Tree climbing crabs	Sesarmidae	1	0.3%	0.4%	1.9	0.04%	0.1%
Rock shrimps	*Sicyonia sp.*	1	0.3%	0.4%	0.8	0.02%	0.03%
Mud shrimps	Upogebiidae	1	0.3%	0.4%	1.2	0.03%	0.04%
Mud crabs	Xanthidae	44	11.9%	17.3%	488.5	10.6%	18.2%
	Shellfish Subtotal	**255**	**69.1%**	**100.0%**	**2676.9**	**58.1%**	**100.0%**
	Grand Total	**369**	**100.0%**		**4609.5**	**100.0%**	

* Indicates a representative species (RS)

Source: URS 2008

Initial survival, defined as the number of alive and injured specimens divided by the total number of specimens impinged, was 20 percent and 41 percent for fish and shellfish, respectively (Exhibit 6). Collectively, survival averaged approximately 34 percent. No federally listed species were captured during the 2007 sampling. However, representative species (important commercial, recreational and forage species) comprised approximately 44 percent of impinged specimens, including pink shrimp (Farfantepenaeus duorarum), swimming crabs (Callinectes spp.), spiny lobster (Panulirus argus), anchovies, dogtooth herring (Chirocentrodon bleekerianus), and mojarras. Of these, pink shrimp accounted for 40 percent of the impinged representative species.

Exhibit 6. Initial survival of fish and shellfish collected during impingement sampling at San Juan Power Plant, 2007.

Common Name	Scientific Name	Total Collected	# Dead	# Alive	# Injured	% Initial Survival
Fish						
Shortfinger anchovy	* *Anchoa lyolepis*	1	1	0	0	0%
Common anchovy	* *Anchoa sp.*	13	12	1	0	8%
Anchovy	* *Anchoviella sp.*	3	2	1	0	33%
Cardinalfish	*Apogon sp.*	1	1	0	0	0%
Ground croaker	*Bairdiella ronchus*	5	3	2	0	40%
Striped croakers	*Bairdiella sp.*	1	1	0	0	0%
Horse eye jack	*Caranx latus*	1	1	0	0	0%
Bigeye jacks	*Caranx sp.*	2	2	0	0	0%
Dogtooth herring	* *Chirocentrodon bleekerianus*	6	4	2	0	33%
Atlantic bumper	*Chloroscombrus chrysurus*	7	4	3	0	43%
Unidentified herring	Clupeidae	1	1	0	0	0%
Rhomboid mojarra	* *Diapterus rhombeus*	3	3	0	0	0%
Anchovy	* Engraulidae	1	1	0	0	0%
Silver jenny	*Eucinostomus gula*	21	17	4	0	19%
Mojarra	* Gerreidae	1	1	0	0	0%
Yellowfin mojarra	* *Gerres cinereus*	10	9	1	0	10%
Moray eels	Muraenidae	1	0	1	0	100%
Snake eels	Ophichthidae	1	1	0	0	0%
Atlantic thread herring	*Opisthonema oglinum*	1	1	0	0	0%
Barbu	*Polydactylus virginicus*	1	1	0	0	0%
Atlantic moonfish	*Selene setapinnis*	3	3	0	0	0%
Lookdown	*Selene vomer*	15	14	1	0	7%
Common puffers	*Sphoeroides sp.*	1	1	0	0	0%
Checkered puffer	*Sphoeroides testudineus*	1	0	1	0	100%
Barracuda	*Sphyraena sp.*	2	0	2	0	100%
Puffers	Tetraodontidae	1	1	0	0	0%
Atlantic cutlassfish	*Trichiurus lepturus*	10	6	1	3	40%
	Fish Subtotal	**114**	**91**	**20**	**3**	**20%**
Shellfish						
Swimming crabs	* *Callinectes spp.*	59	21	37	1	64%
Pink shrimp	* *Farfantepenaeus duorarum*	66	39	26	1	41%
Caribbean spiny lobster	* *Panulirus argus*	1	1	0	0	0%
Porcelain crab	*Petrolisthes sp.*	32	31	1	0	3%
Porcelain crab	Porcellanidae sp.	50	37	13	0	26%
Tree climbing crabs	Sesarmidae	1	1	0	0	0%
Rock shrimps	*Sicyonia sp.*	1	0	1	0	100%
Mud shrimps	Upogebiidae	1	0	1	0	100%
Mud crabs	Xanthidae	44	21	23	0	52%
	Shellfish Subtotal	**255**	**151**	**102**	**2**	**41%**
	Grand Total	**369**	**242**	**122**	**5**	**34%**

* Indicates a representative species (RS)

Source: URS 2008

Average impingement rates from December 1993 through October 1994 were 0.86 fish/hour and 2.84 shellfish/hour (ENSR 1997). In 2007, rates averaged 0.69 fish/hour and 2.1 shellfish/hour. Despite the reduction, these differences are not statistically significant. Converting the 2007 values to annual rates yields estimates of approximately 9,896 fish (27 fish per day) and 22,127 shellfish (61 shellfish per day). The rate of representative species was 0.21 fish per hour. Exhibit 7 summarizes the annual impingement rates.

Exhibit 7. Annual impingement of fish and shellfish at San Juan Power Plant, 2007

Common Name	Scientific Name	Total Collected	Annual Impingement (#s)	Annual Impingement per Intake Hour (#/hr)**	Total Biomass (g)	Annual Biomass (g)	Annual Impingement per Intake Hour (g/hr)**
Fish							
Shortfinger anchovy	* *Anchoa lyolepis*	1	87	0.005	10.1	876	0.055
Common anchovy	* *Anchoa sp.*	13	1,128	0.071	13.0	1,128	0.071
Anchovy	* *Anchoviella sp.*	3	260	0.016	8.1	703	0.044
Cardinalfish	*Apogon sp.*	1	87	0.005	2.9	252	0.016
Ground croaker	*Bairdiella ronchus*	5	434	0.027	47.3	4,104	0.257
Striped croakers	*Bairdiella sp.*	1	87	0.005	27.2	2,360	0.148
Horse eye jack	*Caranx latus*	1	87	0.005	2.0	174	0.011
Bigeye jacks	*Caranx sp.*	2	174	0.011	2.2	191	0.012
Dogtooth herring	* *Chirocentrodon bleekerianus*	6	521	0.033	7.3	633	0.040
Atlantic bumper	*Chloroscombrus chrysurus*	7	607	0.038	17.2	1,492	0.093
Unidentified herring	Clupeidae	1	87	0.005	0.2	17	0.001
Rhomboid mojarra	* *Diapterus rhombeus*	3	260	0.016	7.2	625	0.039
Anchovy	* Engraulidae	1	87	0.005	0.3	26	0.002
Silver jenny	* *Eucinostomus gula*	21	1,822	0.114	109.5	9,501	0.595
Mojarra	* Gerreidae	1	87	0.005	3.2	278	0.017
Yellowfin mojarra	* *Gerres cinereus*	10	868	0.054	221.6	19,228	1.204
Moray eels	Muraenidae	1	87	0.005	115.8	10,048	0.629
Snake eels	Ophichthidae	1	87	0.005	43.6	3,783	0.237
Atlantic thread herring	*Opisthonema oglinum*	1	87	0.005	62.9	5,458	0.342
Barbu	*Polydactylus virginicus*	1	87	0.005	37.2	3,228	0.202
Atlantic moonfish	*Selene setapinnis*	3	260	0.016	2.6	226	0.014
Lookdown	*Selene vomer*	15	1,302	0.082	13.8	1,197	0.075
Common puffers	*Sphoeroides sp.*	1	87	0.005	27.8	2,412	0.151
Checkered puffer	*Sphoeroides testudineus*	1	87	0.005	36.5	3,167	0.198
Barracuda	*Sphyraena sp.*	2	174	0.011	710.4	61,640	3.861
Puffers	Tetraodontidae	1	87	0.005	16.8	1,458	0.091
Atlantic cutlassfish	*Trichiurus lepturus*	10	868	0.054	385.9	33,484	2.097
	Fish Subtotal	**114**	**9,896**	**0.620**	**1,932.6**	**167,689**	**10.503**
Shellfish							
Swimming crabs	* *Callinectes spp.*	59	5,119	0.321	1,754.0	152,192	9.533
Pink shrimp	* *Farfantepenaeus duorarum*	66	5,727	0.359	180.8	15,688	0.983
Caribbean spiny lobster	* *Panulirus argus*	1	87	0.005	191.0	16,573	1.038
Porcelain crab	*Petrolisthes sp.*	32	2,777	0.174	21.4	1,857	0.116
Porcelain crab	Porcellanidae sp.	50	4,338	0.272	37.3	3,236	0.203
Tree climbing crabs	Sesarmidae	1	87	0.005	1.9	165	0.010
Rock shrimps	*Sicyonia sp.*	1	87	0.005	0.8	69	0.004
Mud shrimps	Upogebiidae	1	87	0.005	1.2	104	0.007
Mud crabs	Xanthidae	44	3,818	0.239	488.5	42,386	2.655
	Shellfish Subtotal	**255**	**22,127**	**1.386**	**2,676.9**	**232,271**	**14.548**
	Grand Total	**369**	**32,023**	**2.005**	**4,609.5**	**399,960**	**25.052**

* Indicates a representative species (RS)

** Organisms impinged during one hour of operation at either Units 7&8 or Units 9&10 intakes.

Source: URS 2008

Permit Requirements

According to 40 CFR 122.21(r) *Application requirements for facilities with cooling water intake structures*, SJPP will be required to submit several documents to meet impingement mortality requirements. However, SJPP has conducted several studies that may already contain the required information and therefore fulfill these requirements. Exhibit 8 describes the studies required, provides the studies already submitted, and assesses whether the given requirement might have already been satisfied. Again, EPA Region II will be the ultimate authority in making this assessment when the documents are submitted as part of the permit application.[6]

[6] Or when SJPP demonstrates that previous documents contain the required content; EPA Region II may then waive the relevant submittal requirements.

Exhibit 1. Comparison of Existing Documents to Application Requirements		
Regulatory Requirement	**Existing**	**Notes**
Description of the source water body (§ 122.21(r)(2))	Impingement Mortality & Entrainment Characterization Study And Current Status Report (2008) Proposal for Information Collection - San Juan Power Plant - San Juan, Puerto Rico (2007)	This document provides the most recent description of the source water body This document provides a description of the source water body
Description of the cooling water intake structures (§ 122.21(r)(3))	Impingement Mortality & Entrainment Characterization Study And Current Status Report (2008) Proposal for Information Collection - San Juan Power Plant - San Juan, Puerto Rico (2007) Section 316(a) and (b) Demonstration San Juan Power Plant National Pollutant Discharge Elimination System Permit Renewal Application San Juan Power Plant Permit No. PR0000698 (2011)	This document provides a description of the cooling water intake structures and planned configuration for repowered Units 5 and 6 This document provides a description of the cooling water intake structures prior to repowering Units 5 and 6 This document provides a historical description of the cooling water intake structures This document provides a water balance diagram
Characterization of the biological community in the vicinity of the cooling water intake structure (§ 122.21(r)(4))	Impingement Mortality & Entrainment Characterization Study And Current Status Report (2008) 316(a) Reopener Clause 12 Month Data Report (1997)	This document provides characterization data of the biological community in the vicinity of the cooling water intake structure in 1994-1995 This document provides characterization data of the biological community in the vicinity of the cooling water intake structure in 1994-1995
Description of the cooling water system (§ 122.21(r)(5))	Impingement Mortality & Entrainment Characterization Study And Current Status Report (2008) Proposal for Information Collection - San Juan Power Plant - San Juan, Puerto Rico (2007) Section 316(a) and (b) Demonstration San Juan Power Plant (1997)	This document provides a description of the cooling water system This document provides a description of the cooling water system This document provides a historical description of the cooling water system
Identification of the facility's chosen compliance method for impingement mortality (§ 122.21(r)(6))	Impingement Mortality & Entrainment Characterization Study and Current Status Report (2008)	This document provides an argument that the existing configuration is BTA. However, given the requirements of the Existing Facility Rule, it is likely that the current configuration would not meet BTA requirements. As a result, the permittee would need to develop this submittal.
Description of the facility's operational status (§ 122.21(r)(8))	Impingement Mortality & Entrainment Characterization Study And Current Status Report (2008) Section 316(a) and (b) Demonstration San Juan Power Plant (1997)	This document provides a somewhat dated description of the facility's operational status This document provides a historical description of the facility's operational status

Timeline

As outlined in the draft permit language, the facility will be subject to a compliance schedule as follows:

Exhibit 9. Suggested Compliance Schedule	
Time Frame	**Submittal**
Within 6 months of permit issuance	§ 122.21(r)(2)-(5),(7) and (8) (or equivalent)
Within 3 years of permit issuance	Fish Return Feasibility, Conceptual Design And Cost Study
Within 4 years of permit issuance or as soon as practicable after entrainment BTA is determined[7]	§ 122.21(r)(6) (or equivalent)

As suggested above, some of these materials may be largely redundant to materials that have already been developed. As a result, SJPP should be able to complete and submit them quickly and EPA Region II should have little trouble verifying or approving them (or waiving those requirements, as appropriate).

As discussed in the decision document, an interim requirement for the submittal of a *Fish Return Feasibility, Conceptual Design And Cost Study* was deemed appropriate since the current traveling screen systems lack functional fish returns which are a necessary component of modified traveling screens as defined at § 125.92. The results of this study would facilitate the decision regarding identification of the facility's chosen compliance method for impingement mortality (§ 122.21(r)(6)).

However, the implementation timeline for impingement mortality BTA is more complex. As noted above, the Existing Facility Rule recognizes that some facilities may have both impingement mortality and entrainment requirements. To prevent a facility from implementing an impingement mortality requirement that could be later made obsolete by different requirements to address entrainment, the compliance deadlines for both have been synchronized. Requirements for both impingement mortality and entrainment will go into effect once EPA Region II has made a BTA determination for entrainment.

In most cases, this presents two possible scenarios:

1. If it is abundantly clear that the facility already employs BTA for entrainment or has indicated steps to be taken to address entrainment, there is no need to wait to begin implementing the impingement mortality requirements. This would accelerate compliance by recognizing that no conflicting requirements are imminent and moves the facility along the compliance path more quickly. This scenario, however, may undermine any studies being conducted to inform an entrainment determination.
2. If it is not clear whether there will be requirements for entrainment (or what steps might be taken to address known entrainment issues), it would be prudent to wait and see what decisions are made with regard to entrainment requirements. Once the entrainment BTA requirement is determined, the facility must meet the impingement mortality requirements as soon as practicable.

Given the uncertainties with the biological and technical data at SJPP, it is very likely that the second scenario will be more appropriate.

Analysis of BTA for IM

Each intake (or both intakes combined) must comply with the impingement standard by one of seven alternative compliance methods. The feasibility for compliance via each alternative is discussed below.

[7] The facility is free to implement the compliance method for impingement mortality prior to EPA's determination of entrainment BTA requirements but has the option of waiting until after the entrainment BTA determination before expending substantial technology construction and equipment costs.

Alternative 1: Closed-cycle Cooling

The availability of adequate space to install and operate equipment is an important factor concerning the feasibility and availability of operating a closed-cycle cooling recirculating system as defined at § 125.92. As discussed under entrainment reduction below, there appears to be limited space available onsite for the installation of cooling towers without displacing existing equipment and structures.

Alternative 2: Maximum Through-screen Design Intake Velocity of 0.5 fps

Another alternative is for SJPP to operate a cooling water intake structure that has a maximum through-screen design intake velocity of 0.5 fps. The facility has provided calculated maximum approach velocities (based on mean sea level [MSL]) of 0.58 fps for Units 5 through 8 and 0.82 fps for Units 9 and 10. Since the standard for compliance is based on the through-screen velocity rather than the approach velocity, the corresponding maximum through-screen velocities for SJPP will be higher since through-screen velocity must account for percent open area of the screens and the non-screen area surrounding the screen panels. However, the screen velocity data are irrelevant for both intakes since these screens are downstream of the intake tunnels in which the flow velocities are likely much higher. No data are presented regarding velocities within the tunnels but the velocities are expected to be higher than the bar racks at the tunnel opening. Once fish pass into the tunnels and enter the traveling screen forebay, they may become entrapped by the upstream velocities in the tunnels and the only exit is to become impinged on the screens. As a result, the traveling screen approach and through-screen velocity should have no impact on rates of impingement, and the impingement mortality intake velocity alternative cannot apply to the traveling screens.

EPA has not provided specific guidance regarding how the velocity threshold could be applied to technologies upstream of the traveling screens. A reasonable approach would be to consider the point of compliance for the existing facility rule impingement mortality intake velocity alternative to be the point furthest upstream where flow is not constricted (i.e., <0.5 fps) and where the intake characteristics are such that most fish are stimulated to initiate an avoidance response. Bar racks may not provide sufficient avoidance stimulation and PREPA states that the extended length of the intake tunnels may elicit an avoidance response by fish, resulting in reduced impingement. A study by Glass et al. (1995) is cited, but this study pertains to only to adult Atlantic mackerel and is relevant to gear avoidance behavior, particularly trawls. This study sheds light on avoidance behavior of adult fishes through active swimming, but does not address the involuntary movement of juvenile fishes. While the minimum tunnel entrance water depth (at low tide) is not provided, it is clear that the tunnel entrance would be no larger than the bar racks and, as shown in Exhibit 10, the approach velocity for the bar racks exceeds 0.5 fps. SJPP would not be able to comply with the design velocity alternative unless a screening device with a larger surface area is placed upstream of the CWIS entrance (e.g., wedgewire screens, barrier net/aquatic filter barrier with 3/8 inch mesh or smaller). Impingement mortality compliance via the maximum through-screen design intake velocity of 0.5 fps threshold could be achieved if the facility were to employ coarse or fine mesh wedgewire screens, which are typically designed with a through-screen velocity of 0.5 fps or less. Wedgewire screens are discussed in section 3.5.5.

Exhibit 10. Reported Intake Approach Velocities

	Units 5 through 8 (fps)	Units 9 and 10 (fps)
Reported Bar Screen Approach Velocity	1.57	1.07
Reported Traveling Screen Approach Velocity	0.58	0.82

Source: URS 2008.

Alternative 3: Maximum Through-screen Intake Velocity of 0.5 fps

This alternative allows the facility the option to operate each intake at a (reduced) flow level such that the calculated maximum through-screen is always less than or equal to 0.5 fps regardless of the design flow volume. As described above, the existing intake design does not allow for this threshold to be applied to the traveling screens. As shown above, the upstream velocities (bar screen approach and tunnel) are high and the flow reduction necessary to reduce these velocities under 0.5 fps would need to be on the order of 50% to 70% or more. As noted in the entrainment section below, flow reduction attainable through the use of variable speed pumps will vary, with a reasonable estimate of the average being about 33%. Such a flow reduction is insufficient to meet this velocity alternative, especially since the flow reductions would be variable while the velocity threshold must be met at all times. Therefore, this compliance alternative is unavailable.

Alternative 4: Offshore Velocity Cap

Another compliance alternative is to operate an offshore velocity cap (as defined at § 125.92) that is installed before effective date of the rule. This alternative is only available to existing submerged offshore intakes, and is therefore not available at SJPP. However, this technology could be employed as a component of a combination of technologies under alternative 6 below. As such, it would require an assessment of the efficacy of the technology as designed and would not automatically comply. Issues related to the installation of a submerged offshore intake with velocity cap are discussed further under entrainment reduction below.

Alternative 5: Modified Traveling Screen

Another compliance alternative is to operate a modified traveling screen that meets the definition at § 125.92 and that the Director determines is the best technology available for impingement reduction. This option is both feasible and available at SJPP and is a likely alternative. It would simply require an upgrade of the existing traveling screens to meet the definition of modified Ristroph screens. Such modifications may include:

1. Installation of a fish return sluice that returns fish to source waterbody (San Juan Bay) and does not promote predation or re-impingement of the fish, or require a large vertical drop;
2. Installation of a separate high and low pressure spray wash;
3. Replacement of traveling screen baskets and fish troughs if current design is not designed to minimize turbulence to aquatic life;
4. Continuous operation of traveling screens

Most of these can be readily achieved through replacement of existing traveling screen equipment and modifications to the spray wash system and fish and debris handling troughs in the screen houses. The most challenging modification is the installation of fish returns, since there are currently no fish returns at SJPP. In order for SJPP to comply via this alternative, a functional fish return that contains sufficient water flow to return fish directly to the source water in a manner that does not promote predation and re-impingement is required. The existing facility rule preamble states that return systems should be designed to avoid predation and latent mortality while organisms are in the flume, maintain an appropriate water depth in the flume for high survival of the organisms, located at an appropriate elevation to avoid large drops of the organisms back to the surface water (or large hydraulic jumps if the end of the return is below the water's surface), and sited to avoid repeated impingement of the organisms by the intake structure.

The primary complication that affects the installation of new fish returns is the fact that a 250 ft wide active cargo port and warehouse facility lies between SJPP property and San Juan Bay. One possibility for the Units 5 through 8 intake may be to route a fish return through at least a portion of the currently inactive intake tunnel originally built for Units 1 through 4. If this tunnel is built in a similar manner as the tunnels for the two active intakes and has a head space at MSL of 1.5 ft, tidal data indicates that at high tide (MHHW) the water elevation would be 0.8 ft above MSL leaving a head space of about 0.7 ft. A fish return pipe could be hung inside the tunnel near the top and sloped towards the tunnel opening at the bay. There also appears to be a relatively unobstructed path that a fish return could be routed along the property line from the area where the Units 5 through 8 screens are located and the point where the Units 1 through 4 tunnel turns towards the Bay and passes underneath the cargo dock area. At that point, the fish return could pass through the tunnel wall and then through the tunnel. A minimum slope of 0.003 would result in the top of the pipe to be just about even with the water surface at high tide.[8] The pipe diameter and wash water pumping capacities can be sized properly to ensure there is sufficient velocity in the submerged portion of the pipe to maintain sufficient velocity to sweep debris and fish out and minimize residence time for returned fish. Fish could then be discharged at some location beneath the 32 ft wide wharf. The potential fish return discharge point (the Units 1 through 4 tunnel entrance) is about 300 ft from the intake. Options for traversing the cargo dock area (including this one) should be investigated in a detailed engineering study of the potential options based on conditions specific to this location.

For the Units 9 and 10 intake, it may be possible to construct a buried fish return pipe from the screen house to the area near the end of the wharf. However, there appear to be some above ground obstructions in this area. The exact design and path of the fish return can be determined after conducting a more detailed engineering examination of the potential options on the basis of conditions specific to this location. Constructing fish returns should be possible considering that the facility was able, in the past, to construct a new intake tunnel that traversed the cargo dock area for Units 7 and 8.

The current high pressure spray debris cleaning system for the four dual flow traveling screens serving the intake for Units 5, 6, 7, and 8 passes the screen wash water through a fixed trash rack described as a vertical grate with about 3/4-inch wide slot openings where most debris and impinged organisms are captured and periodically removed manually. The screened wash water is then discharged back to the front of the traveling screens. There is no indication that removed fish are returned to the Bay. The traveling screens are rotated continuously.

The current high pressure spray debris cleaning system for four dual flow traveling screens serving Units 9 and 10 intake passes the collected screen wash water through a flat grate having approximately ½-inch slotted openings where most debris and impinged organisms are captured and periodically removed manually. The screened wash water is then discharged into the outfall 001 discharge tunnel at a location over 200 feet from the point of discharge into San Juan Bay. The water in this tunnel is composed of the combined once-through discharge from the steam condensers and smaller volumes of cooling tower blowdown and boiler steam condensate, and miscellaneous water that has been passed through oil water separators (including miscellaneous cleanup, rinsing, flushing, and other minor operations).

The average temperature rise of the once-through water during the period prior to the repowering of Units 5 and 6 in 2008 ranged between 9 ^{o}F and 12 ^{o}F with maximum ranging between 12 and 17 ^{o}F (note the NPDES limit is 18 ^{o}F). The temperature rise for repowered Units 5 and 6 was calculated to be 13.7 ^{o}F and the weighted average temperature rise for all units adjusted to 100 percent operation load was calculated to be 14.8 ^{o}F. Fish returned via the discharge tunnel would be exposed to these elevated temperatures for a period of up to

[8] The tunnel section beneath the dock area is estimated to be about 220 ft.

several minutes. The different approach for handling screen wash water between the two intakes is likely due to the fact that the Unit 9 and 10 screen house is in fairly close proximity to the discharge tunnel while the Units 5 through 8 screenhouse is farther away. Even if the flat grate were removed and the conduit was improved to reduce injury, fish returned through the discharge tunnel would be subject to significant thermal stress and such a return would not meet the definition of a return designed to avoid latent mortality. Therefore, in order to comply with the impingement mortality standard via this alternative, new fish returns that return fish to the source water need to be installed.

Alternative 6: Combination of Technologies, Management Practices and Operational Measures

SJPP could also operate any other combination of technologies, management practices and operational measures that the Director determines is the best technology available for impingement reduction. This alternative may include any combination of technologies where the combined effect of estimated component impingement mortality reductions is estimated to be equal to or greater than the performance of the selected BTA technology (modified traveling screens). Technologies can include, flow reduction, fish avoidance technologies, scheduling of maintenance downtime to coincide with increased biological activity, wedgewire screens, etc. This alternative may be necessary if the facility is unable to fully comply with the alternative discussed in 2.5.5 and needs further incremental reduction in order to meet the BTA standard.

PREPA provides some discussion of possible incremental reductions such as: minor flow reductions resulting from recirculating screen wash and scheduled maintenance downtime; low approach velocities; presence of the wharf over one intake; and the long intake tunnel. Most of these reductions are relatively minor, some are difficult to quantify, and some are of questionable validity. For example, PREPA suggests that shading from the PRPA wharf results in reduced densities of macroalgae and SAV, thus reducing the number of impinged fish at Units 7 and 8. However, there are currently no data to support this theory. The 2007 IM&E study does not provide a summary or comparative analysis of impingement between Units 7 and 8 and 10, thus it is difficult to validate this claim. Regularly scheduled maintenance downtimes in themselves do not necessarily result in a flow reduction.[9] The timing and duration of maintenance shutdowns are variable and, thus, are not likely to offer a substantial benefit to IM&E. Maintenance scheduled during the identified peak IM&E months is preferable; however, additional studies are necessary to fully evaluate seasonal differences.

Alternative 7: Impingement Mortality Performance Standard

This alternative requires the facility to conduct long-term monitoring for impingement mortality and is not an alternative that is likely to be pursued. In order to achieve measurable reductions in impingement mortality through monitoring, the existing technology would need to be upgraded to include functioning fish returns. Under such a scenario, alternative 5 would be more likely to be pursued.

Additional Compliance Alternatives

In addition to the seven compliance alternatives, the Existing Facility Rule provides two other potential paths to meeting impingement mortality requirements. These are:

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[9] The claim of a reduction assumes the use of the Phase II calculation baseline approach. A more appropriate baseline considers regularly scheduled maintenance downtime as part of normal facility operation and not a reduction. However, if these events are scheduled to occur during periods of low biological activity, the corresponding reduction could be credited.

1. *De minimis rate of impingement.* As described at § 125.94(c)(11), a facility that impinges an extraordinarily small number of aquatic organisms may qualify as already compliant with impingement mortality requirements. Based on a preliminary assessment of the impingement data provided, the number and diversity of impinged fish was low but it does not appear that SJPP would qualify as having a de minimis rate of impingement.[10] However, EPA Region II will be the ultimate arbiter for what qualifies as de minimis, and data limitations might warrant a more thorough study.
2. *Low capacity utilization power generating units.* As described at § 125.94(c)(12), a facility that has an individual generating unit that falls below the capacity utilization thresholds set by the rule (e.g., 8 percent over a two year period) can request that the Director establish site-specific requirements for impingement mortality for the intake structure that serves the rarely-used unit. Based on a preliminary assessment of the data provided, it does not appear that SJPP would qualify as having any units with a low utilization rate.[11]

Role of Costs and Benefits

Under the Existing Facility Rule, there are no explicit opportunities to consider costs and benefits for impingement, given the requirement to meet one of the seven compliance alternatives (none of which use cost as a criterion). Under either of the site-specific compliance paths discussed above (de minimis and low utilization), however, there is some consideration of costs and benefits at an inherent level. For example, the cost to install a technology to "save" a few impinged organisms a day is likely unreasonably high on a per-organism basis; as a result, the less stringent requirements consider costs. A similar argument applies for low utilization units.

Threatened and Endangered Species

The Existing Facility Rule contains numerous provisions for consideration of threatened and endangered (T&E) species. As described in Section 2.2.2 nine species listed as rare, threatened, or endangered by the federal government (US Fish and Wildlife Service) or the Commonwealth are known to occur in the San Juan Bay estuary. The occurrence of the most likely species to come in contact with the SJPP intake (manatees and sea turtles is likely to be limited to occasional transient individuals. Studies by National Marine Fisheries Service, Raytheon, and PREPA between 1993 and 1995 confirm the absence of sea turtles and manatees at the SJPP intake (ENSR 1997a). There is little evidence that the presence of T&E species will play an important role in the determination of IM requirements.

10. BTA for Entrainment

This section includes a description of the BTA for entrainment and compliance alternatives.

[10] The existing facility rule does not provide any guidance as to how to define de minimis. As a sign of EPA's intent for this provision, earlier drafts of the Existing Facility Rule characterized a "low rate" as several organisms per day. Based on 2007 data, SJPP estimated the annual impingement rate for fish and shellfish combined was 2 organisms per hour for both intakes combined.

[11] SJPP reported in 2008 that Units 5 and 6 will be operated as base load units with an expected capacity utilization of 86% and therefore the intake for Units 5 through 8 would be unlikely to meet this criterion and the capacity utilization rates for Unit 7 and 8 become irrelevant in this respect due to the shared intake. In 2008, Units 7, 8, 9 and 10 were described as base load units with a combined capacity utilization rate over the previous five years of 61.4%. SJPP noted in 2008 that once Units 5 and 6 come online, the utilization rates of Units 7 through 10 may be reduced somewhat, but there was no indication that their utilization rates would be diminished substantially.

How BTA for Entrainment is Determined

Section 316(b) requires that all facilities reflect BTA. The Existing Facility Rule establishes national standards for facilities with a design intake flow greater than 2 million gallons per day.[12] As described above, all facilities subject to the final rule must comply with impingement mortality requirements by selecting one of the compliance alternatives. For entrainment, however, requirements will be determined on a site-specific basis. The Existing Facility Rule establishes requirements for facilities with an actual intake flow greater than 125 mgd to develop and submit the appropriate information related to compliance with entrainment requirements.[13] Therefore, SLPP must submit several studies that will enable EPA Region II to make a BTA determination using BPJ. These requirements will be implemented through a compliance schedule in the facility's NPDES permit. This document reviews several possible outcomes for entrainment requirements, but the contents of the studies and as-yet-conducted analyses will weigh heavily in making a BTA determination.

The Existing Facility Rule states that any entrainment requirements "must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of factors relevant for determining" BTA. (See 40 CFR 125.98(f).) After reviewing the information submitted by SJPP, EPA Region II will issue a BTA determination in the facility's fact sheet, including an explanation of any technologies or operational measures that were rejected. EPA Region II *must* consider the following factors in developing the determination:

1. Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base).
2. Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.
3. Land availability inasmuch as it relates to the feasibility of entrainment technology.
4. Remaining useful plant life.
5. Quantified and qualitative social benefits and costs of available entrainment technologies of a sufficient quality and rigor for the director to make a decision.

EPA Region II *may* also consider the following additional factors:

1. Entrainment impacts on the waterbody.
2. Thermal discharge impacts.
3. Credit for unit retirements occurring within the ten years preceding the effective date of the rule.
4. Impacts on water consumption.
5. Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.

Consistent with the Existing Facility Rule, the compliance deadlines for impingement mortality and entrainment have been synchronized; see the impingement mortality section above for a detailed description of the timing of these requirements.

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[12] Even facilities with lower flows are subject to CWA section 316(b), but not the requirements of the Existing Facility Rule. However, facilities with such a small intake flow may be considered to have de minimis impacts for impingement and entrainment.

[13] Facilities with actual flows below this threshold are still subject to a site-specific determination of BTA for entrainment; however, they are not required to submit the studies found at § 122.21(r)(7) and (9-13).

Preliminary Review

For entrainment, it is not clear whether the current configuration at SJPP meets BTA. This section reviews the technological and biological aspects of determining BTA. As described below, the facility faces a number of technical challenges for implementing potential entrainment controls. Additionally, the scope of entrainment impacts is not well-known. Each of these critical elements will be further clarified by the information submitted by SJPP.

Technology

As defined in the final Existing Facility Rule, entrainment includes organisms that would pass through a sieve with a maximum opening of 0.56 inches (same as 3/8 by 3/8 inch mesh). Given, that there is no effective fish return, the intent of using ¼ by ¼ inch mesh for Units 9 and 10 was likely to reduce condenser plugging but it also resulted in a side benefit of reduced entrainment of smaller juveniles. Since the existing ¼ x ¼ inch traveling screens for Units 9 and 10 have maximum opening of 0.35 inches, a portion of the organisms collected on the screens that previously would have been considered as entrainable organisms are "converted" to impinged organisms. Therefore, any traveling screen technology improvements that serve to reduce impingement mortality at Units 9 and 10 should also serve to reduce entrainment mortality to some extent. As noted previously SJPP estimated the entrainment reduction to be approximately 2.5%.[14] Other technologies capable of reducing entrainment mortality include intake flow reduction, relocation of the intake to a submerged location far offshore, use of fine mesh screens including wedgewire screens, and scheduling of maintenance downtime to coincide with increased biological activity. Intake flow reduction can include closed-cycle cooling, installation of variable speed pumps, and replacement with grey water. SJPP already employs closed-cycle cooling for an estimated 2.3% of cooling water flow.

Biology

Section 2.2.2 provides a general description of the biology with a more detailed summary below.

Historic Data

Historic evaluations of entrainment are limited to a 1993-94 study conducted by Raytheon (1997). A summary of the study is presented below.

Day and nighttime sample collections were made during 10 events between October 1993 and September 1994. Intake and outfall streams were sampled using 0.5-meter diameter nets fitted with 202 µm mesh to collect ichthyo-, mero-, and holoplankton and 500 µm for ichthyoplankton only. Single collections were made with the 500 µm mesh nets and triplicate samples were collected with the 202 µm nets. Densities reported for the 202 µm mesh nets, presented below, were derived from averages of the three samples per sampling event, while 500 µm mesh estimates are based on the single sample.

Pre-flexion larval abundances at the discharge were less than 5 percent of the estimated mean daily ichthyoplankton abundance during the day. Conversely, nighttime sampling accounted for 21.5 percent. Species comprising the families Engraulidae and Gobiidae were most commonly encountered. Densities at the intake during the day varied from between 0 individuals/100 m^3 (December) and 52.3 individuals/100 m^3 (November) and from 45.0 individuals/100 m^3 (October) to 323.1 individuals/100 m^3 (November) during nighttime sampling. Outfall densities ranged from 0 individuals/100 m^3 (December and February) to 20.6 individuals/100 m^3 (August)

[14] Presumably this reduction is based on the survival of impinged fish through a functioning fish return.

during the day and from 7.2 individuals/100 m^3 (August) to 1,055 individuals/100 m^3 (November) during nighttime sampling.

Similar to pre-flexion larvae, abundances of post-flexion larvae accounted for less than 5 percent and 35.8 percent of the day and nighttime samples, respectfully, and mostly individuals comprised the families Engraulidae and Gobiidae. Daytime intake densities ranged from between 1.3 individuals/100 m^3 (November) to 84.8 individuals/100 m^3 (August) and from 7.3 individuals/100 m^3 (November) to 282.5 individuals/100 m^3 (September) during nighttime sampling. Outfall densities spanned a low of 1.1 individuals/100 m^3 (March) to 56 individuals/100 m^3 (December) during the day, while nighttime sampling yielded estimates 32.7 individuals/100 m^3 (March) to 1061.9 individuals/100 m^3 (October).

Pre-flexion larvae collected with 500 µm mesh nets were most commonly of the families Engraulidae and Gobiidae; however, a substantial number of pre-flexion larvae could not be identified. The most abundant families of post-flexion larvae included Engraulidae, Gobiidae, and Sciaenidae. As with the pre-flexion samples collected using 200 µm mesh, collections from the 500 µm mesh yielded greater larval abundances during nighttime than daytime. Pre-flexion larvae comprised 12 percent (intake) and 6 percent (outfall) of the total larvae collected during daytime sampling and 34 percent and 32 percent of nighttime samples, respectively. In contrast, post-flexion larvae comprised 88 percent (intake) and 94 percent (outfall) of the total larvae captured during the day and 66 percent and 68 percent, respectively, of those collected at night.

Overall, larval densities collected with 500 µm mesh at the intake ranged from 0 individuals/100 m^3 (June) to 33.4 individuals/100 m^3 (August) during daytime and from 16.9 individuals/100 m^3 (June) to 204.4 individuals/100 m^3 (October) during nighttime. Daytime outfall sampling yielded densities from 2.0 individuals/100 m^3 (May) to 37.0 individuals/100 m^3 (October) and from 35.6 individuals/100 m^3 (March) to 746.0 individuals/100 m^3 (November) for those collected during nighttime sampling.

Current Data

The most current entrainment data were collected and reported in PREPA (2007). A summary of the study is presented below.

Entrainment sampling was scheduled to follow the impingement collections from January through June 2007; however, heavy debris at the CWIS prohibited collections in April, thus extending the collection period one month to July. Paired daytime and nighttime samples were collected in front of the trash rakes using 200 µm and 500 µm mesh nets. All specimens of shellfish meroplankton and ichthyoplankton were retained for enumeration, identification, and measurement. Flow readings during sampling and the duration of the collection were recorded and used to calculate the total volume of water sampled.

A total of eight fish and five shellfish taxa were collected during the six sampling events, with higher densities typically occurring during nighttime sampling, regardless of mesh size (see exhibits 11 and 12). Fish eggs, true crabs, and hermit crabs comprised the majority of entrained organisms. However, specimens were not identified to species, thus the results provide a somewhat course level of assessment and are not adequate to evaluate entrainment of representative species. Three families of representative fish species were noted, including Gobiidae, Elopidae, and Polynemidae, but at low densities. Representative shellfish species comprising Brachyura (swimming crabs) and Penaeoidea (pink shrimp) were also present in entrainment samples.

Exhibit 11. Density (no./100 m^3) of entrained fish and shellfish using 202 µm nets at San Juan Power Plant, 2007

Taxa (scientific name)	Taxa (common name)	January		February		March		May		June		July		July-Dup	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Fish															
Elopidae	Ladyfishes	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Engraulidae	Anchovies	0.0	1.0	0.0	0.0	0.0	29.4	0.0	32.2	3.8	1.4	0.2	0.00	0.0	0.0
Gobiidae	Gobies	0.0	0.0	3.1	1.0	0.0	41.4	0.0	7.7	0.0	1.4	0.0	0.21	0.0	0.1
Gerreidae	Mojarras	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Polynemidae	Threadfins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Soleidae	Soles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pisces	Fish eggs	90.6	19,394.8	6,956.4	366.9	324.4	196.3	1,216.2	230.1	222.1	1,928.1	24.6	80.2	23.9	184.2
Pisces	Unidentified pre-flexion larvae	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Fish Subtotal		**91.7**	**19,395.8**	**6,959.5**	**367.9**	**327.1**	**268.3**	**1,216.2**	**270.0**	**225.9**	**1,931.0**	**24.9**	**80.5**	**23.9**	**184.4**
Shellfish															
Anomuran	Hermit crabs	48.1	27.7	1,045.0	13.5	16.4	3,206.6	390.1	1,426.5	4,219.2	642.7	12.3	43.3	8.3	45.3
Brachyura	True crabs	21.8	30.2	1,045.0	115.9	169.7	1,374.3	169.8	8,743.0	634.5	928.4	63.9	30.5	57.1	73.4
Caridea	Caridean shrimp	59.6	20.2	395.7	11.6	20.5	670.8	1,698.0	2,622.9	697.9	1,414.0	34.4	20.9	21.0	48.4
Penaeoidea	Penaeoid shrimp	0.0	0.0	0.0	1.9	12.3	130.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sergestoidea	Sergestoid shrimp	18.3	0.0	24.7	1.9	4.1	539.9	344.2	230.1	222.1	128.5	6.4	3.2	3.4	0.1
Shellfish Subtotal		**147.9**	**78.1**	**2,510.5**	**144.8**	**223.1**	**5,922.4**	**2,602.1**	**13,022.5**	**5,773.6**	**3,113.6**	**116.9**	**97.9**	**89.8**	**167.1**
Grand Total		**239.6**	**19,473.9**	**9,470.0**	**512.7**	**550.2**	**6,190.7**	**3,818.3**	**13,292.4**	**5,999.5**	**5,044.6**	**141.8**	**178.3**	**113.7**	**351.6**

Source: URS 2008

Exhibit 12. Density (no./100 m^3) of entrained fish and shellfish using 500 µm nets at San Juan Power Plant, 2007

Taxa (scientific name)	Taxa (common name)	January		February		March		May		June		July		July-Dup	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Fish															
Elopidae	Ladyfishes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Engraulidae	Anchovies	0.0	0.0	0.0	0.0	0.0	9.3	0.0	10.1	1.8	0.0	0.0	0.32	0.0	0.0
Gobiidae	Gobies	0.0	0.0	0.0	0.0	0.0	8.0	0.0	2.0	0.9	0.0	0.0	1.08	2.5	0.5
Gerreidae	Mojarras	0.0	0.0	0.0	0.0	1.1	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Polynemidae	Threadfins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soleidae	Soles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Pisces	Fish eggs	47.8	707.4	21.5	799.8	17.5	1,513.5	24.9	517.2	6.5	197.9	1.9	200.1	1.9	110.1
Pisces	Unidentified pre-flexion larvae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.9	0.0	0.0	0.1	0.0
Fish Subtotal		**47.8**	**707.4**	**21.5**	**799.8**	**18.6**	**1,532.1**	**24.9**	**531.4**	**9.2**	**198.9**	**1.9**	**201.4**	**4.7**	**110.7**
Shellfish															
Anomuran	Hermit crabs	29.9	1.7	1,177.7	120.5	12.0	677.1	177.3	425.9	63.7	30.2	24.9	64.5	70.9	44.6
Brachyura	True crabs	23.9	0.0	161.5	13.5	63.3	99.6	312.7	3,194.5	16.6	6.6	26.8	46.8	204.3	17.9
Caridea	Caridean shrimp	25.9	4.2	28.2	16.8	5.5	239.0	112.0	395.5	38.8	17.9	22.9	72.6	98.0	28.3
Penaeoidea	Penaeoid shrimp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sergestoidea	Sergestoid shrimp	0.0	1.7	16.9	13.4	1.1	269.5	238.0	304.2	8.3	5.7	7.6	11.3	41.7	6.0
Shellfish Subtotal		**79.7**	**7.5**	**1,384.3**	**164.2**	**81.9**	**1,285.1**	**840.0**	**4,320.2**	**127.3**	**60.3**	**82.2**	**195.2**	**414.9**	**96.7**
Grand Total		**127.5**	**714.9**	**1,405.7**	**964.1**	**100.5**	**2,817.2**	**864.9**	**4,851.6**	**136.6**	**259.2**	**84.1**	**396.7**	**419.7**	**207.5**

Source: URS 2008

Entrainment rates differed significantly between the 1993-94 and 2007 studies, and most significantly for shellfish and larval fish ($p<0.05$). The average annual entrainment rate at the intake in 1993-94 was 13,162 individuals/100 m^3 of flow (including 1,100 fish eggs, 12,024 shellfish and 38 fish larvae), compared 4,663.7 individuals/100 m^3 of flow (2,234.4 fish eggs, 2,429.3 shellfish and 3.0 fish larvae) in 2007. Representative species saw similar reductions, with larval fish decreasing from 74.4 individuals/100 m^3 to 2.8 individuals/100 m^3 and shellfish decreasing from 6,799 individuals/100 m^3 to 971.6 individuals/100 m^3.

The cause of the differences in results between the studies is difficult to identify. However, it is likely that annual variability and population fluctuations, coupled with differences in sampling design, contribute to the drastically different entrainment values.

Permit Requirements

As with impingement mortality and according to 40 CFR 122.21(r) *Application requirements for facilities with cooling water intake structures*, SJPP will be required to submit several documents to meet impingement mortality requirements. SJPP has conducted several studies that may already contain some of the required information, but for the most part the entrainment-related studies require data and analyses that are not present in previous documents and will need to be created and developed. Exhibit 13 below lists the studies required, provides the studies already submitted, and assesses whether the given requirement might have already been satisfied. Again, EPA Region II will be the ultimate authority in making this assessment when the documents are submitted as part of the permit application.

Exhibit 13. Comparison of Existing Documents to Application Requirements

Regulatory Requirement	Existing	Notes
Description of any previously conducted entrainment performance studies (§ 122.21(r)(7))	• n/a	As noted in Sections 3.2.3 and 3.2.4 above, relevant studies have been conducted and provided to USEPA Region II. If the permittee is aware of any other relevant studies, those would be provided in this submittal.
Entrainment characterization study (§ 122.21(r)(9))	Impingement Mortality & Entrainment Characterization Study And Current Status Report (2008)	This document provides a somewhat dated assessment of impingement mortality and entrainment for one year in 1995 and 6 months in 2007
Comprehensive technical feasibility and cost evaluation study (§ 122.21(r)(10))	Proposal for Information Collection - San Juan Power Plant - San Juan, Puerto Rico (2007)	• This document provides a preliminary assessment of technologies to be considered for evaluation
Benefits valuation study (§ 122.21(r)(11))	• n/a	• It does not appear that the facility has conducted any studies that would meet the requirements for this submittal.
Non-water quality environmental and other impacts assessment (§ 122.21(r)(12))	• n/a	• It does not appear that the facility has conducted any studies that would meet the requirements for this submittal.
Description of the peer review process for studies submitted under (§ 122.21(r)(10)-(12)) (§ 122.21(r)(13))	• n/a	• This submittal cannot be developed until the referenced studies have been completed.

Timeline

As outlined in the draft permit language, the facility will be subject to a compliance schedule as presented in Exhibit 14.

Exhibit 14. Suggested Compliance Schedule

Time Frame	Submittal
Within 3 years of permit issuance	§ 122.21(r)(9) (or equivalent)
Within 4 years of permit issuance	§ 122.21(r)(10)-(13) (or equivalent)

As discussed above, SJPP will need to develop most of these materials, as the data or analyses required have not previously been developed. EPA Region II has flexibility in setting a deadline for submittal of these materials; refer to the draft permit for the facility for the actual compliance schedule.

Once SJPP has submitted all the requisite materials and EPA Region II has reviewed them, an NPDES permit that reflects appropriate permit conditions for impingement mortality and entrainment will be issued. As noted above, impingement requirements will commence once entrainment requirements have been determined.

Analysis of BTA for Entrainment

There are a number of technologies and operational measures that can be used to reduce entrainment impacts. (See the Existing Facility Rule TDD, Chapter 6.) SJPP will examine each of these in greater detail in their submittals, but this section provides a preliminary analysis of the feasibility of several of the more widely-used technologies or measures.

3.5.1 Flow Reduction

Flow reduction is one of the most effective ways to reduce entrainment. Below are several possible approaches.

1. Closed-cycle Cooling

The availability of adequate space to install and operate equipment is an important factor concerning the feasibility and availability of closed-cycle cooling. A review of the site plan indicates that there is very limited space available for the installation of mechanical draft cooling towers of sufficient size or for different tower designs such as natural draft cooling towers.

The total condenser cooling water flow of 749 mgd for Units 5 through 10 would require mechanical draft cooling towers with a total of approximately 36 cells that are each about 50 ft. wide. Thus, an in-line configuration would require one or more towers with a total length of about 1,800 ft. or back-to back towers with a total length of 900 ft. A more compact alternative design also considered was a fan-assisted natural draft cooling tower which, if designed to handle the condenser flow for units 5 through 10, would be approximately 450 ft. in diameter. A review of the site plan shows that the site is very compact measuring about 1,500 ft. at the longest and about 1,300 ft. at the widest. There does not appear to be any undeveloped adjacent land available, as the facility is surrounded by industrial and shipping facilities, nor is there a waterbody suitable for placing cooling towers on barges since the nearby shore of San Juan Bay consists of active shipping wharves. Within the site, there are no contiguous undeveloped areas large enough to place large cooling towers. The installation of cooling towers onsite would require the displacement of existing equipment and structures, some of which may be in active industrial use. As a result, large scale closed-cycle cooling does not appear to be a viable technology for SJPP.

The facility employs six small recirculating cooling towers to provide cooling water for miscellaneous equipment throughout the facility. An estimated 342,720 gpm of freshwater from PRASA is used for makeup and the towers operate at approximately 3.0 cycles of concentration. The circulating volume and temperature rise is not provided. However, if the temperature rise is assumed to be equal to the average condenser rise of about 15 ^{o}F (NPDES limit is 18 ^{o}F), then the estimated corresponding circulating water flow rate would be approximately 18 MGD. The use of cooling towers represents a flow reduction technology and should be factored into IM&E reduction estimates. The estimated circulating flow of 18 MGD is equal to 2.3% of current total design intake flow.

2. Variable Speed Pumps

The fixed speed cooling water pumps normally continue to operate at their full capacities when units are in standby mode or when operating at less than full capacity, so there may be an opportunity to reduce flow through the use of variable speed pumps. The current NPDES permit limits for outfall 001 include temperature rise limit of 18 ^{o}F and a maximum limit of 103 ^{o}F. The ambient source water temperature ranges between 80 and 87 °F in San Juan Bay. In 2002, the mean temperature rise between the cooling water intake and outfall ranged between 9 and 12 °F, with a maximum rise between 12 and 17 °F (USEPA Region II 316(a) Determination). Factoring in repowered Units 5 and 6 which were estimated have a rise of 13.7 °F, the weighted average temperature rise for all units adjusted to 100 percent operation load is calculated to be 14.8 °F. Flow reduction through the use of variable speed pumps would result in a corresponding increase in the temperature rise. While theoretically the facility could operate at the maximum rise of 18 °F, actual operation would require an operating margin of 1-2 degrees to minimize the risk of exceeding the limit. Using the higher end of the range of mean temperature rise of 12 °F as the average rise and 16 °F (margin of 2 °F) as the target rise while operating the variable speed pumps, the average calculated flow reduction available is 33%. At the average rise of 14.8 °F for 100% load, the reduction based on operating at a 16 °F rise is 8%. Clearly, reductions will be greatest when the facility is operating at less than full capacity, especially when units are operating in standby mode. The maximum discharge temperature limit of 103 °F is 16 °F greater than the cited upper end of the seasonal range for the source water temperatures, and given the need for an operating margin of 1-2 degrees, this may reduce the available operating rise to a value below 16 °F limiting the available reduction further during periods of high source water temperatures.

SJPP noted that flow reduction may cause issues concerning condenser fouling. Should this be the case, one possible solution is to install a mechanical condenser cleaning system. Such a system would add to the capital costs but may also result in improved condenser performance, as the current flow velocity does not completely prevent condenser fouling. Another issue is that the increased temperature rise will result in a reduction in steam turbine efficiency, which will need to be factored into the cost. Overall, there are some challenges associated with variable speed pumps, but this may be available for addressing entrainment.

3. Alternate Cooling Water Sources

One method of reducing intake cooling water flow volume is the replacement of surface water withdrawals with water from other sources. These can include discharged water from onsite that contains no waste heat or discharges from nearby facilities. Onsite sources are minimal and would provide no significant reduction in flow. The nearby Puerto Nuevo Waste Water Treatment Plant (WWTP) located about one mile from SJPP discharges an average of 57 MGD (40,000 gpm) of partially treated wastewater (primary treatment only) through a tunnel to a submerged outfall located San Juan Bay 7,365 ft from shore at a depth of 141 ft.[15] This volume represents about 8% of SJPP total design flow. Since partially treated wastewater could not be discharged in San Juan Bay, the use of this water to replace once-through cooling water would require the water to be pumped from, and then back to the WWTP and it would need to pass through a separate condenser dedicated to partially treated wastewater. The smallest condensers at SJPP are the steam turbines at Units 5 and 6 which each require a cooling water flow of 50,000 gpm. This data show that the Puerto Nuevo WWTP could not provide sufficient flow volume to be used in this manner. Were such a system to be considered, it would require the wastewater to be pumped through a pipe from the Puerto Nuevo WWTP to SJPP, passed through the condenser of Unit 5 or 6, and then piped back to the WWTP for disposal. The reduced volume and possibly higher temperature of the wastewater may result in a reduction in the steam turbine efficiency. The likelihood of biofouling growth in the condenser tubes may require the installation of a mechanical tube cleaning system. In summary, it does not appear that alternate sources of cooling water are available at SJPP.

[15] The WWTP wastewater discharge is combined downstream with wastewater from the Bayamón RWWTP and the Bacardi Corporation's WWTP prior to final offshore disposal.

4. Other Flow Reductions

As a result of the repowering, the combined design intake flow (DIF) for Units 5 and 6 increased from 85,000 gpm (122.4 MGD) to 100,000 (144 mgd), an increase of 18%. The corresponding increase in total generating capacity from 88 MW to 468 MW is equal to an increase of 432%. Thus, the repowering to a much more water-efficient combined cycle generating system resulted in a significant increase in generating capacity with only a small increase in the DIF. If looked at in terms of cooling water efficiency, cooling water use per MW (gpm/MW) decreased from 966 gpm/MW to 214 gpm/MW which is equal to a reduction of 78% in the water use per MW.

SJPP also notes that the recirculation of the screen wash water for the Units 5 through 8 traveling screens which is equivalent to approximately 0.2% of total plant design intake flow should be considered as a component of flow reduction.

Intake Technologies

A number of intake technologies are available to reduce entrainment. These are described below.

5. Wedgewire Screens

This following discussion regarding fine mesh wedgewire screens generally also applies to coarse mesh wedgewire screens which are capable of meeting the IM velocity alternative. The performance of fine mesh traveling screens is limited by the fact that many of the immature stages of fish that become impinged are susceptible to injury during handling by the spray wash and return system. The use of fine mesh wedgewire screens can significantly reduce such mortality because no handling occurs and the lower through-screen velocity tends to reduce stress on impinged fish. The installation of wedgewire screens for the Units 5 through 8 intake is conceptually feasible. The intake for Units 5 through 8 is located at the shoreline of the Bay under a Puerto Rico Port Authority (PRPA) wharf. The pierhead/bulkhead line of the wharf (where vessels dock) extends out another 38 feet from the shoreline. Adjacent to the wharf is the Puerto Nuevo Channel which runs parallel to the wharf. The channel is 350 ft wide and is dredged to a depth of 39 ft. NOAA navigation charts show the water depth adjacent to the wharf to be around 25 ft (MLLW) and the intake is reported to be about 18 ft deep (MLLW). This indicates that there is a 38 ft wide area underneath the wharf where low velocity screens such as wedgewire screens could be located without interfering with ship navigation or dock operations. However, an important operational challenge for employing screens beneath the wharf is whether accumulated debris released during air backwashed would be sufficiently removed from the area by currents. The intake is located close to the southeast corner of San Juan Bay which at the opposite end from the mouth of the bay and therefore the area is unlikely to be subject to significant tidal currents. As a result, debris drawn into screens may tend to accumulate in the area potentially causing re-impingement of debris and fish. Also, access to the screens (for both installation and maintenance) is complicated by the presence of an active cargo wharf.

Regarding the intake for Units 9 and 10, the intake is located in an area where tide-induced currents will be minimal due to the presence of nearby piers extending out into the water and it is unclear whether there is available space for wedgewire screens in front of the intake that would not interfere with navigation.

In summary, use of wedgewire screens does not appear to be feasible for the Units 9 and 10 intake, and while they may be potentially feasible for the Units 5 through 8 intake if installed under the wharf, it is possible that the ambient currents may be insufficiently strong to effectively remove accumulated debris.

6. Submerged Offshore Intake

SJPP is located at the southeast corner of San Juan Bay and is approximately 2.8 miles from the shore of the Atlantic Ocean. San Juan Bay itself is fairly shallow with the deepest areas being ship navigation channels and turning areas which are dredged to depths up to 40 ft. Thus, there is no suitable location for placing a submerged intake within San Juan Bay that would provide the benefit of reduced biological densities and not interfere with navigation. The only suitable location would be offshore in the Atlantic Ocean. Water depths of about 100 ft can be reached about ½ mile from shore on the north side of the City of San Juan. The most direct route would require a deep tunnel be constructed beneath San Juan Bay and the City of San Juan with the total distance being over three miles from the plant to the offshore location. The installation of such an intake would have a very high capital cost and would be disruptive to the benthic environment. In summary, it does not appear that a submerged offshore intake is economically feasible at SJPP.

Role of Costs and Benefits

The Existing Facility Rule provides for the consideration of costs and benefits in making a site-specific determination for entrainment at § 125.98(f)(4):

> If all technologies considered have social costs not justified by the social benefits, or have unacceptable adverse impacts that cannot be mitigated, the Director may determine that no additional control requirements are necessary beyond what the facility is already doing. The Director may reject an otherwise available technology as BTA standards for entrainment if the social costs are not justified by the social benefits. The Director may not reject an otherwise available technology as a basis for entrainment requirements based on a comparison of social costs and social benefits if the information on benefits is inadequate or has been waived by the Director.

Certainly, costs could be a consideration for some entrainment options. However, a number of technical (i.e., feasibility) concerns are also present, which may make economic considerations less critical. The eventual role of costs and benefits will become clearer with SJPP's submittals, which will describe the technologies, their costs, and the expected benefits.

It should also be noted that a failure (by SJPP) to provide the necessary documentation would result in EPA Region II basing "the site-specific BTA impingement mortality and entrainment requirement on the performance achieved by a closed-cycle recirculating system." See at § 125.98(f)(5).

Threatened and Endangered Species

The Existing Facility Rule contains numerous provisions for consideration of threatened and endangered (T&E) species. As discussed in Section 2.2 2 nine species listed as rare, threatened, or endangered by the federal government (US Fish and Wildlife Service) or the Commonwealth are known to occur in the San Juan Bay estuary and consist of manatees, turtles, and birds. Due to the use of fine mesh screens entrainment of even juvenile T&E species should be non-existent. See Section 2.7 for further discussion.

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