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Government of Puerto Rico

Puerto Rico Electric Power Authority



**DR-4339-PR Public Assistance**

**PROJECT SCOPE OF WORK WITH COST ESTIMATES**

*Submittal to COR3 and FEMA*



***FAAS<sub>t</sub> - Dams Minor Repairs***  
***(Dams/Hydro)***

***GM #436621***

***01/19/2023***



## Introduction

*The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.*

*Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.*

*This document will be updated with information developed during the initial design and engineering phase through the construction phase.*

*The sections included in this document are:*

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

## Document Revision History

Version	Date	Summary of Changes



## Section 1. Project Information

### General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	FAASt - Dams Minor Repairs (Dams/Hydro)
PREPA Project Number	

### Federal Information

(provided by FEMA)

Damage Number(s)	Listed by dam in section 2.1 below
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number (formerly Project Worksheet)	
Amendment Number	

**Program Manager:** <Name>

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<Insert title here>

**PREPA Project Sponsor:** <Name >

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<Insert title here>

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## Section 2. Facilities

### 2.1. Facilities List

Name	Damage Number	GPS Location
Adjuntas Dam	785857	18.199652, -66.732163
Carite Dam	785858	18.076300, -66.106121
Coamo Dam	785859	18.014364, -66.389925
Caonillas Dam	450241	18.27614, -66.65705
Dos Bocas Dam	785860	18.335623, -66.667038
Garzas Dam	785861	18.137436, -66.741034
Guayabal Dam	785862	18.086912, -66.50398
Guayo Dam	785863	18.210609, -66.834724
Guineo Dam	785864	18.159558, -66.526433
Loco Dam	785865	18.042459, -66.887670
Luchetti Dam	785866	18.091852, -66.864446
Matrullas Dam	785867	18.210465, -66.480215
Patillas Dam	785869	18.019041, -66.021439
Pellejas Dam	785870	18.210561, -66.706471
Prieto Dam	785871	18.185851, -66.863836
Vivi Dam	785872	18.229173, -66.678814
Yahuecas Dam	785873	18.218657, -66.816357

**Note:** GPS coordinates are required for all facilities.

### Facilities Description

The Dams Minor Repairs project addresses minor repair work required across 17 dams managed





by PREPA. The scope and complexity of required work across the 17 locations is similar in nature, which will allow it to be executed as a single project. PREPA has determined that it can secure the best pricing and complete the work at the lowest cost, and in the least time, by executing work across all 17 locations as a single project. The 17 dams and scope are listed in section 2.1 above and are described in section 3.1 below.

The primary purpose of all dams in this project is to create water reservoirs that store water for distribution for public use. These uses include water for consumption, irrigation, and energy production. All dams included in this Scope of Work were constructed between 1913 and 1956. The dams were constructed of different materials and using different engineering practices and methods, including concrete dams, gravity dams, earth-built dams buttress dams, and rockfill dams. Some dams include hydroelectric facilities on or near the dam (i.e. Dos Bocas and Patillas).

## Section 3. Scope of Work

### 3.1. Scope of Work Description (e.g., Plan for Repair)

Brief descriptions of each dam included in this project, and the damage sustained during Hurricanes Irma and Maria, are provided below. The scope of work for this project consists of architectural and design engineering and subsequent repair items for each individual site. These repair items broadly capture repairs to components of the systems that were damaged by the hurricanes, however, PREPA intends to also allocate FAASt funding to repair items not considered under BBA as pre-existing damage/condition. It should be noted that no BBA funding was approved for any of the water assets. FAASt components include site features such as access roadways, fencing, building repairs, structural dam repairs, and electrical equipment repairs to name a few (specifics are included under each DI). Mitigation measures for each specific damaged component will also be noted, but only for FAASt repair items.

Furthermore, PREPA also intends to use this project to reestablish key security features across all their water assets. PREPA's key concerns for their water assets are protection against vandalism, potential terrorism and overall public life safety protection at all sites. Some of these features include the addition of sirens and alarms to warn the public against entering potentially dangerous locations at each site. Since some of the reservoirs by the dams are used recreationally and contain morning glory spillways, fencing will be installed around morning glory spillways to protect against individuals falling through the dam spillways. Protection against vandalism and terrorism will include the addition of security cameras and site perimeter fencing and gates that reduce access to areas within the sites that should be secure.

Overall, the scope of work for this project includes repairs to all damaged and outdated features at the dams. This includes repair and replacement of storm damaged items, repair and replacement of components with pre-existing damage, and security upgrades to sites.

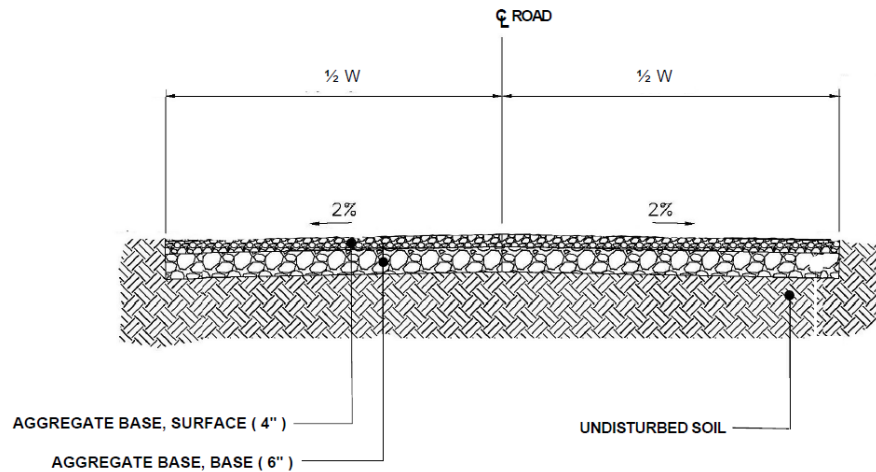
**Adjuntas Dam** – Adjuntas Dam is a gravity dam located in Utuado, Puerto Rico. The dam was built in 1950 on the Grande de Arecibo River to support hydroelectric power production. Adjuntas Dam serves as the most upstream water collection system within the Dos Bocas-Caonillas System. Hurricane-damaged components include doors, walls, conduits and electrical systems, sluice gate hydraulic hoist and hydraulic power unit, railings, access road and parking area, intake rack structure, and drainage piping. No security features require installation for this site.

- Exterior Site - 18.200190, -66.731530
  - Reconstruct roadway to codes and standards 3,750 SF (375 FT L x 10 FT W) of 4-IN



thick gravel roadway and 6-IN aggregate base. See gravel roadway typical section, Figure 1.

- Dam's Right Abutment - 18.199728, -66.731553
  - Remove and replace 250 LF of 1.5 IN underground rigid metal conduit running parallel to the roadway along the dam's right abutment.
  - Remove and replace 1000 LF of electrical cabling including (3 cables x 250 LF each) of THWN #6 electrical cabling and 250 LF of THWN #8 electrical cabling.
  - Remove and replace a 45 FT H wooden utility pole and attached fuse cutout, 100 Amp/240 VAC safety switch, and 15KVA pole-mounted transformer.
  - Remove and replace 100 LF of 14 IN ductile iron pipe used for drainage along the dam's right abutment.
- Dam Crest Walkway - 18.199855, -66.732037
  - Remove and replace wire rope hardware along the dam's crest walkway including one (1) eye bolt rail and two (2) wire rope (U-bolt) clamps for railing.
- Dam's Right Abutment Tunnel Control Valve Building - 18.199728, -66.731553
  - Remove and replace a 3 FT W x 8 FT H (3/16 gauge) steel plate door along the dam's right abutment tunnel control valve building.
  - Replace a missing wall mounted 120 V E26 base vapor tight luminaire along the dam's right abutment tunnel control valve building.
- Dam Gallery Sluice Gate Chamber - 18.199724, -66.732245
  - Remove and replace the hydraulic operation of the 42 IN x 42 IN sluice gate along the dam's gallery sluice gate chamber.
  - Remove and replace the hydraulic operation of the 42 IN x 42 IN sluice gate along the dam's gallery sluice gate chamber including the hydraulic power unit and Westinghouse hydraulic hoist of sluice gate (press head 96, operating cylinder 14.25 IN, working pressure of 750 psi, tested to 1200 psi).
- Reservoir - 18.199740, -66.731923
  - Shore, remove, replace, and paint the 9 FT L x 14 FT H concrete wall in the dam's gallery sluice gate chamber.
  - Clean the sluiceway intake rack structure and surrounding area of storm related debris.



**Figure 1 – Gravel Roadway Section (Typical)**

### Mitigation Scope of Work

- Place 3,750 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Construct drainage swales along both sides of roadway to carry water away from the road and prevent washouts. 2 X 375 LF = 750 LF
- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace 45' wood power pole with composite pole, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (15 kVA), location to be determined at 30% plans.
- Install conduit and install underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.



**Carite Dam** – Carite Dam is an earth dam built in 1913 on the La Plata River, located in Guayama, Puerto Rico. Carite is the primary dam for Carite System. Hurricane damages to this dam include the reservoir spillway, site erosion, access roads, parking areas, safety railing, valves, gabion baskets, expansion joints, access bridge to intake tower, and the intake tower structure.

- Exterior Site and Dam's Intake Structure - 18.060599, -66.099029
  - Remove temporary gravel surface and reconstruct asphalt roadway to codes and standards. replace 5,025 SF (335 FT L x 15 FT W) of 4 IN asphalt roadway. See typical section, Figure 2.
  - Replace a 9 FT W x 7 FT H x 12 FT H gable roofed intake tower structure with a steel frame corrugated metal roofing and siding and two (2) 1.5 FT x 7.5 FT H steel entry doors.
  - Replace a 90 FT L x 10 FT W x 4 IN thick concrete reservoir spillway surface at the dam's intake tower.
  - Replace an open/close coffin ball bearing stand indicator control valve operator at the dam's intake tower.
  - Remove and replace a 96 FT L x 3 FT W access bridge composed of
    - steel grate decking,
    - two (2) longitudinal c-beams (2 IN W x 8 IN H x 96 LF L),
    - fifteen (15) cross c-beams (1.5 IN W x 4 IN H x 3 FT L),
    - five (5) dual column piers composed of 4 IN diameter steel piping with concrete footing and with bracing along the bridge span, and
    - two (2) rows (96 LF each) of 2 IN painted handrail atop 3.25 FT H posts set at 8 FT OC.
- Dam's Left Abutment - 18.076010, -66.106760



- Replace 6000 CY (60 FT x 25 FT x 4 FT/ 27 CF per CY) of compacted fill material upstream the slope of the reservoir rim.
- Reset wooden fence posts and replace 80 LF (2 strands x 40 LF) of barbed wire around the left abutment (fence posts set at 4 FT OC, 21 total).
- Spillway - 18.074737, -66.107755
  - Replace eighteen (18) 2 IN D x 41 IN H rigid metal safety posts with 480 LF of wire rope (2 rows of wire rope x 240 LF per line) along the spillway.
- Spillway Right Side - 18.074766, -66.108005
  - Replace three (3) 1 IN joint filler boards with the following dimensions along the right side of the spillway: 25 FT L X 16 IN W, 20 FT L X 16 IN W, and 13 FT L X 16 IN W.
  - Scratch and replaster 120 SF (40 FT L x 3 FT H) of 1 IN thick plaster layer atop the concrete parapet wall along the right side of the spillway.
  - Scratch, clean, cut and replaster 60 SF (40 FT L x 1.5 FT W) of 1.5 IN thick plaster layer on top the concrete parapet wall along the right side of the spillway. This will include cleaning and coating two (2) ½ IN rebars along the length of the section.
- Spillway Left Side - 18.074495, -66.107812
  - Replace two (2) 1 IN joint filler boards with the following dimensions along the right side of the spillway: 25 FT L X 16 IN W and 20 FT L X 16 IN W.
  - Scratch, clean, cut and replaster 38 SF (25 FT L x 1.5 FT W) of 1.5 IN thick plaster layer on top the concrete parapet wall along the left side of the spillway. This will include cleaning and coating two (2) ½ IN rebars along the length of the section.
  - Scratch and replaster 625 SF (irregular size) of ¼ IN thick plaster along the retaining wall on the left abutment.
  - Scratch and replaster 90 SF (irregular size) of ½ IN thick plaster along the retaining wall on the left abutment.
- Security Features (Site Wide) - 18.076300, -66.106121Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - A 4-view network camera with 1 TB surveillance memory cards and a network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - long range network horn speaker with built in memory,
  - network strobe siren,
  - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate four (4) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor.



- At Torre Carite:
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with
    - A 4-view network camera with 1 TB surveillance memory cards and two network bullet cameras with 256 GB surveillance memory cards, surge protectors, pole-mounts, software, and wireless transport hardware.
    - long range network horn speaker with built in memory,
    - network strobe siren,
    - four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
    - a computer and two monitors (surveillance monitor and full motion monitor),
  - Install and integrate six (6) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
  - Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor.

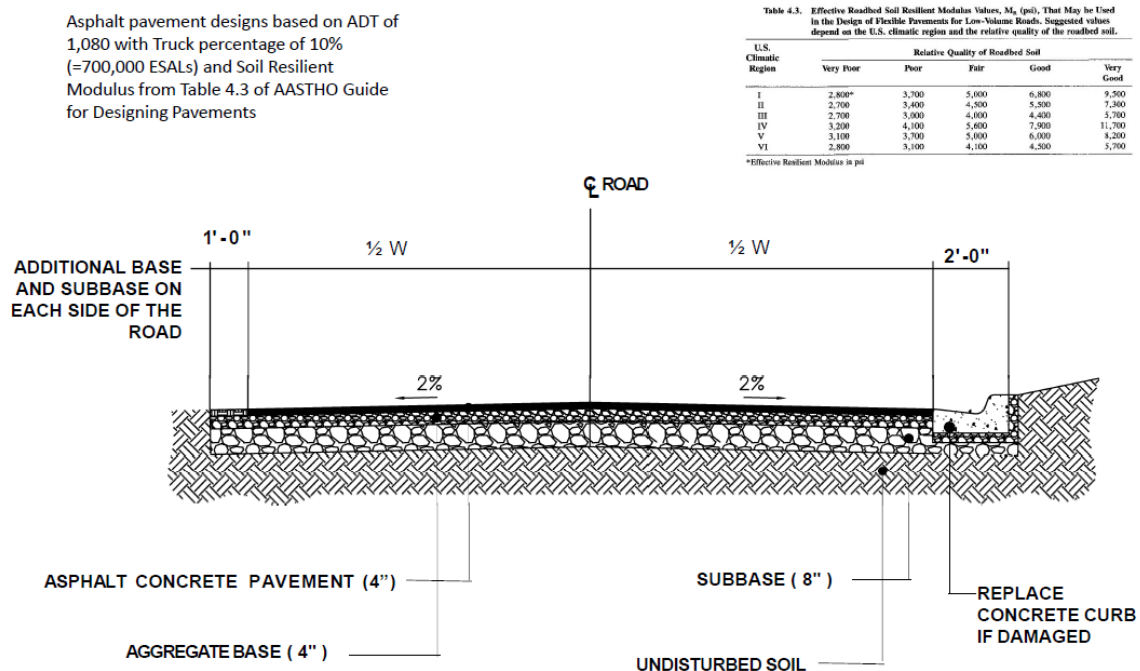
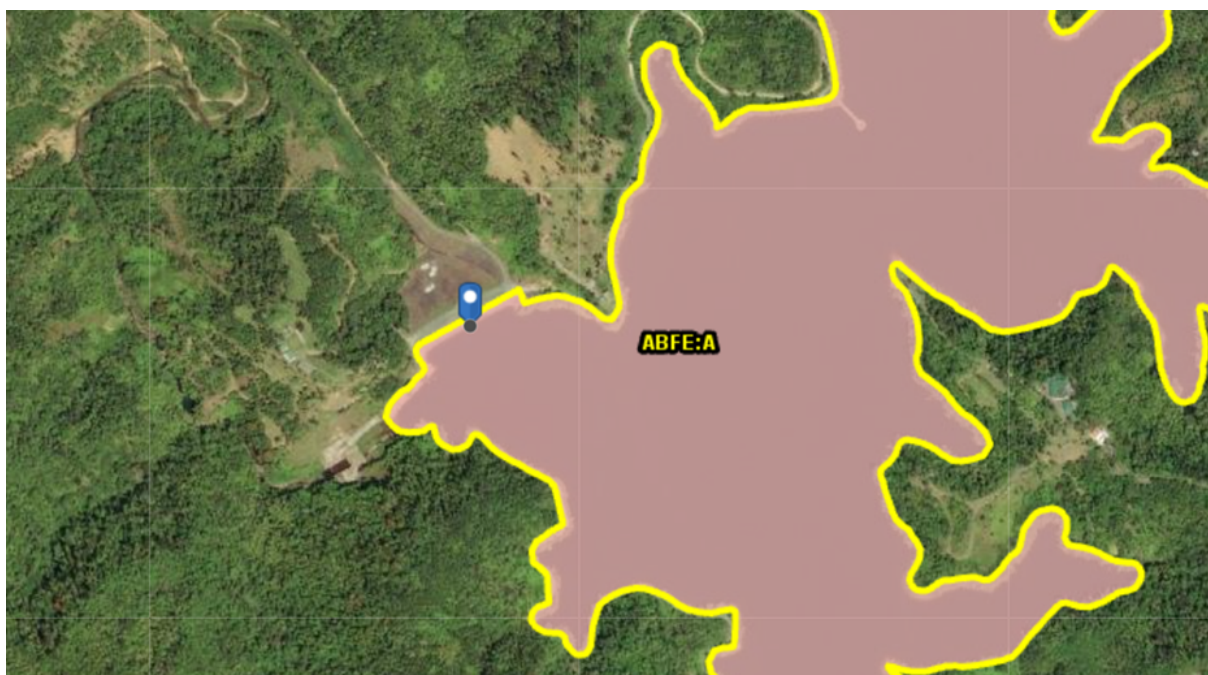


Figure 2 – Asphalt Roadway Section (Typical)

### Mitigation Scope of Work

- Place 5,025 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Construct concrete drainage swales along both sides of roadway to carry water away from the road and prevent washouts. 2 X 335 LF = 670 LF

- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- In area of slope failure, grade slope and terrace, place and anchor geotextile fabric to prevent future landslides. (approximately 410 SY).
- Remove existing rip rap along toe of dam and replace with gabion mattresses to increase the height to length ratio (460 LF). Place and anchor geotextile fabric or fencing on slope above mattresses (2300 SY).





**Coamo Dam** – Coamo Dam is a buttress dam built in 1914 on the Coamo River to support irrigation, and is located in Santa Isabel, Puerto Rico. It makes up part of the South Coast District. Damage to this dam includes fencing, slope erosion, and cracks in the dam's gallery.

- Dam's Right Abutment (Downstream) - 18.014129, -66.390503
  - Remove and replace 50 LF of 5 FT H barbed wire fence, which includes 5-strand barbed wire with metal "h" braces as posts, spaced at 3.5 OC along the dam's right abutment.
- Dam's Left Abutment (Upstream and Downstream) - 18.014190, -66.389090, and 18.014013, -66.389286
  - Cut 592 CY of eroded fill material that deposited on the upstream slope of the reservoir rim and fill 183 CY of downstream slope (near spillway) with fill material.
  - Remove and replace a 45 FT H wooden utility pole.
- Dam's Gallery - 18.014475, -66.390115
- Security Features (Site Wide) - 18.014364, -66.389925
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - A 4-view network camera with 1 TB surveillance memory cards and a network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - long range network horn speaker with built in memory,
    - network strobe siren,
    - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
    - a computer and two monitors (surveillance monitor and full motion monitor),
  - Install and integrate four (4) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
  - Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor.

### **Mitigation Scope of Work**

- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace 45' wood power pole with composite pole, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (15 kVA), location to be determined at 30% plans.
- Install conduit and install underground secondary to facility, location to be determined at



30% plans.

- Remove and dispose of overhead secondary lines and poles.
- In area of slope failures, place and anchor geotextile fabric to prevent future landslides (1,905 + 1,176 = 3,081 SY).
- Place and secure concrete barrier or gabion mattresses to secure the toe of the slope (183 + 242 = 425 LF)



**Dos Bocas Dam** – Dos Bocas Dam is a gravity dam located in Arecibo, Puerto Rico. The dam was built in 1942 on the Arecibo River to support hydroelectric power production. The dam is part of the



Dos Bocas-Caonillas System. Hurricane-damaged components include communications systems, valves, dam foundation, electrical components, the hydraulic power unit and motor, reservoir monitoring system, crane structure, sedimentation of sluiceway, lights, fencing, drainage ditches, and tile drains.

- Dam Groin - 18.335216, -66.665543
  - Remove 44 CY (250 PI LF x 1 LF x 1.5 LF / 27 CY per CF) of debris and sediment from concrete U-shaped channel within the toe of Dos Bocas Dam. Repatch and patch any cracks within U-channel. U-channel diameter is 250 LF and modeled as a semi-circle.
- Dam Crest Walkway - 18.335476, -66.666871
  - Remove, replace, and rewire twelve (12) cobra head (pole mounted) 100W – HPS lamps sitting atop the parapet wall along the bridge/dam crest. This includes 300 LF of 1.25 D rigid metal conduit and 900 LF of 8-gauge copper wire (3 wires x 300 LF).
  - Remove and replace two (2) 3 IN D x 10 FT H ornamental poles along the bridge/dam crest.
  - Clean, scratch, and repaint 7,510 SF of parapet wall along the bridge/dam crest.
  - Remove and replace 2 FT L x 5 FT H chain link swing gate and hardware (pivot hinges) including #9 wire mesh and 1.5 IN diameter posts along the dam crest walkway.
  - Remove and replace a 30 FT L x 6 FT W x 24 FT H, 5 TON trashrack (jib) crane with trolley (see photos), including all rope.
  - Remove and replace 90 LF (45 LF x 2 rails) of painted trashrack safety railing including 2 IN D hollow galvanized steel top and midrails and ten (10) 3.5 FT H posts set at 5 FT OC.
  - Remove and replace an intake crane structure along the dam crest walkway.
  - Remove and replace a 35 FT x 3 FT galvanized steel grate along the dam crest walkway.
  - Remove and replace a flush 12 IN x 12 IN electrical enclosure cover located on the dam crest walkway.
  - Remove and replace a 1.5 IN flange union and globe valve of the trashrack seat gate cleaning device located in the dam gallery.
  - Remove and replace a flush 26.5 IN x 20 IN electrical enclosure cover located in the dam gallery.
  - Remove and replace the Hydraulic Power Unit (HPU) for the operation of the 60 IN x 60 IN Sluice gate, including
    - one (1) steel flexible coupling,
    - a brass four-way valve for the oil service,
    - four (4) brass straightway valves for oil service;
    - a 6-in pressure gage with a ¼ IN brass case bottom connection;
    - a screwed 1.25 IN brass hydraulic relief valve;
    - a 1.25 IN screwed standard brass gate valve;
    - a 1.25 IN screwed brass hose gate valve with brass cap, chain, and Chicago



- hose thread;
- five (5) 3/8 IN screwed hydraulic brass globe valves,
- twenty six (26) 1.25 IN screwed hydraulic galvanized M.I. 90 degree elbows;
- seven (7) 1.25 IN screwed galvanized hydraulic M.I. tees;
- a 1.25 IN screwed hydraulic galvanized M.I. cross;
- five (5) 1.25 IN screwed standard galvanized M.I. screwed union with gaskets;
- five (5) 1.25 IN standard galvanized M.I. screwed unions with gaskets;
- six (6) 1.25 IN screwed standard galvanized M.I. 90 degree elbows;
- four (4) 1.25 IN screwed standard galvanized M.I. tees;
- two (2) 3/8 IN – 300# galvanized screwed M.I. 90 degree elbows;
- four (4) 1/4 IN screwed standard galvanized M.I. 90 degree elbows;
- three (3) 1/4 IN screwed standard galvanized M.I. tees;
- four (4) 1/4 IN standard galvanized M.I. screwed unions with gaskets;
- five (5) 1.25 IN x 3/8 IN galvanized steel hexagonal bushings;
- a 1.25 IN x 1/4 IN galvanized I. busing inside hexagonal bushings;
- a 3/8 IN x 1/4 IN galvanized steel hexagonal bushing (long pattern);
- four (4) 3/8 IN x 1/4 IN galvanized M.I. Bushings outside hexagons;
- and a 3/8 IN x 8 IN extra strong galvanized long nipple.
- Remove and replace the AC motor (10 HP/1750 ROM, 220/440V Frame 326) and oil pump (12 GPM at 1000 psi, rotary Type) of the Hydraulic Power Unit (HPU)
- Scratch and paint 390 SF of exterior concrete paint on the crane control building.
- Dam Gallery - 18.335853, -66.667335
  - Remove and replace a 14 IN D standard iron body swing check valve within the dam's gallery first floor.
  - Remove debris from the foundation drainage holes, which are used to relieve uplift pressure against the dam and which have outlets to the gallery gutter.
  - Remove and replace a 24 IN D tile drain.
- Dam Left Abutment - 18.335706, -66.668547
  - Scratch and paint 262 SF of exterior concrete paint on the gallery access building.
- Reservoir - 18.335313, -66.666830
  - Remove the sluiceway intake rack structure and its surroundings of sediment and debris.
- Security Features (Site Wide) - 18.335623, -66.667038
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - Two 4-view network camera with 1 TB surveillance memory cards, surge protectors, pole-mounts, software, and wireless transport hardware.
    - long range network horn speaker with built in memory,



- network strobe siren,
- three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, and universal power supply and a pole mount kit,
- Install and integrate five (5) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor.

### Mitigation Scope of Work

- Remove existing emergency generator and replace with 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.



**Garzas Dam** – Garzas Dam is an earth dam built on the Vacas River in Adjuntas, Puerto Rico in 1943. This is the main water storage component of the Garzas System. Hurricane-damaged components include roads, electrical infrastructure, fences, poles, diversion tunnel electrical equipment, wiring, conduit, sluice gate mechanical equipment, railings, diversion tunnel, and spillway.

- Right Abutment & Downstream Access Area - 18.136538, -66.739867
  - Remove and replace 60 LF of hollow galvanized steel piping with flattened expanded



- metal sheets with 2.25 IN D x 5 FT H posts spaced at 3 FT OC at the dam's right abutment.
- Reconstruct roadway to codes and standards. 21,000 SF (2,100 FT L x 10 FT W) of 4-IN asphalt (access) roadway. See typical section, Figure 2.
  - Remove and replace the culvert structure including an 11 FT L x 5 FT H headwall, two 5 FT L x 5 FT H wingwalls, a culvert deck (11 FT L x 12 FT W), and three 42 IN D culverts.
  - Remove and replace two hollow galvanized entrance swing gate (6 FT L x 5 FT H) containing 1.5 IN D posts. Remove and replace 24 LF (2 sides x 12 LF each) of guardrail along the bridge of the access road.
  - Remove and replace 22 LF of (2 sides x 11 LF each) of guardrail along the culvert structure.
  - Diversion Tunnel & Gate Chamber - 18.138270, -66.740507 & 18.138403, -66.741110
    - Remove and replace electrical equipment including 700 LF of 2 IN D PVC electrical conduit with 3 strands of copper #10 electrical wiring (2,100 LF total wiring), two (2) 2 IN 90-degree PVC conduit elbows, thirteen (13) 2 IN PVC conduit C Type bodies, eleven (11) 1-gang PVC electrical boxes with weatherproof covers, eleven (11) 120V /15A duplex receptacles, and thirteen (11) pole-mounted HID lamps within the dam's diversion channel and channel gate chamber.
    - Clean and patch a 6 FT L x 3 FT H section of reinforced concrete that shows concrete spall.
    - Remove and replace 20 LF of 2 IN diameter metal railing at entrance edge with 3.5 IN 2 IN diameter posts set at 5 FT OC (5 posts).
    - Remove and replace a quarter moon shaped, 4.5 FT L x 6 FT H entrance swing gate with flattened expanded metal sheets and 4.5 LF of 9 FT H quarter moon shaped entrance fencing with flattened expanded metal sheets at the dam diversion tunnel entrance.
    - Scratch, clean, and patch two (2) cracks (one at STA 5+00 and one at STA 6+00) showing water leak damages within the dam diversion tunnel.
    - Remove and replace 700 LF of 36 IN D steel sluiceway pipeline as well as 700 LF of 2 IN D rigid galvanized electrical conduit and 2,100 LF (3 lines x 700 LF each) of Copper #8 wiring (used to power the HPU motor) within the dam diversion tunnel.
    - Remove and replace the Hydraulic Power Unit (HPU) for the operation of the 33 IN x 33 IN Sluice gate, including
      - one (1) steel flexible coupling,
      - a brass four-way valve for the oil service,
      - four (4) brass straightway valves for oil service;
      - a 6-in pressure gage with a ¼ IN brass case bottom connection;
      - a screwed 1 IN brass hydraulic relief valve;
      - a screwed brass hydraulic glove valve;
      - a screwed 1 IN standard brass gate valve;
      - a 1 IN screwed brass hose gate valve with brass cap, chain, and Chicago hose
-



- thread;
- five (5) 3/8 IN screwed hydraulic brass globe valves,
- a 1/2 IN low pressure brass liquid gauge 12 IN OC;
- fourteen (14) T&G galvanized steel square flange unions with galvanized bolts and gaskets;
- eighteen (18) 1 IN screwed hydraulic galvanized M.I. 90 degree elbows;
- three (3) 1 IN screwed hydraulic galvanized M.I. 45 degree elbows;
- seven (7) 1 IN screwed galvanized hydraulic M.I. tees;
- a 1 IN screwed hydraulic galvanized M.I. cross;
- five (5) 1 IN screwed standard galvanized M.I. screwed union with gaskets;
- eight (8) 1 IN screwed standard galvanized M.I. 90 degree elbows;
- four (4) 1 IN screwed standard galvanized M.I. tees;
- two (2) 1/4 IN galvanized screwed M.I. 90 degree elbows;
- three (3) 1/4 IN screwed standard galvanized M.I. tees;
- four (4) 1/4 IN standard galvanized M.I. screwed unions with gaskets;
- five (5) 1 IN x 3/8 IN galvanized steel hexagonal bushings;
- and a 1 IN x 1/4 IN galvanized iron busing inside hexagonal bushings.
- Remove and replace the AC Motor of the HPU (15 HP/1750 RPM, 220/440V, Frame 326) and the oil pump for the HPU (12 GPM @ 1000 psi, rotary type).
- Remove and replace two (2) 33 IN x 33 IN square sluice gate hydraulic hoist mechanisms in the dam's diversion tunnel gate chamber.
- Remove and replace two (2) 4 IN diameter bypass gate valve in the dam diversion tunnel gate chamber.
- Remove and replace the bypass piping used for equalization including 4 FT of 4 IN cast iron piping, two (2) 4 IN cast iron elbows, and a 4 IN cast iron tee.
- Remove and replace two (2) 4 IN D air valves and 16 LF (8 LF x 2) of cast iron piping.
- Remove and replace 20 LF of 2 IN metal railing (3.5 FT H) with posts set at 5 FT OC at the dam diversion tunnel gate chamber.
- Remove and replace two (2) 2 FT L x 5 FT H entrance swing gates with 1.25 IN x 1.25 IN angular frames and 3/4 IN x 3/4 IN bars at the dam diversion tunnel gate chamber.
- Spillway Tunnel - 18.140314, -66.743074
  - Remove and replace the 20 FT x 10 FT x 12 step galvanized (grated) steel stairway at the tunnel entrance along with 20 LF of 1.5 IN D stairway railing and 1.5 IN D x 3 FT H galvanized steel pipe posts at the spillway tunnel.
  - Inspect dam integrity, patch, and repair the 10 IN L x 8 IN W x 1 FT D and 20 IN L x 2 IN W x 1 FT D holes along the concrete wall of the spillway tunnel that are currently showing signs of seepage.
  - Scratch, clean, and patch a 10 FT L x 8 IN W x 1 FT D hole/crack at the concrete wall of the spillway tunnel.



- Downstream Area - 18.137705, -66.739365
  - Remove and replace a 45 FT H wooden utility pole with a 25 KVA single phase distribution pole mounted transformer, two (2) fuse cutouts, and two (2) lightning surge arrestors.
- Dam Groin - 18.137601, -66.740687
  - Mitigation requested for the dam groin (unclear what is requested here).
  - Reservoir - 18.137324, -66.741414 Clean the sluiceway intake rack and surroundings.
- Security Features (Garzas 1) - 18.094037, -66.734757
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - A 4-view network camera with 1 TB surveillance memory cards and a network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - long range network horn speaker with built in memory,
    - network strobe siren,
    - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
    - a computer and two monitors (surveillance monitor and full motion monitor),
  - Install and integrate three (3) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
  - Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor.
- Security Features (Garzas 2) - 18.073350, -66.730228
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - A 4-view network camera with 1 TB surveillance memory cards and a network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - long range network horn speaker with built in memory,
    - network strobe siren,
    - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
    - a computer and two monitors (surveillance monitor and full motion monitor),
  - Install and integrate three (3) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
  - Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor.



### Mitigation Scope of Work

- Place 21,0000 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Remove existing emergency generator and replace with 200 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace 45' wood power pole with composite pole, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (25 kVA), location to be determined at 30% plans.
- Install conduit and install underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.



**Guayabal Dam** – Guayabal Dam is a buttress dam built in 1913 on the Jacaguas River located in Juana Díaz, Puerto Rico. Damages to this dam include access roads, parking lots, fencing, building shell, crane structures, electrical components, site erosion, flood gates, signs, and spillway, which are included within GM project number 721184. Additionally, site security features will be repaired.

- Site Security - 18.086912, -66.50398
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - Two (2) 4-view network cameras with 1 TB surveillance memory cards and two (2) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.





- two (2) long range network horn speakers with built in memory,
- a network strobe siren,
- four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate five (5) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor.

### No Mitigation

**Guayo Dam** – Guayo Dam is a gravity dam built on the Guayo River in 1956 and is located in Espino, Puerto Rico. Hurricane-damaged components include electrical lines, access road, sluice gate hydraulic hoist and power unit, door to communication shed, and a chain link swing gate.

- Left Abutment Entrance - 18.207868, -66.846678
  - Remove and replace 8 LF of 5 FT H galvanized steel chain-link fence, 4 IN D x 8 FT H tubing, including two (2) posts set at with 1 FT D x 2 FT D concrete footings, 8 LF each of top, mid and bottom rail and a cross brace at the left abutment entrance.
  - Remove and replace two (2) 2 FT x 1.5 FT aluminum warning sign (sheet) at the left abutment entrance and at the dam's control room.
- Right Abutment Entrance - 18.214707, -66.824388
  - Remove and replace two (2) 10 FT L x 5 FT H galvanized chain-link swing gates, 4 IN D x 8 FT H tubing, including two (2) posts set at with 1 FT D x 2 FT D concrete footings, a cross brace, and door hardware at the left abutment entrance.
- Left Abutment Access Road - 18.208914, -66.841323
- Reconstruct roadway to codes and standards. 22,300.8 SF (1,858.4 FT L x 12 FT W) of 4-IN asphalt. See typical section, Figure 2.
- Left Abutment - 18.211012, -66.835462
  - Remove and replace a 45 FT H wooden utility pole along the dam's left abutment. Remove and replace a damaged 200 W – HPS lamp cobra head luminaire attached to the wooden utility pole. Remove and replace 180 LF of damaged aluminum CSR Triplex #2 overhead service drop cable suspended by the utility pole.
- Control Room - 18.210600, -66.835119
  - Remove and replace a 3 FT x 7 FT hollow steel plate door and all associated hardware at the dams control room.
- Dam's Crest Walkway at Left Abutment - 18.210696, -66.835207
  - Repaint 1394 LF (697 LF x 2 abutments) of 2 IN diameter x 3.5 FT H dam crest handrail with posts set at 8 FT OC along the dam crest left and right abutments



- Dam's Crest Walkway at Right Abutment - 18.210261, -66.834342
  - Remove and replace a 3 FT W x 7 FT H 3/16 IN gage steel plated door at the dam's control room entrance.
- Control Room - 18.210600, -66.835119
  - Remove and replace 24 LF of 3 stand barbed wire atop fencing around the dam's control room.
  - Remove and replace two (2) 42 IN x 42 IN hydraulic hoist of the sluice gate.
- Dam's Gallery - Sluice Gate Chamber 18.210518, -66.834776
  - Remove and replace the Hydraulic Power Unit along with the remote-control system for the HPU at the Dam's Control Room and Dam's Gallery Sluice Gate Chamber that operate the sluice gate hydraulic hoist.
- Reservoir 18.210345, -66.834855
  - Clean the sluice intake rack structure and the surroundings of debris and sediment.
- Security Features - 18.210609, -66.834724
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - One (1) long range network horn speaker with built in memory,
    - a network strobe siren,
    - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
    - a computer and one monitor (surveillance monitor),
  - Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

### **Mitigation Scope of Work**

- Place 22,3000 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace 45' wood power pole with composite pole, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 25 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.

- Remove and dispose of overhead secondary lines and poles.



**Guineo Dam** – Guineo Dam is a rockfill dam built on the Toro Negro River in 1931 and is located in Ciales, Puerto Rico. Damages include a chain link fence surrounding the morning glory spillway and upstream and downstream sluice valves.

- Spillway - 18.159619, -66.527555
  - Remove and replace 370 LF of 6 FT H chainlink fence with #9 chain link fabric, posts with concrete footings, top-rail, mid-rail, bottom-rail, diagonal bracing, fittings, and 3-strand barbed wire with arms along the morning glory of the dam. The fence will be partially submerged.
  - Remove and replace a 5 FT W x 6 FT H chain link swing gate with #9 chain link fabric, posts with concrete footings, toprail, bracing, fittings, and 3-strand barbed wire with arms along the morning glory of the dam. The fence will be partially submerged.
- Intake Tower - 18.159195, -66.526073
  - Remove and replace the upstream 2 FT x 3 FT sluice valve that doesn't fully close and poses a threat under emergency flooding conditions.
  - Remove and replace the downstream 3 FT x 4 FT sluice valve that doesn't fully close and poses a threat under emergency flooding conditions.
- Security Features - 18.159558, -66.526433
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.

- one (1) long range network horn speakers with built in memory,
- a network strobe siren,
- three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

### Mitigation Scope of Work

- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace 45" wood power pole with composite pole, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 25 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.



**Loco Dam** – Loco Dam is a gravity dam built on the Loco River in 1951 and is located in Yauco,





Puerto Rico. Hurricane-damaged components include the access road bridge, site erosion, gates, buoys and buoy floatlines, fencing, access road, wire ropes, electrical components, sluiceway intake rack and surroundings, actuator, and windows.

- Exterior Site Main Entrance - 18.037212, -66.890747
  - Remove and replace two (2) painted 7.5 FT W x 6 FT H hollow galvanized tubed (2 IN diameter tubing with lateral spacing at approx. 7.2 IN OC, tubes run vertically) entrance swing gates.
  - Remove and replace 28 LF of 6 FT H chainlink fence with #9 chain link fabric, posts with concrete footings set at 7 FT OC, toprail, bracing, and fittings.
  - Remove and replace 196 LF (18 LF + 28 LF +150 LF) of 6 FT H chainlink fence with #9 chain link fabric, posts with concrete footings set at 7 FT OC, toprail, bracing, and fittings.
- Exterior Site Access Road - 18.040672, -66.888044
  - Remove and replace 6,480 SF (540 LF L x 12 FT W) of 3 IN thick asphalt access road (total length of roadway is 1,800 LF) that was damaged by high velocity run-off during the storm.
- Exterior Site Creek Crossing - 18.041301, -66.888037
  - Infill 20.83 CY (45 FT L x 12.5 FT W x 1 FT D / 27 FT per CY) of eroded roadway base layer material that was scoured as a result of high velocity flow (undersized culvert dammed water which overtopped the roadway and scoured the base layer material).
  - This will require the removal and replacement of the asphalt roadway (45 LF x 12.5 W x 3 IN)
- Exterior Site Facility Access at Right Abutment - 18.042058, -66.888023
  - Remove 120 LF x 20 FT H x 6 FT thick of sediment material that deposited around the access at the right abutment due to a landslide.
  - Remove, replace, and rewire one (1) pole-mounted cobra head 100W – HPS lamps at the access at the right abutment of the dam.
  - Remove and replace 10 LF of 4 FT chainlink fence with #9 chain link fabric, 7 FT H posts set at 7 FT OC and pinned to a 3 FT concrete wall, toprail, bottomrail bracing, and fittings. The fence was damaged by the landslide.
  - Remove and replace 12 LF of 3 FT chainlink fence with #9 chain link fabric, posts with concrete footings set at 7 FT OC and, toprail, bottomrail, and fittings.
  - Remove and replace 13 LF of 5 FT chainlink fence with #9 chain link fabric, posts with concrete footings set at 7 FT OC and, toprail, bottomrail, and fittings.
  -
- Exterior Site Forebay at Right Abutment - 18.042339, -66.887987
  - Remove and replace the (220/440 V/3 PH, Frame B66) sluice gate actuator at the facility access along the right abutment of the dam.
  - Remove and replace 35 LF of 4 FT chainlink fence with #9 chain link fabric, 7 FT H posts set at 7 FT OC and pinned to a 3 FT concrete wall, toprail, bottomrail bracing, and fittings. The fence was damaged by the landslide.



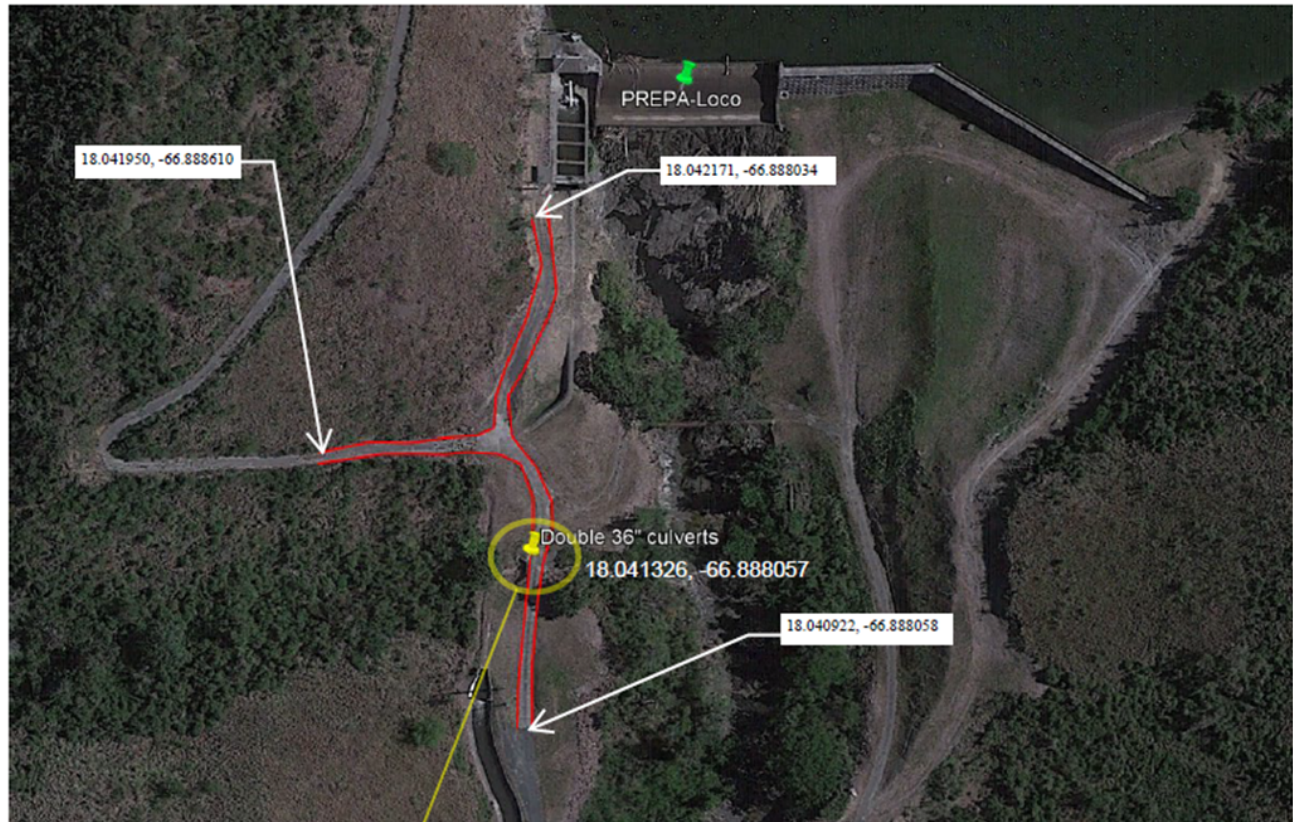
- Exterior Site Intake Deck at Right Abutment - 18.042563, -66.887960
    - Remove and replace 24 LF of 3 FT chainlink fence with #9 chain link fabric, posts with concrete footings set at 7 FT OC and, toprail, bottomrail, and fittings. The fence was damaged by the landslide.
    - Remove, replace, and rewire one (1) pole-mounted cobra head 100W – HPS lamps at the access at the intake deck along the dam's right abutment.
    - Remove and replace 60 LF (2 strands x 30 LF each) of wire rope safety railing at the intake deck along the dam's right abutment.
  - Exterior Site Downstream at Left Abutment - 18.042319, -66.887391
    - Infill 205 CY of fill material downstream of the spillway that was washed out by high-velocity water flow.
  - HPU Building - 18.042517, -66.887948
    - Remove and replace a 5 FT W x 5 FT H aluminum louvered window at the HPU building
  - Reservoir - 18.042636, -66.887740
    - Remove and replace ten (10) out of twenty (20) damaged buoys and 200 LF of floatline (out of 400 LF) within the reservoir.
  - Exterior Site Loco River - 18.041656, -66.887592
    - Remove and replace a 120 LF x 4 FT steel plate (4-IN thick) pedestrian footbridge located downstream of the spillway. The bridge has 240 LF (120 LF x 2 spans) of 4 FT H chain link fence with posts set 8 FT OC and top rail as safety railing.
    - Infill 6.48 CY of fill material adjacent to the stairs that lead up to the steel plate pedestrian footbridge.
  - Reservoir Intake Rack - 18.042567, -66.887859
    - Remove sediment from the sluiceway intake rack and the surrounding structures.
  - Security Features - 18.042459, -66.887670
    - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
      - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
      - one (1) long range network horn speakers with built in memory,
      - a network strobe siren,
      - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
      - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
      - a computer and two monitors (surveillance monitor and full motion monitor),
    - Install and integrate three (3) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
-

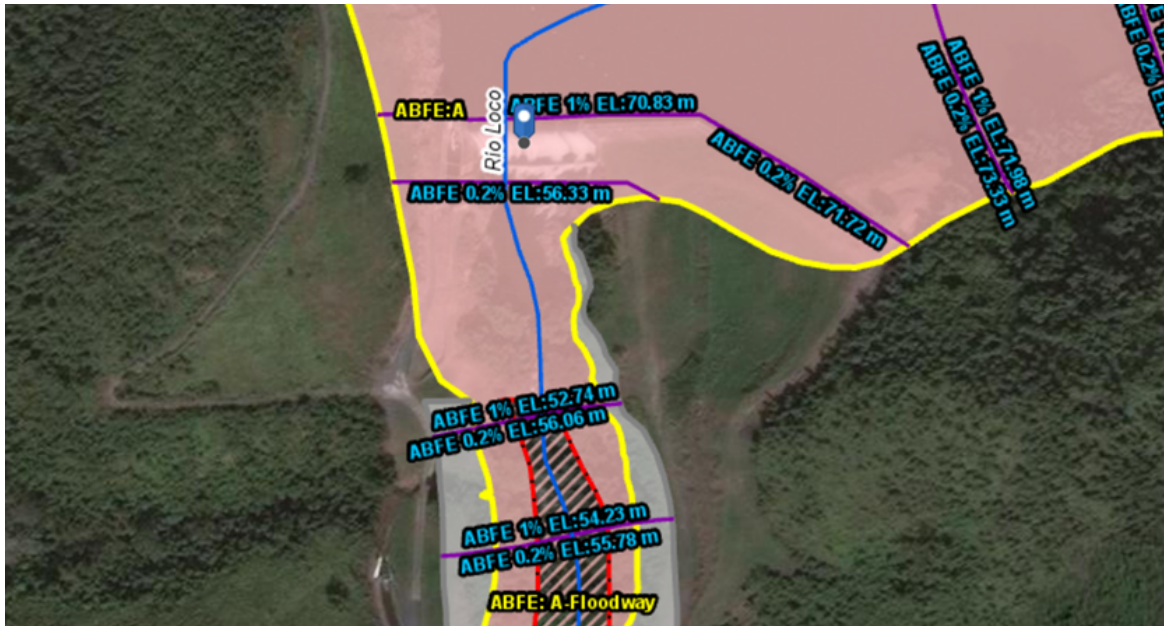
**Mitigation Scope of Work**

- Construct concrete slab downstream of the spillway to prevent future washout. (1,773 SF)
- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace 45" wood power pole with composite pole, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.
- Remove double 36" culverts and replace with short span bridge and supporting structures.
- Grade entrance road with a crown or superelevation, place geotextile pavement fabric, construct concrete swales along entrance road to direct water away from roadway and add 3-inches of gravel so water is adequately directed to the swales.
  - Concrete swales =  $(476 + 415 + 348) = 1,236$  LF
  - Geotextile Fabric =  $15 \text{ LF} \times 645 \text{ LF} / 9 = 1,075$  SY
  - Surface =  $645 \text{ LF} \times 15 \text{ LF} \times 0.25 \text{ LF} / 27 = 89.5$  CY









**Luchetti Dam** – Lucchetti Dam is a gravity dam located in Yauco, Puerto Rico. The dam was built on the Yauco River in 1952 to support irrigation. Hurricane-damaged assets include electrical components, utility poles, cracked gallery, hydraulic unit motor and oil pump, pressure gauges, actuator, and control gate operator.

- Dam's Right Abutment, Left Abutment, & Dam's Crest Walkway - 18.092049, -66.865260; 18.091293, -66.863823; & 18.091756, -66.864437
  - Remove and replace a 45 FT H wooden utility pole along the dam's right abutment. Remove and replace three (3) fuse cutouts and two (2) lightning arrestors attached to the pole.
  - Scratch, prime, and paint 3,964 SF (482 SF at left abutment + 482 SF at right abutment + 3000 SF at dam crest concrete parapet wall) of exterior concrete walls.
- Dam's Distribution Transformer Bank Area - 18.091888, -66.864782
  - Remove and replace a ceramic electrical insulator at the dam's distribution transformer bank area.
  - Remove and replace a 30 IN x 30 IN steel angle frame floor door at the distribution transformer bank area.
  - Remove and replace a 1.5 W x 13 FY H, steel, 12-step, uncaged, fixed access ladder at the distribution transformer bank area.
  - Remove and replace the transformer bank and electrical service connections from the current dam's distribution transformer bank area to the right abutment.
  -
- Dam's Gallery Sluice Gate Chamber - 18.091713, -66.864453
  - Remove and replace the AC motor of the 7.5 HP/125 RPM, 220/440V hydraulic Power unit for the operation of upstream and downstream sluice gates at the dam's gallery sluice gate chamber.





- Remove and replace the 12 GPM @ 1000 psi rotary type oil pump for the hydraulic power unit at the dam's gallery sluice gate chamber.
- Remove and replace the (max pressure 200 psi) water pressure gauge of the bypass piping at the dam's gallery sluice gate chamber.
- Remove and replace five (5) PS25 Medium Base Tougcoat 130 V/200 W incandescent lamps at the dam's gallery.
- Scratch, clean, and patch a 17 FT x ½ IN tranverse crack at the dam's gallery No.11 Sta7+88.
- Remove and replace three (3) 3-IN bypass gate valve at the dam's gallery sluice gate chamber.
- Remove and replace three (3) 3-IN bypass gate valve at the dam's gallery sluice gate chamber.
- Remove and replace the Hydraulic Power Unit (HPU) for the operation of 42 IN x 42 IN sluice gate at the dam's gallery sluice gate chamber.
- Sand blast and paint two (2) (upstream and downstream) sluice gate bonnet cover and hydraulic hoist cylinder for the 42 IN x 42 IN sluice gate at the dam's gallery sluice gate chamber.
- Tunnel Control Valve Building - 18.092806, -66.867470
  - Remove and replace a 45 FT H wooden utility pole along the tunnel control valve building. Remove and replace three (3) 25-KVA single phase pole-mounted distribution transformer, three (3) single fuse cutouts, three (3) lightning arrestors attached to the pole, a pole-mounted 200 W Cobra Head HPS lamp. and 30 LF of 3-Phase overhead service drop conductor cable.
  - Remove and replace 4 LF of electrical service mast composed of 2 IN x 2 IN galvanized steel tubing along the tunnel control valve building.
  - Remove and replace the operator of the control gate (42 IN x 42 IN sluice gate) at the tunnel control valve building, including the actuator (80 LB-FT start, 16 LB-FT run, 3460 RPM, 220/440V, Limitorque Make, Model S/N Y71951A1) and the control panel of the actuator.
  - Pressure wash, prime, and paint 672 SF (13 FT L x 11 FT W x 14 FT H, all four sides) of exterior concrete walls at the control house.
  - Pressure wash, prime, and paint 692 SF (12 FT L x 10 FT W x 13 FT H, all four sides and ceiling) of interior concrete walls at the control house.
  - Remove and replace 143 SF (13 FT L x 11 FT W) of elastomeric roof coating at the control house.
  - Remove and replace the 40 IN L x 36 IN W x 1.5 IN D steel quarter circle floor "grate" at the control valve building.
- Security Features - 18.042459, -66.887670
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - one (1) long range network horn speakers with built in memory,

- a network strobe siren,
- three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

### Mitigation Scope of Work

- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace wood power poles with composite poles, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.



**Matrullas Dam** – Matrullas Dam is an earth dam built on the Matrullas River in 1934 and is located in Ciales, Puerto Rico. Hurricane-damaged components include fencing, flow measurement instrumentation, access roadway, and signage.



- Dam's Crest Walkway - 18.210478, -66.480129
  - Replace a 4 FT L x 3 FT H aluminum AEE sign at the dam's crest walkway. Replace 23 LF of 2 IN x 2 IN galvanized steel L-Beam of framing for the sign.
  - Replace a 4 FT L x 4 FT H aluminum AEE sign at the dam's crest walkway. Replace 12 LF of 1.5 IN D galvanized steel pipe of framing for the sign.
- Downstream Area Access Road - 18.211248, -66.480989
  - Remove and reconstruct roadway to codes and standards. 5,280 SF of 4 IN thick asphalt roadway, See typical section, Figure 2.
  - Remove and replace 160 LF of 6 FT H chainlink fence with #9 chain link fabric, posts with concrete footings, top-rail, mid-rail, bottom-rail, diagonal bracing, fittings, 3-strand barbed wire with arms, and a 5 FT L chainlink fence swing gate along the site downstream area.
  - Remove and replace the main valve remote operation communication system at Matrullas Dam that connects to the Toro Negro 1 Plant.
  - Remove and replace the compact constant flow (CF) bubbler (Make: Sutron, Model: 56-0133-25-1S) at the downstream area of Matrullas Dam.
- Spillway - 18.210633, -66.478833
  - Remove and replace 450 LF of 6 FT H chainlink fence with #9 chain link fabric, posts with concrete footings, top-rail, mid-rail, bottom-rail, diagonal bracing, fittings, 3-strand barbed wire with arms, and a 5 FT L chainlink fence swing gate along the morning glory of the dam. The fence will be partially submerged.
- Security Features - 18.210465, -66.480215
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - one (1) long range network horn speakers with built in memory,
    - a network strobe siren,
    - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
    - a computer and two monitors (surveillance monitor and full motion monitor),
  - Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

### **Mitigation Scope of Work**

- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.



- Replace wood power poles with composite poles, anchored and guyed to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.
- Place 5,280 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Construct drainage swales along both sides of roadway to carry water away from the road and prevent washouts.  $2 \times 5280 \text{ LF} = 10,560 \text{ LF}$

**Patillas Dam** – Patillas Dam is built on the Grande de Patillas River in 1976 and is located in Patillas, Puerto Rico. Damaged assets include concrete beams at the intake tower access bridge, building walls/windows/doors/roofing, communication system components, gate alarm system, power distribution components, lighting, stairs, railing, flooring, fencing, and slope erosion.

- Spillway's Left Abutment - 18.017491, -66.018562
  - Remove and replace 60 LF (30 LF + 30 LF) of 8 FT H chainlink fence with #6 chainlink fabric, posts with continuous concrete footings, top-rail, bottom-rail, fittings, and 3-strand barbed wire with arms along the left abutment of the spillway.
  - Remove and replace 198 LF [(96 LF - 30 LF included above) x 3 strands] of barbed wire along the left abutment of the spillway along with 5 barbed wire arms.
  - Remove and replace 100 LF of 5 FT H chainlink fence with #9 chain link fabric, posts with continuous concrete footings, top-rail, bottom-rail, diagonal bracing, fittings, and 3-strand barbed wire with arms along the dam's spillway left abutment.
- Spillway's Left Abutment Operator's Building - 18.017521, -66.018690
  - Remove and replace a 12,000 BTU split AC unit (SEER 13, 208-230V/1PH/2.5/1/1A, Comfort Breeze model TOA-12O1) at the operator building along spillway's left abutment damaged by wind-blown debris.
  - Remove and replace an HPS – 250 W S50 Horizontal Flood Light (FL-206, 120/277V, 2.5/1.1A) along the operators at the operator building along spillway's left abutment damaged by wind-blown debris.
  - Remove and replace 425 SF (25 FT L x 17 FT W) of galvalume roof terrace at the operator building along spillway's left abutment damaged by wind-blown debris.
- Spillway's Left Abutment Emergency Generator's Building - 18.017504, -66.018809
  - Remove and replace a 3 FT W x 4 FT H awning type, aluminum framed, glass window at the emergency generator building along the spillway's left abutment.
  - Remove and replace 48 SF (12 FT L x 4 FT W) of galvalume roof terrace at the emergency generator building along spillway's left abutment damaged by wind-blown debris.
  - Demolish, brace, and replace the 234 SF (26 FT L x 9 FT H) northwest concrete wall of the spillway's left abutment – emergency generator's building.



- Scratch, prime, and paint 512 SF (25 FT L x 7 FT W x 8 FT H, all walls) of concrete along the interior of the spillway's left abutment – emergency generator's building.
- Scratch, prime, and paint 612 SF (26 FT L x 8 FT W x 9 FT H, all walls) of concrete along the interior of the spillway's left abutment – emergency generator's building.
- Scratch, prime, and paint 360 SF (30 FT L x 12 FT W) of concrete along the ceiling of the spillway's left abutment – emergency generator's building.
- Remove and replace 360 SF (30FT L x 12 FT W) of the membranous, acrylic elastomeric roof cover within the tunnel's control valve building located within the outlet works along the dam's downstream area.
- Remove and replace a 34 IN W x 80 IN H, 3/16 gage steel plate door at the intake tower the spillway's left abutment – emergency generator's building.
- Spillway's Right Abutment - 18.017769, -66.019249
  - Replace 34 CY (180 FT L x 2.5 FT W x 1 FT D / 27 FT per CY) of soil material at the downstream slope of the spillway groin that was damaged by surface run-off.
  - Remove and replace 600 LF (200 LF x 3 strands) of barbed wire along the right abutment of the spillway.
  - Remove and replace a 6 FT L x 8 FT H chainlink fence swing gate with #9 chain link fabric, posts with continuous footings, top-rail, bottom-rail, diagonal bracing, fittings, and 3-strand barbed wire with arms along the dam's spillway right abutment.
- Spillway Access Deck - 18.017679, -66.018969
  - Remove, replace, and rewire the power amplifier (Rating: 400 W Part Number 01-0282435), the solar panel (Peak Power 215 W, Evergreensolar make, model ES-A215-fa3), and the battery (Chemistry SLA, 12 V, 79mAh, Battery Giant product # 24M-AGM-MT) of the tainter gate alarm system along the spillway access deck that were damaged by voltage fluctuations and windblown debris.
  - Remove and replace an HPS – 250 W S50 Horizontal Flood Light (FL-206, 120/277V, 2.5/1.1A) along the spillway access deck damaged by windblown debris.
  - Remove, replace, and rewire three (3) pole-mounted cobra head 100W – HPS lamps at the access at the spillway access deck.
  - Remove, replace, and rewire one (1) pole-mounted cobra head 200W – HPS lamp at the access at the spillway access deck.
  - Remove, replace, and rewire one (1) MH-1500W floodlight projector with glass cover at the access at the spillway access deck.
- Security Features (Patillas Dam) - 18.019041, -66.021439
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - one (1) long range network horn speakers with built in memory,
    - a network strobe siren,
    - four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply



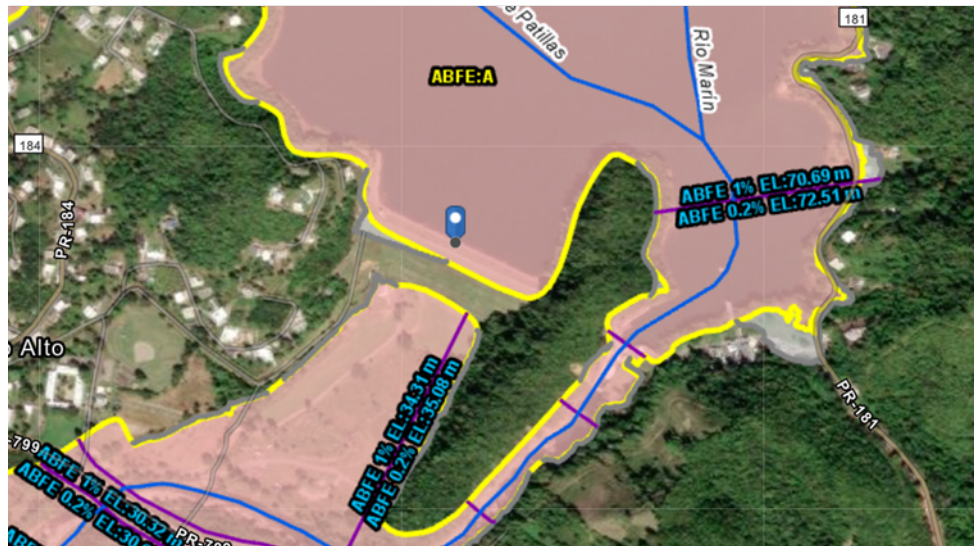


- and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate two (3) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Security Features (Patillas Spillway) - 18.017610, -66.018916
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - one (1) long range network horn speakers with built in memory,
    - a network strobe siren,
    - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
    - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
    - a computer and two monitors (surveillance monitor and full motion monitor),
  - Install and integrate two (3) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

### **Mitigation Scope of Work**

- Remove emergency generator and replace with 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace power pole with composite pole, guyed and anchored to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.
- Anchor and cage 12,000 BTU split unit to prevent uplift and damage by debris.





**Pellejas Dam** – Pellejas Dam is a gravity dam located in Utuado, Puerto Rico. The dam was built on the Pellejas River in 1950 to support hydroelectric power production. Hurricane-damaged assets include electrical components, sluice gate hydraulic hoist and hydraulic power unit, railings, access road and parking area, and intake rack structure and surroundings.

- Access Road - 18.019574, -66.022681
  - Reconstruct roads to codes and standards 6,000 SF (400 LF L x 15 FT W) of 4 IN thick asphalt access road that was damaged by high velocity run-off during the storm. See typical section, Figure 2.
- Dam's Right Abutment & Exterior Site - 18.210587, -66.706190 & 18.210521, -66.706021
  - Remove and replace two (2) 45 FT H wooden utility poles at the dam's right abutment and exterior site. Replace a 25 KVA single phase distribution pole mounted transformer, two (2) fuse cutouts, one (1) lightning surge arrestor, and 230 LF of aluminum CSR Triplex #2 overhead service drop cable (conductor).
  - Replace the 2 IN railing along the stairway access to the dam at the dam's right abutment. The stairway is 14 FT L x 3.5 FT H railing (two sides of railing required).
  - Replace the 2 IN railing along the stairway access to the dam crest at the dam's right abutment. The stairway is 7 FT L x 3.5 FT H railing (two sides of railing required).
  - Replace the 2 IN railing along the stairway access to the reservoir at the dam's right abutment. The stairway is 25 FT L x 3.5 FT H railing (two sides of railing required).
- Dam's Crest Walkway - 18.210587, 18.210587
  - Replace 90 LF of ½ IN safety railing wire rope along the dam's crest walkway.
  - Remove and replace a wall mounted, 120V E26 base vapor tight luminaire at the dam's sluice gate control room.
  - Remove and replace a 3 FT W x 7 FT H 3/16 IN gage steel plated door at the dam's control room entrance.
  - Remove and replace the hydraulic power unit (HPU) for the operation of the 72 IN x 72 IN sluice gate at the dam's sluice gate control room.
- Dam's Upstream Face, Sluice Gate, and Reservoir - 18.210418, -66.706339

- Remove and replace the 1.5 IN diameter rigid conduit electrical service mast at the dam's sluice gate control room.
- Remove and replace the hydraulic hoist of submerged sluice gate for the operation of the 72 IN x 72 IN sluice gate at the dam's upstream face.
- Clean the sluiceway intake rack structure and its surroundings within the reservoir.

### Mitigation Scope of Work

- Place 6,000 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Construct concrete drainage swales along both sides of roadway to carry water away from the road and prevent washouts. 2 X 400 LF = 800 LF
- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace power pole with composite pole, guyed and anchored to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.



**Prieto Dam** – Prieto Dam is a gravity dam built on the Prieto River in 1955 and is located in Maricao, Puerto Rico. Damaged assets include electrical components, mechanical components, access road, hydraulic sluice gate hoist, hydraulic power unit, sluiceway intake rack and surroundings, and



safety/guard railing.

- Access Road - 18.185355, -66.864477
  - Reconstruct roadway to codes and standards 21,580 SF (1,660 LF L x 13 FT W) of 4 IN thick asphalt access road that was damaged by high velocity run-off during the storm. See typical, Figure 2.
  - Remove and replace 50 LF (25 FT L x 2 sides) of guard rail for the bridge.
- Dam's Left Abutment - 18.185828, -66.864178
  - Remove and replace one (1) 45 FT H wooden utility poles at the dam's left abutment.
  - Remove, replace, and rewire one (1) pole-mounted cobra head 100W – HPS lamps at the access at the left abutment of the dam.
  - Replace two (2) pole-mounted, 25 kVA single phase distribution transformers and three (3) fuse cutouts at the dam's left abutment.
  - Remove and replace 30 LF of 2 IN rigid metal conduit and 120 LF (30 x 4 lines) of aluminum – THWN – #6 underground power cable at the dam's left abutment.
  - Remove and replace the remote metering unit at the dam's left abutment.
  - Remove and replace the Westinghouse carrier current coupler at the dam's left abutment.
  - Replace the 2 IN railing along the stairway access to the dam at the dam's left abutment. The stairway is 12.5 FT L x 3.5 FT H railing (two sides of railing required).
  - Scratch and paint 115 LF of 2 IN D metal handrail at the dam's left abutment including ten (10) 3.5 IN posts (60 SF of paint).
  - Remove and repave 2500 SF of 3 IN asphalt at the parking area along the dam's left abutment.
- Dam's Sluice Gate Control Room - 18.185831, -66.864059
  - Remove and replace a 3 FT W x 7 FT H 3/16 IN gage hollow steel plated door at the dam's sluice gate control room entrance.
  - Remove and replace the hydraulic power unit (HPU) for the operation of the 72 IN x 72 IN sluice gate at the dam's sluice gate control room.
- Dam's Upstream Face - 18.185815, -66.863950
  - Remove and replace the hydraulic hoist of submerged sluice gate for the operation of the 72 IN x 72 IN sluice gate at the dam's upstream face.
- Reservoir - 18.185782, -66.863842
  - Clean the sluiceway intake rack structure and its surroundings within the reservoir.
- Security Features - 18.185851, -66.863836
  - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
    - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
    - one (1) long range network horn speakers with built in memory,
    - a network strobe siren,

- three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

### **Mitigation Scope of Work**

- Place 21,580 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Construct concrete drainage swales along both sides of roadway to carry water away from the road and prevent washouts.  $2 \times 1660 \text{ LF} = 3,320 \text{ LF}$
- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace power pole with composite pole, guyed and anchored to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.







**Vivi Dam** – Vivi Dam is a gravity dam located in Utuado, Puerto Rico. The dam was built on the Vivi River in 1950 to support hydroelectric power production. Damages include site erosion, structure doors and windows, electrical components, sluice gate hydraulic hoist and power unit, railings, fencing, access road and parking area, and intake rack structure and surroundings.

- Access Road - 18.229455, -66.678516
  - Reconstruct roadway to codes and standards. 5,850 SF (450 LF L x 13 FT W – total length is 900 LF) of 4 IN thick asphalt access road that was damaged by high velocity run-off during the storm. See typical, Figure 2.
- Dam's Right Abutment - 18.229387, -66.678782 & 18.229321, -66.678782
  - Replace 75 CY (25 FT L x 20 FT W x 4 FT H) of fill material along the access road that was lost due to high velocity run-off during the storm.
  - Remove and replace 50 LF of 5 FT H chainlink fence with #9 chainlink fabric, posts with concrete footings, top-rail, bottom-rail, fittings, and 3-strand barbed wire with arms along the right abutment.
  - Replace the 2 IN railing along the stairway access to the dam bridge at the dam's right abutment. The stairway is 10 FT L x 3.5 FT H railing (two sides of railing required).
  - Replace the 2 IN railing along the stairway access to the trashrack at the dam's right abutment. The stairway is 20 FT L x 3.5 FT H railing (two sides of railing required).
  - Replace 60 LF of W-Beam Guardrail and the concrete foundation that was undermined by the dam's right abutment.
- Tunnel Control Valve Building - 18.229392, -66.678590
  - Remove and replace two (1) 45 FT H wooden utility poles at the dam's right abutment tunnel control valve. Replace two (2) 25 KVA single phase distribution pole mounted transformer, three (3) fuse cutouts, one (1) lightning surge arrestor, and 40 LF of three phase wire #2 overhead service drop cable (conductor).
  - Replace 1,334 CY (90 FT L x 20 FT W x 20 FT H) of fill material at slopes of the reservoir rim adjacent to the control valve building that were removed by wave action during the storm.
  - Remove and replace a 4 FT W x 8 FT H 3/16 IN gage steel plated door at the entrance of the tunnel control valve building at the dam's right abutment.
  - Remove and replace two (2) 30 IN W x 27 IN H adjustable aluminum Maimi type louvered window at the tunnel control valve building at the dam's right abutment.
  - Remove, replace, and rewire a missing wall mounted 120 V E26 base vapor tight luminaire along the dam's right abutment tunnel control valve building.
- Dam's Intake Structure - 18.229276, -66.678736
  - Clean the storage capacity of the intake structure and intake trashrack Rake (cleaner).
- Dam's Crest Walkway & Sluice Gate Control Room - 18.229229, -66.678814
  - Replace 90 LF of ½ IN safety railing wire rope along the dam's crest walkway and two (2) wire rope (U-Bolt) safety railing clamps along the dam's crest walkway.
  - Remove, replace, and rewire two (2) cobra head 100W – HPS luminaire within the dam's sluice gate control room.



- Remove, replace, and rewire a missing wall mounted 120 V E26 base vapor tight luminaire within the dam's sluice gate control room.
- Remove and replace the hydraulic power unit (HPU) for the operation of the 72 IN x 72 IN sluice gate at the dam's sluice gate control room.
- Remove and replace the hydraulic hoist of submerged sluice gate for the operation of the 72 IN x 72 IN sluice gate at the dam's upstream face.
- Reservoir 18.229107, -66.678727 Clean the sluiceway intake rack structure and its surroundings within the reservoir.

**Mitigation Scope of Work**

- Place 5,850 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Construct concrete drainage swales along both sides of roadway to carry water away from the road and prevent washouts. 2 X 900 LF = 1,800 LF
- Install 100 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run time, location to be determined at 30% plans.
- Replace power pole with composite pole, guyed and anchored to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.



**Yahuecas Dam** – Yahuecas Dam is a gravity dam built on the Rio Blanco River in 1956 and is located in Espino, Puerto Rico. Hurricane-damaged components include access road, vertical trash grill, intake rack structure, fencing, and railing.

- Left Abutment Entrance - 18.21473, -66.82423
  - Remove and replace two (2) 7 FT L x 6 FT H chainlink fence swing gates with #6 chain link fabric, two 4 IN x 8 FT posts with concrete footings, top-rail, bottom-rail, braces, and fittings along the dam's spillway left abutment entrance.
  - Replace 24 LF of five strand of barbed wire with metal "h" braces spaced at every 4 FT at the left abutment entrance.
- Access Road - 18.216378, -66.821830
  - Reconstruct roadway to codes and standards 14,256 SF (1,452.6 LF L x 10 FT W – total length is 4,752 LF) of 4 IN thick asphalt access road that was damaged by high velocity run-off during the storm. See typical, Figure 2.
  - Remove and replace 33,264 SF (3326.4 LF L x 10 FT W) of 3 IN thick asphalt access road.
- Dam's Left Abutment - 18.218266, -66.816867
  - Remove and replace one (1) 45 FT H wooden utility poles at the dam's left abutment.
  - Remove and replace a 4 FT L x 5 FT H chainlink fence swing gates with #9 chain link fabric, with continuous concrete footings, rails, braces, and fittings along the dam's left abutment.
  - Remove and replace 40 LF of 5 FT H chainlink fence with #9 chain link fabric, posts



- set at 8 FT OC with continuous concrete footing, top rail, bottom rail, bracing, and fittings along the dam's left abutment.
- Remove and replace two (2) 25 KVA pole mounted, single phase distribution transformers.
  - Dam's Intake Structure - 18.217466, -66.816723
    - Remove and replace two (2) 8.5 FT L x 10 FT H iron vertical trashrack grills consisting of sixteen (16) 4 IN x ½ IN bars with 6 IN spacing at the dam's intake structure.
    - Remove 189 CY of sediment at the dam's intake structure.
    - Remove and replace 20 LF of 1.75 IN galvanized hollow steel platform railing.
  - Dam's Crest Walkway - 18.216378, -66.816606
    - Scratch and paint 115 LF of 2 IN D metal handrail at the dam crest walkway including 28 (28) 3.5 IN posts (353 SF of paint).
    - Remove and replace one (1) 8.5 FT L x 10 FT H iron vertical trashrack grills consisting of sixteen (16) 4 IN x ½ IN bars with 6 IN spacing at the dam's intake structure.
    - Remove and replace the intake leonard type trashrack rake (cleaner) at the dam's intake structure.
    - Scratch and paint 170 LF of 2 IN D metal handrail at the dam's intake structure with 3.5 IN posts (78 SF of paint).
  - Security Features - 18.218657, -66.816357
    - Install and integrate an outdoor rated (rugged) IP video surveillance system with:
      - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
      - one (1) long range network horn speakers with built in memory,
      - a network strobe siren,
      - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
      - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
      - a computer and two monitors (surveillance monitor and full motion monitor),
    - Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

### **Mitigation Scope of Work**

- Place 14,256 SF of geotextile drainage blanket between pavement and subbase to strengthen subgrade.
- Construct concrete drainage swales along both sides of roadway to carry water away from the road and prevent washouts. 2 X 1453 LF = 2,906 LF
- Install 750 kW prime rated generator, auto transfer switches, appurtenances, and enclosure, location to be determined at 30% plans.
- Install generator fuel storage tank and containment for 14-day operational run



time, location to be determined at 30% plans.

- Replace power pole with composite pole, guyed and anchored to withstand 200 mph windspeed.
- Replace pole mount transformer with pad mount transformer (estimate 75 kVA), location to be determined at 30% plans.
- Install conduit and run underground secondary to facility, location to be determined at 30% plans.
- Remove and dispose of overhead secondary lines and poles.



**Additional Security Systems** – Additional security systems are required at the following locations (construction is planned for completion by 12/15/2024):.

Aceituna Dam - 18.148960, -66.493210

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate one (1) solar pole-mounted streetlight atop 20 FT H aluminum



flagpoles.

Calle Benito Alonzo - 18.450983, -66.075864

- Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor

Caonillas Hydroelectric 1 - 18.296190, -66.643259

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - two (2) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),

Caonillas Hydroelectric 2 - 18.239652, -66.669160

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and two (2) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor

Guajataca Dam - 18.396913, -66.923990

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - Two (2) 4-view network camera with 1 TB surveillance memory cards and two (2) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - two (2) long range network horn speakers with built in memory,
  - a network strobe siren,
  - four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a



- pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate six (6) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with two (2) 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor

#### Guayama 1 & 2

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (2) high performance fixed dome camera, Three (3) 4-view network cameras with 1 TB surveillance memory cards, two (2) panoramic cameras, surge protectors, pole-mounts, software, and wireless transport hardware.
  - two (2) long range network horn speakers with built in memory,
  - two (2) network strobe siren,
  - six (6) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor)

#### Guaynabo Cove

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) panoramic camera, one (1) dual-sensor panoramic camera, one (1) dome outdoor camera, surge protectors, pole-mounts, software, and wireless transport hardware.
  - One (1) outdoor fiber optic switch board with integral power and pole mount kits,

#### Juana Diaz

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - Two (2) 4-view network cameras with 1 TB surveillance memory cards, one (1) panoramic camera, one (1) dome outdoor camera, three (3) camera deep learning processing units, surge protectors, pole-mounts, software, and wireless transport hardware.
  - One (1) long range network horn speakers with built in memory,
  - one (1) network strobe siren,
  - seven (7) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 24 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor)

#### Lajas (Quote A)

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - Three (3) 4-view network cameras with 1 TB surveillance memory cards, surge protectors, pole-mounts, software, and wireless transport hardware.



- One (1) long range network horn speaker with built in memory,
- One (1) network strobe siren,
- Four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor)
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with two (2) 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor

#### Lajas (Quote B)

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - Three (3) 4-view network cameras with 1 TB surveillance memory cards, surge protectors, pole-mounts, software, and wireless transport hardware.
  - One (1) long range network horn speaker with built in memory,
  - One (1) network strobe siren,
  - Four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor)
- Install and integrate six (6) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

#### Melania Dam - 17.979323, -66.144991

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate one (1) solar pole-mounted streetlight atop 20 FT H aluminum flagpoles.

#### Palmerojo

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,





- a network strobe siren,
- one (1) outdoor fiber optic switch board with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate two (2) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

Rio Blanco Hydroelectric - 18.243486, -65.785138

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),

Toro Negro Hydroelectric 1 - 18.131580, -66.488110

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate four (4) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with two (2) 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor

Toro Negro Hydroelectric 2 - 18.166569, -66.511416

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and two (2) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,



- a network strobe siren,
- four (4) outdoor fiber optic switch boards with integral power and pole mount kits,
- a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
- a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate five (5) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.
- Install and integrate a 24 VDC high-traffic commercial slide gate operator with two (2) 3-button remote, 40W/33AMP solar panel kit, battery box, and reversing sensor

#### Yauco Hydroelectric 1 - 18.110495, -66.871028

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate three (3) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.

#### Hydroelectric 2 - 18.053400, -66.884231

- Install and integrate an outdoor rated (rugged) IP video surveillance system with:
  - One (1) 4-view network camera with 1 TB surveillance memory cards and one (1) network bullet camera with 256 GB surveillance memory card, surge protectors, pole-mounts, software, and wireless transport hardware.
  - one (1) long range network horn speakers with built in memory,
  - a network strobe siren,
  - three (3) outdoor fiber optic switch boards with integral power and pole mount kits,
  - a server rack, 8 port server switches, battery back-up, universal power supply and a pole mount kit,
  - a computer and two monitors (surveillance monitor and full motion monitor),
- Install and integrate three (3) solar pole-mounted streetlights atop 20 FT H aluminum flagpoles.



### 3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards:** Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project:** Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
  - a. Other improvements, not required by codes and standards
  - b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

#### Choose One (Restoration, Improved or Alternate)

*If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*

Restores to Codes/Standards

**Note:** If A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed A&E work.

### 3.3. Preliminary Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

This document is being submitted to obtain funding for A&E services necessary to develop a detailed SOW for the project.

## Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

### 4.1. Codes, Specifications, and Standards

**Yes. If yes, describe how incorporated below.**

Applicable codes and standards will be identified and incorporated into the plans and specifications.

### 4.2. Industry Standards

**Yes. If yes, describe how incorporated below.**

Applicable industry standards will be identified and incorporated into the plans and specifications.



## Section 5. Cost Estimates

The cost estimate below has been generated at a class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, demolition, construction labor and equipment, engineering, permitting, management, and contingencies.

Cost Type	Amount (\$M)
Preliminary Architectural & Engineering Design	\$1.46
Final Design and Engineering	\$2.50
Construction	\$11.85
<b>Total Project Estimated Cost</b>	<b>\$14.35</b>

**Note:** If available, detailed engineering cost estimates will be included as an attachment.

## Section 6. 406 Hazard Mitigation Proposal

### 6.1. 406 Mitigation Opportunity Scope of Work

Mitigation Scope of Work is included in narrative above.

### 6.2. 406 Mitigation Opportunity Cost Estimate

DI	Location	Coordinates	Repair Cost Before CEF	HMP Cost Before CEF	HMP Cost After CEF	Cost Effectiveness	
785857	Adjuntas Dam	18.199652, -66.732163	\$ 126,590.22	\$ 212,138.99	\$ 484,329.95	167.58%	BCA = 1.01
785858	Carite Dam	18.076300, -66.106121	\$ 530,646.82	\$ 553,144.05	\$ 1,262,871.22	104.24%	BCA = 1.01
785859	Coamo Dam	18.014364, -66.389925	\$ 310,122.49	\$ 253,127.18	\$ 577,909.20	81.62%	100% rule
450241	Dos Bocas Dam	18.335623, -66.667038	\$ 394,984.10	\$ 149,969.95	\$ 342,393.16	37.97%	100% rule
785860	Garzas Dam	18.137436, -66.741034	\$ 1,138,492.76	\$ 265,523.51	\$ 606,210.99	23.32%	100% rule
785862	Guayo Dam	18.210609, -66.834724	\$ 717,947.89	\$ 189,376.00	\$ 432,360.25	26.38%	100% rule
785863	Guineo Dam	18.159558, -66.526433	\$ 166,716.34	\$ 174,824.14	\$ 399,137.21	104.86%	BCA = 1.01
785864	Loco Dam	18.042459, -66.887670	\$ 177,532.35	\$ 344,928.02	\$ 787,497.71	194.29%	BCA = 1.01
785865	Luchetti Dam	18.091852, -66.864446	\$ 189,690.83	\$ 187,932.31	\$ 429,064.20	99.07%	100% rule
785866	Matrullas Dam	18.210465, -66.480215	\$ 211,522.60	\$ 262,904.56	\$ 600,231.71	124.29%	BCA = 1.01
785867	Patillas Dam	18.019041, -66.021439	\$ 201,583.38	\$ 182,095.03	\$ 415,737.22	90.33%	100% rule
785869	Pellejas Dam	18.210561, -66.706471	\$ 155,741.47	\$ 221,500.48	\$ 505,702.95	142.22%	BCA = 1.01
785870	Prieto Dam	18.185851, -66.863836	\$ 334,022.27	\$ 363,207.47	\$ 829,231.13	108.74%	BCA = 1.01
785871	Vivi Dam	18.229173, -66.678814	\$ 212,378.31	\$ 279,071.40	\$ 637,141.88	131.40%	BCA = 1.01
785872	Yahuecas Dam	18.218657, -66.816357	\$ 480,120.35	\$ 699,257.83	\$ 1,596,460.45	145.64%	BCA = 1.01
Repair Cost of mitigated DIs before CEF =			\$ 5,348,092.19	\$ 4,339,000.92	\$ 9,906,279.24		
CEF factor =			\$ 2.28				
Repair Cost of mitigated DIs after CEF =			\$ 12,210,113.72				

## Section 7. EHP Requirements

EHP considerations (complete EHP scoping document and checklist) will be identified and evaluated during the preliminary A&E design phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities.

All work will be designed and completed in accordance with locally adopted codes and standards, FEMA-





approved industry standards, and Federal EHP regulations, laws, and Executive Orders. The proposed scopes of work are within guidelines as set forth in the FINDING OF NO SIGNIFICANT IMPACT, signed by John J. McKee, Regional Environmental Office, FEMA Region II on June 16, 2021, and the Programmatic Environmental Assessment (PEA) for Public Facilities Infrastructure Recovery and Resilience for Puerto Rico, published by FEMA July 2022. Specifically, the repair, restoration, replacement and hazard mitigation of the Commonwealth's utility and communication systems are included. Approved actions include removal and replacement of current infrastructure, upgrading systems, utility trench installation, flood barrier installations, relocation of infrastructure to less hazardous locations and facility hardening. The Caonillas Hydroelectric system is the class of utility covered under the PEA as a delivery system as described in the PEA: water storage facilities, water pump stations, treatment plants for potable water/wastewater and their associated delivery systems; supplemental power generation, transmission, and distribution facilities, including, but not limited to, wind turbines, solar farms, generators, substations, and power lines; natural gas storage, transmission, and distribution facilities; stormwater, sewage, and wastewater collection systems and treatment plants; and communication systems.

Allowances for a project's limits of disturbance are based on existing conditions and proposed locations. The EA considers actions of up to five-acres for sites in urban areas and up to two-acres in rural areas of ground disturbance activity after considering thresholds of other federal agency for new construction. Ground disturbance activities may include the establishment of staging areas, temporary construction activities, site access preparation, and site construction.

Under the PEA, utility networks include telecommunication systems, power, backup power, potable and wastewater systems, stormwater management systems, and heating, ventilation, and air conditioning systems. Upgrades to telecommunication networks, potable water, wastewater, and stormwater systems could involve open cut trenching and replacement of existing pipes with right sized piping and equipment meeting current codes and standards. Associated activities may involve temporary staging area establishment; removal and installation of piping and pumps; and the disposal of old piping, broken pavement, and old pumps. Site work may include surface grading, conduit replacements, trenching, concrete applications, cutting and resurfacing of pavement or curb and gutter, and hardware placement. Trenches will be backfilled following utility placement. Associated actions may involve the maintenance of vegetation.

As stated in the PEA, FEMA anticipates that negligible to minor short-term direct adverse impacts to ESA-listed animal species and a negligible long-term adverse impact to ESA-listed plant species may occur during activities including clearing and grubbing, the removal and replacement of existing structures, and personnel and equipment mobilization and demobilization. Construction activities will act as a deterrent to ESA-listed wildlife as they will avoid construction areas once activities have begun. Bird mobility should minimize impacts to ESA-listed avian species. FEMA anticipates implementation of conservation measures from USFWS consultations and existing agreements will further minimize impacts to ESA-listed species.

The Programmatic Environmental Assessment, Transportation: Bridges, Culverts, Roads, and Landslides, Commonwealth of Puerto Rico, November 2020 addresses landslide repair impacts that will require ground disturbance with heavy equipment. Stabilization of landslides with conventional engineering methods will likely involve the placement of concrete or another fill material over, above, and below an existing slide. Due to steep slopes and limited roadways, the process of accessing and remediating landslides may require additional ground disturbance outside existing ROWs or the current landslide face.



FEMA anticipates that by establishing limitations on project size and project location, these thresholds will assist in minimizing adverse impacts to geology and soil. Additionally, FEMA anticipates that by setting forth Recipient requirements for permits and implementation of BMPs, these commitments will further minimize adverse impacts to physical resources. For instance, this PEA constrains landslide project size to two acres for actions that do not involve roadway repair. FEMA anticipates that by limiting actions to two acres, the installation of site access and staging areas in locations where no such previously disturbed lands occur will assist in minimizing adverse impacts to geologic and soil resources.

To prevent future landslides, the removal of soil at landslide sites may occur. FEMA anticipates that the implementation of landslide stabilization techniques may result in adverse short-term negligible to minor impacts to soil as the excavation of material occurs. The implementation of sediment and erosion prevention measures will minimize adverse short-term minor impacts to soil resources. For projects equal to or over one acre, the NPDES program requires an NPDES permit and the development of SWPPP that will limit the impacts of erosion and sedimentation. Additionally, conservation measures will apply to all projects. FEMA expects the remediation and stabilization of soils to be a beneficial long-term negligible to minor impact to soil resources.

Depending on the location of the landslide, adverse short-term negligible to minor impacts to potential farmland soils may occur. The prevention of future landslides and removal of landslide debris will result in a long-term beneficial impact to farmland as agricultural lands will likely experience fewer and smaller landslide disturbances.

FEMA anticipates that the installation of support structures into the bedrock may cause negligible to minor short-term impacts and negligible long-term impacts to geologic resources.

As previously stated, PREPA is responsible for obtaining all applicable federal, Puerto Rican, and local permits and other authorizations for project implementation prior to construction and will adhere to all permit conditions. Any substantive change to the approved SOW will be re-submitted for re-evaluation by FEMA for compliance with NEPA, the ESA, Section 106 of the NHPA, and other relevant laws and EOs. Adherence to the following permit requirements during project implementation will be enforced:

1. Stormwater, Soils, and Erosion and Sediment Control: Under the EPA NPDES, any project disturbing equal to or greater than one acre in size requires an EPA Construction General Permit, an NPDES Permit, and a SWPPP. The permits and plan require BMPs which serve to protect soil and stormwater. The subrecipient is required to: manage any piles of soil or debris, minimize steep slope disturbance, preserve native topsoil unless infeasible; and minimize soil compaction and erosion (EPA 2021). For each project, the subrecipient will implement the BMPs and guidelines recommended in the Puerto Rico Erosion and Sediment Control Handbook for Developing Areas (PREQB and USDA NRCS 2005). The subrecipient will be responsible for obtaining all necessary permits such as an NPDES permit and implementing the associated erosion and sediment control plans (i.e., SWPPP).

2. Clean Air Act: The subrecipient is responsible for complying with all applicable EPA and PRDNER/PREQB requirements for fugitive dust suppression. The subrecipient will prepare a General Conformity applicability analysis for applicable actions under this PEA.

3. Work Affecting Water: For any project that involves WOTUS, including wetlands, the subrecipient will be responsible for initiating the permitting process with the USACE and the PRDNER. The subrecipient is responsible for obtaining appropriate permits prior to the beginning of work, and implementing all requirements of the permits, including pre-construction notification. Staging areas and access roads must be located outside the jurisdictional boundaries of WOTUS.



4. Floodplains: For FEMA funded actions that may affect or are within a floodplain, under requirements established under 44 CFR § 60.3 and 44 CFR § 9.11, the subrecipient will ensure the project is in compliance with the local PRPB floodplain administrator and follow appropriate mitigation requirements for new construction or substantial improvement.
5. Endangered Species Act: All projects will comply with and implement the ESA conditions found in any FEMA programmatic consultation that applies, or those conditions from a project-specific consultation.
6. Tree Cutting: The subrecipient is responsible for complying with applicable PRDNER/ PREQB requirements for pruning, trimming, removal, and planting of vegetation.
7. Invasive Species: EO 13112, Invasive Species, directs federal agencies to prevent the introduction of invasive species, providing resources for their control, and minimize the economic, ecological, and human health impacts caused by their presence. The subrecipient is responsible for restoring disturbed soils by planting native, non-invasive species. Construction equipment should be power washed prior to initial transport to the construction site and prior to changing locations to prevent the spread of noxious weeds.
8. Historic Properties: FEMA will review all SOWs to determine compliance with Section 106 of the NHPA. FEMA will follow the programmatic agreement for compliance in accordance with the amended Programmatic Agreement Among the Federal Emergency Management Agency, the Puerto Rico State Historic Preservation Officer, and the Puerto Rico Central Office for Recovery, Reconstruction and Resiliency and any project-specific programmatic agreement that may be executed for the undertaking pursuant to Stipulation II.C.6(c) of the amended Programmatic Agreement and in accordance with 36 CFR § 800.14(b). The subrecipient will be responsible for coordination with the ICP for compliance with historic preservation and archaeological requirements. In the event an unexpected discovery of archaeological materials or human remains or if it appears that the undertaking has affected a previously unidentified historic property or a known property in an unanticipated manner, then FEMA, in coordination with SHPO, will address the discovery or unanticipated effect in accordance with the amended Programmatic Agreement (Unexpected Discoveries, Previously Unidentified Properties, or Unexpected Effects) and in accordance with any similar stipulation included in the State-wide or project-specific programmatic agreement if one is executed for the undertaking.
9. Communities with EJ Concerns: In accordance with EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, the subrecipient will be responsible for involving the local minority and low-income populations and community when impacts from public facility project construction may occur. Integrating public participation will aid in determining and minimizing potential impacts within the communities with EJ concerns.
10. Construction Material and Debris: The subrecipient is responsible for obtaining any permits associated with transportation and handling of construction material and debris. The subrecipient will identify, handle, transport, and dispose of hazardous materials and/or toxic waste in accordance with EPA and PRDNER/PREQB requirements. The subrecipient is responsible for determining the presence of asbestos or lead containing materials and obtaining applicable permits before beginning work. The subrecipient is responsible for ensuring that all non-recyclable debris generated from repair and



demolition activities be deposited at a PRDNER/PREQB permitted landfill.

11. Utility Clearance: For all ground disturbing activities, the subrecipient is responsible for locating utilities. OSHA mandates that if a utility provider cannot respond to a request to locate underground utility installations or cannot establish the exact location of these installations, the contractor may proceed provided they use detection equipment or other acceptable means to locate utility installations.





## Section 8. Program Manager Lead Certification

*Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.*

\_\_\_\_\_  
Program Manager's Printed Name

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

## Section 9. PREPA Project Sponsor Comments

### Comments

*<Insert any comments here>*

\_\_\_\_\_  
PREPA Project Sponsor's Printed Name

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature



## **Section 10. Attachments**

### **10.1. Project Detailed Cost Estimates**

*<Insert project detailed cost estimates from A&E here (if available)>*

### **10.2. Engineering Studies and Designs**

*<Insert engineering studies and designs (if available)>*

### **10.3. Location Maps and Site Pictures**

*<Insert a map of sufficient scale identifying the project area and any additional location maps and site pictures (if available)>*

### **10.4. Other: (Please Describe)**

*<Insert other documents attached to this submittal>*