DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SOUTH ATLANTIC DIVISION
60 FORSYTH STREET SW, ROOM 10M15
ATLANTA, GA 30303-8801

REPLY TO ATTENTION OF

CESAD-CG

19 December 2017

MEMORANDUM FOR Commander, Jacksonville District, CESAJ-PD

SUBJECT: Approval of the Rio Anton Ruiz Restoration Continuing Authorities Program (CAP) Section 1135, Integrated Feasibility Report and Environmental Assessment (EA)

1. Reference Memorandum, CESAJ-PD, 26 October 2017, subject: Final Revised Integrated Feasibility Study and Environmental Assessment for the Rio Anton Ruiz Restoration Continuing Authorities Program (CAP) Section 1135.

2. The South Atlantic Division concurs with the District Commander's recommendation for project construction. The subject Integrated Feasibility Report and EA are approved.

3. Point of contact for this action is Ms. Kenitra Stewart at (404) 562-5229.

DIANA M. HOLLAND
Brigadier General, USA
Commanding

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

26 OCT 2017

CESAJ-PD

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, South Atlantic Division (CESAD-PDP) 60 Forsyth Street, Room 10M15, Atlanta, GA 30303

Subject: Final Revised Integrated Feasibility Study and Environmental Assessment for the Río Antón Ruíz Restoration Continuing Authorities Program (CAP) Section 1135

1. This memorandum transmits one (1) copy of the following documents for review.

a. Revised Final Main Report and appendices for the subject project.

b. SAD/SAJ Final Report for SAD comments with SAJ responses.

c. Feasibility submittal package checklist (Tab G).

d. Documentation of District Quality Control, Agency Technical Review and Legal Review.

e. Project Schedule.

f. Cost Estimate (M-CACES).

g. Updated CAP Fact Sheet with Table 1.

h. compliance memos.

2. POC for this memorandum is Brooke Hall, Planning Technical Lead, at (904) 232-1061

Encl

ERIC P. SUMMA
Chief, Planning and Policy Division

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION
60 FORSYTH STREET SW, ROOM 10M15
ATLANTA, GA 30303-8801

REPLY TO
ATTENTION OF

11 OCT 2017

CESAD-PDP

MEMORANDUM FOR Commander, Jacksonville District, CESAJ-PD

SUBJECT: Final Integrated Feasibility Study and Environmental Assessment for the Rio Anton Ruiz Restoration Continuing Authorities Program (CAP) Section 1135

1. Reference memorandum, CESAJ-PD, 13 July 2017, subject as above.

2. The South Atlantic Division (SAD) reviewed the subject Continuing Authorities Program (CAP) Detailed Project Report and Environmental Assessment (EA). In order to receive approval, the attached review comments should be responded to.

3. If you have any questions the point of contact for this action is Kenitra Stewart, 404-562-5229.

Encl
as

ERIC L. BUSH
Chief, Planning and Policy Division

Rio Anton Ruiz CAP 1135

Integrated Feasibility Report & Environmental Assessment

SAD Comments

22 August 2017

1. Concern: Items of Local Cooperation

Basis of Concern: The items of local cooperation in section 7.1. do not mention the Territory waiver that adjusts cost-sharing, nor does it mention the expected responsibilities of DNER to continue to perform salinity monitoring.

Significance of Concern: medium

Actions Needed to Resolve: Clarify items of local cooperation

2. Concern: terminology of phases in CAP

Basis of Concern: the report and draft describes actions in the design and construction phase or the Preconstruction Engineering and Design phase. CAP only has the feasibility phase and the Design and Implementation phase.

Significance of Concern: low

Actions Needed to Resolve: Revise to correctly name the phase, or to describe it as occurring during project design.

3. Concern: Description of costs and cost-sharing

Basis of Concern: Executive summary describes costs as "Therefore, Federal costs total 75% of the Recommended Plan, or $2,968,000. Non-federal costs total 25%, or $989,000 minus $455,000". Table 4.2 is incomplete and does not display cost-sharing for Project First Costs. The report should make it clear to the non-Federal sponsor and the vertical team what actual funding is needed to implement the project. Related to that, if the TPCS in the cost appendix must display cost-sharing under the fully funded cost column, it too must be revised to show the $455,000 adjustment both times it applies- first for the feasibility costs (which make the study 100% federal), and second for the fully funded Design and Implementation costs (3081Fed +455, 1027 non-Fed -455).

Significance of Concern: medium

Encl

Actions Needed to Resolve: Revise report to show actual cost-sharing that includes the adjustment based on the $455,000 Territory waiver. Initial 75/25 cost-sharing for the Design and Implementation phase is estimated to be $2,968,000 Federal and $989,000 non-Federal, to which the waiver is applied resulting in Federal cost of $3,423,000 and non-Federal cost of $534,000. The TPCS display of fully funded cost sharing must adjust feasibility phase costs (which makes the study 100% federal), and the fully funded Design and Implementation costs (3081Fed +455, 1027 non-Fed -455).

4. Concern: NMFS Coordination

Basis of Concern: report and draft FONSI not current on NMFS coordination

Significance of Concern: Low

Actions Needed to Resolve: Revise draft FONSI and main report where there are placeholders for NMFS response to match the environmental appendix documentation that includes NMFS response.

5. Concern: Cultural Resources Costs

Basis of Concern: It is not clear if there are Cultural Resources costs in the Total Project Cost Summary that are part of construction costs. It appears from the description in the main report, such as in 5.3.8., that they should be in WBS 30 Planning Engineering and Design for actions to be conducted during design prior to construction.

Significance of Concern: Low

Actions Needed to Resolve: Clarify if there are cultural resources activities and related costs during construction.

Monitoring and Adaptive Management

6. Concern: Monitoring and Adaptive Management- cost/cost-sharing

Basis of Concern: Section 2039 WRDA 2007 Implementation Guidance, CAP 1135 model PPA June 2017 version. Section 2039 implementation guidance directs that scope, cost and duration of monitoring be described in the decision document. This Detailed Project Report has a very good monitoring and adaptive management plan. A few items need clarification to understand costs.

Salinity monitoring. The M&AM Plan states "The annual monitoring plan will conclude in 5 years. The project sponsor, DNER, currently monitors salinity gauges in the project area every 2 weeks. A commitment to continue this effort will be established and formalized through the Project Partnership Agreement (PPA)."

6.1. The cost of this in Table E-4 just has "DNER". It is not clear if this is considered an action that is not part of the project and thus no cost, which would then provide no reason to formalize in the PPA, or if it is a project cost for which DNER should receive work in kind credit. If it is needed to monitor project success, it would appear to be a part of the project.

6.2. If DNER was not already monitoring salinity every two weeks, is that a reasonable frequency needed for project monitoring? (i.e., is monthly adequate? Quarterly?).

6.3. Whatever periodicity is acceptable, should that cost be included in the project cost estimate, with work in kind provided to the sponsor?

Significance of Concern: Medium

Actions Needed to Resolve: Clarify if salinity monitoring should be part of project costs, and if so, if the frequency is reasonable, and if DNER will conduct as work-in-kind and be eligible for credit as described in section F-15 of Appendix F of ER 1105-2-100. Further, modify total project costs if needed.

7. Concern: Monitoring and Adaptive Management- PPA

Basis of concern: PPA. Paragraph 3.c. of the Section 2039 WRDA 2007 implementation guidance states that "Financial and implementation responsibilities for the monitoring plan will be identified in the Project Partnership Agreement". The June 2017 CAP Section 1135 model PPA, Articles 1.B., 1.F., and 1.G. describe this generally in that 1.B. states that construction costs include monitoring and adaptive management and 1.F. and 1.G. define monitoring and adaptive management broadly and then refer to the description in the decision document. It is not clear that the commitment to continue salinity monitoring by DNER needs to be described in Article I.A. or if it just needs to be clear in this report, as Article 1.F. will refer to the monitoring described in the decision document.

Significance of Concern: Low

Actions Needed to Resolve: Clarify if the commitment to continue salinity monitoring must be explicitly described in the PPA, or if the PPA formalizes the commitment by referring to what is described in the decision document.

8. Concern: Monitoring and Adaptive Management- duration

Basis of Concern: Monitoring is cost-shared up to 10 years, and the revised Model CAP 1135 PPA allows up to 10 years in the definition of monitoring in Article I.F. Monitoring is described as being five years, including for the Pterocarpus forest. It is not clear if the 93 acres of Pterocarpus forest described in the monitoring plan will show signs of recovery as quickly as five years.

Significance of Concern: Low.

Actions Needed to Resolve: Verify if five years is adequate to detect Pterocarpus forest recovery. For a minor cost the monitoring could continue up to 10 years if needed.

9. Concern: Appendix C – Real Estate Plan

Basis of concern: 25. Chart of Accounts For Project – The costs as submitted by SAJ Real Estate were altered and substituted in the Real Estate Plan, which has created a distorted and incorrect estimate. The original estimated real estate administrative costs were $36,000.00 Non-Federal and $36,000 Federal. Those numbers were changed to $21,000 Non-Federal and $63,000 Federal. Apparently, the change was an attempt to reflect the cost share split. The credit for Non-Federal real estate administrative expense does not include the Federal administrative expense. Combining the Non-Federal and Federal cost and applying a cost share percentage to that total results in an incorrect Real Estate cost estimate for each entity.

Significance of concern: Medium

Actions needed to Resolve: The costs as originally provided by SAJ Real Estate should be in the Real Estate Plan.

10. Concern: Executive Summary:

Basis of Concern: Cost and Implementation Paragraph, Page E-10: A number of $3,731,000 is cited as the current Cost Estimate of the Recommended Plan. That number isn't supported in the Certified Cost Estimated provided with the Final Report.

Significance of Concern: High

Actions needed to Resolve: Please confirm the intent of this number as shown and either clarify what items constitute this value, or correct to match the certified costs.

11. Concern: Certified Cost Estimate

Basis of Concern: Feasibility Study Costs, Feature Code 22: Cost Estimate currently shows a total study cost of $250,000, split between Fed and Non-Fed at a 75/25 Split after the first $100K. This breakout reflects neither the correct total study costs, nor the fact that Section 1032 of WRRDA 2014 provides a $455,000 credit to each phase of the study. This was pointed out in the ATR Comment 6880594.

Significance of Concern: High

Actions needed to Resolve: Correct the total study costs and revise the cost share breakout to reflect S. 1032 of WRRDA 2014.

12. **Concern: Estimated Total Project Cost:**

Basis of Concern: This cost share break out depicts a straight 75/25 split of the costs. It ignores any LERRD crediting that comes into play and it doesn't allow for the Section 1032 Credit of WRRDA 2014 for the D/I phase.

Significance of Concern: Medium

Actions needed to Resolve: Revise the numbers IAW with implementation guidance on S. 1032 of WRRDA 2014 if we're truly interested in showing what the Federal investment is estimated at when compared against the CAP Limit.

13. Concern: Enclosure 3, Remaining Tasks

Basis of Concern: The table in Enclosure 3 doesn't list the tasks needed to complete the Environmental Coordination. As this needs to be completed in order to execute a PPA, then a task and estimated completion date should be added.

Significance of Concern: Medium

Actions needed to Resolve: Update schedule of remaining tasks accordingly.

14. Concern: Main Report

Basis of Concern: Table 4-1; This table refers to the Price Levels as FY17, which doesn't match what is shown in the Total Project Cost Summary.

Significance of Concern: High

Actions needed to Resolve: Please confirm Price Levels used and adjust accordingly.

15. **Concern:** Main Report

Basis of Concern: Table 4-2; Somewhere in the Decision Document a clear outlay of Federal and Non-Federal financial obligations and the path to those final numbers should be shown. This seems like the logical table to document the cash and credit requirements. Price Levels don't match the TPCS. Do keep in mind that the Fully Funded costs will be utilized when preparing your PPA package, so it is important to be able to trace numbers back to a Certified Cost estimate in an approved Decision Document. If there is no Work in Kind expected, state that as well so when it comes time to prepare the PPA it is clear in the decision document.

Significance of Concern: Medium

Actions needed to Resolve: Utilize this table to show how any LERRD/WIK credits that would be applied in addition to S. 1032 of WRRDA 2014. It would also be an opportune time to demonstrate that the CAP limit isn't being breached when considering Feasibility costs as well.

16. **Concern: Main Report**

Basis of Concern: Table 4-2; Non-Federal Acquisition/Administrative Costs are reported as creditable back in Section 23 of the Real Estate Plan. Table 4-2 doesn't reflect this same information. Refer to the Model PPA for clarification on what should receive credit.

Significance of Concern: Medium

Actions needed to Resolve: Confirm what is creditable and what isn't and reflect it within this table so a non-Federal Cash contribution can be shown.

17. **Concern: Main Report**

Basis of Concern: Paragraph 5.3.8, Cultural Resources; This section of the report acknowledges the fact that there are still some unknowns that need to be addressed in the D/I phase in order to close out Section 106 through a phased approach. The Cost Estimate also includes a line item for Cultural Resources, in the amount of $226,000. However, the costs and the description don't definitively answer the question on the One Percent Statutory Level as set forth in Public Law 93-291 for Data Recovery.

Significance of Concern: High

Actions needed to Resolve: Acknowledge the Statutory limit in this section of the report and clearly articulate the actions expected to be taken during D/I phase and call out whether or not Data Recovery is anticipated or included in the reported costs.

Major Comments

18. Concern: Page ES-2, last sentence (regarding the Puerto Rico Coastal Zone Management Program) and page 1-3, 1st paragraph

Basis of Concern: The single sentence (which is the same in both locations) has multiple issues. (1) Is it correct to call the Humacao Natural Reserve "a recognized element" of the PR Coastal Zone Management Program? Or was it officially designated as a nature reserve under the provisions of the PR CZMP? The HNR is a reserve that has been under the administration of PR DNER since 1984. (2) It is the "Puerto Rico Coastal Zone Management Program", so insert the word "Zone" for the correct name. (3) The PR CZMP encompasses 40 statutes and was approved by NOAA; it is not "established in principle". (4) I could not find the existence of a Coast Management Plan. (5) The CZMP was adopted in 1978 under the authority of the Federal Coastal Zone Management Act and approved by NOAA in 1978 – not 1979.

Significance of Concern: Medium

Actions Needed to Resolve: Correct the facts in the sentence.

19. Concern: Monitoring and Adaptive Management

Basis of Concern: The totality of the report indicates that monitoring and adaptive management will be conducted (e.g., Appendix E, and the inclusion of a monitoring and adaptive management plan), but the main report fails to specify the need for monitoring and adaptive management as part of the Recommended Plan.

Significance of Concern: Medium

Actions Needed to Resolve: To support the inclusion of monitoring in the PPA, the report must be clear regarding the need for monitoring and adaptive management, to include the period of time for these activities and responsibilities of the Corps versus NFS to conduct these activities and cost share. However, the details regarding responsibilities are not sufficiently clear. For example, will DNER be solely responsible for conducting and the costs of salinity monitoring (as seems to be indicated in Appendix E)? If it was addressed in the Executive Summary and main report, then identify where and, if not, add information. Also, add as needed any monitoring requirements to the Items of Local Cooperation list in section 7.1.

20. Concern: Page ES-10, second line

Basis of Concern: We should use the correct name of a statute.

Significance of Concern: Low, but we should get this correct every time (and note it is correct on page 2-11 in section 2.3.4.)

Actions Needed to Resolve: Replace "Fisheries" with "Fishery", and insert a hyphen after "Magnuson".

21. Concern: NMFS Coordination Documented in the Report

Basis of Concern: Report and FONSI must support the decision to proceed, and support includes completion of ESA consultation

Significance of Concern: High

Actions Needed to Resolve: Update all text discussing ESA consultation with NMFS to address receipt of NMFS's concurrence on 22 Aug. (For future submittals, recommend following SAD Planning's suggestion to put placeholders in the report (e.g., "consultation was completed on _____") rather than write the report to state that consultation is still ongoing and will be completed prior to project implementation.)

22. Concern: Page 3-1, Section 3.2.2, 1st sentence concerning NED and NER.

Basis of Concern: NED is not relevant to this report. NER is not "a subset" of NED formulation. NER is "National Ecosystem Restoration," not "National Environmental Restoration".

Significance of Concern: Medium; our reports should correctly state fundamental Planning principles and correctly spell out basic acronyms.

Actions Needed to Resolve: Correct the sentence.

23. Concern: Page 5-2, Section 5.3.3, last paragraph (and elsewhere summarizing the USFWS's concurrence); USFWS 17 Apr 17 letter in Appendix D.

Basis of Concern: USFWS (unlike NMFS) did not provide a blanket concurrence. Instead, USFWS concurred with the Corps' determination, provided that its attached measures for the Antillean manatee and Puerto Rican boa are followed.

Significance of Concern: High

Actions Needed to Resolve: Add to the text information about the conditions imposed by USFWS on its concurrence.

24. Concern: Page 6-2, Section 6.2, Environmental Commitments

Basis of Concern: (Related to item 6 above) The report states that the "standard manatee protection construction conditions" will be incorporated into plans and specifications for this project. (1) Are these "standard" conditions the equivalent of the conservation measures/conditions that USFWS is requiring via its ESA coordination letter? (2) Is it sufficiently clear that the Corps will require its employees and contractors to follow the conditions?

Significance of Concern: High.

Actions Needed to Resolve: Resolve the manatee protection measures that must be followed and revise as needed the report.

25. Concern: Page 6-2, Section 6.2, Environmental Commitments.

Basis of Concern: (Related to item 6 above) This section fails to include the conservation measures for the Puerta Rican boa that USFWS attached to its 17 Apr 17 coordination letter.

Significance of Concern: High.

Actions Needed to Resolve: Add the PR boa conservation measures.

26. Concern: Insufficient NEPA Analysis.

Basis of Concern: Where are sections to address cumulative impacts as well as irreversible and irretrievable commitment of resources?

Significance of Concern: High.

Action Needed to Resolve: Identify where these are addressed and, if omitted, consult with SAJ OC and address them.

27. Concern: Section 8.1, Acronyms.

Basis of Concern: The acronyms list was added from another SAJ report, apparently with no effort to tailor it for this report. It is missing acronyms that are in this report, includes acronyms that are not relevant, and was obviously applicable to the State of Florida rather than the Commonwealth of Puerto Rico.

Significance of Concern: High because, again, this highlights a fundamental failure in DQC. This kind of problem is the norm but should not be and needs to be corrected systemically.

Action Needed to Resolve: Correct the list so it is useful and applicable or, if SAD Planning concurs, delete it.

Minor Comments

28. Concern: Page ES-13, Conclusion and Recommendation

Basis of Concern: It is awkward wording to state that the recommended plan "is suggested for endorsement at the discretion of the Commander".

Significance of Concern: Low

Actions Needed to Resolve: Recommend stating that the RP is recommended for approval or similar wording.

29. Concern: Page 3-7, section 3.5.6.1.1 and page 5-1, section 5.2.3.

Basis of concern: On page 3-7, how are "freshwater fish" a main ecosystem? On page 5-1, "sea grass habitat" is included.

Significance of Concern: Low

Actions Needed to Resolve: Clarify.

30. Concern: Page 3-7, section 3.5.6.1.1, 5th and 6th sentences

Basis of Concern: These sentences must be read at least twice because each is two separate sentences that are connected by a space or comma. Incorrect punctuation makes them confusing and requires extra time to understand them.

Significance of Concern: Low.

Action Needed to Resolve: Correct the punctuation.

31. Concern: Page 4-3, section 4.2.2, Work-in-Kind.

Basis of Concern: In-kind contributions are not a requirement.

Significance of Concern: Low.

Action Needed to Resolve: Correct the statement to reflect that the NFS does not plan to provide any in-kind contributions.

32. Concern: Page 5-4, section 5.3.8, 3rd sentence.

Basis of Concern: The sentence is difficult to follow and should better reflect the statement in the SHPO's letter dated 30 Aug 16.

Significance of Concern: Low.

Action Needed to Resolve: The sentence is more accurate if it reflects the statement in the SHPO letter. For example: "If HU-6 contains archaeological materials that my reveal important information regarding the prehistory or history of Puerto Rico and construction will destroy or damage that information, then the criteria of adverse effect, as defined in 36 C.F.R. 800.5(a)(10 would have to be applied."

33. **Concern:** Adaptive management would only be considered if reduction occurs.

Basis of Concern: Why would adaptive management not be considered if 15 acres are not established? Also, what is the basis for the expectation that 15 acres can be established within a5-year timeframe?

Significance of Concern: Medium

Action Needed to Resolve: Explain what is the detailed adaptive management plan?

Rio Anton Ruiz CAP 1135

Final SAJ responses to SAD Comments

Submitted October 2017

Rio Anton Ruiz CAP 1135

Integrated Feasibility Report & Environmental Assessment

SAD Comments

22 August 2017

SAD Comments- Pat O'Donnell

1. Concern: Items of Local Cooperation -

Basis of Concern: The items of local cooperation in section 7.1. do not mention the Territory waiver that adjusts cost-sharing, nor does it mention the expected responsibilities of DNER to continue to perform salinity monitoring.

Significance of Concern: medium

Actions Needed to Resolve: Clarify items of local cooperation

SAJ Response: Concur: Text corrected by SAJ OC (section 7.1 Local Items of Cooperation). Ongoing salinity monitoring by DNER will be used to verify salinity targets, however, it is not a component of the project that will be cost-shared. Therefore the expected responsibility of DNER to perform salinity monitoring is not mentioned.

2. Concern: terminology of phases in CAP -

Basis of Concern: the report and draft describes actions in the design and construction phase or the Preconstruction Engineering and Design phase. CAP only has the feasibility phase and the Design and Implementation phase.

Significance of Concern: low

Actions Needed to Resolve: Revise to correctly name the phase, or to describe it as occurring during project design.

SAJ Response: Concur: "PED" and "Design and Construction" has been changed to D&I throughout the report where applicable.

3. Concern: Description of costs and cost-sharing –

Basis of Concern: Executive summary describes costs as "Therefore, Federal costs total 75% of the Recommended Plan, or $2,968,000. Non-federal costs total 25%, or $989,000 minus $455,000". Table 4.2 is incomplete and does not display cost-sharing for Project First Costs. The report should make it clear to the non-Federal sponsor and the vertical team what actual funding is needed to implement the project. Related to that, if the TPCS in the cost appendix must display cost-sharing under the fully funded cost column, it too must be revised to show the $455,000 adjustment both times it applies- first for the feasibility costs (which make the study 100% federal), and second for the fully funded Design and Implementation costs (3081Fed +455, 1027 non-Fed -455).

Significance of Concern: medium

Actions Needed to Resolve: Revise report to show actual cost-sharing that includes the adjustment based on the $455,000 Territory waiver. Initial 75/25 cost-sharing for the Design and Implementation phase is estimated to be $2,968,000 Federal and $989,000 non-Federal, to which the waiver is applied resulting in Federal cost of $3,423,000 and non-Federal cost of $534,000. The TPCS display of fully funded cost sharing must adjust feasibility phase costs (which makes the study 100% federal), and the fully funded Design and Implementation costs (3081Fed +455, 1027 non-Fed -455).

SAJ Response: Please ignore the cost share break out on the TPCS and refer the table 4.2 within the main report.

4. Concern: NMFS Coordination -

Basis of Concern: report and draft FONSI not current on NMFS coordination

Significance of Concern: Low

Actions Needed to Resolve: Revise draft FONSI and main report where there are placeholders for NMFS response to match the environmental appendix documentation that includes NMFS response.

SAJ Response: The FONSI and report were updated with the completed NMFS consultation information. Correspondence was added to Appendix D-1 (Environmental Coordination).

5. Concern: Cultural Resources Costs –

Basis of Concern: It is not clear if there are Cultural Resources costs in the Total Project Cost Summary that are part of construction costs. It appears from the

description in the main report, such as in 5.3.8., that they should be in WBS 30 Planning Engineering and Design for actions to be conducted during design prior to construction.

Significance of Concern: Low

Actions Needed to Resolve: Clarify if there are cultural resources activities and related costs during construction.

SAJ Response: Concur: language added to Section 5.3.8 paragraph 3 to clarify cultural resource costs.

Monitoring and Adaptive Management

6. Concern: Monitoring and Adaptive Management- cost/cost-sharing -

Basis of Concern: Section 2039 WRDA 2007 Implementation Guidance, CAP 1135 model PPA June 2017 version. Section 2039 implementation guidance directs that scope, cost and duration of monitoring be described in the decision document. This Detailed Project Report has a very good monitoring and adaptive management plan. A few items need clarification to understand costs.

Salinity monitoring. The M&AM Plan states "The annual monitoring plan will conclude in 5 years. The project sponsor, DNER, currently monitors salinity gauges in the project area every 2 weeks. A commitment to continue this effort will be established and formalized through the Project Partnership Agreement (PPA)."

6.1. The cost of this in Table E-4 just has "DNER". It is not clear if this is considered an action that is not part of the project and thus no cost, which would then provide no reason to formalize in the PPA, or if it is a project cost for which DNER should receive work in kind credit. If it is needed to monitor project success, it would appear to be a part of the project.

6.2. If DNER was not already monitoring salinity every two weeks, is that a reasonable frequency needed for project monitoring? (i.e., is monthly adequate? Quarterly?).

6.3. Whatever periodicity is acceptable, should that cost be included in the project cost estimate, with work in kind provided to the sponsor?

Significance of Concern: Medium

Actions Needed to Resolve: Clarify if salinity monitoring should be part of project costs, and if so, if the frequency is reasonable, and if DNER will conduct as work-in-kind and be eligible for credit as described in section F-15 of Appendix F of ER 1105-2-100. Further, modify total project costs if needed.

SAJ Response: The following language was added to the monitoring and adaptive management plan:

Ongoing salinity monitoring by DNER will be used to verify salinity targets, however, it is not a component of the project that will be cost-shared. The project sponsor, DNER, is not seeking in-kind credit. DNER plans to continue biweekly salinity monitoring, which is an appropriate frequency to document long-term salinity changes. Monitoring plans will be reviewed during design and implementation. If necessary, adjustments may be made to the monitoring, not to exceed the cost estimates provided in the IFR/EA.

7. Concern: Monitoring and Adaptive Management- PPA -

Basis of concern: PPA. Paragraph 3.c. of the Section 2039 WRDA 2007 implementation guidance states that "Financial and implementation responsibilities for the monitoring plan will be identified in the Project Partnership Agreement". The June 2017 CAP Section 1135 model PPA, Articles 1.B., 1.F., and 1.G. describe this generally in that 1.B. states that construction costs include monitoring and adaptive management and 1.F. and 1.G. define monitoring and adaptive management broadly and then refer to the description in the decision document. It is not clear that the commitment to continue salinity monitoring by DNER needs to be described in Article I.A. or if it just needs to be clear in this report, as Article 1.F. will refer to the monitoring described in the decision document.

Significance of Concern: Low

Actions Needed to Resolve: Clarify if the commitment to continue salinity monitoring must be explicitly described in the PPA, or if the PPA formalizes the commitment by referring to what is described in the decision document.

SAJ Response: Ongoing salinity monitoring by DNER will be used to verify salinity targets, however, it is not a component of the project that will be cost-shared. The project sponsor, DNER, is not seeking in-kind credit; therefore, the commitment to continue salinity monitoring will not be described in the PPA. Monitoring plans will be reviewed during design and implementation. If necessary, adjustments may be made to the monitoring, not to exceed the cost estimates provided in the IFR/EA.

8. Concern: Monitoring and Adaptive Management- duration -

Basis of Concern: Monitoring is cost-shared up to 10 years, and the revised Model CAP 1135 PPA allows up to 10 years in the definition of monitoring in Article I.F. Monitoring is described as being five years, including for the Pterocarpus forest. It is not clear if the 93 acres of Pterocarpus forest described in the monitoring plan will show signs of recovery as quickly as five years.

Significance of Concern: Low.

Actions Needed to Resolve: Verify if five years is adequate to detect Pterocarpus forest recovery. For a minor cost the monitoring could continue up to 10 years if needed.

SAJ Response: In consideration of this comment, the following language was added to the monitoring and adaptive management plan:

"Monitoring plans will be reviewed during design and implementation to ensure that they incorporate any new scientific understanding of typha marsh and Pterocarpus recovery and mangrove reduction needs. If necessary, adjustments may be made to the monitoring plans, not to exceed the cost estimates provided in the integrated feasibility report and environmental assessment (IFR/EA)."

Changes to be considered include stretching the monitoring period from 5 years with annual monitoring to 10 years with biannual monitoring. Coordination with local agencies regarding monitoring and methods in the project vicinity will continue to be leveraged to minimize impacts to schedule and cost.

9. Concern: Appendix C – Real Estate Plan –

Basis of concern: 25. Chart of Accounts For Project – The costs as submitted by SAJ Real Estate were altered and substituted in the Real Estate Plan, which has created a distorted and incorrect estimate. The original estimated real estate administrative costs were $36,000.00 Non-Federal and $36,000 Federal. Those numbers were changed to $21,000 Non-Federal and $63,000 Federal. Apparently, the change was an attempt to reflect the cost share split. The credit for Non-Federal real estate administrative expense does not include the Federal administrative expense. Combining the Non-Federal and Federal cost and applying a cost share percentage to that total results in an incorrect Real Estate cost estimate for each entity.

Significance of concern: Medium

Actions needed to Resolve: The costs as originally provided by SAJ Real Estate should be in the Real Estate Plan.

SAJ Response: Concur: the RE costs have been fixed in the revised RE Appendix and in table 4.2 within the main report.

10. Concern: Executive Summary: -

Basis of Concern: Cost and Implementation Paragraph, Page E-10: A number of $3,731,000 is cited as the current Cost Estimate of the Recommended Plan. That number isn't supported in the Certified Cost Estimated provided with the Final Report.

Significance of Concern: High

Actions needed to Resolve: Please confirm the intent of this number as shown and either clarify what items constitute this value, or correct to match the certified costs.

SAJ Response: Concur: Total project cost value has been fixed to reflect $3,957,000

11. Concern: Certified Cost Estimate –

Basis of Concern: Feasibility Study Costs, Feature Code 22: Cost Estimate currently shows a total study cost of $250,000, split between Fed and Non-Fed at a 75/25 Split after the first $100K. This breakout reflects neither the correct total study costs, nor the fact that Section 1032 of WRRDA 2014 provides a $455,000 credit to each phase of the study. This was pointed out in the ATR Comment 6880594.

Significance of Concern: High

Actions needed to Resolve: Correct the total study costs and revise the cost share breakout to reflect S. 1032 of WRRDA 2014.

SAJ Response: Concur: the Feature Code 22 on the TPCS is incorrect. Please refer to table 4.2 within the main report.

12. **Concern: Estimated Total Project Cost: -**

Basis of Concern: This cost share break out depicts a straight 75/25 split of the costs. It ignores any LERRD crediting that comes into play and it doesn't allow for the Section 1032 Credit of WRRDA 2014 for the D/I phase.

Significance of Concern: Medium

Actions needed to Resolve: Revise the numbers IAW with implementation guidance on S. 1032 of WRRDA 2014 if we're truly interested in showing what the Federal investment is estimated at when compared against the CAP Limit.

SAJ Response: Concur: please refer to table 4.2 within the main report.

13. Concern: Enclosure 3, Remaining Tasks –

Basis of Concern: The table in Enclosure 3 doesn't list the tasks needed to complete the Environmental Coordination. As this needs to be completed in order to execute a PPA, then a task and estimated completion date should be added.

Significance of Concern: Medium

Actions needed to Resolve: Update schedule of remaining tasks accordingly.

SAJ Response: The Environmental Coordination has been completed as of 22 Aug 17 therefore there are no further environmental coordination activities that still need to occur.

14. Concern: Main Report –

Basis of Concern: Table 4-1; This table refers to the Price Levels as FY17, which doesn't match what is shown in the Total Project Cost Summary.

Significance of Concern: High

Actions needed to Resolve: Please confirm Price Levels used and adjust accordingly.

SAJ Response: Concur: the Price levels were confirmed and this is reflected on the table 4-1 to read as "FY18"

15. **Concern:** Main Report **–**

Basis of Concern: Table 4-2; Somewhere in the Decision Document a clear outlay of Federal and Non-Federal financial obligations and the path to those final numbers should be shown. This seems like the logical table to document the cash and credit requirements. Price Levels don't match the TPCS. Do keep in mind that the Fully Funded costs will be utilized when preparing your PPA package, so it is important to be able to trace numbers back to a Certified Cost estimate in an approved Decision Document. If there is no Work in Kind expected, state that as well so when it comes time to prepare the PPA it is clear in the decision document.

Significance of Concern: Medium

Actions needed to Resolve: Utilize this table to show how any LERRD/WIK credits that would be applied in addition to S. 1032 of WRRDA 2014. It would also be an opportune time to demonstrate that the CAP limit isn't being breached when considering Feasibility costs as well.

SAJ Response: Concur: please refer to table 4.2 within the main report.

16. **Concern: Main Report –**

Basis of Concern: Table 4-2; Non-Federal Acquisition/Administrative Costs are reported as creditable back in Section 23 of the Real Estate Plan. Table 4-2 doesn't reflect this same information. Refer to the Model PPA for clarification on what should receive credit.

Significance of Concern: Medium

Actions needed to Resolve: Confirm what is creditable and what isn't and reflect it within this table so a non-Federal Cash contribution can be shown.

SAJ Response: Concur: please refer to updated table 4.2 within the main report.

06217. **Concern: Main Report -**

Basis of Concern: Paragraph 5.3.8, Cultural Resources; This section of the report acknowledges the fact that there are still some unknowns that need to be addressed in the D/I phase in order to close out Section 106 through a phased approach. The Cost Estimate also includes a line item for Cultural Resources, in the amount of $226,000. However, the costs and the description don't definitively answer the question on the One Percent Statutory Level as set forth in Public Law 93-291 for Data Recovery.

Significance of Concern: High

Actions needed to Resolve: Acknowledge the Statutory limit in this section of the report and clearly articulate the actions expected to be taken during D/I phase and call out whether or not Data Recovery is anticipated or included in the reported costs.

SAJ Response: Concur: language added to Section 5.3.8 paragraph 3 to outline the actions expected to be taken during D/I phase, address the likelihood of conducting data recovery, and acknowledge the one percent statutory level.

Rio Anton Ruiz CAP 1135

Final Integrated Feasibility Report & Environmental Assessment, July 2017

Additional SAD Comments

15 September 2017

SAD Comments- OC

Major Comments

1. Concern: Page ES-2, last sentence (regarding the Puerto Rico Coastal Zone Management Program) and page 1-3, 1st paragraph

Basis of Concern: The single sentence (which is the same in both locations) has multiple issues. (1) Is it correct to call the Humacao Natural Reserve "a recognized element" of the PR Coastal Zone Management Program? Or was it officially designated as a nature reserve under the provisions of the PR CZMP? The HNR is a reserve that has been under the administration of PR DNER since 1984. (2) It is the "Puerto Rico Coastal Zone Management Program", so insert the word "Zone" for the correct name. (3) The PR CZMP encompasses 40 statutes and was approved by NOAA; it is not "established in principle". (4) I could not find the existence of a Coast Management Plan. (5) The CZMP was adopted in 1978 under the authority of the Federal Coastal Zone Management Act and approved by NOAA in 1978 – not 1979.

Significance of Concern: Medium

Actions Needed to Resolve: Correct the facts in the sentence.

SAJ Response: Due to the confusion and lack of value added, the sentence was removed from both sections.

2. Concern: Monitoring and Adaptive Management

Basis of Concern: The totality of the report indicates that monitoring and adaptive management will be conducted (e.g., Appendix E, and the inclusion of a monitoring and adaptive management plan), but the main report fails to specify the need for monitoring and adaptive management as part of the Recommended Plan.

Significance of Concern: Medium

Actions Needed to Resolve: To support the inclusion of monitoring in the PPA, the report must be clear regarding the need for monitoring and adaptive management, to include the period of time for these activities and responsibilities of the Corps versus NFS to conduct these activities and cost share. However, the details regarding responsibilities are not sufficiently clear. For example, will DNER be solely responsible for conducting and the costs of salinity monitoring (as seems to be indicated in Appendix E)? If it was addressed in the Executive Summary and main report, then identify where and, if not, add information. Also, add as needed any monitoring requirements to the Items of Local Cooperation list in section 7.1.

SAJ Response: Information explaining the need for including monitoring in the Recommended Plan was added to section 4.1 “General Description”.

The following language was added to the monitoring and adaptive management plan:

Ongoing salinity monitoring by DNER will be used to verify salinity targets, however, it is not a component of the project that will be cost-shared. The project sponsor, DNER, is not seeking in-kind credit; therefore, the commitment to continue salinity monitoring will not be described in the PPA. Monitoring plans will be reviewed during design and implementation. If necessary, adjustments may be made to the monitoring, not to exceed the cost estimates provided in the IFR/EA.

3. Concern: Page ES-10, second line

Basis of Concern: We should use the correct name of a statute.

Significance of Concern: Low, but we should get this correct every time (and note it is correct on page 2-11 in section 2.3.4.)

Actions Needed to Resolve: Replace “Fisheries” with “Fishery”, and insert a hyphen after “Magnuson”.

SAJ Response: text corrected ES-10, second line

4. Concern: NMFS Coordination Documented in the Report

Basis of Concern: Report and FONSI must support the decision to proceed, and support includes completion of ESA consultation

Significance of Concern: High

Actions Needed to Resolve: Update all text discussing ESA consultation with NMFS to address receipt of NMFS's concurrence on 22 Aug. (For future submittals, recommend following SAD Planning's suggestion to put placeholders in the report (e.g., "consultation was completed on _____") rather than write the report to state that consultation is still ongoing and will be completed prior to project implementation.)

SAJ Response: The FONSI and report were updated with the completed NMFS consultation information. Correspondence was added to Appendix D-1 (Environmental Coordination).

5. Concern: Page 3-1, Section 3.2.2, 1st sentence concerning NED and NER.

Basis of Concern: NED is not relevant to this report. NER is not "a subset" of NED formulation. NER is "National Ecosystem Restoration," not "National Environmental Restoration".

Significance of Concern: Medium; our reports should correctly state fundamental Planning principles and correctly spell out basic acronyms.

Actions Needed to Resolve: Correct the sentence.

SAJ Response: Concur: text corrected (Page 3-1, section 3.2.2 1st sentence)

6. Concern: Page 5-2, Section 5.3.3, last paragraph (and elsewhere summarizing the USFWS's concurrence); USFWS 17 Apr 17 letter in Appendix D.

Basis of Concern: USFWS (unlike NMFS) did not provide a blanket concurrence. Instead, USFWS concurred with the Corps' determination, provided that its attached measures for the Antillean manatee and Puerto Rican boa are followed.

Significance of Concern: High

Actions Needed to Resolve: Add to the text information about the conditions imposed by USFWS on its concurrence.

SAJ Response*:* The FONSI and report were updated to better reflect the USFWS concurrence conditions and the Corps' commitment to incorporating those conditions into the project.

7. Concern: Page 6-2, Section 6.2, Environmental Commitments

Basis of Concern: (Related to item 6 above) The report states that the "standard manatee protection construction conditions" will be incorporated into plans and specifications for this project. (1) Are these "standard" conditions the equivalent of the conservation measures/conditions that USFWS is requiring via its ESA coordination letter? (2) Is it sufficiently clear that the Corps will require its employees and contractors to follow the conditions?

Significance of Concern: High.

Actions Needed to Resolve: Resolve the manatee protection measures that must be followed and revise as needed the report.

SAJ Response*:* The standard conditions generally mentioned are the equivalent of the conditions provided by USFWS in ESA coordination. A statement of commitment that USACE and its contractors will comply with the standard conditions during construction activities was added to the "Environmental Commitments" section and references to standard conditions were added to pertinent sections of the report.

8. Concern: Page 6-2, Section 6.2, Environmental Commitments.

Basis of Concern: (Related to item 6 above) This section fails to include the conservation measures for the Puerta Rican boa that USFWS attached to its 17 Apr 17 coordination letter.

Significance of Concern: High.

Actions Needed to Resolve: Add the PR boa conservation measures.

SAJ Response*:* The "Environmental Commitments" section was updated to include the Puerto Rican boa standard conditions provided by USFWS. A statement of commitment that USACE and its contractors will comply with the standard conditions during construction activities was added to the "Environmental Commitments" section and references to standard conditions were added to pertinent sections of the report.

9. Concern: Insufficient NEPA Analysis.

Basis of Concern: Where are sections to address cumulative impacts as well as irreversible and irretrievable commitment of resources?

Significance of Concern: High.

Action Needed to Resolve: Identify where these are addressed and, if omitted, consult with SAJ OC and address them.

SAJ Response*:* Section on cumulative impacts, irreversible and irretrievable commitment of resources, and unavoidable adverse environmental effects were added to section 5 of the report. SAJ OC reviewed the information added and concurred with the addition on 10/12/2017.

10. Concern: Section 8.1, Acronyms.

Basis of Concern: The acronyms list was added from another SAJ report, apparently with no effort to tailor it for this report. It is missing acronyms that are in this report, includes acronyms that are not relevant, and was obviously applicable to the State of Florida rather than the Commonwealth of Puerto Rico.

Significance of Concern: High because, again, this highlights a fundamental failure in DQC. This kind of problem is the norm but should not be and needs to be corrected systemically.

Action Needed to Resolve: Correct the list so it is useful and applicable or, if SAD Planning concurs, delete it.

SAJ Response*:* Acronym list has been updated.

<u>Minor Comments</u>

11. Concern: Page ES-13, Conclusion and Recommendation

Basis of Concern: It is awkward wording to state that the recommended plan "is suggested for endorsement at the discretion of the Commander".

Significance of Concern: Low

Actions Needed to Resolve: Recommend stating that the RP is recommended for approval or similar wording.

SAJ Response: Concur: text corrected

12. Concern: Page 3-7, section 3.5.6.1.1 and page 5-1, section 5.2.3.

Basis of concern: On page 3-7, how are "freshwater fish" a main ecosystem? On page 5-1, "sea grass habitat" is included.

Significance of Concern: Low

Actions Needed to Resolve: Clarify.

SAJ Response: Concur: freshwater "fishery" corrected. Sea grass habitat removed. (Page 3-7, section 3.5.6.1.1 and page 5-1, section 5.2.3)

13. Concern: Page 3-7, section 3.5.6.1.1, 5th and 6th sentences

Basis of Concern: These sentences must be read at least twice because each is two separate sentences that are connected by a space or comma. Incorrect punctuation makes them confusing and requires extra time to understand them.

Significance of Concern: Low.

Action Needed to Resolve: Correct the punctuation.

SAJ Response: Concur: punctuation corrected (page 3-7, section 3.5.6.1.1, 5th and 6th sentences)

14. Concern: Page 4-3, section 4.2.2, Work-in-Kind.

Basis of Concern: In-kind contributions are not a requirement.

Significance of Concern: Low.

Action Needed to Resolve: Correct the statement to reflect that the NFS does not plan to provide any in-kind contributions.

SAJ Response: Concur: text corrected (page 4-3, section 4.2.2 WIK)

15. Concern: Page 5-4, section 5.3.8, 3rd sentence.

Basis of Concern: The sentence is difficult to follow and should better reflect the statement in the SHPO's letter dated 30 Aug 16.

Significance of Concern: Low.

Action Needed to Resolve: The sentence is more accurate if it reflects the statement in the SHPO letter. For example: "If HU-6 contains archaeological materials that my reveal important information regarding the prehistory or history of Puerto Rico and construction will destroy or damage that information, then the criteria of adverse effect, as defined in 36 C.F.R. 800.5(a)(10 would have to be applied."

SAJ Response: Concur: text amended.

Final Integrated Feasibility Report & Environmental Assessment, July 2017

Additional SAD Comments – Monitoring and Adaptive Management Plan

August 16, 2017

1. Concern: Page 9, section 4.1, 5th paragraph.

Comment: "Concern that adaptive management would only be considered if reduction occurs. Why would adaptive management not be considered if 15 acres are not established? Also, what is the basis for the expectation that 15 acres can be established within a 5-year timeframe? What is the detailed adaptive management plan?"

SAJ Response: Due to the documented success of the temporary SWIMs installed in 2007, the uncertainty is low for this project and adaptive management is not anticipated for this project. Monitoring data will be used to assess restoration success. Monitoring plans will be reviewed during design and implementation to ensure that they incorporate any new scientific understanding of typha marsh recovery needs. If necessary, adjustments may be made to the monitoring plans, not to exceed the cost estimates provided in the IFR/EA. The monitoring and adaptive management plan has been revised to clearly reflect this information.

2. Concern: Page 9, section 4.2, last paragraph.

Comment: "Will adaptive management be considered if 93 acres are not established? What is detailed adaptive management plan? Also, what is the basis for the expectation that 93 acres can be established within a 5-year timeframe?"

SAJ Response: Due to the documented success of the temporary SWIMs installed in 2007, the uncertainty is low for this project and adaptive management is not anticipated for this project. Monitoring data will be used to assess restoration success. Monitoring plans will be reviewed during design and implementation to ensure that they incorporate any new scientific understanding of Pterocarpus recovery needs. If necessary, adjustments may be made to the monitoring plans, not to exceed the cost estimates provided in the IFR/EA. The monitoring and adaptive management plan has been revised to clearly reflect this information.

3. Concern: Page 10, section 4.3, 7th paragraph.

Comment: "What is the basis for the assumption that for natural reduction of mangroves in this time period? Would adaptive management be considered if 15 acres are not reduced? What is adaptive management plan?"

SAJ Response: Mangrove species will be documented after completion of the project construction and prior to the start of monitoring. Natural decline of the species is expected to occur due to the transition from the existing saline environment (approximately 35ppt) to a brackish environment (less than 10ppt). The species with the

highest sensitivity to freshwater, such as red mangrove, will be selected as an indicator of desired salinity reduction. Following completion of the weir construction, annual monitoring will be performed to assess mangrove loss in the HNR. Due to the documented success of the temporary SWIMs installed in 2007, the uncertainty is low for this project, and adaptive management is not anticipated for this project. Monitoring data will be used to assess the natural decline of species. Monitoring plans will be reviewed during design and implementation to ensure that they incorporate any new scientific understanding of mangrove reduction needs. If necessary, adjustments may be made to the monitoring plans, not to exceed the cost estimates provided in the IFR/EA. The monitoring and adaptive management plan has been revised to clearly reflect this information.

CERTIFICATION OF LEGAL REVIEW

The Final Integrated Feasibility Report and Environmental Assessment for the Rio Anton Ruiz Restoration Continuing Authorities Program Section 1135 Study has been fully reviewed by the Office of Counsel, USACE, Jacksonville District and is legally sufficient.

_____
Brooks Moore,
Supervisory Attorney for Civil Works

Date: October 25, 2017

COMPLETION OF DISTRICT QUALITY CONTROL

Final District Quality Control (DQC) of **The Rio Anton Ruiz 1135 CAP Integrated Feasibility Report and EA SAD/SAJ comment responses** has been completed per direction of EC 1165-2-209. All concerns resulting from the DQC review of the SAD/SAJ comment responses of the Final Report have been mutually resolved and comments incorporated

Brooke Hall Study Manager (PTL) PD-PW	*SIGNATURE*
Jim Suggs Project Manager/CAP Program Manager *(home district)* PM-WN	*SIGNATURE*
Hansler Bealyer Chief, Acquisition Branch Real Estate Division RE-A	*SIGNATURE*
Kelly Keefe Section Chief, Watershed Planning Section (Acting) PD-PW	*SIGNATURE*
Jason Spinning Section Chief, Coastal Section PD-EC	*SIGNATURE*
Andy Loschiavo Section Chief, South Florida Section PD-ES	*SIGNATURE*

FINAL INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

RÍO ANTÓN RUÍZ RESTORATION CONTINUING AUTHORITIES PROGRAM (CAP) SECTION 1135 PROJECT

July 2017
REVISED October 2017

Pterocarpus

Typha Marsh

West Indian Whistling Duck

Redear Sunfish

Antillean Manatee

Río Antón Ruíz

US Army Corps of Engineers
JACKSONVILLE DISTRICT

FINDING OF NO SIGNIFICANT IMPACT
RÍO ANTÓN RUÍZ
CONTINUING AUTHORITIES PROGRAM
SECTION 1135 PROJECT
HUMACAO, PUERTO RICO

The U.S. Army Corps of Engineers, Jacksonville District (Corps), has prepared an environmental assessment in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, and the White House's Council on Environmental Quality regulations to assess environmental effects of the following actions in the Integrated Feasibility Report and Environmental Assessment (IFR/EA), dated July 2017 for the Río Antón Ruíz 1135 Continuing Authorities Program (CAP) project in Humacao, Puerto Rico. The Recommended Plan consists of the following:

- Installation of two sheetpile notched concrete cap weirs at the location of the temporary SWIM structures. Weir #1 will be approximately 180 linear feet. Weir #2 will be approximately 140 linear feet.
- Both weirs will have a notch that is 3 feet deep by 15 feet wide with a 2 feet by 1 foot concrete cap to allow for continued vessel and fauna transit.
- Use of a vibration or impact hammer to drive the sheetpile.

In addition to the "no action" alternative, two alternatives were also evaluated, including the Recommended Plan. While other smaller scale alternatives are economically justified, the Recommended Plan best protects the entire HNR system from salt water intrusion as a result of the diversion channel. The Recommended Plan meets all of the project objectives and is the environmentally preferable alternative. Failure to protect the *Pterocarpus officinalis* forest and lagoon system could lead to impacts to the essential habitat for federally and locally listed species.

I have reviewed the IFR/EA for the Recommended Plan. This Finding incorporates by reference all discussions and conclusions contained in the IFR/EA enclosed herewith. Based on the information analyzed in the IFR/EA, which reflects pertinent information obtained from agencies having jurisdiction by law and/or special expertise, I conclude that the Recommended Plan will not significantly affect the quality of the human environment and does not require an Environmental Impact Statement. Reasons for this conclusion are, in summary:

a. The Recommended Plan is in compliance with the Endangered Species Act of 1973, as amended. In a letter dated April 17, 2017, the U.S. Fish and Wildlife Service (USFWS) concurred with the Corps' determination that the Recommended Plan "may affect, but is not likely to adversely affect" listed

species under USFWS jurisdiction, provided that the standard conditions for the Antillean manatee and Puerto Rican Boa are incorporated into the project. In a letter dated August 22, 2017, the National Marine Fisheries Service (NMFS) concurred with the Corps' determination that the Recommended Plan is not likely to adversely affect listed species and/or designated critical habitat under NMFS jurisdiction.

b. Water quality certification will be obtained from the Puerto Rico Environmental Quality Board during the design and implementation phase of the project, prior to initiation of construction. The Corps coordinated a consistency determination pursuant to the Coastal Zone Management Act with the Puerto Rico Planning Board. The Puerto Rico Planning Board determined via letter dated July 6, 2017 that the project is consistent with the Commonwealth of Puerto Rico's Coastal Management Program.

c. The Recommended Plan has been coordinated with the Puerto Rico State Historic Preservation Officer (SHPO) in accordance with Section 106 of the National Historic Preservation Act (NHPA) and consideration given under the National Environmental Policy Act. The Corps does not anticipate that historic properties will be adversely affected by the Recommended Plan. However, to ensure avoidance, minimization, or mitigation of impacts to historic properties eligible or potentially eligible for the National Register of Historic Places, comprehensive archaeological surveys will be performed within the project footprint during the Design and Implementation (D&I) phase. Copies of the archaeological survey report will be provided to the Puerto Rico SHPO in advance of project construction, and concurrence on a determination of effect will be also be sought from the SHPO. No construction will occur until all applicable legal requirements have been met, including appropriate analysis and consultation with interested parties as defined under Section 106 of the NHPA. Consultation is ongoing and will be finalized prior to project implementation.

d. The Corps prepared this IFR/EA consistent with 1999 guidance provided by the NMFS Southeast Regional Office to the Corps regarding coordinating Essential Fish Habitat (EFH) consultation requirements with NEPA. The Corps sent the EFH consultation request, along with the draft IFR/EA, to NMFS on March 31, 2017. In a letter dated August 4, 2017, NMFS concurred with the Corps' determination that the project will not adversely affect EFH and did not provide any EFH conservation recommendations.

All practicable means to avoid and minimize adverse environmental effects have been incorporated into the Recommended Plan. Measures will be in place during construction to eliminate, reduce, or avoid adverse impacts to below the threshold of significance to fish and wildlife resources including the following:

- A Protected Species Observer shall be present on the project during all construction activities and shall ensure that if any protected species (Puerto Rican boa, marine mammals, sea turtles) enter the buffer area, the project shall cease in-water operations until either the animal has voluntarily left and

been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal.

- Water quality shall be protected by adherence to the Commonwealth of Puerto Rico's water quality certification requirements.

In view of the above and the attached IFR/EA, and after consideration of public and agency comments received on the project, I conclude that the Recommended Plan would not result in a significant effect on the quality of the human environment. This Finding of No Significant Impact incorporates by reference all discussions and conclusions contained in the IFR/EA enclosed herewith. A copy of these documents will be made available to the public at the following website: http://www.saj.usace.army.mil/About/DivisionsOffices/Planning/EnvironmentalBranch/EnvironmentalDocuments.aspx.

Timika M. Wilson

Timika M. Wilson
Lieutenant Colonel, U. S. Army
District Commander

9 FEB 18
Date

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FINAL INTEGRATED FEASIBILITY REPORT
AND ENVIRONMENTAL ASSESSMENT
Humacao, Puerto Rico

EXECUTIVE SUMMARY

PURPOSE AND NEED

The purpose of the Río Antón Ruíz Restoration Project is to preserve the Pterocarpus forest and the biodiversity of both the freshwater and saltwater fauna and flora within the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The United States Army Corps of Engineers (USACE) completed a Section 205 Flood Control Project in 2001 which reduced flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. The 205 project included construction of a levee, interior drainage canal and culverts, as well as a diversion channel. The 205 flood control project was successful in protecting the coastal communities from flooding; however, the construction of the diversion channel has had negative impacts to the Humacao Natural Reserve ecosystem. The diversion channel has allowed the increase of salt water intrusion into the freshwater ecosystem, thus changing the biodiversity of the lagoon system and deteriorating the overall health of the Pterocarpus Forest and ultimately leading to the decline of the Pterocarpus population.

The authority for conducting this feasibility study is the Continuing Authorities Program (CAP), Section 1135 of the Water Resource Developmental Act (WRDA) of 1986, as amended, "Project modifications for the improvement of the environment." The Federal Interest Determination (FID) was approved on February 26, 2016.

Río Antón Ruíz is located in the Municipality of Humacao on the southeast coast of Puerto Rico (**Figure ES-1**). The project area includes a lagoon system and a Pterocarpus forest in the Humacao Natural Reserve (HNR). Six lagoons encompassing approximately 615 acres (249 hectares) compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas (**Figure ES-2**). The Mandri lagoons and the low coastal floodplain serve as detention areas during floods. The coastal communities of Punta Santiago, Verde Mar, and Villa Palmira are the main populated areas within the watershed.

The HNR represents an outstanding example of several Caribbean coastal vegetation types, including palustrine emergent and forested wetlands, grassy uplands, estuarine emergent, scrub-shrub, and coastal lagoons. The old-growth Pterocarpus forest, located along the middle reaches of the Río Antón Ruíz, is the largest and best preserved in Puerto Rico. The edges of the Mandri lagoon system are dominated by red, black, and white mangroves.

Figure ES-1: Map of project location.

The purpose of the Río Antón Ruíz Restoration Project is to preserve the Pterocarpus forest and the biodiversity of both the freshwater and saltwater fauna and flora within the HNR in Humacao, Puerto Rico. The HNR lagoon system, one of the largest remaining forested freshwater swamps in Puerto Rico, is dominated by approximately 371 acres of protected Pterocarpus trees (**Figure ES-2**).

Figure ES-2: Map of Humacao Natural Reserve.

In 2001, the USACE completed construction of the Río Antón Ruíz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended. The purpose of the 205 Flood Control Project was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. Historically, flooding occurred in these communities when runoff from the mountains within the watershed flowed into the HNR lagoon system and the Pterocarpus forest before reaching the Caribbean Sea. The authorized flood control project protects those communities from flooding with a levee, interior drainage canal, and a diversion channel to the ocean. Since the completion of the authorized flood control project in 2001, the lagoon system and Pterocarpus forest ecosystem have been affected by high levels of salinity, reference **Figure ES-3**. The Pterocarpus tree has a salinity tolerance of between 8-10 parts per thousand (ppt). Field observations indicate that a vast number of Pterocarpus trees on the north shore of the Río Antón Ruíz were exhibiting signs of environmental stress such as wilting, loss of foliage, and dry bark. Trees along the Boca Prieta channel have died as a result of the exposure to higher salinity levels. In addition to the damages to the Pterocarpus forest, there have been changes to the biodiversity of the lagoon system. For example, the freshwater emergent marsh, Typha marsh, has been extirpated and replaced by mangroves and the freshwater aquatic species have been displaced by saltwater fish species. The submerged or emergent aquatic vegetation species are decreasing, which serve as food for several species of small fish and aquatic birds.

In a letter dated May 26, 2004, the Department of Natural and Environmental Resources (DNER) notified the USACE that post-completion of the 205 flood control project, salinity levels in the HNR lagoon system and Pterocarpus forest have substantially increased, from below 10 ppt up to 35 ppt. In order to preserve the HNR ecosystem, temporary saltwater intrusion measures (SWIMs) were developed and constructed

by the USACE in 2007 under the authority of the original 205 flood control project and funded 100% by the non-federal sponsor (DNER). It was intended that the information gathered from implementing the temporary structures would aid in determining if a permanent solution would be warranted. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 ppt to below 10 ppt. The SWIMs were temporary impermeable plugs across the diversion channel near the lagoon and across the Río Antón Ruíz immediately upstream of the confluence with the diversion channel. The plugs consisted of heavy lift bag barriers (high-density polyethylene and UV resistant) and sandbags placed in the diversion channel and riverbed in water depths of 5 to 10 feet. The plugs were armored with riprap on the upstream and downstream sides to resist damage during storm discharges. DNER salinity monitoring stations within the HNR system were used to monitor the salinity levels upon completion of the temporary SWIMs. **Figure ES-4** shows the trend in salinity levels before and after installation of the SWIMs. Prior to installation of the SWIMs, the average salinity levels in Mandri 2 and 3 were 16 and 17 ppt, respectively. Salinity levels frequently exceeded 20 ppt, and only dipped below 10 ppt approximately 30% of the readings in five years. The graphic shows that after installation of the SWIMs in May 2007, the salinity levels in Mandri 2 and 3 remained consistently below 5.0 ppt to November 2008, at which point the salinities began to increase slowly back to frequent levels above 20 ppt. At the end of 2008/beginning of 2009, the temporary SWIMs lost their effectiveness and the salinity data exceeded 10 ppt. As reported by DNER, the SWIM plugs have deteriorated mostly as a result of damage to the sand bags due to small boat traffic. Once damaged, the sand bags were susceptible to being dislodged and migrate away from their initial placement location. Regardless, the intended purpose of the SWIMs was temporary in nature to determine if they were an effective solution and if a permanent measure was warranted. The data showed the temporary plugs were successful in achieving the target salinity levels of 10 ppt or less.

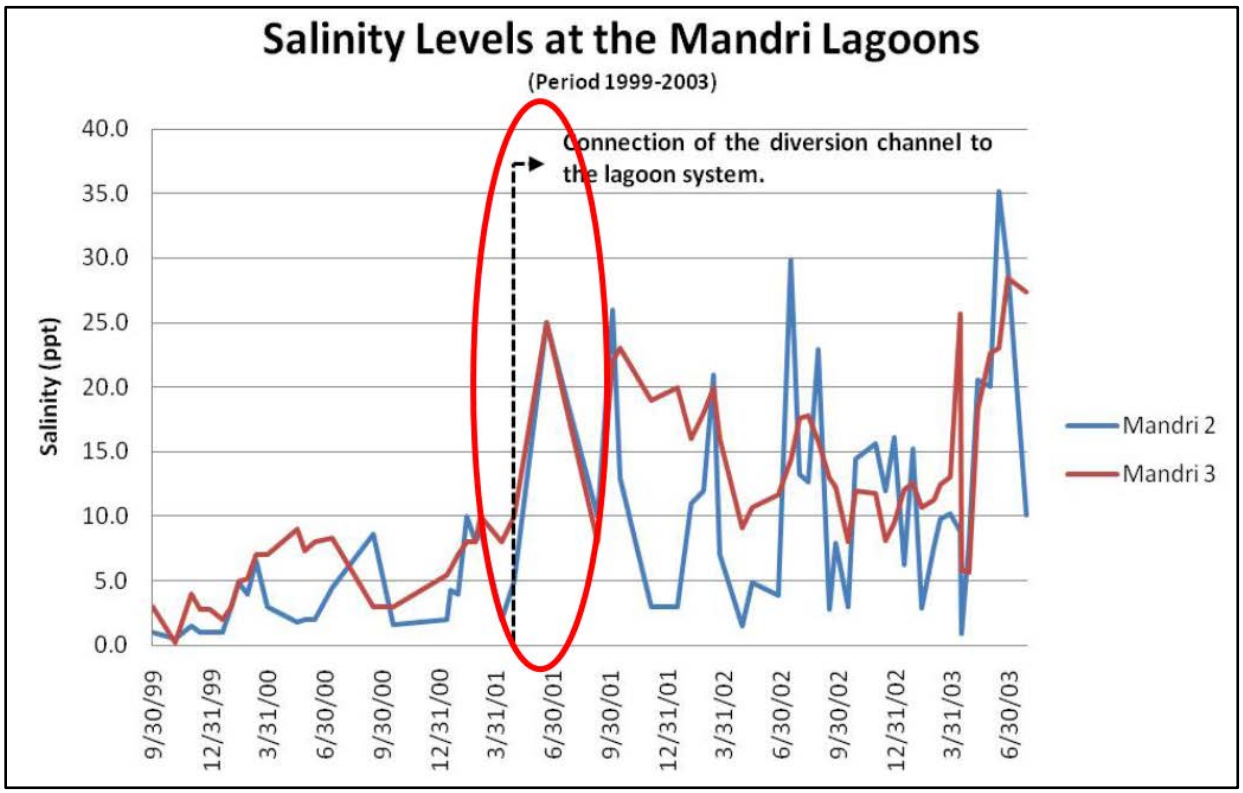


Figure ES-3: Salinity Levels at the Mandri Lagoons Post original 205 Construction

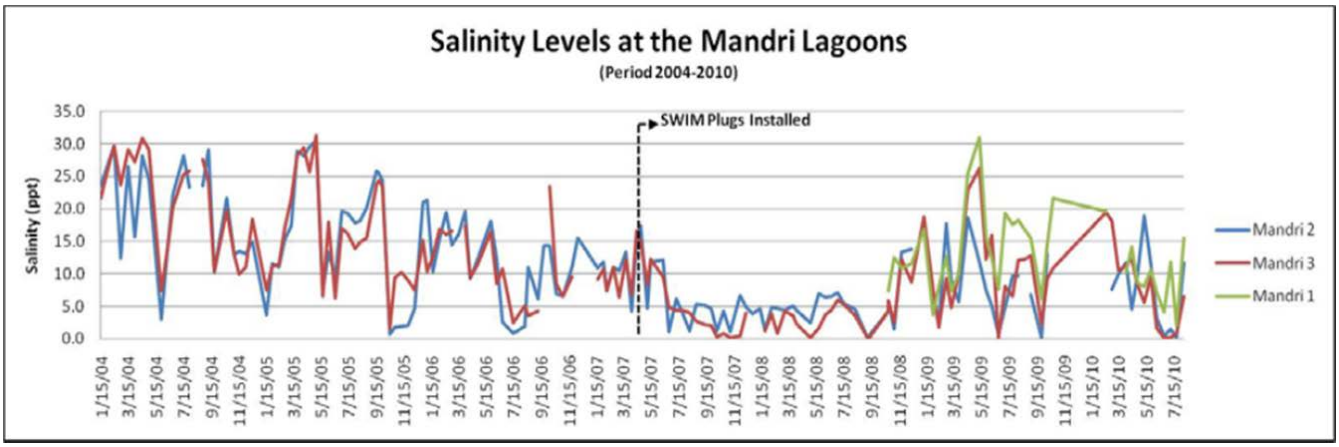


Figure ES-4: Salinity Levels at the Mandri Lagoons Post SWIM structure installation

Need

There is a need to initiate a permanent measure to restore and sustain the Pterocarpus forest habitat and biodiversity in the HNR. The temporary plugs demonstrated their success in reducing the salinity conditions, but have deteriorated over time as expected and saltwater intrusion has returned to the HNR system by the beginning of 2009.

ALTERNATIVE PLANS AND THE RECOMMENDED PLAN

Federal Interest Determination and the Description of the Tentatively Selected Plan

The 2001 Río Antón Ruíz Flood Control Project Section 205, effectively provided flood protection of the towns to the south, but also adversely impacted the HNR by allowing saltwater intrusion through improvements of a diversion channel which is larger and allowed more direct access to the ocean. The HNR ecosystem includes a Pterocarpus forest (*Pterocarpus officianalis)* which is the largest known stand of its type in Puerto Rico. According to the USDA's Natural Resource Conservation Service plant database, *Pterocarpus officinalis* is not located anywhere in the United States except for Puerto Rico (USDA 2016). The Puerto Rican boa (*Epicrates inornatus*), a federally listed species, makes its home in the HNR and uses the trees for hunting and resting. Another federally listed species, the Antillean manatee (*Trichechus manatus*), has been sighted in the HNR system. Additionally, the forest supports the only known nesting area in Puerto Rico for the locally endangered West Indian whistling duck (*Dendrocygna arborea*). Other locally endangered species include the white-cheeked pintail (*Anas bahamensis*), Caribbean coot (*Fulica caribaea*), ruddy duck (*Oxyura jamaicensis*), and the peregrine falcon (*Falco peregrins*). These species appear to be nesting and feeding in the HNR. The HNR is also utilized for recreation activities as well as serving as an education resource for teaching and research. Failure to protect the Pterocarpus stand could lead to impacts to essential habitat for these federally and locally listed species.

The recommended plan is to construct two permanent sheetpile weirs with a notched concrete cap at the location of the existing temporary SWIM structures, thus limiting the saltwater intrusion into both the Pterocarpus forest and the lagoon systems.

Objectives

The following study objectives have been developed for the 50-year period of analysis (2020-2070) based on the Río Antón Ruíz Restoration 1135 CAP Project problems, opportunities, goals, and Federal and state objectives and regulations.

- O1: Reduce salinity levels to below 10 ppt in the HNR lagoon system while considering the future effects of sea level rise
- O2: Improve and increase spatial extent and overall health of the Pterocarpus forest habitat
- O3: Improve freshwater fishery habitat within the lagoon system

Management Measures

A number of different solutions were developed as management measures. These management measures were developed to satisfy one or multiple objectives. The main goal of the project is to preserve the Pterocarpus forest and the biodiversity of the freshwater fauna and flora within the HNR in Humacao, Puerto Rico, while also maintaining the authorized level of flood protection that is afforded by the existing 205 project. The following management measures have been considered to meet this goal:

- Non-Structural, NS-1: O&M plan for the sandbar near the outlet of the diversion channel
- Structural, S-1: sheetpile weirs (with a concrete cap)
- Structural, S-2: Temporary sandbag SWIM structures

The O&M plan for the sandbar, NS-1, was screened out because it is not a long-lasting or efficient measure with high O&M costs for the continued maintenance of the sandbar. It would also be difficult to mimic the natural formation of a sandbar in a planned maintenance schedule. In addition, by creating a sandbar instead of allowing natural formation, the sandbar could create a restriction on the outfall, causing untended impacts to the original flood reduction project (205). The temporary sandbag SWIM structures, S-2, were screened out due to the fact that it is not a lasting complete measure and would require continued maintenance after storm events, as well as from boating wear and tear. They were effective as a temporary means, but have proven to not be a viable longer lasting, more permanent solution.

Alternative Development

The initial array of alternatives is described below:

- No Action – The no action alternative, no management measures would be implemented and the saltwater intrusion and loss of the freshwater Pterocarpus ecosystem caused by the USACE 205 flood control project would continue.

- Alternative 1 – Construct two permanent sheetpile weirs with a notched concrete cap at the location of the existing temporary SWIM structures one located at the mouth of the Río Antón Ruíz and the second in the diversion channel near the lagoon, thus limiting the saltwater intrusion into both the Pterocarpus forest and the lagoon systems.

- Alternative 1A – Construct one permanent sheetpile weir with a notched concrete cap at the location of the temporary SWIM structure located on the Río Antón Ruíz. This will reduce the inflow of saltwater intrusion into the Pterocarpus forest only.

- Alternative 1B – Construct one permanent sheetpile weir with a notched concrete cap at the location of the temporary SWIM structure located on the diversion channel at the lagoon. This will reduce the inflow of saltwater intrusion into the Mandri lagoon only.

- Alternative 2 – Construct one sheetpile notched concrete cap weir downstream of the confluence of the diversion channel and the Río Antón Ruíz. An existing bridge and a cultural resource area preclude placement of a weir in this location. This alternative was screened out due to these constructability issues, as well as the possibility of affecting the original 205 construction project by causing flooding.

Alternative Comparison

Cost-effectiveness Analyses were performed for Alternatives 1, 1A, 1B. The two cost-effective plans, Alternatives 1 and 1B, were then carried forward to compare with the No Action Plan, and an Incremental Cost Analysis (ICA) was performed. (**Tables ES-1 and ES-2**) Through ICA, Alternative 1 was determined to be a "Best Buy" plan and the National Ecosystem Restoration (NER) Plan. Alternative 1 was selected as the recommended plan because it yields the greatest lift in habitat units, meets all project objectives, is cost-effective, and has the lowest incremental cost per habitat unit. (**Table ES-3**)

Table ES-1: Cost-Effectiveness analysis for the initial array of alternatives

Alternative*	Plan Cost (Budget Estimate, Class 3)	Average Annual Cost CRF (i=2.875%, n=50)	Average Annual NER Benefits	Average Annual Cost per Unit Output	Cost Effective (Yes/No)
No Action Plan	$0		-	N/A	N/A
Alternative 1B	$1,745,500	$66,200	459	$144	Yes
Alternative 1A	$2,336,200	$88,700	201	$441	No
Alternative 1	$2,978,400	$113,000	815	$139	Yes
* Alternatives are displayed in order of increasing cost.					
Plan costs include construction cost; Planning, Engineering & Design; and construction management costs.					

Table ES-2: Incremental cost analysis of the top two alternatives

Alternative	Average Annual Plan Cost (Budget Estimate, Class 3)	Average Annual Plan Outputs (Habitat Units)	Incremental Cost	Incremental Habitat Unit	Average Annual Incremental Cost per Habitat Unit
No Action Plan	$0	0	$0	0	$0
Alternative 1b	$66,200	459	$66,200	459	$144
Alternative 1	$113,000	815	$46,800	356	$131

Table ES-3: Alternative Summary Matrix

Alternatives	Objectives			Output		CE/ICA	
	O1: Reduce salinity: HNR system	O2: Pterocarpus recovery	O3: Improve Fishery	NER Benefits	Cost per Unit Output	Cost-effectiveness	Incremental Cost
Alternative 1*	Yes	Yes	Yes	815	$139	Yes	$131
Alternative 1A	No	Yes	No	201	$441	No	0
Alternative 1B	No	No	Yes	459	$144	Yes	$144
No Action	No	No	No	0	0	-	0

*Recommended Plan

Recommended Plan Benefits

Alternative 1, the Recommended Plan, consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary SWIM structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel. The entire system is 1,046 acres of freshwater lagoons, cattails (Typha marsh), and Pterocarpus forest.

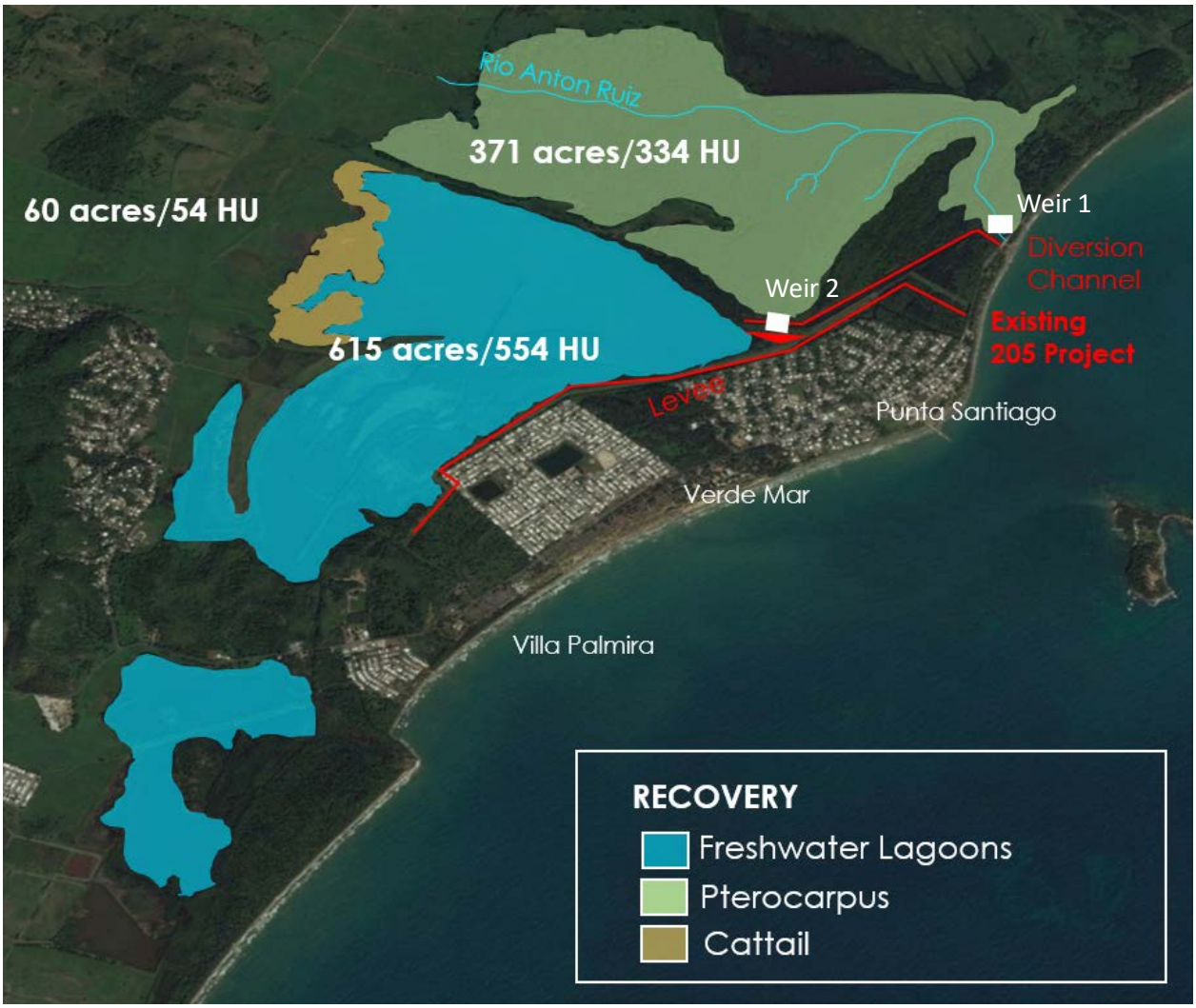


Figure ES-5: Recommended Plan.

SEA LEVEL CHANGE (SLC)

The HNR is vulnerable to sea level rise. Alternative design focused on proposing adaptable solutions that can withstand current conditions, including sea level rise. Future sea level rise was considered, per guidance, in order to recommend an alternative that is adaptable to future sea level change by the sponsor, if necessary. As sea levels rise, effectiveness of the weirs in preventing saltwater from entering the Pterocarpus forest and lagoon system may be reduced. At that time, the Recommended Plan could be adapted by the sponsor by constructing additional height uniformly across the entire length of the respective weir. This feature shall ensure the project functions as designed both under existing and future sea level conditions. Any investigation, design, and construction of such adaptations would be the responsibility of the sponsor. The required Sea Level Change and Climate Change Analyses are included in Appendix A, Section 3.

ENVIRONMENTAL CONSIDERATIONS

This project follows a logical progression from the previously completed 205 flood control project in 2001 and installation of the temporary saltwater intrusion measures (SWIMs) in 2007. Environmental considerations for this project include species listed as threatened or endangered under the Endangered

Species Act, as well as designated critical habitat, habitats designated as essential fish habitat under the Magnuson-Stevens Fishery Conservation and Management Act, water quality under the Clean Water Act, and historic and cultural resources protected under the National Historic Preservation Act. A detailed list of all environmental laws, regulations, and executive orders applicable to this action and compliance with those requirements is included in Chapter 6 of this report.

Implementation of the preferred alternative is expected to provide habitat benefits for several species. Mangroves are expected to naturally die off, allowing the Typha marsh to naturally recruit other types of vegetation. The Pterocarpus trees are anticipated to recover and improve in health and spatial extent. The freshwater fish species are expected to naturally recruit in the freshwater lagoon systems. Besides temporary impacts from construction activities, there are no anticipated negative significant effects of this project.

COST ESTIMATE AND IMPLEMENTATION

The current cost estimate for the Recommended Plan, Alternative 1, is $3,957,000. This cost includes construction management supervision and inspection, and supervision and administration (S&I/S&A), engineering during construction, and administrative costs. Refer to the Total Project Cost Summary (TPCS) located in the Cost Appendix. The certified costs for construction for the Recommended Plan is $2,728,000 (**Table ES-4**). The cost share ratio for a Section 1135 CAP project is 75% Federal, 25% non-federal. However, the Commonwealth of Puerto Rico has an exemption of $455,000 as per Section 1032, WRRDA 2014. Paragraph 3 of the implementation guidance states:

> *3. Application of the Waiver Amount. Section 1156 applies to American Samoa, Guam, Commonwealth of the Northern Mariana Islands, the Virgin Islands and Puerto Rico. The adjusted waiver amount under Section 1156 will be applied only to those studies for which a Feasibility Cost Sharing Agreement (FCSA) is executed on or after June 10, 2014 and to those projects for which the initial construction contract is awarded on or after June 10, 2014. As applicable, the adjusted waiver amount is separately applied to both study and construction of a project as follows: 1) up to $455,000 is applied toward the non-Federal sponsor's cash requirement for the study; and, 2) up to $455,000 is applied toward the non-Federal sponsor's cash requirement for design and construction of the project, including the 5 percent minimum cash contribution required for structural flood damage reduction projects. For the study and for the construction of a project, cost sharing is first calculated using the general cost sharing criteria. Then the non-Federal sponsor's cash requirement is reduced by $455,000, or to zero if the non-Federal cash requirement is less than $455,000. If the cash requirement waived for a study is less than $455,000, the remaining balance of the study waiver is not applied to increase the amount of the waiver applied to construction of the project.*

The project receives the exemption in Feasibility phase and in the Design & Implementation (DI) phase as per the appropriate cost share defined in the FCSA and PPA, which is 50-50 feasibility and 75-25 DI.

Therefore, Federal costs total 75% of the Recommended Plan, or $2,968,000 and Non-federal costs total 25%, or $989,000 before the Section 1156 waiver amount is applied. Applying the Section 1156 waiver amount, the Federal cost of $2,968,000 is increased by $455,000 to $3,423,000, and the non-Federal amount is decreased by $455,000 to $534,000. The expected construction duration is approximately 9-10 months.

Table ES-4: Alternative Cost Comparison

Alternative	Budget Estimate for Screening 18-Aug-16		Refined Project Cost 23-Mar-17	
	Construction Cost Only	Total Project Cost (Const & Non-Const. Cost)	Construction Cost Only	Total Project Cost (Const & Non-Const. Cost)
Alternative 1	$2,100,000	$2,978,400	$2,924,000	$3,957,000
*Alternative 1A	$1,571,000	$2,336,200		
*Alternative 1B	$1,264,000	$1,963,496		
Alternative 2	$1,350,000	$2,067,900		
*Cost for Alt 1A and Alt 1B were subtracted from Alternative 1				

Table ES-5: Certified cost of the Recommended Plan.

Planning Level Estimates 18AUG2016					
	Item	**Number of Units**	**Units**	**Sub-Total Cost (Including Contingency)**	**Combined Const Cost with Non-construction cost**
Alternative 1	Temporary Cofferdam to enable construction (Sheet Pile & Water pumps)	640	LF	$825,000	$1,170,086
	Permanent Structure (Include - Sheet Pile, Concrete Cap, Rip Rap and Prep Work)	320	LF	$1,275,000	$1,808,314
			Total =	**$2,100,000**	**$2,978,400**
	Item	**Number of Units**	**Units**	**Sub-Total Cost (Including Contingency)**	**Combined with Non-construction cost**
Alternative 2	Temporary Cofferdam to enable construction (Sheet Pile & Water pumps)	400	LF	$727,150	$1,113,832
	Permanent Structure (Include - Sheet Pile, Concrete Cap, Rip Rap and Prep Work)	200	LF	$622,850	$954,068
			Total =	**$1,350,000**	**$2,067,900**
REFINED COST ESTIMATE (First Cost) 23MAR2017					
	Item	**Number of Units**	**Units**	**Sub-Total Cost (Including Contingency)**	**Combined with Non-construction cost**
Alternative 1	Temporary Cofferdam to enable construction (Sheet Pile & Water pumps)	640	LF	$1,184,366	$1,602,783
	Permanent Structure (Include - Sheet Pile, Concrete Cap, Rip Rap and Prep Work)	320	LF	$1,739,634	$2,354,217
			Total =	**$2,924,000**	**$3,957,000**

COORDINATION WITH AGENCIES AND THE PUBLIC

A public notice with links to the integrated feasibility report and environmental assessment and associated appendices was available for review and comment for 30 days from March 31, 2017, the date of the Notice of Availability. No comments were received through the public notice process.

Consultation to comply with Section 106 responsibilities under the National Historic Preservation Act (NHPA) is ongoing and will be completed prior to project implementation. An Essential Fish Habitat (EFH) assessment is included within the integrated report consistent with 1999 guidance provided by the

National Marine Fisheries Service (NMFS) Southeast Regional Office to the Corps regarding EFH consultation requirements. Coordination for EFH and Section 7 of the Endangered Species Act (ESA) with the United States Fish and Wildlife Service (USFWS) and NMFS was initiated on March 31, 2017. In a letter dated April 17, 2017, the U.S. Fish and Wildlife Service (USFWS) concurred with the Corps' determination that the Recommended Plan "may affect, but is not likely to adversely affect" listed species under USFWS jurisdiction, so long as the standard conditions for the Antillean manatee and Puerto Rican Boa are incorporated into the project. Copies of the NMFS EFH and Section 7 ESA concurrence letters were received on August 4, 2017 and August 22, 2017, respectively. ESA and EFH coordination correspondence is included in Appendix D-1 (Environmental Coordination). Listed and protected species that may occur in the vicinity of the proposed work include:

- Puerto Rican Boa (*Epicrates inornatus*)
- Antillean Manatee (*Trichechus manatus*)
- Loggerhead Sea Turtle (*Caretta caretta*)
- Green Sea Turtle (*Chelonia mydas*)
- Hawksbill Sea Turtle (*Eretmochelys imbricata*)
- Leatherback Sea Turtle (*Dermochelys coriacea*)
- Nassau Grouper (*Epinephelus striatus*)
- Scalloped Hammerhead Shark (*Sphyrna lewini*)
- Pillar Coral (*Dendrogyra cylindrus*)
- Rough Cactus Coral (*Mycetophyllia ferox*)
- Lobed Star Coral (*Orbicella annularis*)
- Mountainous Star Coral (*Orbicella faveolata*)
- Boulder Star Coral (*Orbicella franksi*)
- Elkhorn Coral (*Acropora palmata*)
- Staghorn Coral (*Acropora cervicornis*)
- Migratory Birds

USACE has concluded the project will have no effect on the scalloped hammerhead shark and the seven listed coral species. The project may affect, but is not likely to adversely affect (MANLAA) the other species listed above, and will not affect any designated critical habitat (DCH). This project will be performed in compliance with Puerto Rico's water quality standards. An application for a water quality certification will be submitted to the Puerto Rico Environmental Quality Board (EQB) during the design and implementation phase. In compliance with the Coastal Zone Management Act (CZMA), a Federal Consistency Determination (FCD) was submitted to the Commonwealth of Puerto Rico for concurrence during the public notice phase of the draft integrated report. A copy of the Puerto Rico Planning Board's concurrence with the FCD was received on July 6, 2017 and is included in Appendix D-3 (CZMA).

RESIDUAL RISK

Even with implementation of the Recommended Plan, residual risk remains. The Recommended Plan is a sustainable solution to reduce saltwater intrusion into the HNR system. The Recommended Plan is designed to be adaptable to sea level rise for the 50 year analysis of the project. However with the continued sea level rise, it is anticipated at some point the weirs would no longer be effective in limiting saltwater intrusion into the Pterocarpus forest and lagoons. Salinity monitoring performed by the Sponsor will determine when the weirs are no longer effective.

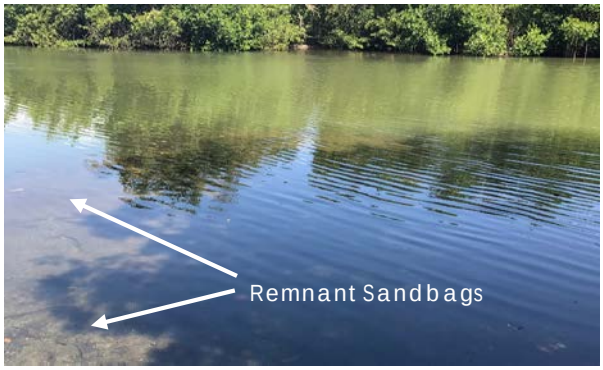
CONCLUSION AND RECOMMENDATION

The Recommended Plan (Alternative 1: Two sheetpile weirs with a concrete cap) described in this final report provides the optimum solution for restoration of the Humacao Natural Reserve Ecosystem. Implementation of the Recommended Plan for the Río Antón Ruíz 1135 Project is recommended for approval by the Commander, South Atlantic Division, U.S. Army Corps of Engineers (SAD). Based on the analysis that was performed for the temporary SWIM structures constructed under the authority of the original 205 flood control project, the implementation of the Río Antón Ruíz 1135 project will have no adverse impacts to the performance of the original 205 flood control project.

RÍO ANTÓN RUÍZ RESTORATION CONTINUING AUTHORITIES PROGRAM SECTION 1135 STUDY HABITAT OVERVIEW

Saltwater intrusion at the confluence of the ocean with the original Section 205 flood control diversion channel and the Río Antón Ruíz

Saltwater intrusion continues into the once freshwater Mandri Lagoon system, as well as the Río Antón Ruíz impacting open water, as well as adjacent Pterocarpus trees along the Río Antón Ruíz and Typha Marsh adjacent to the lagoon system



Remnants of the temporary sand bags that successfully limited saltwater intrusion until they eroded. These sandbags are in the same location as the proposed weirs.

Along the original Section 205 flood control diversion channel

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1 INTRODUCTION*

1.1 STUDY AUTHORITY*

This study was conducted under the authority of Section 1135 of the Water Resources Development Act of 1986, as amended – Project Modifications for Improvement of the Environment. Section 1135 projects are part of a larger Continuing Authorities Program (CAP) under which the Secretary of the Army, acting through the Chief of Engineers, is authorized to plan, design, and implement certain types of water resources projects without additional project-specific authorization. The Section 1135 authority allows USACE to carry out projects for improving the quality of the environment when it is determined that such modifications are feasible and consistent with the authorized project purpose and will improve the quality of the environment in the public interest. Section 1135 authority is designed to address environmental degradation associated with an existing USACE project.

The feasibility study was carried out in a manner consistent with the USACE Environmental Operating Principles (EOPs). The principles are consistent with NEPA, the Army's Environmental Strategy with its four pillars (prevention, compliance, restoration, and conservation), and other environmental statutes that govern USACE activities. Finally, the implementation framework proposed as part of the study seeks to work collaboratively, fully engaging individuals, agencies, and local groups in identifying, planning, and implementing ecosystem restoration efforts.

1.2 STUDY SPONSOR

The study was requested by the Department of Natural and Environmental Resources (DNER) of Puerto Rico, the non-federal sponsor, in a letter dated February 5, 2015 (Appendix F). The Commonwealth supports the Recommended Plan to implement ecosystem restoration efforts within Humacao Natural Reserve (HNR). A Feasibility Cost Sharing Agreement was executed on May 27, 2016.

Congressional representation for the area includes the following:

Honorable Jennifer Gonzalez,
Resident Commissioner for Commonwealth of Puerto Rico
1213 Longworth House Office Building
Washington, DC 20515

1.3 PROJECT AREA

Río Antón Ruíz is located in the Municipality of Humacao on the southeast coast of Puerto Rico (**Figure 1-1**). The project area, a total of 1,046 acres, includes a lagoon system and a Pterocarpus forest in the HNR. Six lagoons encompassing approximately 615 acres (249 hectares) compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas (**Figure 1-2**). The Mandri lagoons and the low coastal floodplain serve as detention areas during floods. The coastal communities of Punta Santiago, Verde Mar, and Villa Palmira are the main populated areas within the watershed.

Figure 1-1: Map of project location.

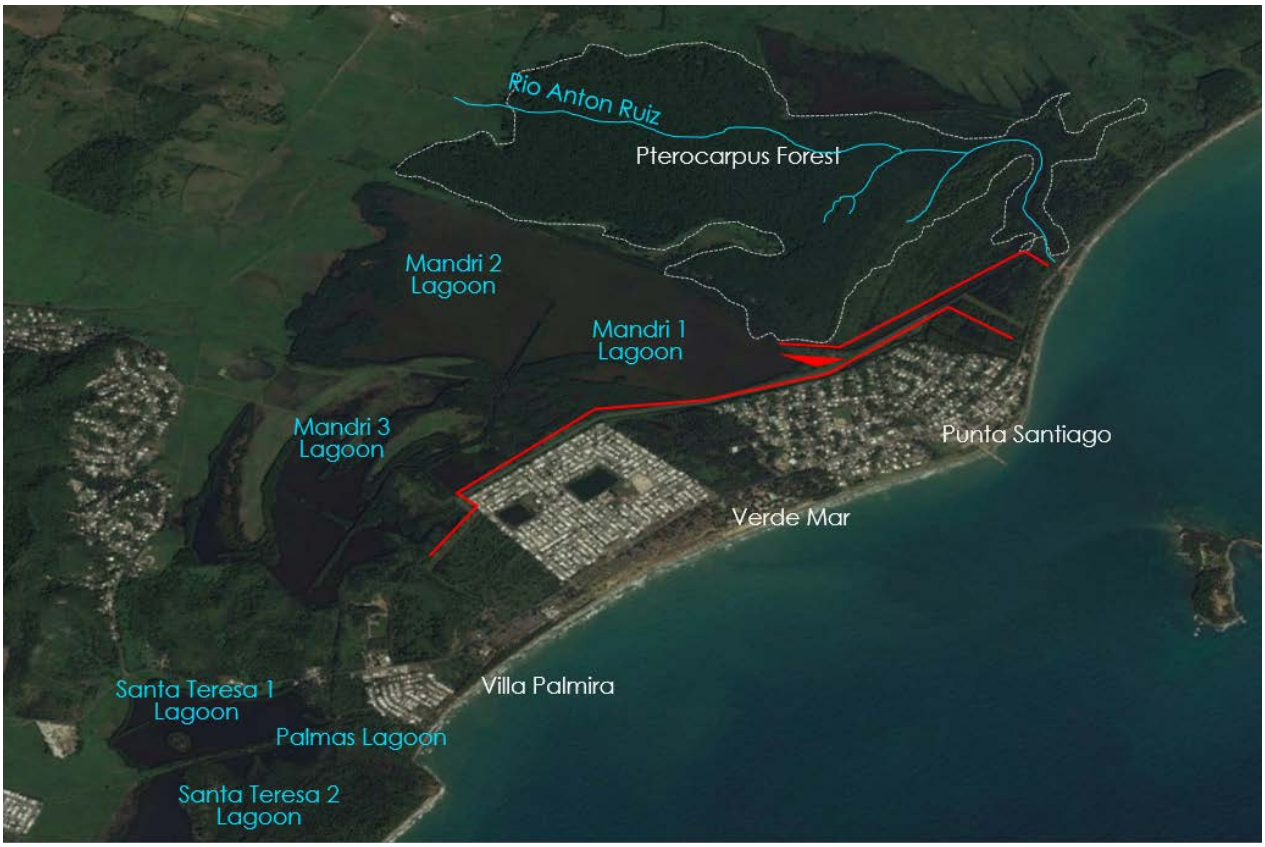

Figure 1-2: Map of project location.

1.4 STUDY PURPOSE AND NEED

Purpose

The purpose of the Río Antón Ruíz Restoration Project is to restore and preserve the Pterocarpus forest and the biodiversity of the freshwater fauna and flora within the HNR in Humacao, Puerto Rico. The HNR lagoon system, one of the largest remaining forested freshwater swamps in Puerto Rico, is dominated by approximately 371 acres of protected Pterocarpus trees.

In 2001, the USACE completed construction of the Río Antón Ruíz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended. The purpose of the Section 205 Flood Control Project was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. Historically, flooding occurred in these communities when runoff from the mountains within the watershed flowed into the HNR lagoon system and the Pterocarpus forest before reaching the Caribbean Sea. The authorized flood control project protects those communities from flooding with a levee, interior drainage canal, and diversion channel to the ocean. Since the completion of the authorized flood control project in 2001, the lagoon system and the Pterocarpus forest ecosystem have been negatively affected by high levels of salinity. Field observations indicate that a vast number of Pterocarpus trees on the north shore of the Río Antón Ruíz were exhibiting signs of environmental stress such as wilting, loss of foliage, and dry bark. Trunks and trees along the Boca Prieta channel have died as a result of the exposure to higher salinity levels. In addition to the damages to the Pterocarpus forest, there have been changes to the biodiversity of the lagoon system. For example, the Typha marsh (Cattail marsh) has been extirpated and replaced by mangroves, the freshwater aquatic species have been displaced by saltwater fish species such as common pompano, Atlantic tripletail, king mackerel, Atlantic Spadefish, and Tarpon. The submerged or emergent aquatic vegetation species are decreasing, which serve as food for several species of small fish and aquatic birds.

In a letter dated May 26, 2004 (Appendix F), the Department of Natural and Environmental Resources (DNER) notified the USACE that post completion of the 205 flood control project, salinity levels in the HNR lagoon system and Pterocarpus forest have substantially increased, up to 35 ppt. In order to preserve the HNR ecosystem, a series of temporary saltwater intrusion measures (SWIMs) were developed and constructed in 2007 under the authority of the original 205 flood control project and funded 100% by the non-federal sponsor (DNER). It was intended that the information gathered from implementing the temporary structures would aid in determining if a permanent solution would be warranted. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 ppt to below 10 ppt. The SWIMs were temporary impermeable plugs across the diversion channel near the lagoon and across the Río Antón Ruíz immediately upstream of the confluence with the diversion channel. The plugs consisted of heavy (high-density polyethylene and UV resistant) lift bag barriers and sandbags placed in the diversion channel and riverbed in water depths of 5 to 6 feet, and up to 10 feet, respectively. The plugs were armored with riprap on the upstream and downstream sides to resist damage during storm discharges. DNER salinity monitoring stations within the HNR system were used to monitor the salinity levels upon completion of the temporary SWIMs. After the installation of the SWIMs, salinity data gathered at the monitoring stations indicated that the initial target salinities below 10 ppt had been met. **Figure ES-4** shows the trend in salinity levels before and after installation of the SWIMs. Prior to installation of the SWIMs, the average salinity levels in Mandri 2 and 3 were 16 and 17 ppt, respectively. Salinity levels frequently exceeded 20 ppt, and only dipped below 10 ppt approximately 30% of the readings in five years. The graphic shows that after installation of the SWIMs in May 2007, the salinity levels in Mandri 2 and 3 remained consistently below 5.0 ppt to November 2008, at which point the

salinities began to increase slowly back to frequent levels above 20 ppt. As reported by DNER, the deterioration of the sandbag weirs was caused by boat propellers. This is attributed to the sandbags/plugs deteriorating over time and according to information provided by DNER, small boats used by fishermen have cut the SWIMs with their propellers while crossing. Regardless, the intended purpose of the SWIMs was temporary in nature to determine if they were an effective solution and if a permanent measure was warranted. The data showed the temporary plugs were successful in achieving the target salinity levels of 10 ppt or less.

Need

There is a need to initiate a permanent measure to restore and preserve the habitat of the Pterocarpus forest and biodiversity in the HNR. Although the temporary plugs were initially successful, salinity levels increased at most of the stations by the beginning of 2009 due to the deterioration of the sandbags/plugs over time. Therefore, the plugs have lost their effectiveness and allow saltwater intrusion into the HNR system. It should be noted that the plug deterioration was expected, eventually. The plugs were intended only as a temporary measure to lower the salinity levels while data was gathered to determine if the construction of permanent tidal exchange measures would be warranted.

1.5 PROJECTS AND PRIOR STUDIES* (BY AGENCY) IN THE VICINITY

1.5.1 SECTION 205 RÍO ANTÓN RUÍZ FLOOD CONTROL PROJECT (USACE)

The original authorized Río Antón Ruíz CAP Section 205 flood control project ("Río Antón Ruíz at Humacao, Puerto Rico, Final Detailed Project Report and Environmental Assessment, Section 205, Flood Control", dated October 1993) included a levee, interior drainage works, diversion channel, culverts, and wetland mitigation (see **Figure 1-3**). The project levee is approximately 11,870 feet long and protects communities along the coastline from the Standard Project Flood (SPF) originating from the upstream inland lagoon. A culvert passing through the levee embankment that drains into the diversion channel consists of three 6-ft diameter corrugated metal pipes with flap gates. This structure provides an additional outlet for the interior drainage system in the event that the existing Boca Prieta outlet is closed. The diversion channel conveys flows from the lagoon to the sea through the existing Río Antón Ruíz outlet. The Section 205 flood control project was completed in June 2001 and transferred to the non-federal sponsor, the DNER, in February 2003.

Figure 1-3: Map of Original 205 Flood Control Project

1.5.2 TEMPORARY SWIM PROJECT (USACE)

Salinity data from 1999 through 2001 indicates that the salinity levels at Mandri stations 2 and 3 were below 10 ppt prior to project completion. After completion of the project and connection of the diversion channel to the lagoon system, data gathered from 2004 through 2007 indicated that the salinity levels had more than tripled within the Mandri lagoons. The highest salinity level recorded was 35.2 ppt. Based on field inspections conducted by USACE staff, and the monitoring data provided by DNER, per a letter dated July 14, 2005, USACE agreed that ecosystem changes were evident in the vicinity of the Río Antón Ruíz Flood Control Project, likely due to construction of the diversion channel. In this letter, USACE suggested the investigation and implementation of temporary saltwater intrusion measures (SWIM) to lower the salinity levels and a study to assess the saline effects on the natural system. In order to preserve the Pterocarpus forest and some of the biodiversity of both the freshwater and saltwater fauna and flora, a study was conducted and a series of temporary saltwater intrusion measures were developed and constructed to limit the amount of saltwater effects on the lagoon system and the Pterocarpus forest. The temporary measures study was entitled "Río Antón Ruíz Flood Control Project, Temporary SWIMs, Humacao, Puerto Rico, November 11, 2011". The salinity information gathered by DNER after construction of the SWIMs would be used to determine their effectiveness, if additional studies would be required, and if the construction of permanent tidal exchange measures would be warranted. After installation of the SWIMs in 2007, data indicates that salinity levels at all the monitoring stations decreased and met the initial target (below 10 ppt). Salinity levels measured at the stations ranged from approximately 0.1 to 7.0 ppt. These levels could be attributed to the SWIMs, as well as rainfall events. However, at the end of 2008,

salinity levels increased at most of the stations, and in several monitoring events they exceeded 10 ppt concentrations. The salinity levels increased because the SWIM plugs (sandbags placed at the bottom of the channel, up to mean low water level) deteriorated mostly as a result of damage from small boats used by fishermen. The plugs have lost their effectiveness and allow saltwater intrusion into the lagoon system. A hydrographic survey performed in 2016 shows that they are essentially gone. It should be noted that the SWIMs deterioration was expected to eventually occur. SWIMs were intended only as a temporary measure to lower the salinity levels while data was gathered to determine if the construction of permanent tidal exchange measures would be warranted.

2 EXISTING AND FUTURE-WITHOUT-PROJECT CONDITIONS

This chapter describes the physical features (conditions), environmental resources (affected environment), and socio-economic environment that could be affected if none of the alternatives were implemented. This chapter, in conjunction with the description of the "no-action" alternative, forms the baseline conditions for determining the impacts of the proposed action and reasonable alternatives.

2.1 GENERAL SETTING*

This chapter describes the existing physical, natural, and economic environment in the study area within the Río Antón Ruíz 1135 CAP Project. This chapter provides both the existing conditions (a baseline) as well as a broad forecast of the future conditions for each main category.

Río Antón Ruíz is located in the Municipality of Humacao on the southeast coast of Puerto Rico (**Figure 1-1**). The project area includes a lagoon system and a Pterocarpus forest in the Humacao Natural Reserve (HNR). Six lagoons, encompassing approximately 615 acres (249 hectares), compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas (**Figure 1-2**). The Mandri lagoons and the low coastal floodplain serve as detention areas during floods. The coastal communities of Punta Santiago, Verde Mar, and Villa Palmira are the main populated areas within the watershed.

2.2 PHYSICAL ENVIRONMENT (CONDITIONS)*

This section describes the physical conditions that are relevant to the decision to be made. It does not describe the entire existing physical environment, but only that pertinent to forming the baseline conditions to determine the impacts of the proposed action and reasonable alternatives.

2.2.1 HYDROLOGY

EXISTING CONDITIONS

The hydrological analysis of the project area was developed with a limited amount of data. Using the U.S. Geological Survey (USGS) quadrangle topographic maps with a scale of 1 to 20,000, the drainage basin was delineated and subdivided into five sub-basins as shown in **Figure 2-1**.

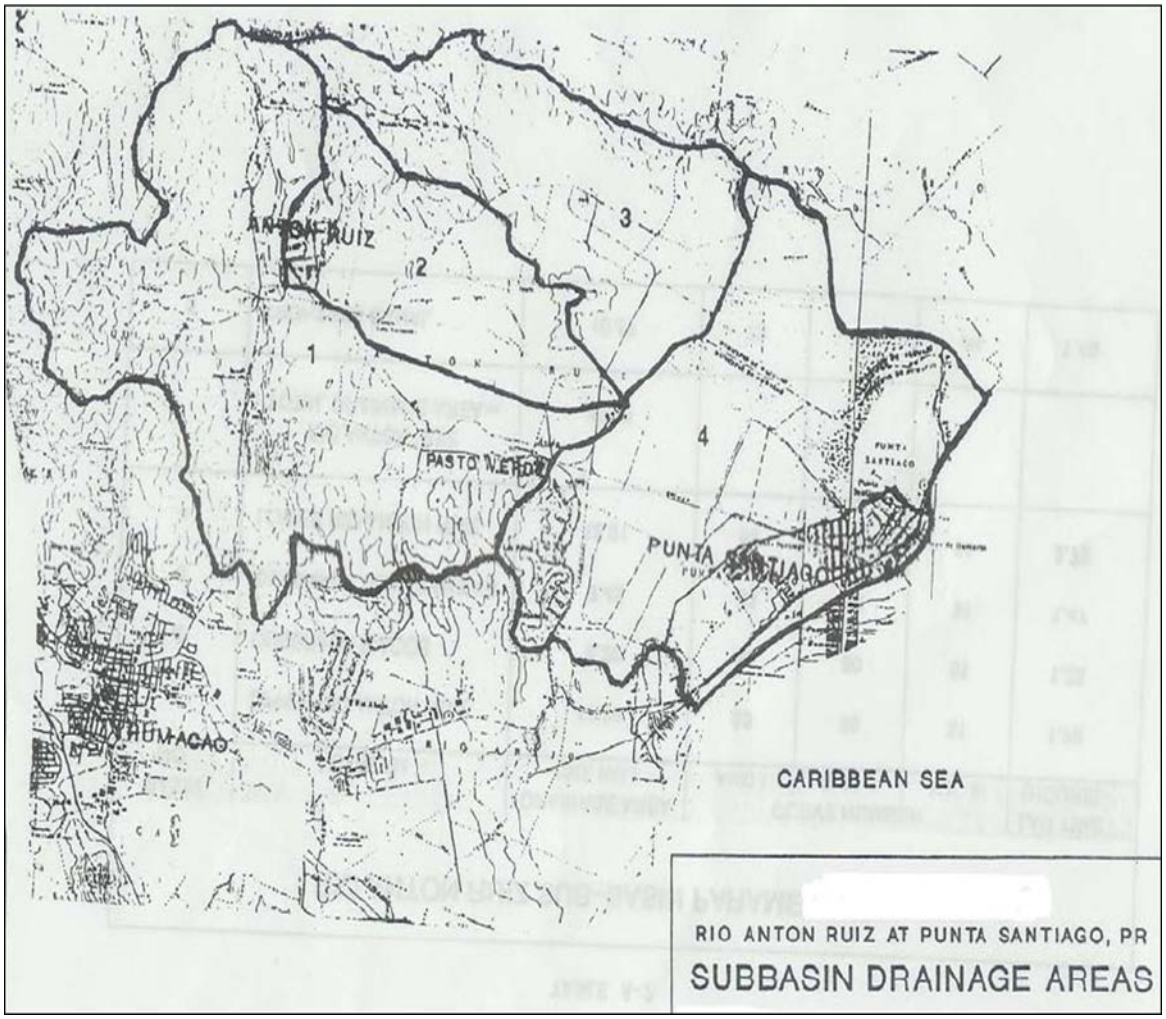

Figure 2-1: Sub-basin Drainage Areas (from 1993 Detailed Project Report)

The USGS operates several rain gages near the basin and the National Weather Service (NWS) Technical Paper No. 42 (TP-42) shows generalized estimates of rainfall depth-frequency data for the area. Contained in the report are isopluvial maps of precipitation contours for selected frequencies. **Table 2-1** shows the average point rainfalls that were developed for the study area after adjustments for aerial distribution were applied.

Table 2-1: Rainfall for Río Antón Ruíz Basin for various frequencies and duration.

Percent Chance Storm	Rainfall in mm						
	Duration in Hours						
	0.25	1	2	3	6	12	24
50	39	70	85	94	110	133	155
20	52	90	114	126	152	185	217
10	61	103	132	148	180	221	260
4	72	119	157	177	217	269	316
2	81	132	176	199	246	306	361
1	89	144	195	221	276	345	408
SPF	89	144	229	290	406	470	540

The Standard Project Storm (SPS) is defined as the most severe flood-producing rainfall depth-area-duration relationship and isohyetal pattern of any storm that is considered reasonably characteristic of the region. The Probable Maximum Precipitation (PMP) is defined as the greatest depth of precipitation for a given duration that is physically possible over the area of a given size storm at a particular geographic location at a certain time of the year. The SPS was assumed to be 50 percent of the PMP to determine the Standard Project Flood (SPF) for this project study.

The U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC) HEC-1 Flood Hydrograph Package computer program was used to calculate the runoff volumes and peak discharges for several frequencies. The HEC-1 computer package estimates surface runoff resulting from synthetic or observed storm events. The rainfall-runoff relationship for this study was computed using the Soil Conservation Service (SCS) curve number methodology. The SCS method calculates losses from curve numbers which are related to soil types, land uses, and antecedent moisture conditions. **Table 2-2** shows the parameters that were developed for each of the subbasins.

Table 2-2: Río Antón Ruíz Subbasin Parameters.

Subbasin No.	Drainage Area (km^2)	Curve Number			Lag Time (Hr)
		AMC I	AMC II	AMC III	
1	15.36	63	80	91	1.70
2	5.20	63	80	91	1.28
3	7.48	63	80	91	1.47
4	12.91	63	80	91	3.73
5	10.57	72	86	94	1.48

Note: Lag times were computed for each basin using the following Kirpich Formula:

$Lag = 0.0013L^{1.155} / H^{0.385}$

Where:
Lag = Lag time in hours
L = Length of basin in feet
H = Fall elevation of basin in feet

2.2.1.1 RÍO ANTÓN RUÍZ WATERSHED

The Río Antón Ruíz watershed is located on the eastern coast of Puerto Rico with the headwaters originating in the steep mountains near the El Yunque rainforest. The drainage area map is shown in **Figure 2-2**.

Rainfall will collect into steep mountain streams and then flow in a southeasterly direction across a flat coastal plain before flowing into the Mandri lagoons. There is a large forest that includes primarily freshwater flora such as the Pterocarpus, as well as certain species of mangroves located within the coastal plain adjacent to the Mandri lagoons. The Río Antón Ruíz and Boca Prieta channels are the only outlets for the Río Antón Ruíz drainage basin. The Mandri lagoons and the low coastal floodplain serve as detention areas during floods. The coastal communities of Punta Santiago, etc. are the main populated areas within the watershed.

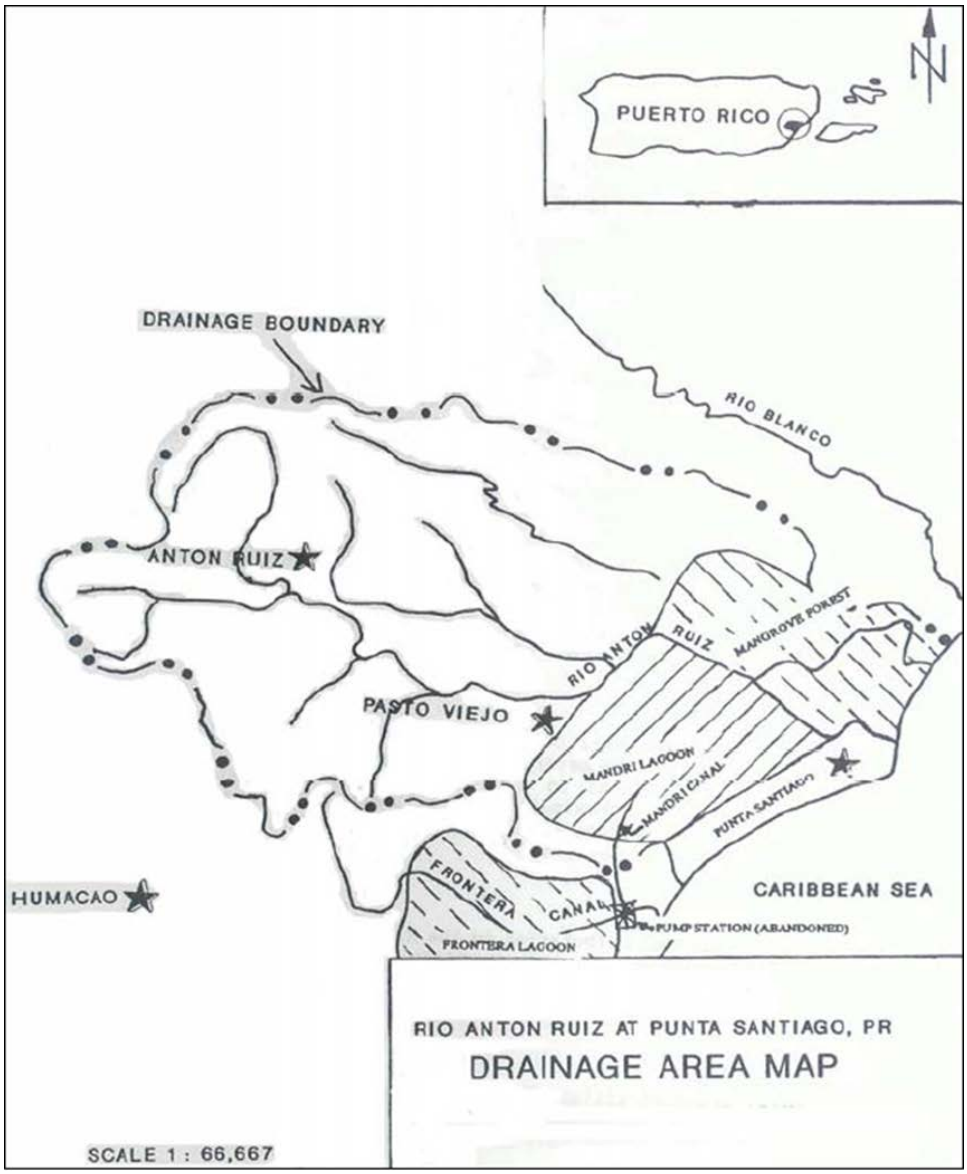

Figure 2-2: Drainage Area Map (from 1993 Detailed Project Report)

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Conditions in the physical environment for the hydrologic system will most likely continue to be the same in the future. Significant land use changes are not expected to occur within the life of the project, and, thus, the amount of sedimentation will likely continue at the current rate.

2.2.2 SEA LEVEL

EXISTING CONDITIONS

Over the next 100 years, it is possible that rising sea levels associated with climate change could have a dramatic impact on the project area. The magnitude of those impacts will depend on which of three projected trends adopted by the USACE occurs. **Figure 2-3** displays the low, intermediate, and high sea level range projections, graphic and tabular, relative to NOAA station 9755371 (San Juan, PR).

Estimated Relative Sea Level Change from 2016 To 2116
9755371, San Juan, PR
NOAA's Published Rate: 0.00541 feet/yr
All values are expressed in feet

Year	USACE Low	USACE Int	USACE High
2016	0.00	0.00	0.00
2020	0.02	0.04	0.10
2025	0.05	0.09	0.24
2030	0.08	0.15	0.40
2035	0.10	0.22	0.57
2040	0.13	0.28	0.77
2045	0.16	0.36	0.99
2050	0.18	0.43	1.22
2055	0.21	0.51	1.47
2060	0.24	0.60	1.74
2065	0.27	0.69	2.03
2070	0.29	0.78	2.33
2075	0.32	0.88	2.66
2080	0.35	0.98	3.00
2085	0.37	1.09	3.37
2090	0.40	1.20	3.75
2095	0.43	1.32	4.15
2100	0.46	1.44	4.57
2105	0.48	1.57	5.00
2110	0.51	1.70	5.46
2115	0.54	1.83	5.93
2116	0.54	1.86	6.03

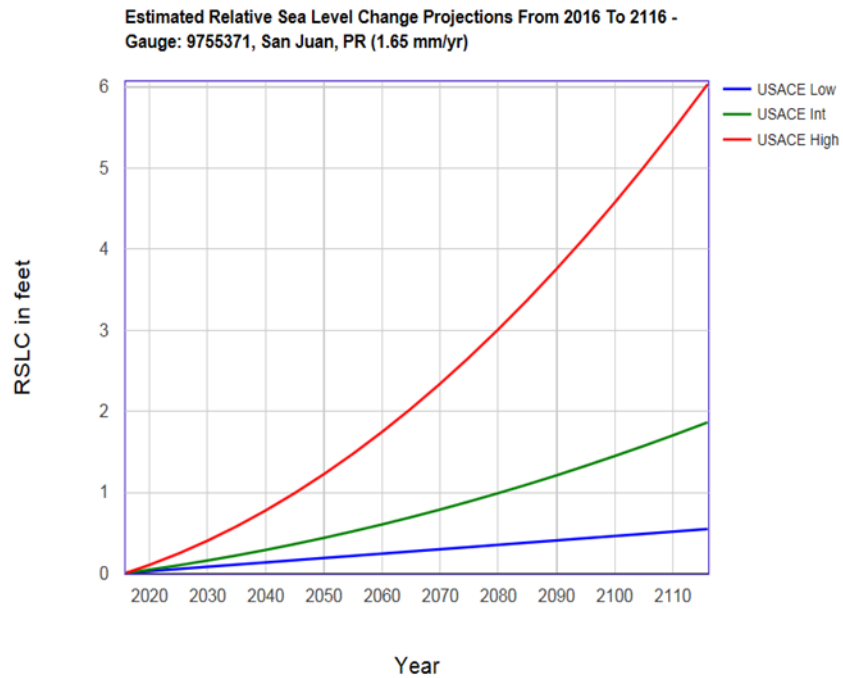

Figure 2-3: Relative Sea Level Change Projection (retrieved from http://corpsclimate.us)

Based on sea level projections, it is anticipated that within 50 years, sea level rise will be approximately 0.3 feet for the low rate, 0.8 feet for the intermediate rate, and 2 feet for the high rate. Within 100 years, the sea level rise will be approximately 0.5 feet for the low and up to 6 feet for the high rate. The project is designed to be able to be adapted to sea level rise as needed. To mitigate for anticipated sea level rise, the permanent SWIM weirs shall be constructed such that additional height can be added uniformly across the entire length of the respective weir via additional concrete or weir boards bolted on. This feature shall ensure the project functions as designed both under existing and future sea level conditions. The adaptive management that would be required for any future sea level rise would be the sponsor's responsibility. The project can adapt to the low and intermediate rates of rise for the 50 year projection, and still serve as an effective saltwater intrusion measure. The high rates of rise are high enough that waters would begin to flank the channel banks and protected areas, reducing both the saltwater intrusion and flood reduction benefits. For further details reference Appendix A, Section 3.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Sea level is projected to rise approximately 0.29 feet within the 50 year project horizon following the low relative sea level change projection. Although sea level will negatively affect many species, with or without project implementation, the species that would benefit from project conditions would likely experience mass mortality without completion of this project.

2.2.3 CLIMATE

EXISTING CONDITIONS

The climate of Puerto Rico is tropical marine; warm temperatures with little variation, steady ocean breezes, and abundant rainfall result from a constant high level of solar radiation, the presence of trade winds from the northeast, and the mountainous topography of the island. The average temperature in the Humacao area ranges between a maximum of 86° F and a minimum of 69.8° F. The average annual temperature is 77° F (USACE 1993).

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Climate conditions will likely continue to be the same in the near future; however, over the coming decades, temperatures will continue to rise, which could cause an increase in the amount of rainfall and the frequency of high temperature days (USEPA 2016). For further details reference Appendix A, Section 3.

2.3 NATURAL ENVIRONMENT (AFFECTED ENVIRONMENT)*

This section describes the environmental resources that are relevant to the decision to be made. It does not describe the entire existing environment, but only those environmental resources that would affect, or that would be affected by, the alternatives if they were implemented.

2.3.1 VEGETATION

EXISTING CONDITIONS

The HNR lagoon system is one of the largest remaining forested freshwater swamps in Puerto Rico and is dominated by approximately 371 acres of protected Pterocarpus trees. The *Pterocarpus officinalis* stand located in the HNR is the largest known stand of its type in Puerto Rico. According to the USDA's Natural Resource Conservation Service plant database, *Pterocarpus officinalis* is not located anywhere in the United States except for Puerto Rico (USDA 2016). The HNR was established in the 1970s when the Puerto Rico Planning Board commissioned a scientific reconnaissance of the area to determine areas for consideration as a candidate for preservation. This area was selected because the freshwater swamp *Pterocarpus officinalis* forest was the best developed stand and is also in near-virgin state at its center (NOAA 1986). In addition to the Pterocarpus forest, Typha marsh and submerged and emergent freshwater aquatic vegetation are also present in the lagoon system.

Following the completion of the 2001 construction of the Río Antón Ruíz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended, the DNER notified USACE in a letter dated May 26, 2004 that salinity levels in the HNR lagoon system and Pterocarpus forest had substantially increased. Field observations indicated that the lagoon system and Pterocarpus forest ecosystem have been adversely affected by high levels of salinity. Pterocarpus trees exhibit signs of environmental stress such as wilting, loss of foliage, and dry bark. Trunks and trees along the Boca Prieta channel have died as a result of the exposure to higher salinity levels. In addition to the damages to the Pterocarpus forest, the Typha marsh has been extirpated and replaced by mangroves. Although there are no historic surveys or quantifiable data of submerged and emergent freshwater aquatic vegetation species, the presence of these species is decreasing.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Without implementation of the project, saltwater intrusion will continue to promote a marine environment within the lagoon system. No recovery of the Pterocarpus forest, Typha marsh, or submerged and emergent freshwater aquatic vegetation would occur. It is anticipated that eventually all remaining freshwater vegetation, Typha marsh, and Pterocarpus forest would die off and be overtaken by saltwater species, such as mangroves. The loss of this vegetation would detrimentally impact the HNR's overall biodiversity and ecosystem.

2.3.2 FISH AND WILDLIFE RESOURCES (OTHER THAN THREATENED AND ENDANGERED SPECIES)

EXISTING CONDITIONS

The freshwater biological communities in the project area must cope with the saltwater intrusion. Degradation from the loss of freshwater habitat has likely caused a decline in the number of freshwater species present in the habitat, which can impact life cycles, community structures, population densities, and the overall biodiversity of fauna located in the lagoon system. In addition, the Pterocarpus forest provides critical nesting habitat for the locally endangered West Indian whistling duck. Other locally endangered species include white-cheeked pintail, Caribbean coot, ruddy duck, and the peregrine falcon. All of these species appear to be nesting and feeding in the HNR.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Failure to preserve the freshwater and saltwater biodiversity in the lagoon system would lead to impacts on locally endangered bird nesting and foraging habitat. Continued saltwater intrusion will promote a marine environment within the lagoon system, which would eventually lead to the complete loss of freshwater systems and species and ultimately less biodiversity in the HNR. Loss of the HNR Pterocarpus forest would reduce the amount of critical nesting habitat available for the West Indian whistling duck.

2.3.3 THREATENED, ENDANGERED, AND PROTECTED SPECIES

EXISTING CONDITIONS

Based on preliminary coordination, USACE believes that the following species have the potential to be in or near the project area and thus must be considered as part of the design and construction:

- Puerto Rican Boa (*Epicrates inornatus*)
- Antillean Manatee (*Trichechus manatus*)
- Loggerhead Sea Turtle (*Caretta caretta*)
- Green Sea Turtle (*Chelonia mydas*)
- Hawksbill Sea Turtle (*Eretmochelys imbricata*)
- Leatherback Sea Turtle (*Dermochelys coriacea*)
- Nassau Grouper (*Epinephelus striatus*)
- Scalloped Hammerhead Shark (*Sphyrna lewini*)
- Pillar Coral (*Dendrogyra cylindrus*)
- Rough Cactus Coral (*Mycetophyllia ferox*)
- Lobed Star Coral (*Orbicella annularis*)
- Mountainous Star Coral (*Orbicella faveolata*)
- Boulder Star Coral (*Orbicella franksi*)
- Elkhorn Coral (*Acropora palmata*)
- Staghorn Coral (*Acropora cervicornis*)
- Migratory Birds

Puerto Rican Boa (*Epicrates inornatus*)
The Puerto Rican boa was listed as endangered in 1970 (35 FR 13519). It is the largest snake in Puerto Rico, averaging a length of 6 ½ feet. The color can be variable but typically ranges dark browns, grays, and blacks with a series of spots or black bars and a blackish belly. This boa is unique to Puerto Rico and is widespread in its distribution across the island. The species is abundant in protected and inaccessible areas. It can be found in a variety of habitats and is arboreal and terrestrial. Sub-adults and adults' diet consists of birds, small mammals, and lizards. The Puerto Rican boa is non-poisonous and generally harmless unless provoked.

Antillean Manatee (*Trichechus manatus manatus*)
The Antillean manatee is a subspecies of the West Indian manatee (*Trichechus manatus*). The manatee is a large, plant-eating aquatic mammal that move between freshwater and saltwater environments. They can be found throughout the southeastern United States and in the Caribbean in shallow coastal waters, rivers, and springs. Adult manatees are approximately 10 feet long, weighing between 800 – 1200 pounds, and consume approximately 4-9% of their body weight each day. Although manatees feed underwater, they frequently rest just below the water surface with only the snout above water. Manatees were listed as endangered throughout its range for both the Florida and Antillean subspecies (*Trichechus manatus latirostris* and *Trichechus manatus manatus*) in 1967 (32 FR 4001).

Loggerhead Sea Turtle (*Caretta caretta*)
Loggerhead sea turtles inhabit the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Females select high energy beaches on barrier strands adjacent to continental land masses for nesting. Steeply sloped beaches with gradually sloped offshore approaches are favored. After leaving the beach, hatchlings swim directly offshore and eventually are found along drift lines. They migrate to the near-shore and estuarine waters along the continental margins and utilize those areas as the developmental habitat for the sub-adult stage. Loggerheads are predators of benthic invertebrates.

Green Sea Turtle (*Chelonia mydas*)
The green sea turtle weighs approximately 150 kg and lives in tropical and sub-tropical waters. Green turtles occupy three habitat types: high energy oceanic beaches, convergence zones in the pelagic habitat, and benthic feeding grounds in the relatively shallow, protected waters. Females deposit eggs on high energy beaches, usually on islands, where a deep nest cavity can be dug above the high water line. Hatchlings leave the beach and move in the open ocean. Green sea turtles forage in pastures of seagrasses and/or algae, but small green turtles can also be found over coral reefs, worm reefs, and rocky bottoms.

Hawksbill Sea Turtle (*Eretmochelys imbricata*)
The hawksbill sea turtle is a small to medium-sized marine turtle weighing up to 15 kilograms in the United States. The hawksbill lives in tropical and sub-tropical waters of the Atlantic, Pacific, and Indian Oceans. Hawksbill turtles use different habitat types at different stages of their life cycle. Post hatchlings take shelter in weed lines that accumulate at convergence zones. Coral reefs are the foraging habitat of juveniles, sub-adults, and adults. They are also known to inhabit mangrove-fringed bays and estuaries, particularly along the eastern shore where coral reefs are absent. Hawksbills feed predominantly on

sponges and nest on low and high energy beaches, frequently sharing the high-energy beaches with green sea turtles. Nests are typically placed under vegetation.

Leatherback Sea Turtle (*Dermochelys coriacea*)
The leatherback sea turtle is the largest living turtle and weighs up to 700 kg. The leatherback lives in tropical and sub-tropical waters. Habitat requirements for juvenile and post-hatchling leatherbacks are virtually unknown. Nesting females prefer high-energy beaches with deep unobstructed access. Leatherbacks feed primarily on jellyfish.

Nassau Grouper (*Epinephelus striatus*)
Nassau grouper was listed as threatened in 2016 (81 FR 42268). It is a top predator in reef systems and is slow growing and long lived. Although considered a reef fish, it transitions through a series of ontogenetic shifts of both habitat and diet. Juveniles are found in nearshore, shallow waters whereas adults are most abundant on high relief coral reefs or rocky substrate in clear water. Both adults and juveniles will use natural or artificial reefs. Nassau grouper reproduce during annual aggregations in which large numbers will collectively spawn (NMFS 2013).

Scalloped Hammerhead Shark (*Sphyrna lewini*)
Four distinct population segments (DPS) of the scalloped hammerhead shark were listed in July 2014. The Eastern Atlantic DPS and Eastern Pacific DPS were listed as endangered. The Central and Southwest Atlantic DPS and Indo-West Pacific DPS were listed as threatened. The scalloped hammerhead shark is a coastal pelagic species that typically resides in coastal warm temperate and tropical seas and feeds on crustaceans, cephalopods, and rays. Adult aggregations are common at seamounts, but otherwise adults are generally found alone or in pairs.

Pillar Coral (*Dendrogyra cylindrus*)
Pillar coral was listed as threatened in 2014 (79 FR 67356). It is tan colored with tentacles that are often exposed during daylight giving a fur light appearance over a skeleton that looks similar to brain coral. Sexual reproduction occurs via broadcast spawning of gametes into the water column in mid-August. Pillar coral can be found in warm marine environments throughout the Caribbean Sea and subtropical and tropical West Atlantic Ocean. Similar to other corals, populations have collapsed throughout their range from disease outbreaks with losses compounded locally by hurricanes, increased predation, bleaching, elevated temperatures, and other factors. Although this coral is located within the region, it is not present within the project footprint and is not likely present within the action area.

Rough Cactus Coral (*Mycetophyllia ferox*)
Rough cactus coral was listed as threatened in 2014 (79 FR 67356). This species occurs in the Caribbean, southern Gulf of Mexico, Florida, and the Bahamas. The corals are most commonly found in fore reef environments but can also occur in deeper habitats and lagoons. Similar to other corals, populations have collapsed throughout their range from disease outbreaks with losses compounded locally by hurricanes, increased predation, bleaching, elevated temperatures, and other factors. Although this coral is located within the region, it is not present within the project footprint and is not likely present within the action area.

Lobed Star Coral (*Orbicella annularis*), Mountainous Star Coral (*Orbicella faveolata*), and Boulder Star Coral (*Orbicella franksi*)

Lobed star coral, mountainous star coral, and boulder star coral were listed as threatened in 2014 (79 FR 67356). *O. faveolata* and *O. franksi* were previously included in *O. annularis.* Most studies prior to 1994 do not distinguish between the three species clearly. The corals occur in the Caribbean, Gulf of Mexico, Florida, and the Bahamas. It is thought these corals could be present in Bermuda as well. *O. annularis* is a common species in fore reef environments, especially in semi-protected reefs, lagoons, and upper reef slopes. *O. faveolata* is found in backreef fore reef environments and is also abundant in fore reef environments between 10-20m. *O. franksi* is most abundant from 15-30m in fore reef environments. Similar to other corals, populations have collapsed throughout their range from disease outbreaks with losses compounded locally by hurricanes, increased predation, bleaching, elevated temperatures, and other factors. Although this coral is located within the region, it is not present within the project footprint and is not likely present within the action area.

Elkhorn Coral (*Acropora palmata*)
Elkhorn coral is a large, branching coral with thick and sturdy antler-like branches. The dominant mode of reproduction is asexual, with new colonies forming when branches break off of a colony and reattach to the substrate. Sexual reproduction occurs via broadcast spawning of gametes into the water column once each year in August or September. Since 1980, populations have collapsed throughout their range from disease outbreaks with losses compounded locally by hurricanes, increased predation, bleaching, elevated temperatures, and other factors. Although this coral is located within the region, it is not present within the project footprint and is not likely present within the action area.

Staghorn Coral (*Acropora cervicornis*)
Staghorn coral is a branching coral with cylindrical branches ranging from a few centimeters to over 6.5 feet (2 m) in length. The dominant mode of reproduction for staghorn coral is asexual fragmentation, with new colonies forming when branches break off a colony and attach to the substrate. Sexual reproduction occurs via broadcast spawning of gametes into the water column once each year in August or September. Staghorn coral occur in back reef and fore reef environments from 0-98 feet (0-30 m) deep. The upper limit is defined by wave forces, and the lower limit is controlled by suspended sediments and light availability. Staghorn coral is found throughout the Florida Keys, the Bahamas, and the Caribbean islands. This coral occurs in the western Gulf of Mexico, but is absent from U.S. waters in the Gulf of Mexico. It also occurs in Bermuda and the west coast of South America. The greatest source of region-wide mortality for staghorn coral has been disease outbreaks, mainly of white band disease. Other, more localized losses have been caused hurricanes, increased predation, bleaching, algae overgrowth, human impacts, and other factors. This species is also particularly susceptible to damage from sedimentation and is sensitive to temperature and salinity variation. Although this coral is located within the region, it is not present within the project footprint and is not likely present within the action area.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)
Failure to reduce the salinity in the lagoon system could lead to impacts on the flora and fauna within the ecosystem. The continued saltwater intrusion will promote a marine environment within the lagoon system. Eventual loss of the freshwater systems and species would ultimately impact the overall biodiversity in the HNR. Less foraging, nesting, and resting opportunities could make the lagoon system less enticing for listed species.

2.3.4 ESSENTIAL FISH HABITAT (EFH)

EXISTING CONDITIONS

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires Federal agencies to consult with NMFS on activities that may affect Essential Fish Habitat (EFH). This report and integrated EA is prepared consistent with guidance provided by the NMFS Southeast Regional Office to USACE, Jacksonville District, regarding coordinating EFH consultation requirements with NEPA (NMFS 1999a). EFH is defined in the Magnuson-Stevens Act as "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The rules promulgated by the NMFS in 2002 further clarify EFH with the following definitions:

- Waters – aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate;
- Substrate – sediment, hard bottom, structures underlying the waters, and associated biological communities;
- Necessary – the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and
- Spawning, breeding, feeding, or growth to maturity – stages representing a species' full life cycles (50 CFR Part 600; NMFS, 2002).

Components of waters, substrate, and necessity, as defined above, exist in the project area for various stages of fish species life cycles. The entire watered portion of the project area is considered as EFH under the above definition. Corals, coral reefs, seagrasses, and hard bottoms are designated as a Habitat Area of Particular Concern (HAPC), which is a subset of EFH that is either rare, particularly susceptible to human-induced degradation, especially important ecologically, or located in an environmentally stressed area. In light of their designation as HAPC, and Executive Order 13089, NMFS applies greater scrutiny to projects affecting corals and seagrasses to ensure practicable measures to avoid and minimize adverse effects to these habitats are fully explored. Although there are no corals, coral reefs, or hard bottoms currently present in the project area, seven federally listed species of coral are present within the region. The seven listed corals are included in Section 7 ESA coordination with NMFS. Coordination documents can be found in Appendix D-1 (Environmental Coordination).

Research conducted in the HNR indicates that salinity is the most significant influence on the distribution and abundance of fish in the lagoon system, with the largest amount of fish reaching the lagoons through the Río Antón Ruíz River (Reserva Natural de Humacao, 2015). Results from experimental studies conducted since 2005 by HNR personnel show an increase in saltwater fish species and a decrease in freshwater fish species. Species lists for 2014 through 2016 were provided by HNR staff and are included in Appendix D-7 (Humacao Natural Reserve 2014-2016 Fish Lists).

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

With no action taken, the ongoing degradation of viable freshwater benthic habitat would continue. Freshwater fish would likely leave the area to escape and avoid the environmental stress of high salinity and saltwater fish would likely naturally recruit and dominate the lagoon.

2.3.5 AIR QUALITY

EXISTING CONDITIONS

The Clean Air Act (CAA), as amended, requires Federal actions to conform to an approved state implementation plan (SIP) designed to achieve or maintain an attainment designation for air pollutants as defined by the National Ambient Air Quality Standard (NAAQS). The NAAQS were designed to protect public health and welfare. The criteria pollutants include carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter ($PM_{2.5}$ and PM_{10}), VOC, and lead (Pb). The General

Conformity Rule (40 CFR Parts 51 and 93) implements these requirements for actions occurring in air quality nonattainment areas.

The project is located in the Air Quality Control Region (AQCR) known as Puerto Rico AQCR (40 CFR 81.77). The project area is in attainment for all the NAAQS.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Air quality conditions would remain the same if the Recommended Plan is not implemented.

2.3.6 WATER QUALITY

EXISTING CONDITIONS

As discussed below, monitoring of salinity in the area around Río Antón Ruíz has been conducted in association with conservation of the freshwater wetland hardwood forest, largely comprised of *Pterocarpus officinalis,* in the HNR. There is concern that the adjacent diversion canal, which was completed in 2001 to provide flood control for the Town of Punta Santiago, may influence the freshwater regime in the area. Therefore, the objective of this project is to better protect the freshwater system in and around the Mandri Lagoon by reducing the potential of oceanic saltwater intrusion into the system through construction of underwater partitions. These would function to inhibit the saline wedge in the lower part of the water column from moving upstream into the freshwater dominant system.

Salinity

The dominant influence on the freshwater and salinity regime in the lagoon area is from upland/upstream freshwater flows (Colon-Rivera, et al., 2014). Other controlling factors on the salinity within the lagoon include the Rio Anton Outlet (Weston, et al., 2009). To address concerns about saltwater intrusion into the system, saltwater intrusion control measures (SWIM) were undertaken and completed in 2007, which included installation of two temporary SWIM plugs, which were comprised of large lift bag barriers and riprap armoring for protection of the bags during period of high flow rates. The monitoring that was conducted as part of the SWIM plugs indicate that they were successful at significantly reducing salinity to less than 5 parts per thousand (Weston, et al., 2009). Based on the positive outcome of the SWIM plugs, it was determined that a permanent partitions would be a desirable solution for conserving the natural reserve.

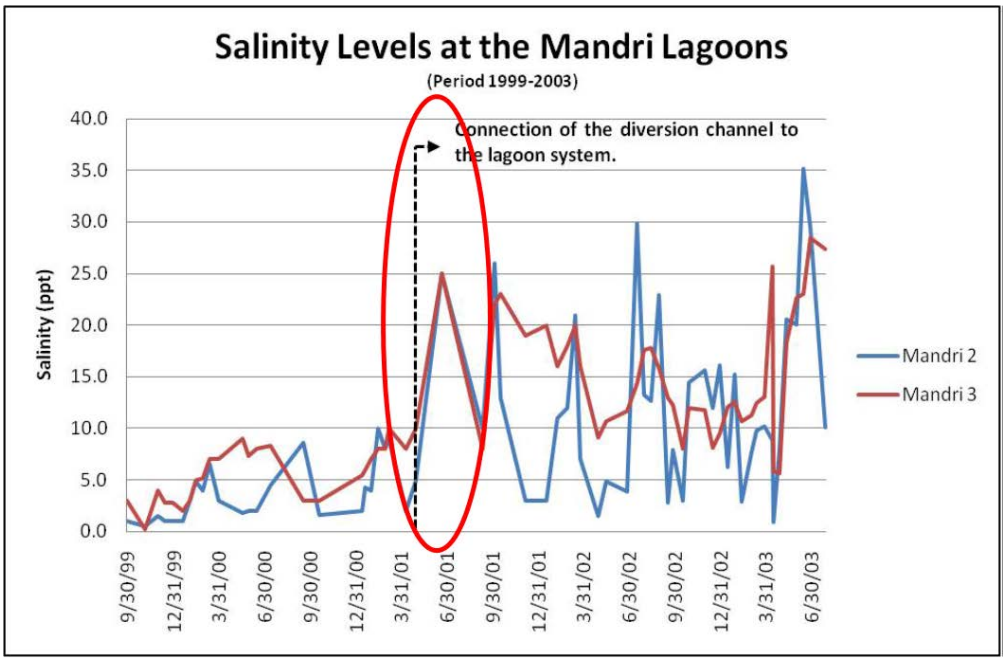

Figure 2-4: Salinity Levels at the Mandri Lagoons Post original 205 Construction

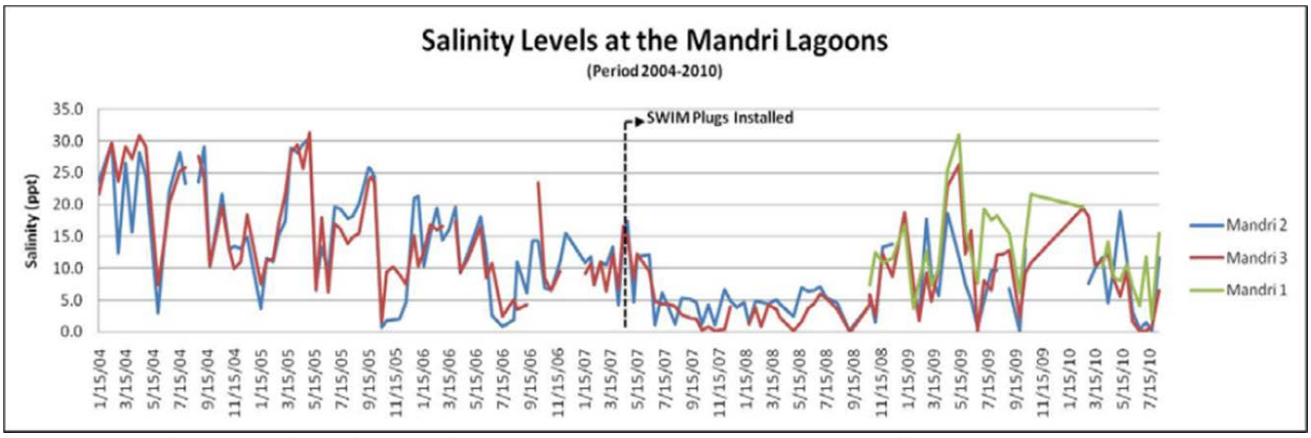

Figure 2-5: Salinity Levels at the Mandri Lagoons Post SWIM structure installation

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Water quality conditions would remain the same if the Recommended Plan is not implemented.

2.3.7 NOISE

EXISTING CONDITIONS

Noise in the Río Antón Ruíz project area is created by sources commonly found in natural and human environments. Natural sources of ambient noise include weather, e.g. rain and thunder, etc., waves and surf, and wildlife. Anthropogenic noise could include commercial and residential vehicles and vessels. The underwater acoustic environment is likely dominated by noise from vessels traversing the lagoon, however natural sources such as weather, water movement, and wildlife would also contribute to underwater ambient noise.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Noise levels in the project area would likely remain the same if the Recommended Plan is not implemented.

2.3.8 CULTURAL RESOURCES

EXISTING CONDITIONS

The current project is situated within the original Section 205 Río Antón Ruíz Flood Control project. Archaeological sites HU-6 and HU-7 existed within the project right-of-way and were impacted as a result of construction activities associated with the creation of the original project. Sites HU-6 and HU-7 are small Ostionoid-period (ca. A.D. 600 – 1200) villages that are located within 500 meters of each other. Both sites consist of moderately dense archaeological deposits likely resulting from small year-round household occupations. In 1999, mitigation in the form of data recovery was utilized to avoid adverse effects to the project. The data recovery resulted in the following report: *Archaeological Data Recovery at Sites HU-6 and HU-7, Río Antón Ruíz Flood Control Project, Municipio de Humacao, Puerto Rico* by New South Associates.

The mitigation associated with the project utilized a section of 36 CFR 800 whereby the project was able to avoid a no adverse effect determination by mitigating the effects in advance of the undertaking. The section of 36 CFR 800 which allowed for a mitigated "No Effect" determination was removed in the 2004 update of 36 CFR 800 and no longer exists in the current implementing regulations. While mitigation was provided for the effects to sites HU-6 and HU-7 associated with the original project, no new determination in eligibility was made even though significant portions of the site have been completely removed as a result of the original construction project. If portions of the site do remain, then under the previous version of the regulations they remain eligible for inclusion in the National Register of Historic Places (NRHP).

The current project and design features fall within the edge of HU-6. While a significant portion of the site was removed during the data recovery and construction of the original project, cultural materials may still exist within the periphery of the site. Additional consultation and cultural resources survey will be required to clarify the issues and determine if HU-6 remains eligible for inclusion in the NRHP.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The future-without-project condition will have no effect on resources eligible for inclusion on the NRHP. Mitigation conducted in 1999 still suffices to mitigate any currently existing project effects.

2.3.9 AESTHETIC AND RECREATION RESOURCES

EXISTING CONDITIONS

The project is located in the Humacao Natural Reserve (HNR). The HNR was established in the 1970s when the Puerto Rico Planning Board commissioned a scientific reconnaissance of the area for consideration as a candidate for preservation. This area was selected because the freshwater *Pterocarpus officinalis* forest was the best developed stand and in near-virgin state at its center. Originally established primarily for research and education purposes, the HNR has grown to include ecotourism and recreation with trails through the reserve, guided tours, and rentals for kayaks, paddle boats, paddleboards, and bicycles. The Department of Natural and Environmental Resources (DNER) administers the reserve in collaboration with

INECOH (Ecotourism Initiative of Humacao), which is directed towards the promotion of ecotourism in the HNR and the economic growth of the community.

Figure 2-6: Ecotourism within the HNR

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

The future without-project conditions will likely have no effect on the recreation resources, however, the aesthetic features of the forest will change as the *Pterocarpus officinalis* stand is exposed to continually high levels of salinity. It is likely that the *Pterocarpus officinalis* stand would eventually die off and mangroves would naturally recruit.

2.4 SOCIO-ECONOMIC ENVIRONMENT

2.4.1 LOCAL ECONOMY AND DEMOGRAPHICS

EXISTING CONDITIONS

The Municipality of Humacao is located on the eastern coast of Puerto Rico about 34 miles from the San Juan Metropolitan Area. The municipality, officially established in 1793, covers an area of 44.84 square miles.

Data collected in the U.S. Census Bureau's 2011-2015 American Community Survey 5-Year Estimates (covering January 1, 2011 through December 31, 2015) for Puerto Rico as a whole is used here to describe the Municipality of Humacao and Census Tract 1801 (representative of the study area) and the social and economic characteristics in the geographic areas relevant to the current study. Over this time period,

Puerto Rico's population was around 3.5 million people, with the Municipality of Humacao accounting for approximately 56,000 people. Within the municipality, the study area is best represented by Census Tract 1801, home to around 5,500 of the island's inhabitants.

As shown below in **Table 2-3**, the average per capita income near the study area is $8,837, which is lower than that reported in both the Municipality of Humacao and across Puerto Rico as a whole. Note that the median family income in Tract 1801 is also below the median income of families in both the municipality and throughout the island.

Table 2-3: Income Comparison

Location	Median Family Income	Per Capita Income
Puerto Rico	$ 22,976	$ 11,394
Humacao	$ 22,165	$ 10,678
Tract 1801 (study area)	$ 20,472	$ 8,837

The unemployment rate in the study area was approximately 23% over the period from 2011-2015, compared to approximately 14% in the Municipality of Humacao and 18% in Puerto Rico overall. Additionally, over 44% of the population surrounding the study area was considered to be below the poverty line, while around 45% of both the Municipality of Humacao's population and Puerto Rico's total population falls into this category.

In terms of economic activity, the top three industries employing workers in the Municipality of Humacao between 2011 and 2015 were (1) educational services, health care, and social assistance, (2) manufacturing, and (3) retail trade. Other industries of note included professional services, recreation, and accommodation and food services.

Specific to the proposed project area, the HNR includes ecotourism and recreation; offering trails through the reserve, guided tours, and rentals for kayaks, paddle boats, paddleboards, and bicycles. The DNER administers the reserve in collaboration with INECOH (Ecotourism Initiative of Humacao), which is directed towards the promotion of ecotourism in the Humacao Natural Reserve and the economic growth of the community.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

Current population projections for Puerto Rico from the United Nations Department of Economic and Social Affairs Population Division indicate that the island's population is likely to remain similar to the 2015 population of approximately 3.5 million people, or to decline slightly through 2050 (https://esa.un.org/unpd/wpp/Graphs/DemographicProfiles/).

2.4.2 LAND USE

EXISTING CONDITIONS

Within the study area, the Humacao Natural Reserve covers 1,046 acres and is currently composed of deteriorating Pterocarpus trees, saltwater lagoons, and mangroves.

FUTURE-WITHOUT-PROJECT CONDITIONS (NO ACTION ALTERNATIVE)

If no project is implemented, the Humacao Natural Reserve is expected to remain, but the composition of the area will likely convert from freshwater flora and fauna to mangroves and saltwater lagoons.

3 PLAN FORMULATION

3.1 PROBLEMS AND OPPORTUNITIES*

A problem is an existing undesirable condition to be changed. An opportunity is a chance to create a future condition that is desirable.

The purpose of this feasibility study is to develop an implementable and acceptable plan to change the future conditions and to address specific problems and opportunities in the study area.

3.1.1 PROBLEMS

Existing problems in the study area include:

- Increased salinity levels as a result of the 2001 Río Antón Ruíz Flood Control project have adversely impacted the HNR Pterocarpus forest, lagoon system, and associated Typha marsh.

3.1.2 OPPORTUNITIES

Opportunities are positive conditions in the study area that may result from implementation of a Federal project such as:

- The reduction of salinity levels in the HNR by installing permanent measures to improve habitat for the Pterocarpus trees.
    - Such reduction of salinity levels may support freshwater aquatic vegetation growth in the ecosystem, improve the habitat for desirable freshwater fauna.
- Natural reduction of the saltwater mangroves on the northern perimeter of the Mandri 1 and 2 lagoons will increase the available habitat for Pterocarpus trees.

3.2 CONSTRAINTS

3.2.1 PLANNING CONSTRAINTS

A constraint limits the extent of the planning process. It is a statement of things or situations the alternative plans should avoid. Constraints are designed to avoid undesirable changes between the future without and with-project conditions. The planning constraints relative to this study are:

1. Avoid induced flooding of adjacent properties within the study area and impacts to the 205 flood control project.
2. Avoid or minimize impacts to environmental resources within the study area.
3. Avoid or minimize impacts to significant cultural resources that may exist within the project area

3.2.2 LOCAL CONSTRAINTS

Local and state laws do not constrain National Ecosystem Restoration (NER) formulation . However, they may be considered in the selection of a Locally Preferred Plan (LPP). At this time, there is no LPP. The sponsor is in full support of the Recommended Plan.

3.3 OBJECTIVES

3.3.1 PLANNING OBJECTIVES

The following study objectives have been developed for the 50-year period of analysis (2020-2070) based on the Río Antón Ruíz Restoration 1135 CAP Project problems, opportunities, goals, and Federal and state objectives and regulations. For information regarding the anticipated restoration targets and timing of the objectives reference Appendix E, the Monitoring and Adaptive Management Plan.

- O1: Reduce salinity levels to below 10 ppt in the HNR lagoon system while considering the future effects of sea level rise
- O2: Improve and increase spatial extent and overall health of the Pterocarpus forest habitat
- O3: Improve freshwater fishery habitat within the lagoon system

3.3.2 FEDERAL ENVIRONMENTAL OBJECTIVES

USACE strives to balance the environmental and development needs of the nation in full compliance with the National Environmental Policy Act (NEPA) and other authorities provided by Congress and the Executive Branch. Public participation is encouraged early in the planning process to help define problems and environmental concerns relative to the study. Therefore, significant environmental resources and values that would likely be impacted, favorably as well as adversely, by an alternative under consideration are identified early in the planning process. All plans are formulated to avoid to the fullest extent practicable any adverse impact on important resources. Significant adverse impacts that cannot be avoided are mitigated as required by Section 906(d) of WRDA 1986.

This report is an integrated feasibility study and environmental document. As with a separate NEPA document, it discusses and documents the environmental effects of the Recommended Plan and summarizes compliance with Federal statutes and regulations.

3.3.2.1 ENVIRONMENTAL OPERATING PRINCIPLES

The feasibility study was carried out in a manner consistent with the USACE Environmental Operating Principles (EOPs). The principles are consistent with NEPA, the Army's Environmental Strategy with its four pillars (prevention, compliance, restoration, and conservation), and other environmental statutes that govern USACE activities. Finally, the implementation framework proposed as part of the study seeks to work collaboratively by fully engaging individuals, agencies, and local groups in identifying, planning, and implementing solutions that maximize sustainable habitat within Río Antón Ruíz.

3.4 SUMMARY OF MANAGEMENT MEASURES

Management measures are specific structural or nonstructural actions that would take place at geographical locations within the project areas. Management measures were selected to accomplish at least one of the planning objectives for the Río Antón Ruíz 1135 CAP project. Both nonstructural (NS) measures and structural (S) measures were identified.

Non-Structural

- NS-1: O&M plan for the sandbar near the outlet of the diversion channel

Structural

- S-1: sheetpile weirs with a concrete cap

- S-2: Temporary sandbag SWIM structures

SCREENING OF MANAGEMENT MEASURES

Screening is the ongoing process of eliminating measures which will no longer be considered, based on planning criteria. The screening criteria used to eliminate measures included: does the management measure meet the project objectives and constraints, is the measure cost-effective, is it technically feasible, operationally flexible, and does it provide environmental benefits? The O&M plan for the sandbar near the outlet of the diversion channel was screened out because it is not a long-lasting or efficient measure and due to high O&M costs for the continued maintenance of the sandbar. It would also be difficult to mimic the natural formation of a sandbar in a planned maintenance schedule. In addition, by creating a sandbar instead of allowing natural formation, the sandbar could create a restriction on the outfall, causing impacts to the original flood reduction project (205). The temporary sandbag SWIM structures were screened out due to the fact that it is not a lasting complete measure and would require continued maintenance post storm events as well as from boating wear and tear. They were effective as a temporary means, but have proven to not be a viable permanent solution. The team carried forward the structural measure of the sheetpile weir with a concrete cap. Based on the temporary SWIM study that was completed, the team decided to move forward with the existing SWIM locations as the placement location for the weirs. The team also utilized lessons learned from the temporary SWIM project to implement a design feature in the proposed weirs, the design feature is to construct a notch in the concrete cap of the weir to allow for navigation and safe transit of aquatic species.

3.5 ALTERNATIVE DEVELOPMENT

Using the management measures described above, the PDT initially considered an array of 5 alternatives, including the No Action plan. A description of the final array of alternatives, along with initial alternatives that did not meet the screening criteria, is listed below.

3.5.1 NO ACTION

The No Action alternative involves no implementation of management measures.

3.5.2 ALTERNATIVE 1

The objective of this alternative is to construct two sheetpile notched concrete cap weirs at the locations of the current temporary SWIM structures (**Figure 3-1**).

The management measures are:

- S-1: sheetpile weirs with a concrete cap

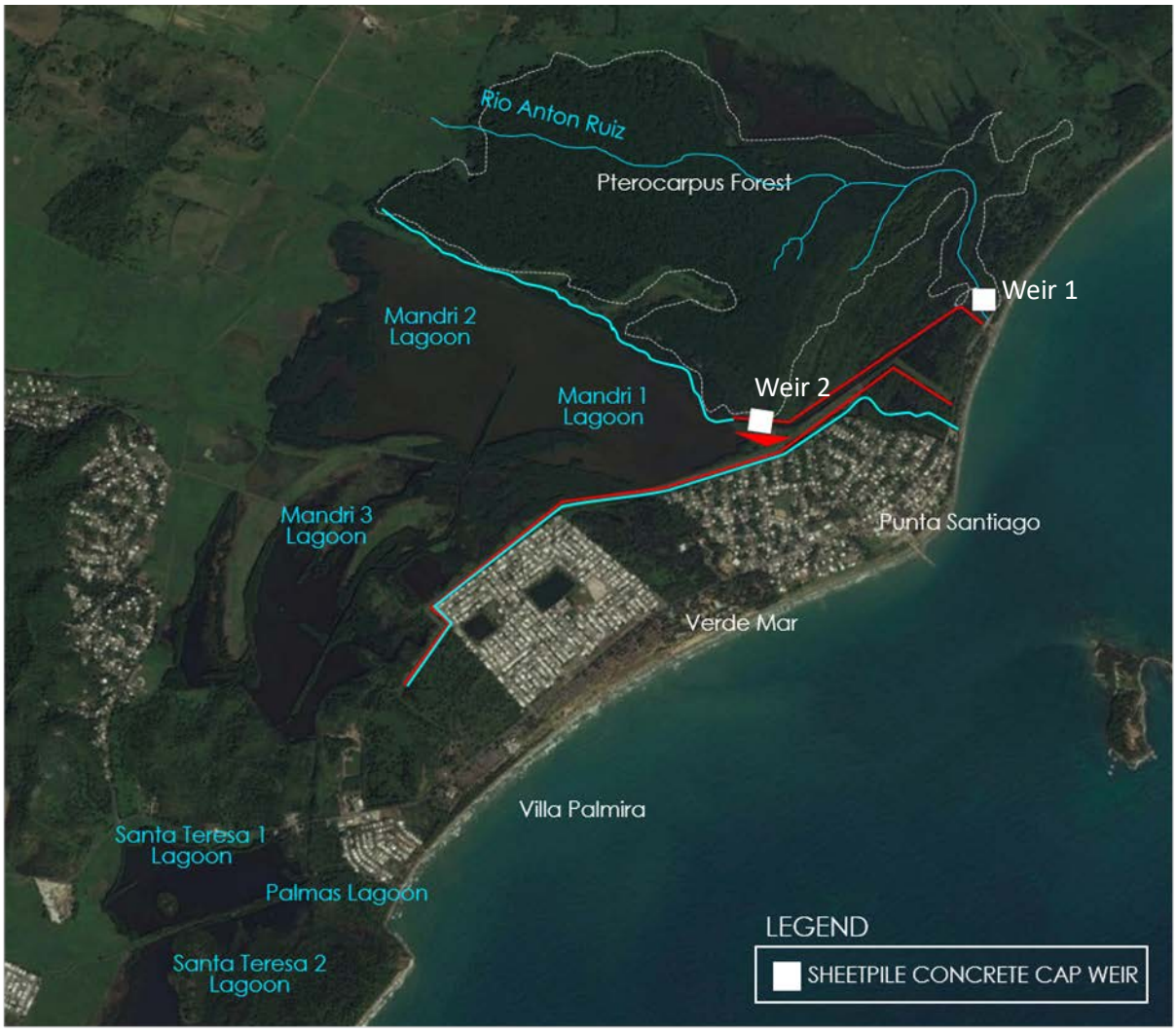

Figure 3-1: Alternative 1.

3.5.3 ALTERNATIVE 1A

The objective of this alternative is to construct one sheetpile notched concrete cap weir at the current location of the temporary SWIM structure at the Río Antón Ruíz. (**Figure 3-2**).

The management measures are:

- S-1: sheetpile weirs with a concrete cap

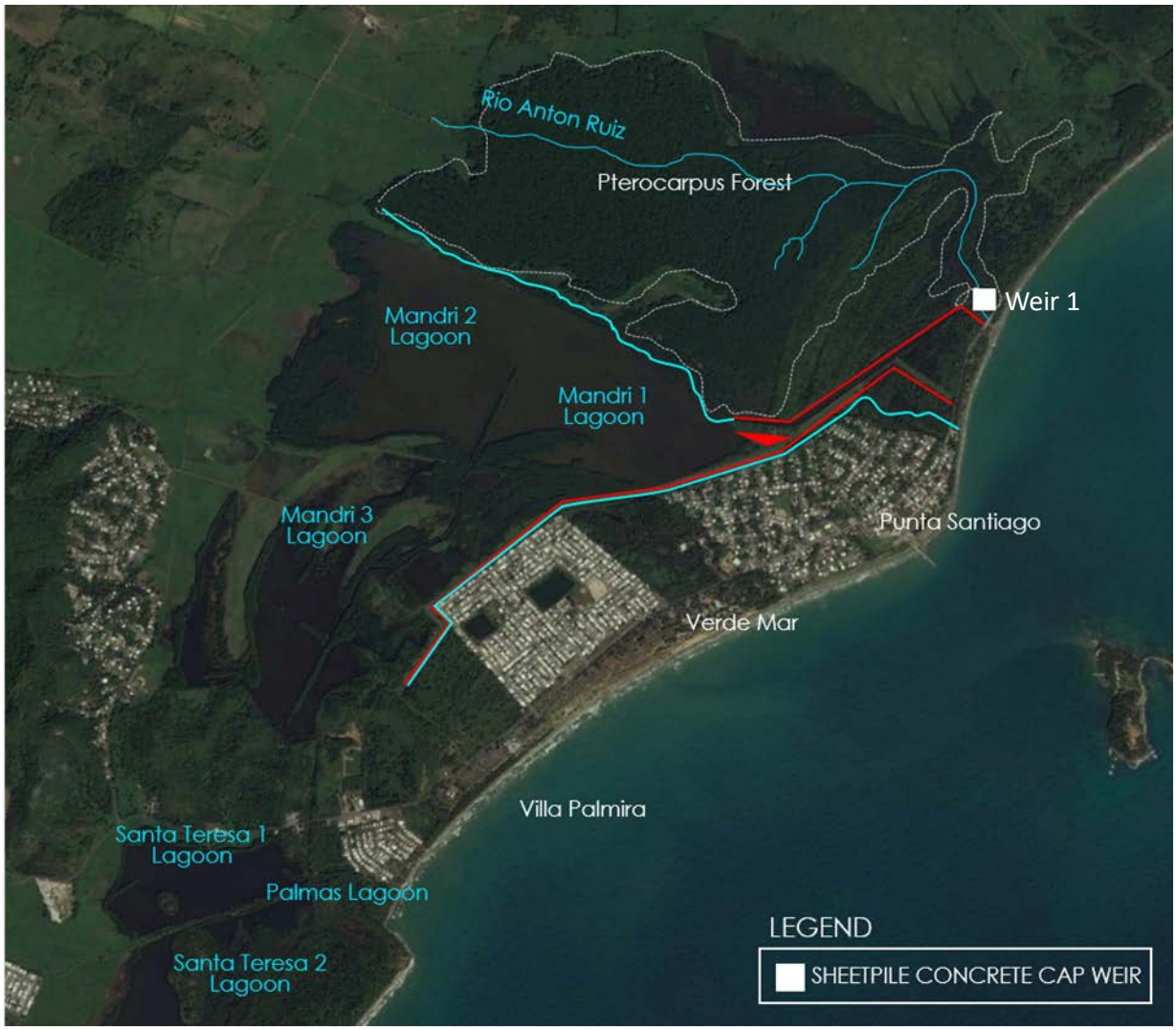

Figure 3-2: Alternative 1A

3.5.4 ALTERNATIVE 1B

The objective of this alternative is to construct one sheetpile notched concrete cap weir at the current location of the temporary SWIM structure at the diversion channel near the lagoon. (**Figure 3-3**).

The management measures are:

- S-1: sheetpile weirs with a concrete cap

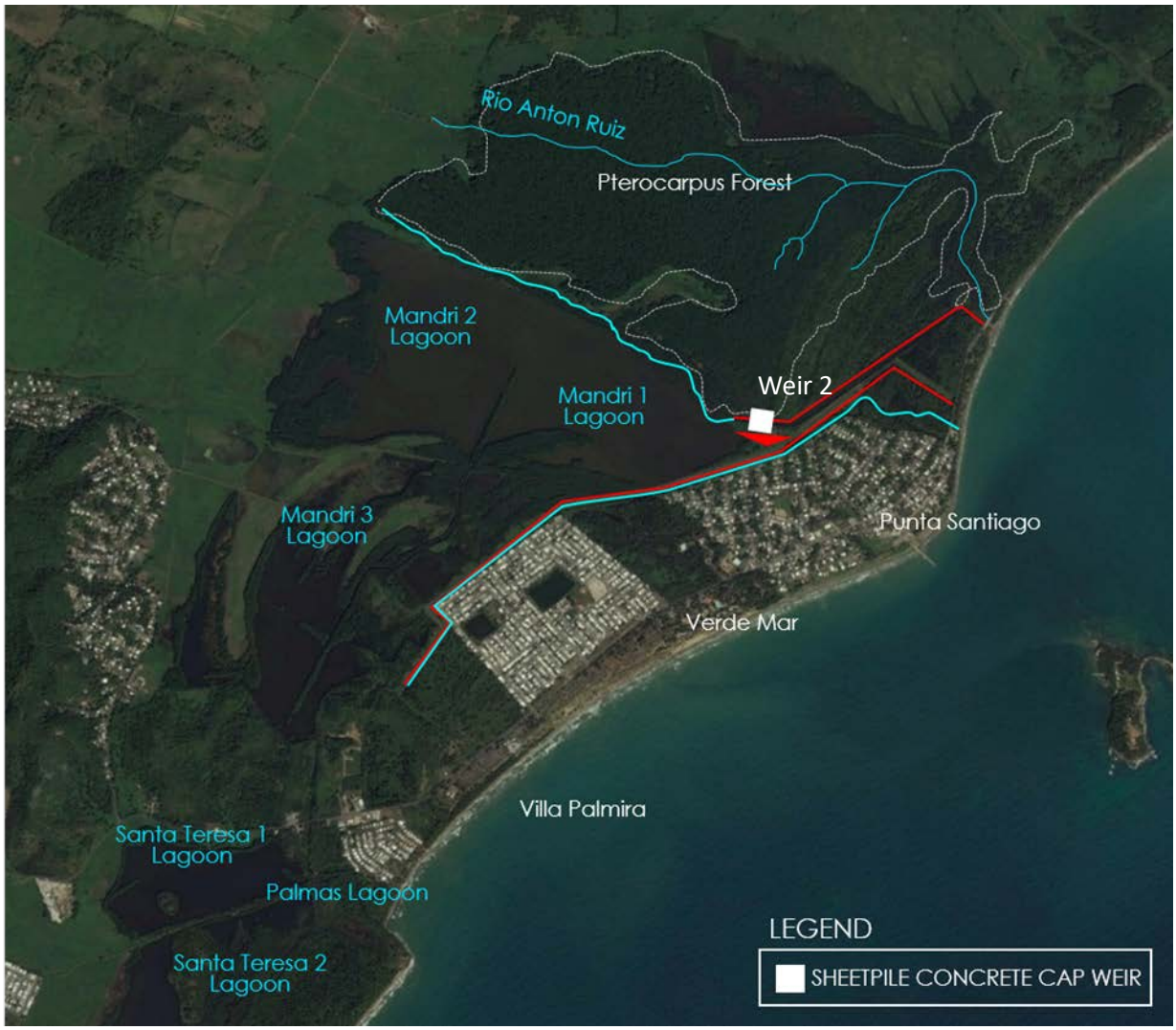

Figure 3-3: Alternative 1B.

3.5.5 OTHER ALTERNATIVE CONSIDERED BUT SCREENED OUT: ALTERNATIVE 2

In addition to the alternatives listed above, the PDT initially considered a fifth alternative, Alternative 2, which is one sheetpile concrete weir downstream of the confluence of the diversion channel and the Río Antón Ruíz. The existing bridge, the sandbar, and a cultural resource area, would preclude placement of a weir in this location. This alternative was screened out due to these constructability issues, as well as the possibility of affecting the original 205 construction project by causing flooding.

3.5.6 SCREENING OF FINAL ALTERNATIVES

The final array of alternatives considered for implementation (No Action, 1, 1A, 1B) were evaluated for their success in meeting the Planning Objectives, including Purpose and Need, and the Planning Constraints, including technical and environmental feasibility, environmental acceptability, and habitat analysis. The evaluation criteria were then considered in screening the alternatives according to their overall acceptability. As stipulated under the CAP 1135 Authority, Cost-effectiveness/Incremental Cost Analysis (CE/ICA) should focus on alternative solution. A discussion of the evaluations follows, with a summary of findings and screening results shown in **Table 3-6**.

3.5.6.1 HABITAT BENEFIT ANALYSIS

To facilitate the selection of a preferred alternative and to ensure that the Federal government is investing funds in the most cost effective plans, USACE requires that the benefits be quantified so that relative levels of habitat benefit (output) can be compared to the costs. Each habitat restoration measure will be analyzed using the following Habitat Suitability Index (HSI) model that was developed following the HEP (Habitat Evaluation Procedures) methodology.

HEP was developed by USFWS (1980) to facilitate the identification of impacts from various Federal actions on fish and wildlife habitat. HEP can provide numeric scores for existing conditions at a project site, potential future without-project conditions, and various action alternatives for a species or assemblage of species in a particular geographic area. HEP is implemented by the use of one or more HSIs, which are mathematical relationships designed to represent the habitat suitability of an area for a single species, or assemblage of species, as well as different life stages of a species or assemblage of species. A set of variables that represents the habitat requirements for the species (e.g. salinity, water depth, substrate) is combined into a mathematical model. The variables are then measured and their corresponding index values are inserted into the model to produce a score that describes existing habitat suitability. The value is an index score between 0 and 1, though a perfect score of 1 was not found to exist within the project area.

Although approval of planning models under EC 1105-2-412 is not required for CAP projects (Civil Works Policy Memorandum #1 [January 19, 2011]), the principles to ensure quality continue to be necessary. Models and analysis must be compliant with USACE policy, theoretically sound, computationally accurate, and transparent. The variables developed for this HSI are based upon data in the literature of species habitat requirements and preferences and are inherently based on best professional judgment. The basis for the HSI and its application was reviewed by USACE discipline specialists, Federal and state agency representative technical experts, and non-federal sponsor technical experts familiar with habitat evaluation procedures.

Suitable HSI models must include habitat variables for which data collection is possible or data are already available. Variables must also show a change in score between the existing and the proposed condition. If the project does not affect the suitability index score for a species, it will not be possible to quantify an effect. The suitability indices (SIs) for various habitat parameters for the species are combined arithmetically or geometrically to yield an overall index score for the species.

The purpose of this project is to preserve the Pterocarpus forest and the biodiversity of the freshwater fauna and flora in the HNR.

3.5.6.1.1 Habitat Suitability Indices

The three main ecosystems within the HNR that are in need of recovery are the Pterocarpus forest, the Typha marsh, and the freshwater fishery. Therefore, the main parameter that affected the HSI was the salinity. With each alternative being a variation on the number of weirs required to achieve all the project objectives, the team looked at which alternative would provide the most protection and value in reducing the salinity levels within the HNR system. Due to the fact that the system is already degraded/degrading, the existing conditions were rated fairly low. The Pterocarpus forest is exhibiting signs of environmental stress, wilting of leaves, tree trunks are losing their bark, and the special density of the trees has decreased as well as along the Mandri lagoon the trees have died off therefore the existing condition was given a

score of 0.4. The Typha marsh has been eradicated and replaced by mangroves.A score of 0.1 was assigned assuming there might still be a few locations where Typha marsh is still in existence. The Freshwater fish was assigned an existing condition of 0.1 for the same reason as the Typha marsh. The lagoons are now saline which does not support a freshwater fishery habitat. Alternative 1 recommends two weirs at the location of the temporary SWIM structures protecting both the Pterocarpus forest and the lagoon system from saltwater intrusion. Therefore the assigned HSI for the three factors (Pterocarpus forest, Typha marsh, and the freshwater fish) for the with-project is high at a 0.9. Alternative 1A is the single weir at the Río Antón Ruíz, protecting only the Pterocarpus forest, thus allowing saltwater to continue to flow into the lagoon system which would allow for the continued degradation of the western side of the Pterocarpus forest that borders the Mandri Lagoon. Therefore the HSI assigned to the Pterocarpus forest with-project is not rated as high due to the fact that degradation will continue due to the lack of protection of the lagoon system. The Typha Marsh and freshwater fish recovery will not occur because the lagoons will remain a marine environment. Alternative 1B is the single weir protecting the lagoon system, allowing saltwater intrusion to continue within the Pterocarpus forest. The HSI assigned for the Typha marsh and freshwater fish recovery is high due to the fact that the lagoons will return to a freshwater system and there will be a minor amount of saltwater intrusion from the Pterocarpus forest on the west side due to the lack of protection of the forest. The forest will continue to degrade and die off due to the continued saltwater intrusion up through the Río Antón Ruíz.

3.5.6.1.2 Habitat Units

Habitat Units (HUs) were calculated by multiplying the HSI scores for the three alternatives by the total acreage of recovered habitat created. Total HUs are calculated using the following equation:

Equation 3-1. Habitat Unit Calculation.

$$HUs = HSI\ Score \times Habitat\ Area\ (in\ Acres)$$

Table 3-1: Habitat Units – Alternative 1

ALTERNATIVE 1			
PTEROCARPUS FOREST (371.0 ACRES)	EXISTING CONDITION	NO ACTION	WITH PROJECT
Habitat Quality Rating (0.0-1.0)	0.4	0	0.9
Habitat Units	148.4	0	333.9
TYPHA MARSH RECOVERY (+60 Acres)	Existing Condition	No Action	With Project
Habitat Quality Rating (0.0-1.0)	0.1	0	0.9
Habitat Units	6	0	54
FRESHWATER FISH RECOVERY (615 Acres)	Existing Condition	No Action	With Project
Habitat Quality Rating (0.0-1.0)	0.1	0	0.9
Habitat Units	61.5	0	553.5
TOTAL HABITAT UNITS FOR ALT 1			941.4

Table 3-2: Habitat Units – Alternative 1A

ALTERNATIVE 1A			
PTEROCARPUS FOREST (371.0 ACRES)	EXISTING CONDITION	NO ACTION	WITH PROJECT
Habitat Quality Rating (0.0-1.0)	0.4	0	0.7
Habitat Units	148.4	0	259.7
TYPHA MARSH RECOVERY (+60 Acres)	Existing Condition	No Action	With Project
Habitat Quality Rating (0.0-1.0)	0.1	0	0
Habitat Units	6	0	0
FRESHWATER FISH RECOVERY (615 Acres)	Existing Condition	No Action	With Project
Habitat Quality Rating (0.0-1.0)	0.1	0	0
Habitat Units	61.5	0	0
TOTAL HABITAT UNITS FOR ALT 1			259.7

Table 3-3: Habitat Units – Alternative 1B

ALTERNATIVE 1B			
PTEROCARPUS FOREST (371.0 ACRES)	EXISTING CONDITION	NO ACTION	WITH PROJECT
Habitat Quality Rating (0.0-1.0)	0.4	0	0
Habitat Units	148.4	0	0
TYPHA MARSH RECOVERY (+60 Acres)	Existing Condition	No Action	With Project
Habitat Quality Rating (0.0-1.0)	0.1	0	0.9
Habitat Units	6	0	54
FRESHWATER FISH RECOVERY (615 Acres)	Existing Condition	No Action	With Project
Habitat Quality Rating (0.0-1.0)	0.1	0	0.8
Habitat Units	61.5	0	492
TOTAL HABITAT UNITS FOR ALT 1			546

The HU values are used in the CE/ICA for cost analysis, which can be found in the following section.

3.5.6.1.3 Cost-effectiveness and Incremental Cost Analysis

The final evaluation of measures and alternative plans includes a Cost-effectiveness (CE)/Incremental Cost Analysis (ICA) consistent with USACE guidance. The CE/ICA is an evaluation tool which considers and identifies the relationship between changes in cost and changes in quantified, but not monetized, habitat benefits. The evaluation is used to identify the most cost effective alternative plans to reach various levels of restoration output and to provide information on whether different (increasing) levels of restoration are worth the added cost. The CE/ICA helps planners identify cost effective plans, which provide a certain level of habitat output at the least cost. The results provide an array of alternatives which undergo a

tradeoff analysis incorporating other decision-making criteria, such as significance of outputs, acceptability, completeness, effectiveness, risk and uncertainty, and reasonableness of costs to arrive at a Recommended Plan (ER 1105-2-100, E-36).

For this study, CE/ICA calculations were completed using a simple spreadsheet, which is appropriate given the limited number of alternatives considered. The CE/ICA uses Budget Estimate (Class 3) costs provided by SAJ Cost Engineering at the October 2016 (FY17) price level. Each alternative was compared to a No Action alternative to determine habitat unit lift based on habitat quality ratings and costs, resulting in a final array. **Table 3-4** displays the Class 3 cost, the average annual cost (at the FY17 discount rate of 2.875% for a fifty year period of analysis), the average annual habitat units output, and the average annual cost per habitat unit of output for each alternative. The plans are displayed in order of increasing costs. Alternative 1A was screened out because the plan produces less habitat units at a greater cost than Alternative 1B and is therefore not cost-effective. Alternative 1b and Alternative 1 were carried into the final array of alternatives as cost-effective plans.

Table 3-4: Cost-effective analysis for initial array of alternatives.

Alternative*	Plan Cost (Budget Estimate, Class 3)	Average Annual Cost CRF (i=2.875%, n=50)	Average Annual NER Benefits	Average Annual Cost per Unit Output	Cost Effective (Yes/No)
No Action Plan	$0		-	N/A	N/A
Alternative 1B	$1,745,500	$66,200	459	$144	Yes
Alternative 1A	$2,336,200	$88,700	201	$441	No
Alternative 1	$2,978,400	$113,000	815	$139	Yes
* Alternatives are displayed in order of increasing cost.					
Plan costs include construction cost; Planning, Engineering & Design; and construction management costs.					

Table 3-5 displays the ICA completed for the plans in the final array of alternatives (Alternatives 1b and 1), including the incremental increase in habitat units resulting from selection of the associated plan and the additional cost per incremental habitat unit for each plan in the final array. Alternative 1, highlighted in **Table 3-5**) is a Best Buy plan and is selected as the National Ecosystem Restoration (NER) plan. This alternative has the lowest average annual cost per incremental habitat unit while also meeting all study objectives. The plan aims to reduce salinity levels to below 10 ppt in the HNR Pterocarpus forest and lagoon system, improve and increase the spatial extent and overall health of the Pterocarpus forest habitat, and improve freshwater fishery habitat within the lagoon system.

Table 3-5: Incremental Cost Analysis – Final Array

Alternative	Average Annual Plan Cost (Budget Estimate, Class 3)	Average Annual Plan Outputs (Habitat Units)	Incremental Cost	Incremental Habitat Unit	Average Annual Incremental Cost per Habitat Unit
No Action Plan	$0	0	$0	0	$0
Alternative 1b	$66,200	459	$66,200	459	$144
Alternative 1	$113,000	815	$46,800	356	$131

3.5.6.1.4 Alternatives Comparison Analysis

After completion of the Habitat Units calculations and the CE/ICA the team put together an Alternative Summary Matrix to display each alternative, which objective has been met by the alternative, the NER benefits, and the CE/ICA conclusions. The Recommended Plan, Alternative 1, was selected based on all of this information. (**Table 3-6**)

Table 3-6: Alternative Summary Matrix

Alternatives	Objectives			Output		CE/ICA	
	O1: Reduce salinity: HNR system	O2: Pterocarpus recovery	O3: Improve Fishery	NER Benefits	Cost per Unit Output	Cost-Effectiveness	Incremental Cost
Alternative 1*	Yes	Yes	Yes	815	$139	Yes	$131
Alternative 1A	No	Yes	No	201	$441	No	0
Alternative 1B	No	No	Yes	459	$144	Yes	$144
No Action	No	No	No	0	0	-	0

*Recommended Plan

4 RECOMMENDED PLAN

The goal of the Recommended Plan (Alternative 1) is to install two weirs that will aid in the reduction of saltwater intrusion into the Pterocarpus forest and the lagoon system allowing for the reduction of salinity levels which will, in turn, allow for the recovery of the Pterocarpus forest, the Typha marsh, and the freshwater fish. (**Figure 4-1**). Figure 4-1 shows the total project area with projected total habitat units achieved from implementation of the recommended plan, Alternative 1.

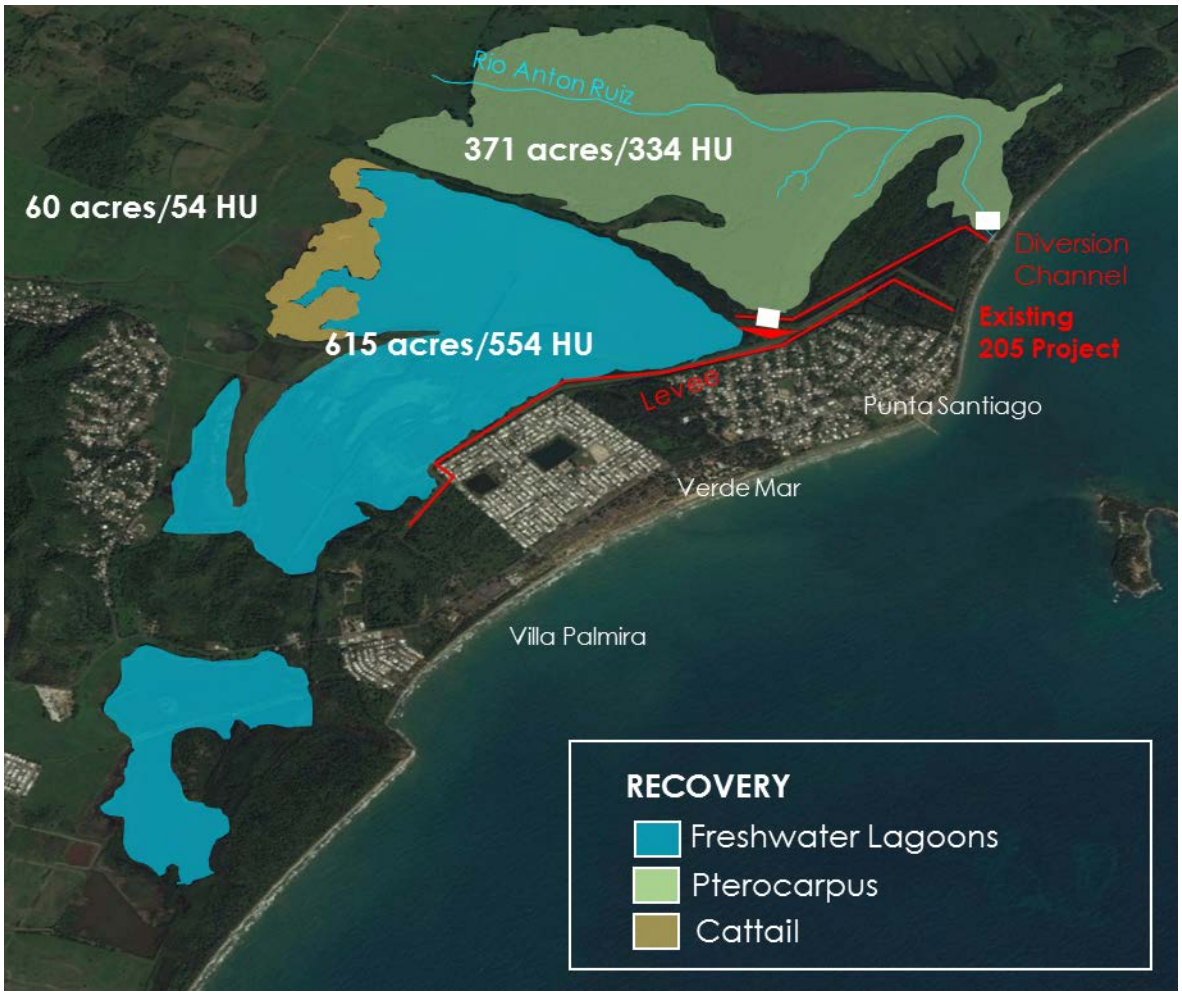

Figure 4-1: Recommended Plan.

4.1 GENERAL DESCRIPTION

The Recommended Plan, Alternative 1, consists of notched concrete-capped sheetpile weirs located at the two existing temporary SWIM sites. One location is within the Río Antón Ruíz, just north of the confluence of the Río Antón Ruíz and the diversion channel. The other location is within the diversion channel, approximately ½ mile from the mouth of the diversion channel at the lagoon. A conceptual cross section sketch of the weir can be referenced in **Figure 4-2**.

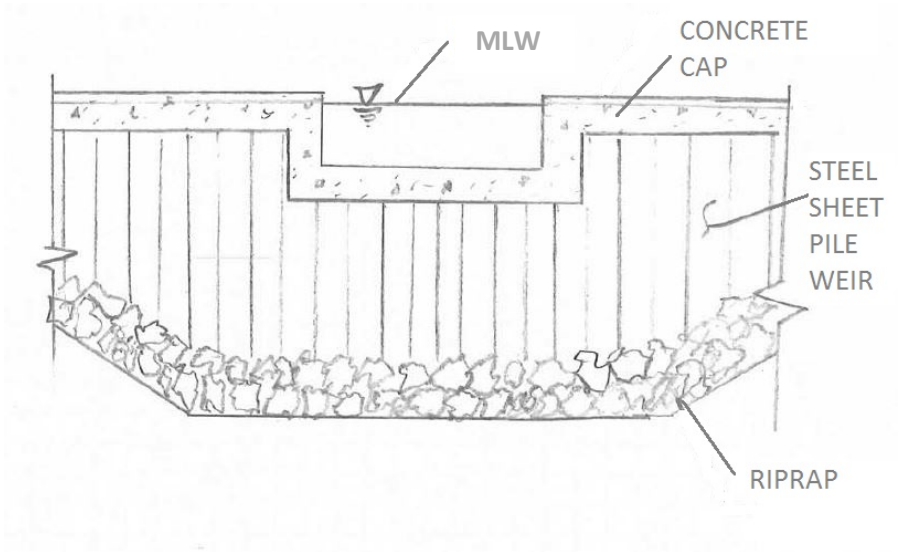

Figure 4-2: Conceptual Cross Section sketch of the weir

The Recommended Plan also includes monitoring to assess the restoration success of the typha marsh and Pterocarpus and natural decline of the mangroves. Detailed information on the monitoring activities and success criteria is found in Appendix E (Monitoring and Adaptive Management Plan). Due to the documented success of the temporary saltwater intrusion measures (SWIMs) installed in 2007, the uncertainty is low for this project and adaptive management is not included in this project.

4.2 DESIGN AND CONSTRUCTION CONSIDERATIONS

During the design phase, additional soil borings and hydrographic/topographic survey will be collected for use in refined analysis of the riprap, sheetpile, and hydraulic designs. The sheetpile material should be investigated during final design, including the use of cold rolled steel or vinyl sheetpile sections to possibly reduce costs.

The construction sequence for the project is anticipated to involve the installation of erosion and sediment control features including silt fence along the work perimeters and floating turbidity barriers within the Río Antón Ruíz and diversion channels, upstream and downstream of the structure locations. The structures will be sheetpile driven from the bank of the diversion channel. The sheetpile weirs will have a concrete cap. Depending on the tidal conditions, there may be the need to draw down the water level directly adjacent to the sheetpile in order to construct the concrete cap. Sheetpile or use of other means to create a small dewatering cell and then pumping directly back into the channel should be sufficient if the concrete cap is placed in sections. No diversion of water (diversion channel) is anticipated for the dewatering efforts. Access for the project will be via the existing project limits, within the berms along the channel and adjacent to the levee. An existing disposal/borrow area will be used for the staging/stockpiling. All construction and maintenance access can use the existing project limits from the original 205 project.

4.2.1 ENGINEERING ANALYSIS

Replacement of the SWIM plugs with the permanent sheetpile weirs will have no adverse influence on the hydrologic condition of the study area; therefore, no update to the original Section 205 has been undertaken. No major changes in land use have occurred in the basin. The hydraulic analysis performed resulted in a weir design that ensures that the permanent replacements for the temporary SWIM's will match, at minimum, the effectiveness in reducing salinity values upstream while not adversely impacting flood discharges to tide, i.e. having no impact on the flood damage reduction provided by the original project.

The Recommended Plan is to install permanent SWIM consisting of two sheetpile concrete capped weirs at the same locations as the two originally placed temporary SWIM plugs. The top of the weirs are intended to be 0.25 ft. above Mean Low Water (MLW) elevation, with a 15 foot wide by 3 foot deep "notch" within the center of the diversion channel and Río Antón Ruíz respectively. The top elevation of the notch section will be 2.75 ft. below MLW to allow for navigation of the diversion channel and river at low water elevations, while mitigating saltwater intrusion into the Mandri lagoon system and further upstream of the Río Antón Ruíz. DNER and other agencies need access to the monitoring stations. It is recommended that buoys, or some other form of channel marker or navigational aid, be included with the project to direct boat traffic toward the notched opening.

As per the calculations provided in Appendix A, Engineering Appendix, the permanent SWIM weirs match the discharge performance of the temporary SWIM weirs with head above the weir crest of between 0.1 and 1.0 feet. As head above the SWIM weirs exceed 1.0 feet, the permanent SWIM weirs outperform the temporary SWIM weirs, thus showing no degradation of system functionality by implementation of the permanent SWIM weirs.

Stability and structural analyses were performed on the sheetpile weirs. The notched weirs will have soil at equal elevations on both sides; thus, they do not typically resist a load from retained soil. Two load cases were investigated: 1) 5-foot scour occurring on one side of the weir, and 2) impact by a small commercial watercraft. The weir was designed as a cantilever sheetpile wall in accordance with USACE criteria, EM 1110-2-2504, *Design of Sheetpile Walls* (March 1994). The sheetpile section selected was PZC-13. Since the weirs will be permanently submerged, marine grade ASTM A690 sheetpile was also selected. Sheetpile design analyses can be located in Attachment C of Appendix A. The bottom elevation of the sheetpile wall will be -24.0 feet. Riprap, R-60 standard gradation, will be placed for approximately 25 feet downstream of each weir to protect from potential scouring during an SPF event.

4.2.2 PLAN IMPLEMENTATION REQUIREMENTS

NON-FEDERAL RESPONSIBILITIES

The non-federal sponsor for the project is the Puerto Rico Department of Natural and Environmental Resources (DNER). The non-federal project sponsor will provide an up front cash contribution for the construction costs of the proposed project. The non-federal sponsor shall provide lands, easements, and rights-of-way, and a portion of the administrative costs associated with land requirements. The non-federal project sponsor will be responsible for all costs related to operation, maintenance, repair, rehabilitation, and replacement of project features.

FEDERAL RESPONSIBILITIES

USACE is responsible for budgeting for the Federal share of future Federal construction projects. Federal funding is subject to the budgetary constraints inherent in the formation of the national civil works budget in a given fiscal year. USACE would perform the necessary design needed prior to construction. USACE would obtain water quality certification, coordinate with the state as required by the Coastal Zone Management Act, and construct the project. Cost sharing of Design and Implementation are subject to the availability of appropriations.

WORK-IN-KIND

The Non-Federal Sponsor does not plan to provide any in-kind contributions.

PROJECT PARTNERSHIP AGREEMENT

The Project Partnership Agreement (PPA) remains to be developed.

SPONSOR'S VIEWS

The sponsor is in full support of the Recommended Plan.

REAL ESTATE REQUIREMENTS

Department of Natural and Environmental Resources (DNER) of the Commonwealth of Puerto Rico, the non-federal sponsor, acquired the lands for a previous CAP Section 205 project in fee and will certify that the lands are available for construction for this project. The construction area will be available via a temporary work area easement. The staging area will be available via a temporary work area easement from the non-federal sponsor. Access to the temporary work area will be provided via a perpetual road easement from the non-federal sponsor. Refer to **Figure 4-3.**

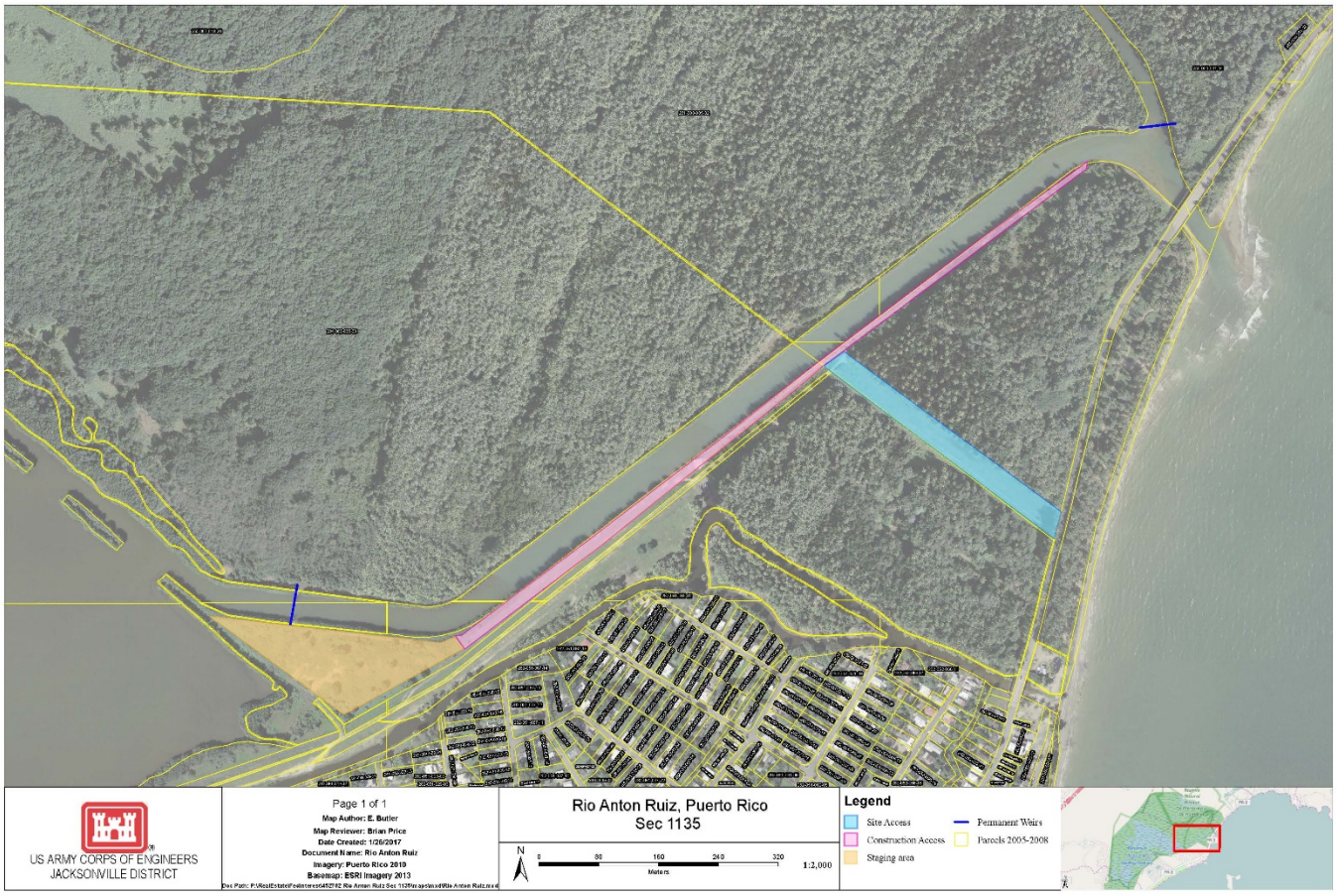

Figure 4-3: Real estate requirements.

PERMITS

This project will be performed in compliance with the Commonwealth of Puerto Rico's water quality standards. An application for water quality certification will be submitted to the Puerto Rico Environmental Quality Board during the design and implementation phase. In compliance with the Coastal Zone Management Act, a Federal Consistency Determination (FCD) is included in Appendix D-3 (CZMA). In a letter dated July 6, 2017, the Puerto Rico Planning Board concurred with the FCD. All permits and approvals will be obtained prior to the start of construction.

4.3 DETAILED COST ESTIMATE AND COST APPORTIONMENT

A detailed cost estimate is provided in the Cost Engineering Appendix. The costs shown here are more developed and will vary from those shown in Chapter 2, which were planning level costs. **Table 4-1** shows a cost summary, and **Table 4-2** details the Federal and non-federal cost apportionment.

Table 4-1: Recommended Plan cost summary (FY18 price levels).

Río Antón Ruíz CAP Section 1135	
Summary of Project Cost (FY18 Price Levels)	
Item	***Project First Cost**
Construction	$2,924,000
Adaptive Management	$132,000
Cultural Resources	$226,000
D&I	$302,000
Construction Management	$288,000
Real Estate	$84,000
Total	**$3,957,000**
*Costs Include contingency	

Table 4-2: Cost sharing of the Recommended Plan (FY18 price levels).

Río Antón Ruíz CAP Section 1135						
Summary of Project Cost (FY18 Price Levels)						
Item	Non-Fed Cash	Non-Fed LERRD	Non-Fed Work In-Kind	Total Non-Fed Share 25%	Federal Share 75%	Project First Cost
	$947,000	$42,000	0	$989,000	$2,968,000	
Section 1032, WRRDA 2014 Waiver				-$455,000	+$455,000	
TOTAL				$534,000	$3,423,000	**$3,957,000**
Note: Dollar values are rounded						

4.4 RISK AND UNCERTAINTY

Even with implementation of the Recommended Plan, some residual risk remains. The Recommended Plan addresses the issue of saltwater intrusion into the HNR system. Sea level rise is a risk to the system as a whole, however, the weirs are adaptable to sea level rise. Reference Appendix A for further details.

4.5 SEA LEVEL CHANGE CONSIDERATIONS

The total regional sea level rise predicted by the three scenarios (low, intermediate, and high) at the end of the 50 year life of the project were projected to be 0.29, 0.78 ft., and 2.33 ft., respectively. The potential impacts of sea level rise include increased salinity concentrations within the diversion channel, leading to the lagoon system and Río Antón Ruíz. For further details reference Appendix A.

In general, the project is adaptable to regional sea level rise to ensure that project functions as intended during its service life. While there is expected to be a small increase in tidal surge and penetration for all three scenarios, the structural aspects of the project will be either unaffected or can be easily adapted to accommodate the change.

5 EFFECTS OF THE RECOMMENDED PLAN (PROPOSED PLAN)*

This chapter of the integrated report identifies and evaluates the anticipated environmental constraints and impacts associated with the Recommended Plan (Proposed Action).

The terms "impact" and "effect" are used interchangeably in this chapter. Impacts may be discussed as positive or negative and/or significant or minor, as appropriate to the condition or resource. Positive impacts occur when an action results in a beneficial change to the resource, whereas negative impacts occur when an action results in a detrimental change to the resource. Significant impacts occur when an action substantially changes or affects the resource. A minor impact occurs when an action causes impact, but the resource is not substantially changed. Impacts are also discussed as temporary as well as short and long-term, and are associated with relative time frames as the direct result of the action. In this case, temporary refers to an impact only during the period of construction. Short-term describes the impact as continuing for 1-3 years post construction, whereas long-term describes impacts that are permanent or would be expected to remain for many years. This chapter is organized by resource area following the same sequence as in Chapter 2.

5.1 GENERAL SETTING

5.2 PHYSICAL ENVIRONMENT (CONDITIONS)*

5.2.1 HYDROLOGY

The Recommended Plan will not change the project area's hydrology. Reference Appendix A for further information.

5.2.2 SEA LEVEL

The Recommended Plan has no impact on the project area's sea level or sea level rise; however, the project itself is adaptable to regional sea level rise to ensure that it continues to function as intended during its service life. The required Sea Level Change Analysis is included in Appendix A, Section 3.

5.2.3 CLIMATE

The Recommended Plan will not change the project area's climate. Minimal amounts of greenhouse gases (GHG) would be created during construction of the proposed project; however, the release of GHG emissions will cease with completion of construction. The recovery of the *Pterocarpus* forest and Typha marsh may aid in the natural carbon capture and/or carbon sequestration processes. The required Climate Change Analysis is included in Appendix A, Section 3.

5.3 NATURAL ENVIRONMENT (AFFECTED ENVIRONMENT)*

5.3.1 VEGETATION

Implementation of the Recommended Plan is expected to improve freshwater habitat conditions in the HNR lagoon system. A reduction in salinity will promote recovery of the Typha marsh. Mangroves are

expected to naturally die off, allowing the Typha marsh to naturally recruit. Submerged and emergent aquatic vegetation species would also recover, which adds to the biodiversity of the freshwater system.

5.3.2 FISH AND WILDLIFE RESOURCES (OTHER THAN THREATENED AND ENDANGERED SPECIES)

The Recommended Plan supports the project's purpose to preserve the Pterocarpus forest and the biodiversity of the freshwater fauna and flora within the HNR lagoon system. There may be temporary impacts to fish and wildlife during construction, however, these impacts are expected to be minor and cease with the completion of construction.

5.3.3 THREATENED, ENDANGERED, AND PROTECTED SPECIES

USACE has contacted USFWS and NMFS requesting consultation on the following species:

- Puerto Rican Boa (*Epicrates inornatus*)
- Antillean Manatee (*Trichechus manatus*)
- Loggerhead Sea Turtle (*Caretta caretta*)
- Green Sea Turtle (*Chelonia mydas*)
- Hawksbill Sea Turtle (*Eretmochelys imbricata*)
- Leatherback Sea Turtle (*Dermochelys coriacea*)
- Nassau Grouper (*Epinephelus striatus*)
- Scalloped Hammerhead Shark (*Sphyrna lewini*)
- Pillar Coral (*Dendrogyra cylindrus*)
- Rough Cactus Coral (*Mycetophyllia ferox*)
- Lobed Star Coral (*Orbicella annularis*)
- Mountainous Star Coral (*Orbicella faveolata*)
- Boulder Star Coral (*Orbicella franksi*)
- Elkhorn Coral (*Acropora palmata*)
- Staghorn Coral (*Acropora cervicornis*)
- Migratory Birds

Temporary adverse effects to water clarity resulting from the Recommended Plan's construction activity may occur. Best Management Practices (BMPs) will need to be followed to minimize negative impacts to any listed species. Final details for BMPs will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods.

USACE has concluded the project will have no effect on the scalloped hammerhead shark and the seven listed coral species. The project may affect, but is not likely to adversely affect (MANLAA) the other species listed above, and will not affect any designated critical habitat (DCH). In a letter dated April 17, 2017, USFWS concurred with the USACE MANLAA determination, provided that the standard conditions for the Antillean manatee and Puerto Rican Boa are incorporated into the project. In a letter dated August 22, 2017, the National Marine Fisheries Service (NMFS) concurred with the Corps' determination that the Recommended Plan is not likely to adversely affect listed species and/or designated critical habitat under NMFS jurisdiction. Detailed analysis and coordination letters for this project are located in Appendix D-1 (Environmental Coordination).

5.3.4 ESSENTIAL FISH HABITAT (EFH)

Implementation of the Recommended Plan will provide a benefit to freshwater fish habitat. Reducing the salinity of the lagoon system will promote recovery and recruitment of freshwater fish species and submerged or emergent aquatic vegetation species, which serve as food for various fish and aquatic birds. Mobile saltwater species will likely leave the lower salinity areas. Immobile species will naturally die off allowing for the recovery and recruitment of freshwater species. While installation of the weirs will impact the non-motile benthic community, these impacts would cease with the completion of construction. Benthic repopulation within the impacted areas will occur by organisms migrating from adjacent habitat. Impacts from the construction activities to mobile marine organisms, such as fish, are expected to be insignificant and temporary as these organisms are able to relocate and avoid direct physical effects.

A final response from NMFS Habitat Conservation Division on the integrated EFH assessment was received on August 4, 2017. NMFS concurred with the Corps' determination that the project will not adversely affect EFH. NMFS did not provide any EFH conservation recommendations.

5.3.5 AIR QUALITY

Temporary increases in air pollution from construction vehicles and equipment will likely occur during project construction, however, the impacts to air quality are anticipated to be localized and negligible, lasting only until construction is complete. The project will not construct any new sources of air pollution. The contractor will be required to comply with applicable air pollution standards of the Commonwealth of Puerto Rico and all Federal emission and performance laws and standards, including the U.S. Environmental Protection Agency's Ambient Air Quality Standards.

5.3.6 WATER QUALITY

Construction of the Recommended Plan will reduce salinity levels to 10ppt or less in the lagoon system. The weirs may also provide somewhat improved water quality by filtering suspended solids. The proposed weirs will be of a low-profile design in order to accommodate the anticipated flow rates in the system associated with large storm events.

There could be minor, temporary impacts to water quality, mainly turbidity during construction at each project site. Construction equipment may release negligible amounts of pollutants into the water, including oils and grease. BMPs will be used to limit the possibility of negatively effecting water quality. Detailed pollution control plans will be developed during the design phase. An application for a water quality certification will be submitted to Puerto Rico's EQB.

5.3.7 NOISE

The Recommended Plan would result in minor, short term, local increases in noise production during the construction phase of the project. The noise would result from the use of heavy machinery and vibratory or impact pile driving.

Coordination with NMFS included potential effects to sea turtles and Nassau grouper as a result of noise created by vibratory or impact pile driving. Although Nassau grouper are reef fish and would likely not be found within the river, noise travelling from impact pile driving could travel into the nearshore area where

Nassau grouper could be located. The following evaluation of noise effects is based on analysis prepared in support of the Biological Opinion for SAJ-82 (NMFS 2014):

Direct, physical injury effects to sea turtles and Nassau grouper are not expected from construction machinery or materials because these species have the ability to detect and move away; however, noise effects from pile driving could cause physical injury or change animal behavior in the affected area. Adverse physical injury effects could occur either immediately if a single noise event exceeds the threshold for direct physical injury or through prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals. Behavioral effects can be adverse if the noise prevents animals from migrating, feeding, resting, or reproducing. Sound degradation would occur as the noise travels from the construction sites, through the river, and out to the nearshore area.

Based on NMFS noise calculations, installation of metal sheet piles by vibratory hammer will not result in any form of injurious noise effects but could result in behavioral effects at radii of 52 feet (16 m) for sea turtles and 243 feet (74 m) for Nassau grouper. Installation of steel sheet piles by impact hammer could cause single-strike or peak-pressure injurious noise effects to sea turtles and Nassau grouper within 5 feet of the pile driving impact. The cumulative sound exposure level of multiple impact pile strikes over the course of a day may cause physical injury to sea turtles and Nassau grouper up to 430 feet from the impact location. The installation of piles using an impact hammer could also result in behavioral effects for sea turtles at a distance of 606 feet from the impact location and for Nassau grouper at a distance of 2,814 feet from the impact location.

A bubble curtain and cushion blocks will be deployed as noise abatement measures if an impact driver is used for pile driving. A ramp-up/soft-start procedure will also be used during impact pile driving. In this procedure, the force exerted by the hammer is gradually increased to maximum power with the intent to provide a stimulus for mobile species to leave the area before the single strike sound exposure level reaches an injury-causing threshold.

Nassau grouper are reef fish are not likely to be found inside of the river but could be within the nearshore area. Given the mobility of sea turtles and Nassau grouper, it is expected that they will move away from noise disturbances and continue to avoid it. If an individual chooses to remain within the behavioral response zone, it could be exposed to behavioral noise effects during pile installation; however, installation will occur only during the day. Species will be able to resume normal activities during quiet periods between pile installations and at night. Any behavioral effects associated with pile driving are expected to be insignificant. In addition, the project will adhere to NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions*, dated March 23, 2006. If a sea turtle is observed within 50 feet of the construction site, all in-water activities, including pile driving, will cease until the animal is observed to leave the area of its own accord. Because the area monitored for listed species is larger than the noise physical injury zone, observers will provide adequate protection making adverse effects extremely unlikely to occur. Construction crews would be required to comply with all applicable laws regarding noise, including any potential time of day restrictions and maximum decibel levels. All noise effects associated with the Proposed Action would cease with completion of construction.

5.3.8 CULTURAL RESOURCES

The Recommended Plan has the potential to effect archaeological site HU-6. Although much of the site was destroyed during the 2000 archaeological data recovery and the subsequent construction of the diversion channel, it is not clear whether significant archaeological materials remain within the proposed project footprint. As 36 CFR Part 800 no longer provides for a finding of no adverse effect through the process of data recovery, if HU-6 still contains archaeological materials that may reveal important information regarding the prehistory or history of Puerto Rico than construction has the potential to destroy or damage that information which would result in an adverse effect as defined in 36 CFR 800.5(a)(1).

As discussed in the existing condition, archaeological site HU-6 exists within the boundaries of the proposed project area. Consultation with the Puerto Rico State Historic Preservation Officer (SHPO) was initiated in a letter dated August 1, 2016, whereby the USACE requested clarification on the NRHP eligibility of site HU-6 and the previous determination of effects. The Puerto Rico SHPO responded on August 30, 2016 stating that if HU-6 contains archaeological materials that might reveal important information regarding the prehistory or history of Puerto Rico and construction will destroy or damage that information, then the criteria of adverse effect, as defined in 36 C.F.R. 800.5(a)(10) would have to be applied. Based on this consultation, the USACE determined that final project designs are necessary to determine effects to cultural resources.

The USACE will develop detailed designs of the construction footprint during the Design and Implementation (D&I) phase of the project. Once details on the precise construction footprint are obtained and design is complete, a Phase I cultural resource survey will be undertaken to determine if any archaeological materials remain within the area of potential effects (APE). If intact cultural deposits are identified as a result of the Phase I survey, a Phase II cultural resources assessment will be undertaken to determine if the portions of site HU-6 located within the APE possess the qualities of significance and integrity defined by the National Register of Historic Places Criteria for Evaluation (36 CFR 60.4 [a-d]) to be eligible for listing in the NRHP. The USACE would first take steps to avoid or minimize adverse effects to site HU-6 should the site be found eligible for inclusion in the NRHP. Costs associated with the initial Phase I survey, a Phase II archaeological assessment, coordination with interested parties, and redesign of the project footprint to avoid or minimize adverse effects to historic properties are presented in Appendix B. Data recovery to mitigate adverse effects to site HU-6 is not anticipated and would only be considered by the USACE as a final recourse if project impacts cannot be avoided. Costs associated with data recovery are not provided in the Cost Engineering and Risk Analysis and would be expected to exceed the one percent statutory level set by the by the Archeological and Historic Preservation Act of 1974 (Public Law 93-291) on the USACE's general authority to make expenditures for data recovery. Should data recovery be required as a result of the phased evaluation of site HU-6, and through consultation with the Puerto Rico SHPO, a waiver request to exceed the one percent statuary level would be submitted in accordance with Section 208 of the National Historic Preservation Act Amendments of 1980.

A consultation letter indicating the USACE's intention to conduct a phased approach to the evaluation of cultural resources associated with the Recommended Plan was sent to the Puerto Rico SHPO on February 22, 2017. The SHPO responded on March 17, 2017, concurring that future consultation during the D&I phase of the project will be required to determine effects of the undertaking on historic properties. As

such, consultation with the Puerto Rico SHPO is ongoing and will be completed during D&I of the project. All above-referenced consultation letters are documented in Appendix D-6 (SHPO Coordination). No construction will occur until all legal requirements have been met, including appropriate analysis and consultation with interested parties as defined under Section 106 of the NHPA.

5.3.9 AESTHETIC AND RECREATION RESOURCES

The Recommended Plan is subtidal and, therefore, will not impact aesthetics. The notches in the concrete weirs will maintain recreational access.

5.4 SOCIO-ECONOMIC ENVIRONMENT

5.4.1 LOCAL ECONOMY AND DEMOGRAPHICS

There is no evidence currently available to suggest that the socio-economic conditions in Puerto Rico and the Municipality of Humacao described in the existing condition will vary significantly in the future. Enhancement of the Pterocarpus habitat within the HNR, as part of the project, may help to sustain or grow ecotourism in the area.

5.4.2 LAND USE

If the proposed project is implemented, HNR is expected to remain and to convert back to a freshwater habitat made up of Pterocarpus trees, freshwater lagoons, and Typha marsh.

5.5 CUMULATIVE EFFECTS

Cumulative effects are defined in 40 CFR §1508.7 as those effects that result from "the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

Past actions in the area of the project site are discussed in section one of this report. The Recommended Plan would result in long-term benefits, which should outweigh any short-term environmental losses. The cumulative impact of replacing the SWIMs with permanent notched weirs allows for a permanent solution to reduce salinity in the lagoon system. Cumulative impacts to EFH and ESA listed species for this project are minimal. Turbidity and disturbance associated with the SWIMs replacement will be temporary and no long term impacts are anticipated. It is expected that the general public and state and local governments could have permitted activities in or around the project area. Federal activities are evaluated under NEPA directly for each project. Other projects that take place in-water or would impact wetlands would be evaluated under a permit issued by USACE Regulatory Division. These activities are not expected to have significant effects on the environment individually or cumulatively.

5.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.6.1 IRRETRIEVABLE

An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period

of time. An example of an irretrievable loss might be where a type of vegetation is lost due to road construction. Replacement of the temporary SWIMs would result in the permanent loss of non-motile benthic community at the site of replacement. These affects would be temporary as the habitat would recolonize over time by organisms migrating from adjacent habitat.

5.6.2 IRREVERSIBLE

An irreversible commitment of resources is one in which the ability to use, and/or enjoy the resource, is lost forever. One example of an irreversible commitment might be the mining of a mineral resource. The energy and fuel used during construction would be an irreversible commitment of resources.

5.7 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Impacts from the construction activities to mobile marine organisms, such as fish, are expected to be insignificant and temporary as these organisms are able to relocate and avoid direct physical effects. While installation of the weirs will impact the non-motile benthic community, these impacts would cease with the completion of construction. Benthic repopulation within the impacted areas will occur by organisms migrating from adjacent habitat. These effects are expected to be short-term and minor in nature.

Reducing the salinity of the lagoon system will promote long-term recovery and recruitment of freshwater fish species and submerged or emergent aquatic vegetation species. Mobile saltwater species will likely leave the lower salinity areas. Immobile species will naturally die off allowing for the recovery and recruitment of freshwater species.

6 ENVIRONMENTAL COMPLIANCE

6.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA)

Under the requirements of Section 102 of the National Environmental Policy Act (NEPA), this proposed project constitutes a major Federal action and an Environmental Assessment (EA) is therefore required. This EA, integrated with the feasibility report, has been prepared pursuant to NEPA and its implementing regulations. A Notice of Availability for the integrated report and Finding of No Significant Impact (FONSI) was coordinated with pertinent agencies and interested stakeholders for review and comment. The project is in compliance with the National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, *et seq*. P.L. 91-190.

6.1.1 AGENCY COORDINATION

The proposed project is being coordinated with the following agencies:

- USFWS
- NMFS
- USEPA
- EQB and Puerto Rico Planning Board (PRPB)
- SHPO
- DNER

All agency coordination letters are included in Appendix D-1 (Environmental Coordination) and D-3 (CZMA).

6.1.2 LIST OF RECIPIENTS

Consistent with NEPA regulations and guidance, a Notice of Availability of the draft report and draft Finding of No Significant Impact (FONSI) was distributed to the following list of recipients:

- NOAA-NMFS
- USACE
- USCG
- USEPA
- USFWS
- Municipality of Humacao
- Puerto Rico Department of Natural and Environmental Resources
- Puerto Rican Culture Institute
- Puerto Rico Economic Development Department
- Puerto Rico Environmental Quality Board
- Puerto Rico Fire Department
- Puerto Rico Health Department
- Puerto Rico National Guard
- Puerto Rico Permits Management Agency
- Puerto Rico Planning Board
- Puerto Rico Public Service Commission

- Puerto Rico State Historic Preservation Office

A complete distribution list is included Appendix D-4 (Distribution List).

6.1.3 COMMENTS RECEIVED AND RESPONSES

A public notice with links to the draft integrated feasibility report and EA, and associated appendices, was posted on March 31, 2017 to the Jacksonville District USACE environmental documents website for public and agency review and comment for 30 days from the date of the Notice of Availability (dated March 31, 2017). No comments on the draft FONSI and/or report were received under the public notice.

6.2 ENVIRONMENTAL COMMITMENTS

USACE, and its contractors, commit to avoiding, minimizing, or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications:

PROTECTION OF MANATEES DURING ALL IN-WATER CONSTRUCTION ACTIVITIES

USACE will incorporate the standard manatee protection construction conditions provided by USFWS with their April 17, 2017 letter into the plans and specifications for this project. USACE and its contractors commit to avoiding, minimizing, or mitigating for adverse effects to all endangered species during construction activities.

PROTECTION OF PUERTO RICAN BOAS DURING CONSTRUCTION ACTIVITIES

USACE will incorporate the standard Puerto Rican Boas protection construction conditions provided by USFWS in their April 17, 2017 letter into the plans and specifications for this project. USACE and its contractors commit to avoiding, minimizing, or mitigating for adverse effects to all endangered species during construction activities.

PROTECTION OF ALL MARINE MAMMALS (MANATEES AND DOLPHINS) DURING CONSTRUCTION ACTIVITIES

USACE will utilize a shutdown zone which will always be a minimum of 15 meters (50 feet) around the work area. For impact pile driving, which generates impulsive sound, a larger 40 meter (130 foot) shutdown zone shall be implemented for marine mammals only; the standard shutdown zone will continue to be applied for all other protected species. If a manatee or bottlenose dolphin approaches or enters a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without redetection of the animal.

PROTECTION OF SEA TURTLES AND SMALLTOOTH SAWFISH

USACE shall incorporate NMFS' "Sea Turtle and Smalltooth Sawfish Construction Conditions" into the plans and specifications for this project. USACE will utilize a shutdown zone, which will always be a minimum of 15 meters (50 feet) around the work area. If a sea turtle or smalltooth sawfish is observed approaching or entering a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without redetection of the animal. USACE and its contractors commit to avoiding, minimizing, or mitigating for adverse effects to all endangered species during construction activities.

6.3 ENVIRONMENTAL COMPLIANCE

6.3.1 CLEAN AIR ACT OF 1972

The project is located in the AQCR known as Puerto Rico AQCR. The project area is in attainment for all the NAAQS. The project will not create any new sources of air pollution and it will be performed in compliance with Puerto Rico's air quality standards. This project is in compliance with the Act.

6.3.2 CLEAN WATER ACT OF 1972

An application for Section 401 water quality exemption/certification will be made to Puerto Rico's Office of Permits Management. All water quality standards will be met and the project will be in compliance with this Act. A Section 404(b)(1) evaluation is included in this report as Appendix D-2 (404(b)(1)).

6.3.3 COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990

There are no designated coastal barrier resources in the project area that would be affected by this project. These acts are not applicable.

6.3.4 COASTAL ZONE MANAGEMENT ACT OF 1972

A Federal Consistency Determination (FCD), in accordance with 15 CFR 930 Subpart C, is included in this report as Appendix D-3 (CZMA). In a letter dated July 6, 2017, the Puerto Rico Planning Board concurred with the FCD. This project is in compliance with the Act.

6.3.5 ESTUARY PROTECTION ACT OF 1968

No designated estuary would be affected by project activities. This Act is not applicable.

6.3.6 FARMLAND PROTECTION POLICY ACT OF 1981

No prime or unique farmland would be impacted by implementation of this project. This Act is not applicable.

6.3.7 RIVERS AND HARBORS ACT OF 1899

Because the project is affirmatively authorized by Congress, no further approval under Section 10 (33 U.S.C. 403) is required.

6.3.8 SUBMERGED LANDS ACT OF 1953

The project would occur on the submerged lands of Puerto Rico. By following the permit process, the Commonwealth of Puerto Rico will be coordinated with and this project will be in compliance with the Act.

6.3.9 WILD AND SCENIC RIVER ACT OF 1968

No designated Wild and Scenic river reaches would be affected by project related activities. This Act is not applicable.

6.3.10 ENDANGERED SPECIES ACT OF 1973

Pursuant to Section 7 of the Act, coordination was initiated with NMFS and USFWS on March 31, 2017. In a letter dated April 17, 2017, USFWS concurred with the Corps' determination that the Recommended Plan "may affect, but is not likely to adversely affect" listed species under USFWS jurisdiction, so long as the standard conditions for the Antillean manatee and Puerto Rican Boa are incorporated into the project. A copy of the NMFS Section 7 ESA concurrence letter was received on August 22, 2017. USACE has concluded the project "may affect, but is not likely to adversely affect" the following listed species: Puerto Rican Boa (*Epicrates inornatus*), Antillean Manatee (*Trichechus manatus*), Loggerhead Sea Turtle (*Caretta caretta*), Green Sea Turtle (*Chelonia mydas*), Hawksbill Sea Turtle (*Eretmochelys imbricata*), Leatherback Sea Turtle (*Dermochelys coriacea*), and the Nassau Grouper (*Epinephelus striatus*). This project will not affect the Scalloped Hammerhead Shark (*Sphyrna lewini*), any listed corals, or DCH. Coordination document for this project are located in Appendix D-1 (Environmental Coordination). The Corps will comply with all substantive and procedural requirements of the Act before and during construction. This project is in compliance with the Act.

6.3.11 FISH & WILDLIFE COORDINATION ACT OF 1958

A Memorandum of Agreement was signed by the Corps and USFWS on March 31, 2017 agreeing to utilize the NEPA review and ESA consultation process to complete coordination responsibilities under the Fish and Wildlife Coordination Act to avoid duplicate analysis and documentation efforts. This project was coordinated with the USFWS and is in compliance with the Act.

6.3.12 MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

No migratory birds will be affected by project activities. The project has been coordinated with USFWS and is in compliance with these acts.

6.3.13 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976

An Essential Fish Habitat (EFH) Assessment is included within this integrated report. A final response from NMFS Habitat Conservation Division was received on August 4, 2017. NMFS concurred with the Corps' determination that the project will not adversely affect EFH and did not provide any EFH conservation recommendations.. Copies of relevant correspondence are located in Appendix D-1 (Environmental Coordination). This project is in compliance with the Act.

6.3.14 ANADROMOUS FISH CONSERVATION ACT

Anadromous fish species will not be affected. The project was coordinated with the NMFS and is in compliance with the Act.

6.3.15 MARINE MAMMAL PROTECTION ACT OF 1972

There is no anticipated take of any marine mammal during any activities associated with the project. Appropriate actions will be taken to avoid listed and protected marine mammal species effects during project construction. If a marine mammal is identified within the project boundaries, cease work requirements will be implemented until the animal leaves the project area of its own volition, preventing

potential take of the animal under the MMPA. As a result of this, the project is in compliance with the Act.

6.3.16 MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT (OCEAN DUMPING ACT)

Ocean disposal is not a component of this project; therefore, this Act is not applicable.

6.3.17 NATIONAL HISTORIC PRESERVATION ACT OF 1966

Consultation with the Puerto Rico State Historic Preservation Officer (SHPO) has been initiated in accordance with the National Historic Preservation Act of 1966, as amended, and as part of the requirements and consultation processes contained within the NHPA implementing regulations of 36 CFR 800. This project shall be in compliance with the Archeological Resources Protection Act (96-95) and the Abandoned Shipwreck Act of 1987 (PL 100-298; 43 U.S.C. 2101-2106). The Puerto Rico Preservation Officer reviewed the project and, by letter dated August 30, 2016, found that archaeological site HU-6 may remain eligible for inclusion in National Register of Historic Places and further consultation is needed. All consultation letters referenced in Section 5.3.8 are documented in Appendix D-6 (SHPO Coordination). Consultation is ongoing and the project remains in compliance with the National Historic Preservation Act. Completion will be required prior to project implementation. No construction will occur until all legal requirements have been met, including appropriate analysis and consultation with interested parties as defined under Section 106 of the NHPA.

6.3.18 UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970

This project does not involve real property acquisition and/or displacement of property owners or tenants. The Act is not applicable to this project.

6.4 EXECUTIVE ORDER (EO) COMPLIANCE

6.4.1 EO 11988, FLOODPLAIN MANAGEMENT

To comply with EO 11988, the policy of USACE is to formulate projects that, to the extent possible, avoid or minimize adverse effects associated with the use of the floodplain and avoid inducing development in the floodplain unless there is no practicable alternative. No activities associated with this project are located within a floodplain, which is defined by EO 11988 as an "area which has a one percent or greater chance of flooding in any given year." The project is in compliance with the EO.

6.4.2 EO 11990, PROTECTION OF WETLANDS

This project will improve environmental conditions and promote recovery of the project area's Typha marsh. This project is in compliance with this EO.

6.4.3 EO 12898, ENVIRONMENTAL JUSTICE

The environmental justice assessment recognizes the issues addressed in the Environmental Justice Guidance under NEPA (CEQ 1997), and uses USEPA Guidance for Incorporating Environmental Justice Concerns in USEPA's NEPA Compliance Analyses (USEPA 1998) as a guide.

An environmental justice assessment requires an analysis of whether minority and low-income populations (i.e. "populations of concern") would be affected by a proposed Federal action and whether they would experience adverse impacts from the proposed action at any of the site alternatives. If there are adverse impacts, the severity and proportionality of these impacts on populations of concern must be assessed in comparison to the larger non-minority or non-low-income populations. At issue is whether such adverse impacts fall disproportionately on minority and/or low-income members of the community and, if so, whether they meet the threshold of "disproportionately high and adverse." If disproportionately high and adverse effects are evident, then USEPA guidance advises that it should trigger consideration of alternatives and mitigation actions in coordination with extensive community outreach efforts (USEPA 1998).

The proposed action will not result in adverse human health or environmental affects which would disproportionally impact a particular minority or low-income population. This project is in compliance with this EO.

6.4.4 EO 13045, DISPARATE RISKS INVOLVING CHILDREN

This EO mandates that each Federal agency make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

As the proposed action does not affect children disproportionately from other members of the population, the proposed action would not increase environmental health or safety risks to children. This project is in compliance with this EO.

6.4.5 EO 13089, CORAL REEF PROTECTION

This EO may apply to coastal projects, especially those which might directly or indirectly impact coral reefs. There are no coral reefs in the project footprint, however, pursuant to Section 7 of the Endangered Species Act, coordination was conducted with NMFS for seven listed species of coral. In a letter dated August 22, 2017, NMFS concurred with the Corps' determination that the project will have no effect on the seven listed species of coral and will not affect any DCH. This project is fully coordinated under the ESA and is in full compliance with the EO. Coordination documents are located in Appendix D-1 (Environmental Coordination).

6.4.6 EO 13112, INVASIVE SPECIES

No new or invasive species will be introduced due to this project. Cattails are often considered invasive, however, Typha marsh has been historically present in this area and repopulation of the marsh will reestablish the previously existing waterfowl habitat. Following implementation of the temporary salt water intrusion measures (SWIMs), no new or unwanted invasive species were identified as migrating into

the area. Since CAP projects do not include an operations and maintenance component, the NFS would be responsible for invasive species control following project completion. The project is in compliance with this EO.

7 RECOMMENDATIONS

I have given consideration to all significant aspects in the overall public interest, including engineering feasibility, economic, social, cost and risk analysis, and environmental effects. The Recommended Plan described in this final report provides the optimum solution for ecosystem restoration within the study area that can be developed within the framework of the formulation concepts. Implementation of the Recommended Plan for the Río Antón Ruíz 1135 Project is recommended at this time, with such modification as the discretion of the Commander, South Atlantic Division, U.S. Army Corps of Engineers (SAD), deems advisable.

The Recommended Plan is to install two weirs that will aid in the reduction of saltwater intrusion into the Pterocarpus forest and the lagoon system allowing for the reduction of salinity levels which will, in turn, provide an ecosystem solution that recovers the natural condition of the Humacao Natural Reserve and preserves the Pterocarpus forest from further degradation.

7.1 ITEMS OF LOCAL COOPERATION

Federal implementation of the recommended project would be subject to the non-Federal sponsor agreeing to comply with Federal laws and policies, including but not limited to:

a. Provide 25 percent of total construction costs, subject to a reduction of up to $455,000, as follows::

    1. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material as determined by the Federal Government to be required or to be necessary for the construction, operation, and maintenance of the project;
    2. Provide, during construction, any additional contributions necessary to make its total contribution equal to 25 percent of total project costs, subject to a reduction of up to $455,000;

b. Provide, during construction, 100 percent of any project costs that exceed the federal limit of $10,000,000;

c. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project;

d. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

e. Shall not use project lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project;

f. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way necessary for construction, operation, and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

g. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

h. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

i. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

j. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local Governments at 32 CFR, Section 33.20;

k. Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c));

l. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction or operation and maintenance of the project. However, for lands that the Government determines to be subject to the navigation servitude, only the Government

shall perform such investigation unless the Government provides the non-Federal sponsor with prior specific direction in which case the non-federal sponsor shall perform such investigation in accordance with such written direction;

m. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, rehabilitation, or replacement of the project;

n. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA;

o. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211(e)) which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

7.2 DISCLAIMER

The recommendations contained herein reflect the information available at this time and current departmental policies governing the formulation of individual projects. They do not reflect the program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher level reviews within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to a higher authority as proposals for project modification and/or implementation funding. The recommendations herein for the provision of a CAP Section 1135 project for the Río Antón Ruíz do not include any provisions for work which would result in any new Federal expenditures or financial assistance prohibited by the Coastal Barrier Resources Act (Public Law 97-348); nor were funds obligated in past years for this project for purposes prohibited by this Act.

Timika M. Wilson
Lieutenant Colonel, U.S. Army
District Commander

8 ACRONYMS AND REFERENCES

8.1 ACRONYMS

A

ac	Acres
ac-ft.	Acre-Feet
ACHP	Advisory Council on Historic Preservation
AM	Adaptive Management
APE	Area of Potential Effect
AQCR	Air Quality Control Region
ASTM	America Society for Testing and Materials

B

BMP	Best Management Practices

C

CAA	Clean Air Act
CAP	Continuing Authorities Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CE/ICA	Cost-effective/Incremental Cost Analysis
cm/s	Centimeters Per Second
CZMA	Coastal Zone Management Act

D

DCH	Designated Critical Habitat
D&I	Design & Implementation
DNER	Department of Natural and Environmental Resources
DPS	Distinct Population Segment

E

EA	Environmental Assessment
ECB	Existing Conditions Baseline
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EOPs	Environmental Operating Principles
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
ESA	Endangered Species Act

F

FCSA	Feasibility Cost Share Agreement
FCD	Federal Consistency Determination
FEIS	Final Environmental Impact Statement
FID	Federal Interest Determination
FONSI	Finding of No Significant Impact
F.S.	Federal Statute
ft.	feet
FWC	Florida Fish and Wildlife Conservation Commission
FWO	Future without-project Condition (or the No Action Alternative under NEPA)
FY	Fiscal Year

G

H

HAPC	Habitat Area of Particular Concern

HEC	Hydrologic Engineering Center
HEP	Habitat Evaluation Procedures
HNR	Humacao Natural Reserve
HSI	Habitat Suitability Index
HU	Habitat Unit
I	
IFR	Integrated Feasibility Report
INECOH	Ecotourism Initiative of Humacao
J	
K	
Kg	Kilograms
L	
LERRD	Lands, Easements, Rights of Way, Relocations, and Disposals
LPP	Locally Preferred Plan
M	
MANLAA	May Affect, Not Likely to Adversely Affect
MLW	Mean Low Water
MMPA	Marin Mammal Protection Act
N	
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NFS	Non-Federal Sponsor
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic Atmospheric Administration

NPS	National Park Service
NRHP	National Register of Historic Places
NRC	National Research Council
NS	Non-Structural
NWS	National Weather Service

O

OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and Replacement
O&M	Operation & Maintenance

P

PDT	Project Delivery Team
PMP	Probable Maximum Precipitation
PPA	Project Partnership Agreement
POM	Project Operating Manual
ppt	Parts Per Thousand

Q

R

S

S	Structural
S&A	Supervision & Administration
S&I	Supervision & Inspection
SAD	South Atlantic Division
SAV	Submerged Aquatic Vegetation
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office(er)
Sis	Suitability Indices
SIP	State Implementation Plan
SPF	Standard Project Flood
SPS	Standard Project Storm

SWIMs	Saltwater Intrusion Measures

T

TMDL	Total Maximum Daily Limits
TP	Total Phosphorous
TP	Technical Paper
TPCS	Total Project Cost Summary

U

USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

V

W

WQBELs	Water Quality Based Effluent Limits
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act

X

Y

Z

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Continuing Authorities Program
Section 1135 Project

Engineering Appendix

for

Rio Anton Ruiz Restoration Project

Municipality of Humacao, Puerto Rico

to the

Integrated Feasibility Report

and Environmental Assessment

17 February 2017

Prepared By:

US Army Corps of Engineers ®
Jacksonville District
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ATTACHMENTS

Attachment A – Site Layouts

Attachment B - Geotechnical Data and Analyses

Attachment C - Structural Plates and Analyses

1.0 Purpose

The purpose of this engineering appendix to the feasibility report (aka detailed project report) is to discuss the methods and plans for solutions to reduce the salinity levels for the Rio Anton Ruiz Restoration project, Humacao, Puerto Rico, Continuing Authorities Program (CAP) Section 1135 (Project Modifications for Improvements to the Environment) that was introduced after construction of a prior CAP Section 205 flood control project. This engineering appendix will include alternatives evaluated, costs and benefits, preliminary designs, and recommendations. Upon approval, this document will be included as an appendix to the Final Integrated Feasibility Report.

2.0 Project Background

2.1 Location

The project is located in the Municipality of Humacao on the southeast coast of Puerto Rico. See **Figure 1** below.

Figure 1. Project Location

2.2 Original Project (Section 205)

The authorized purpose of the Río Antón Ruiz CAP Section 205 flood control project ("Rio Anton Ruiz at Humacao, Puerto Rico, Final Detailed Project Report and Environmental Assessment, Section 205, Flood Control", dated October 1993) is to reduce flooding damages from the Rio Anton Ruiz to the communities of Punta Santiago, Verde Mar, and Villa Palmira. To achieve the authorized purpose, the project has the following features:

- 11,870 feet (3,619 meters) of standard project flood (SPF) levee for flood protection
- 5,150 feet (1,570 meters) of diversion channel
- 8,270 feet (2,521 meters) of interior drainage ditch, collecting the drainage from the interior communities and outfalling to the diversion channel and Boca Prieta outlet
- 127-foot long, three-barrel, 72-inch (1.8 meter) CMP, flap gated structure to serve as the interior drainage outfall
- Two, 195-foot (59 meter) gaps in the Boca Prieta dike
- Two salt water intrusion measures (canal plugs) within the diversion channel (post-original construction, but included as part of the 205 project)

Construction was completed under two contracts with the levee, diversion channel, interior drainage ditch and culvert structure completed in June of 2001 and the salt water intrusion measure (SWIM) completed on March of 2007. See **Figure 2** for project features completed in 2001.

Figure 2. Section 205 Project Features

2.3 Post-Construction

Since completion of the initial flood control project features in 2001, the lagoon system and its surrounding environment have been adversely affected by saltwater intrusion. Some of the primary effects include those to the Humacao Natural Preserve (HNR) Pterocarpus Forest, which is one of the largest remaining forested freshwater swamps in Puerto Rico. These swamps are dominated by bloodwood (*Pterocarpus officinalis*) trees. This tree species is protected and has a low saltwater tolerance, requiring mainly freshwater to survive. Since the completion of the project, field observations by DNER and USACE indicated that a vast number of bloodwood trees on the north shore of the Río Antón Ruiz were subject to environmental stress (e.g. wilting, loss of foliage, and dry bark and trunks), likely due to increased salinity levels. In addition, changes in the lagoon system biodiversity have been observed. For example, some species of plants, such as mangroves, that rely on both fresh and saltwater have increased spatially, and fish not previously documented in the area have appeared since the completion of the flood control project.

2.4 Temporary Saltwater Intrusion Measures (SWIM)

Salinity data from 1999 thru 2001 indicates that the salinity levels at Mandri Stations 2 and 3 were below 10 ppt prior to project completion. After completion of the project and connection of the diversion channel to the lagoon system, data gathered from 2004 thru 2007 indicated that the salinity levels had more than tripled within the Mandri Lagoons. The highest salinity level recorded was 35.2 ppt.

Based on field inspections conducted by USACE staff and the monitoring data provided by DNER, per a letter dated July 14, 2005, USACE agreed that ecosystem changes were evident in the vicinity of the Río Antón Ruiz Flood Control Project, likely due to construction of the diversion channel. In this letter, USACE suggested the investigation and implementation of temporary SWIM to lower the salinity levels and a study to assess the saline effects on the natural system. In order to preserve the Pterocarpus Forest and some of the biodiversity of both the freshwater and saltwater fauna and flora, a study was conducted and a series of temporary saltwater intrusion measures were developed and constructed to limit the amount of saltwater effects on the lagoon system and the Pterocarpus Forest. The temporary measures study was entitled "Rio Anton Ruiz Flood Control Project, Temporary Saltwater Intrusion Measures (SWIM), Humacao, Puerto Rico, November 11, 2011". The salinity information gathered by DNER after construction of the SWIMs would be used to determine the effectiveness of the SWIMs, if additional studies would be required, and if the construction of permanent tidal exchange measures would be warranted.

After installation of the SWIMs in 2007, data indicates that salinity levels at all the monitoring stations decreased and met the initial target (below 10 ppt). Salinity levels measured at the stations ranged from approximately 0.1 to 7.0 ppt. These levels could be attributed to the SWIMs, as well as rainfall events.

However, at the end of 2008, salinity levels increased at most of the stations, and in several monitoring events they exceeded 10 ppt concentrations. It is assumed that the salinity levels are increasing because the SWIM plugs (sandbags placed at the bottom of the channel, up to mean low water level) have deteriorated mostly as a result of damage to the sandbags from small boats used by fishermen. The plugs are losing their effectiveness and allowing saltwater intrusion into the lagoon system. It should be noted that the SWIMs deterioration was expected to eventually occur. SWIMs were intended only as a temporary measure to lower the salinity levels during the data gathering to determine if the construction of permanent tidal exchange measures would be warranted.

2.5 Current (Proposed) Section 1135 Project

The current project is authorized under Section 1135 Project Modifications for Improvement to the Environment of the Continuing Authorities Program. As discussed previously, this project area was part of a CAP Section 205 flood control project that included construction of a diversion channel. A subsequent study on saltwater intrusion measures was conducted, and temporary saltwater intrusion measures (sandbags) were placed. The temporary measures were monitored for salinity levels and deemed to have successfully lowered the salinity levels. This Section 1135 project involves the design and construction of permanent features to reduce the salinity levels within the diversion channel (and thus lagoon system and Pterocarpus Forest). The current project includes evaluating three alternatives:

Alternative 1 consists of concrete-capped sheet pile weirs located at the two existing temporary SWIM sites (see Figure 6). One location is within the Rio Anton Ruiz, just north of the confluence of the Rio Anton Ruiz and the diversion channel. The other location is within the diversion channel, approximately ½ mile from the mouth of the diversion channel.

Alterative 2 consists of the same concrete-capped sheet pile weir, but only one at a new site. The location selected was within the diversion channel prior to the confluence of the diversion channel and the Rio Anton Ruiz.

The non-structural plan considered involves sand placement within the diversion channel, near the mouth of the diversion channel. There was previously a sand bar at this location that continues to wash out and build back during various storm events. The alternative was considered as a non-structural plan that would provide a more consistent sand bar, as the non-Federal sponsor has indicated that the sand bar does not develop as quickly as it used to (prior to the Section 205 project).

Alternatives 1a and 1b were developed to also review the incremental costs and benefits of constructing only one of the weirs. Alternative 1a consists of constructing the same concrete-capped sheet pile as in Alternative 1, but at only within the Rio Anton Ruiz channel. Alternative 1b was also the same as Alternative 1, but constructed only within the diversion channel.

The existing three barrel drainage culvert is severely deteriorated. It was originally considered as part of the project, but screened out early on. The replacement of the culvert would not provide any benefits for the purposes of environmental restoration (under 1135) as its purpose is to serve as an outfall for the interior drainage into the diversion channel. The culvert is located downstream of the lagoon and forest and thus

would not provide any "flushing out" or other benefits for the 1135 project, but would nearly double the costs of the project.

3.0 Hydrology and Hydraulics

3.1 Project History

The coastal areas of Punta Santiago historically experienced frequent flooding, possible at any time during the year. Punta Santiago is a community within the project area directly on the coast. Flood damages were occurring when runoff from the mountains exceeded the detention capacity of the Mandri, Palmas, and Santa Teresa lagoons and flooded the low coastal areas in and around Punta Santiago. The authorizing document that details the hydrologic and hydraulic analysis of the study area is the "Rio Anton Ruiz at Humacao, Puerto Rico, Final Detailed Project Report and Environmental Assessment, Section 205, Flood Control", dated October 1993. See **Figures 3, 4, & 5** for location and drainage areas as outlined in the October 1993 Detailed Project Report.

Figure 3. Humacao Natural Reserve lagoon system

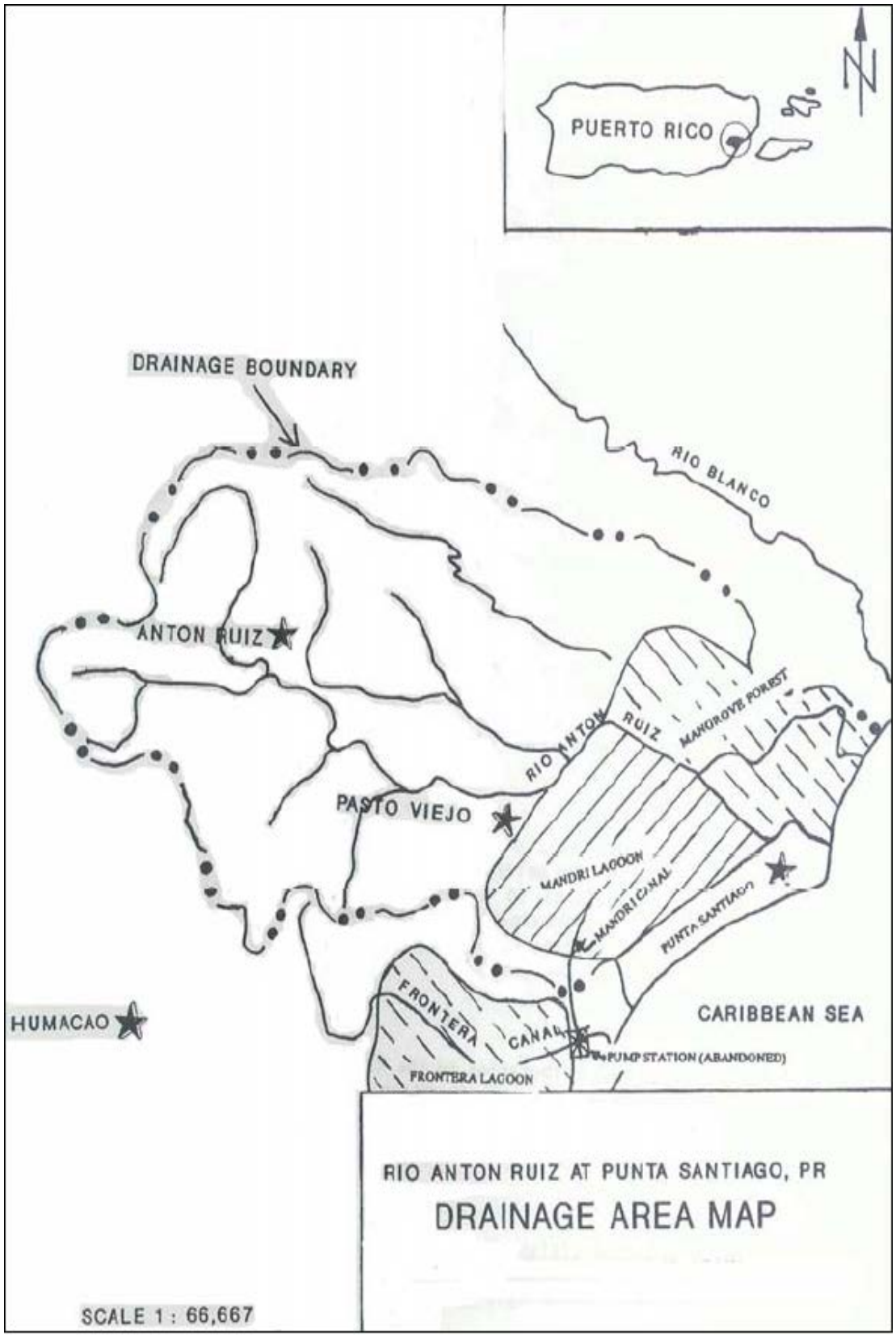

Figure 4. Drainage Area Map (from 1993 Detailed Project Report)

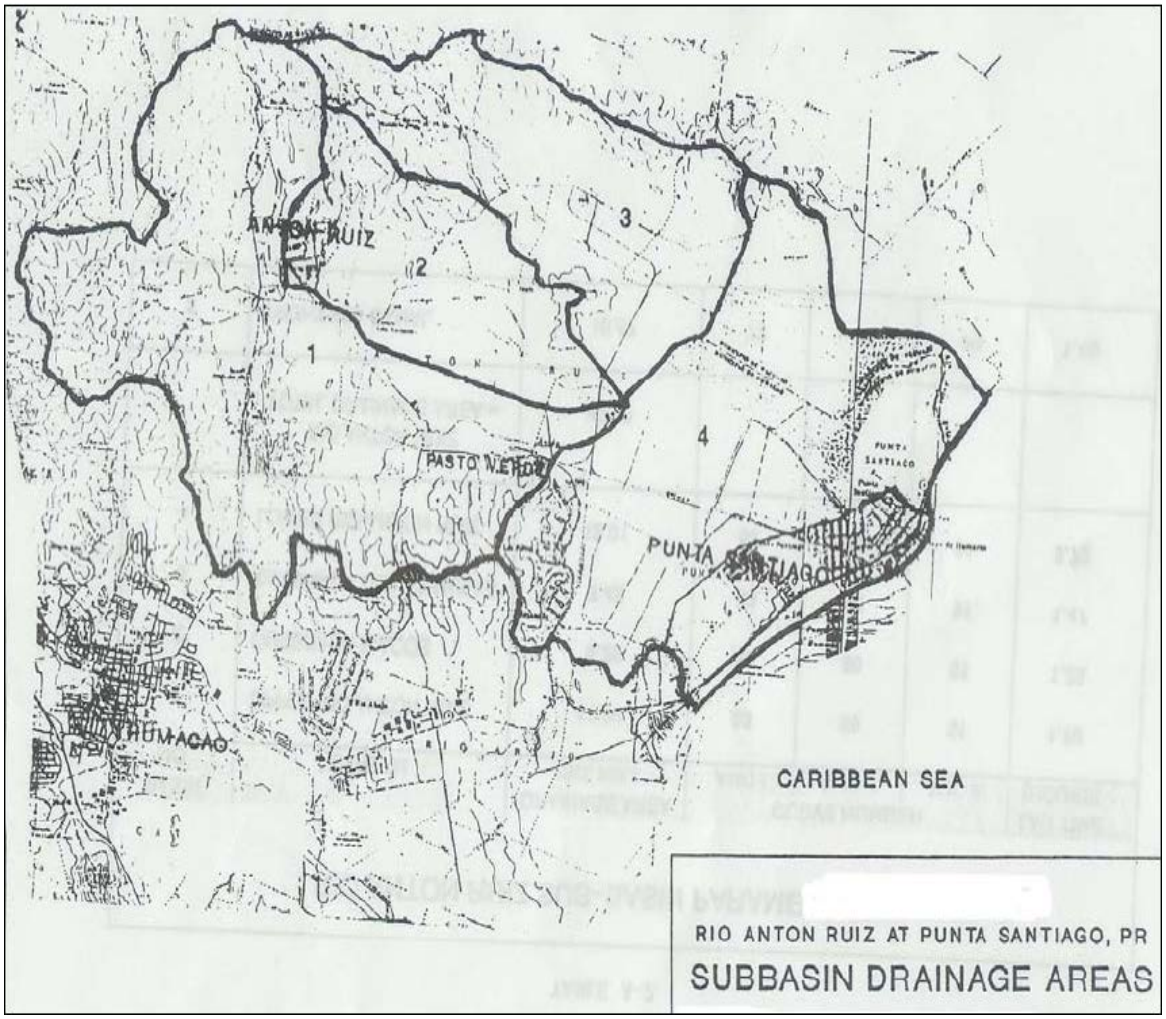

Figure 5. Subbasin Drainage Areas (from 1993 Detailed Project Report)

Hydrologic analyses detailed within the aforementioned report remains the most current related to the study area. Shortly after completion of contract 1 of the authorized flood control project, it was noted by Puerto Rico's Department of Natural and Environmental Resources (DNER) that the lagoon system and its surrounding environment were adversely affected by salt water intrusion. This led to a post construction change with the installation of two new temporary SWIM plugs in March 2007 (contract 1A). One located within the diversion channel near the Mandri lagoon and the other across the Rio Anton Ruiz immediately upstream of its confluence with the diversion channel. See **Figures 6, 7, & 8** for location of SWIM plugs and post installation photographs.

Section 6 of the final "SWIM Monitoring Report", November 2011, indicated the elevation of the SWIM plugs were set to the Mean Low Water (MLW) tide level based on the closest NOAA tide gage, which is located near the Roosevelt Roads Naval Air Station in the Municipality of Ceiba, approximately six (6) kilometers (3.73 miles) north of the project

site. The purpose for establishing the plug elevations at MLW was to ensure an exchange of salt and fresh waters between the Caribbean Sea and the Lagoon system was still possible (i.e. not to completely eliminate saltwater intrusion, only reduce salinity concentrations); and additionally, to allow small boat traffic during the day-to-day monitoring of the lagoon system by DNER.

Section 6 (Project Performance) paragraph "g" within the Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual (OMRR&R) states the following in relation to the SWIM's:

"The constructed SWIM feature is a temporary measure that consists of 2 plugs, one across the diversion channel near the lagoon and the other across the Rio Anton Ruiz above its confluence with the diversion channel. The two measures are approximately 150 feet to 200 feet long and consist of sand bags. The total amount of sand bags and the ranges of sizes are about 100 sand bags that weigh about 12 tons each, 40 heavy lift bags that weigh about 5,000 lbs each, and 8,000 sand bags that weigh about 70 lbs each. The top elevation of those bags was set to allow surface water to flow over the bags and limit the amount of salt water tide flowing into the system. DNER will be monitoring the lagoon and Rio Anton Ruiz River for at least 5 years from the construction date of the SWIM plugs in order to determine the design requirements for the permanent SWIM measure."

Figure 6. Location of SWIM Plugs (as per survey 16-027)

Figure 7. SWIM installed across the diversion channel (March 2007)

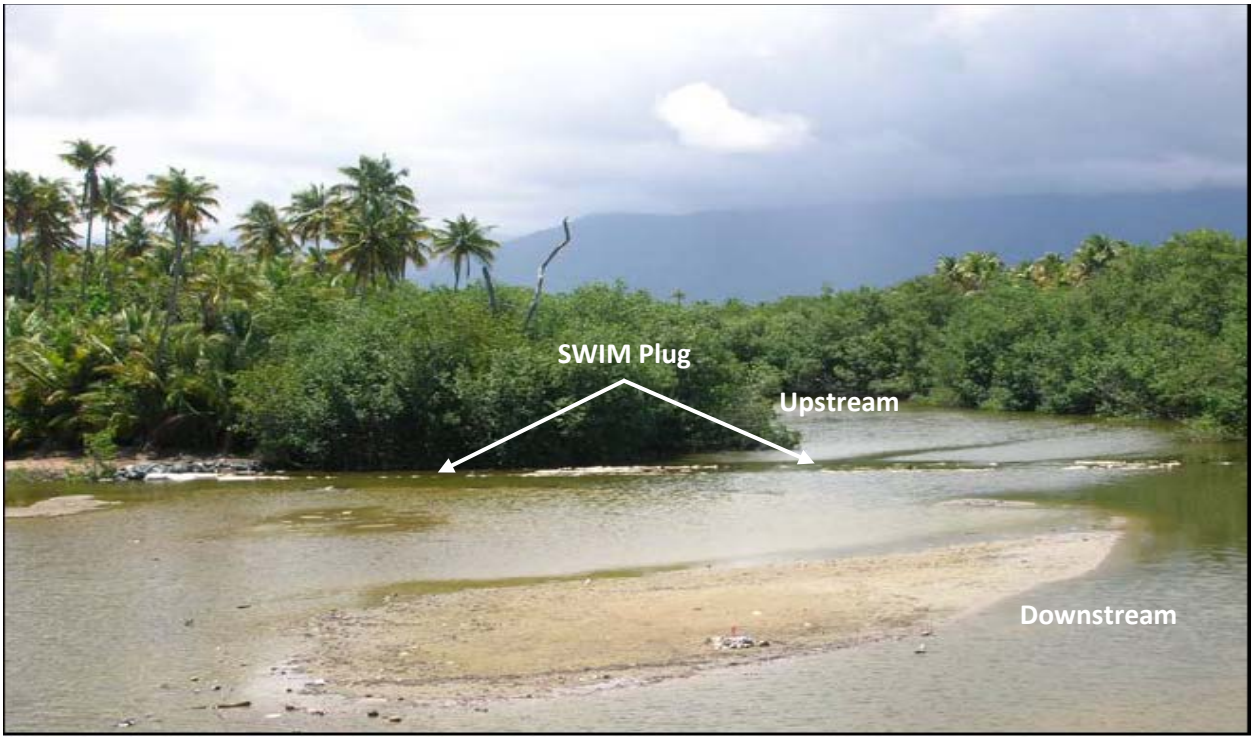

Figure 8. SWIM installed across the Rio Anton Ruiz (March 2007)

3.2 Current (Proposed) Project Modifications

USACE is authorized to assist in the restoration of degraded ecosystems through the modification of USACE structures, operations, or implementation of measures in affected areas as outlined in Section 1135 of the Continuing Authorities Program (CAP). This project seeks to provide a permanent solution to the previously installed temporary SWIM plugs. It should be noted that after installation of the temporary SWIM plugs, salinity data retrieved from DNER monitoring stations indicated a decrease in salinity that met initial targets successfully (below 10 parts per thousand (ppt)). Based on this data, the decrease in salinity can be attributed to the temporary SWIM plugs.

Replacement of the SWIM plugs will have no adverse influence on the hydrologic condition of the study area; therefore, no update to the original Section 205 has been undertaken. No major changes in land use have occurred in the basin. The hydraulic analysis performed resulted in a weir design that ensures that the permanent replacements for the temporary SWIM's will match, at minimum, the effectiveness in reducing salinity values upstream while not adversely impacting flood discharges to tide (i.e. no impact on flood damage reduction provided by original project). **Figure 9** indicates the location of the existing SWIM plug within the diversion channel as per hydrographic survey 16-027 (February 2016). **Figure 10** indicates the location of the existing SWIM plug within the Rio Anton Ruiz as per survey 16-027. **Figure 11** is a cross section of the diversion channel and SWIM plug converted from meters into feet with stationing from left bank to right bank looking downstream. **Figure 12** is a cross section of the Rio Anton Ruiz and SWIM plug converted from meters into feet with stationing from left bank to right bank looking downstream.

An analysis was performed of the vertical datum relationship between the Puerto Rico Vertical Datum of 2002 (PRVD02) and tidal datums relative to this project. Purpose for requesting this analysis was to ensure consistency with respect to project elevation reporting with that of survey 16-027. Elevations of tidal datums referenced to PRVD02 in feet are as follows:

Mean Higher High Water	MHHW = +0.807 ft, PRVD02
Mean High Water	MHW = +0.545 ft, PRVD02
Mean Sea Level	MSL = 0.000 ft, PRVD02
Mean Tide Level	MTL = -0.007 ft, PRVD02
Mean Low Water	MLW = -0.561 ft, PRVD02
Mean Lower Low Water	MLLW = -0.768 ft, PRVD02

The above tidal elevations are taken as the tailwater (downstream) elevations for both the diversion channel and Rio Anton Ruiz SWIM plugs. That is, discharge possible across

the SWIM plugs is a function of head above the SWIM plug (weir) crest and degree of submergence of the SWIM plug caused by the tailwater elevation.

Figure 9. Survey of SWIM within diversion channel (survey 16-027, March 2016)

Figure 10. Survey of SWIM within Rio Anton Ruiz (survey 16-027, March 2016)

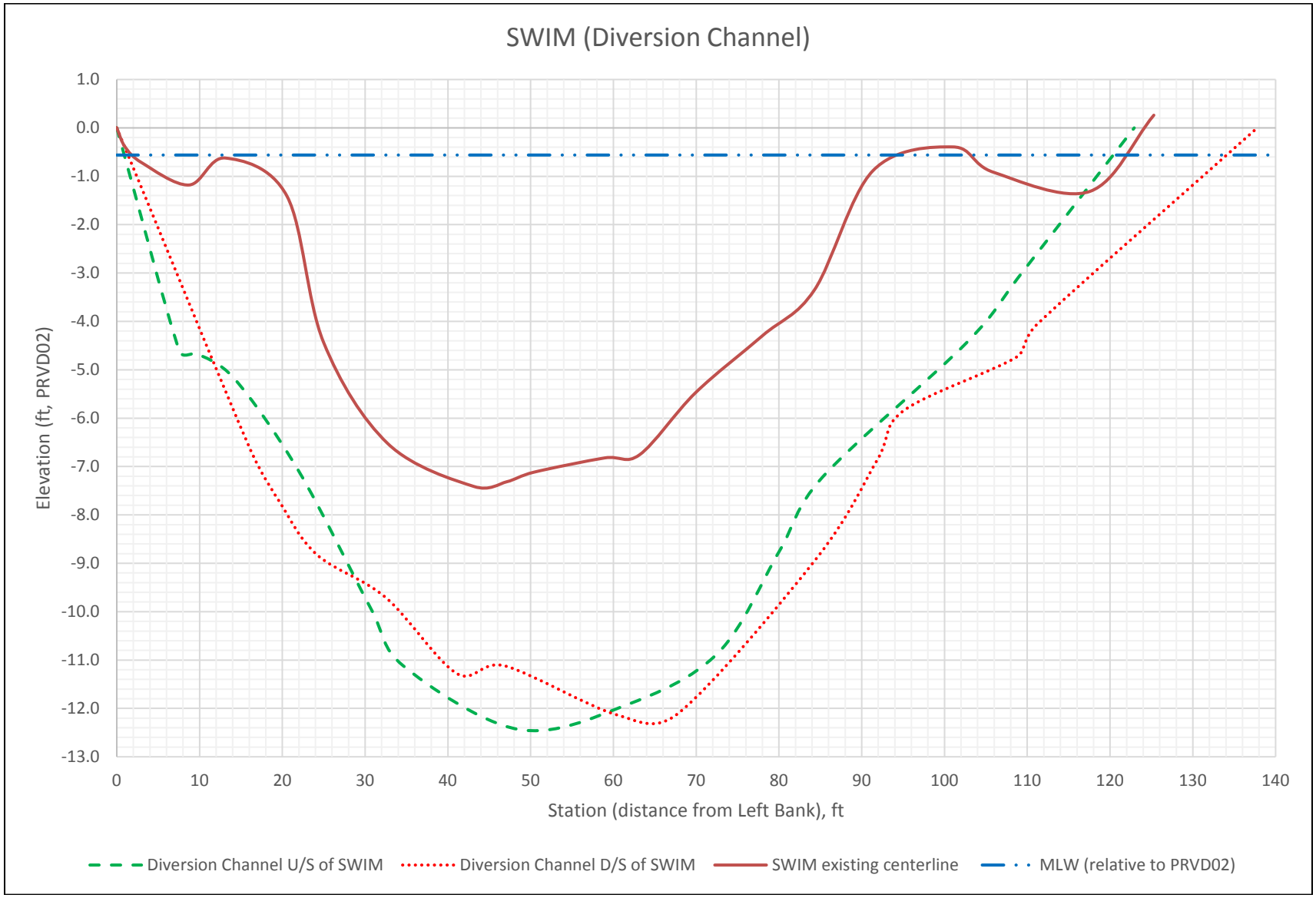

Figure 11. Cross section of diversion channel SWIM plug (survey 16-027, March 2016)

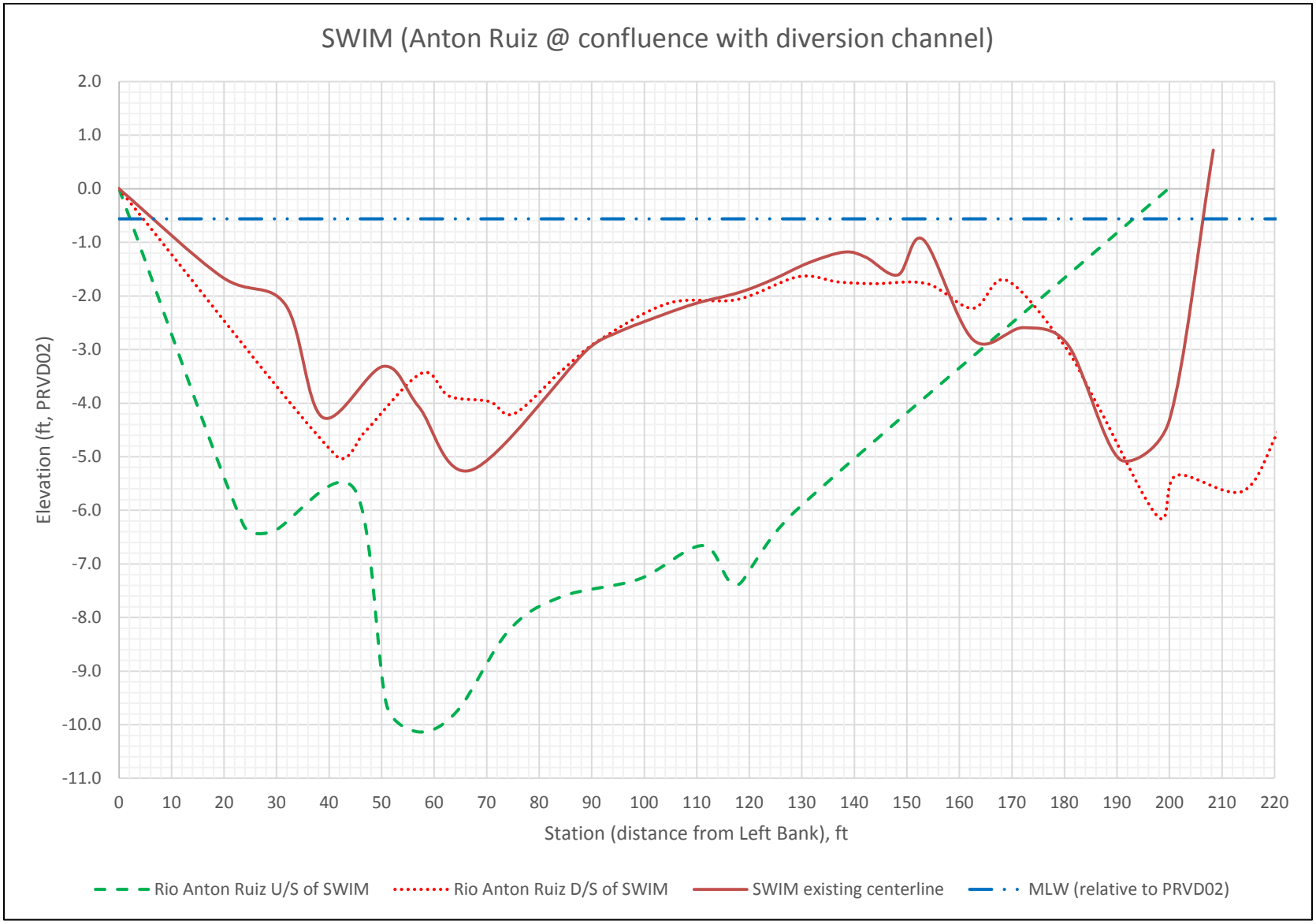

Figure 12. Cross section of Rio Anton Ruiz SWIM plug (survey 16-027, March 2016)

3.3 Hydraulic Analysis

The temporary SWIM plugs act as broad crested weirs where the as-built breadth of the weir was approximately 15 ft. Discharge over the weirs can be approximated using the following equation:

$$Q = CLH_e^{3/2} \qquad \text{(Equation 1)}$$

Where:

Q = Volumetric discharge (cfs)
C = Coefficient of discharge (variable*)
L = Weir Length (ft)
H_e = Energy head above weir crest (ft)

*The coefficient of discharge varies depending upon many factors (e.g. breadth of weir, head above weir crest, submergence of weir crest, etc.). Typical values of "C" for a broad crested weir of breadth 15 ft range from 2.63 – 2.70 (Brater & King, Handbook of Hydraulics, 6th edition) assuming a "free, uncontrolled" hydraulic flow regime, i.e. headwater is not influenced by tailwater. For instances where the weir crest is submerged, i.e. headwater is influenced by tailwater, the hydraulic flow regime transitions to "submerged, uncontrolled", and the discharge coefficient "C" is reduced based upon a submergence ratio (d/D or in other words, TW above weir crest / HW above weir crest) as developed by the U.S. Deep Waterways submerged-weir model (USGS, Water-Supply and Irrigation Paper No. 200). See **Table 1** for the coefficient reduction based on submergence ratio. Coefficient of discharge within equation 1 is modified to "C_s" when performing calculations for the submerged hydraulic condition.

Table 1. Relative Coefficients, U.S. Deep Waterways submerged-weir model

$\frac{d}{D}$	$\frac{C'}{C}$	$\frac{d}{D}$	$\frac{C'}{C}$
0.0	1.000	0.5	0.937
.1	.991	.6	.907
.2	.983	.7	.856
.3	.972	.8	.778
.4	.956	.9	.621
		1:0	

Alternative 1 Plan (see Attachment A, Alternative 1 Site Layout) is to install permanent SWIM consisting of two sheet pile, concrete capped weirs at the same locations as the two originally placed temporary SWIM plugs. Top of weirs are intended to be 0.25 ft above Mean Low Water (MLW) elevation with a 15 foot wide by 3 foot deep "notch" within the center of the diversion channel and Rio Anton Ruiz respectively. Top elevation of the notch section will be 2.75 ft below MLW to allow navigation of the diversion channel and river at low water elevations while mitigating salt water intrusion into the Mandri lagoon system and further upstream of the Rio Anton Ruiz . DNER and other agencies need access to the monitoring stations. Thus, the notches are a design feature to ensure that small boat traffic can traverse the weirs at low water. It is recommended that buoys or some other form of channel marker or navigational aids be included with the project to direct boat traffic toward the notched opening.

The permanent SWIM plugs will also act as broad crested weirs where the breadth of the concrete cap will be 1.5 ft. Discharge over the permanent weirs can also be approximated using Equation 1. The coefficient of discharge for the permanent SWIM plugs with a weir breadth of 1.5 ft range from 2.62 – 3.32 (Brater & King, Handbook of Hydraulics, 6th edition) assuming a “free, uncontrolled” hydraulic flow regime, i.e. headwater is not influenced by tailwater. For instances where the weir crest is submerged, i.e. headwater is influenced by tailwater, the hydraulic flow regime transitions to “submerged, uncontrolled”, and the discharge coefficient “C” is reduced based upon a submergence ratio (d/D or in other words, TW above weir crest / HW above weir crest) as developed by the U.S. Deep Waterways submerged-weir model (USGS, Water-Supply and Irrigation Paper No. 200) as shown in **Table 1**. Coefficient of discharge within equation 1 is modified to “C_s” when performing calculations for the submerged hydraulic condition.

The temporary SWIM plugs were installed with a crest elevation equal to the MLW tidal elevation; therefore, it can be assumed that “free, uncontrolled” discharge occurs when the tailwater of the weir is at or below this elevation and the headwater is above. As the tailwater rises above the MLW elevation, the SWIM plugs become submerged and therefore discharge over the weir transitions to “submerged, uncontrolled” flow. See **Figures 13** and **14** for “free, uncontrolled” discharge ratings with respect to both the temporary and permanent SWIM plugs within the diversion channel and Rio Anton Ruiz respectively. Additionally, see **Figures 15** and **16** for “submerged, uncontrolled” discharge ratings with respect to both the temporary and permanent SWIM plugs within the diversion channel and Rio Anton Ruiz respectively. Note, that for the “submerged, uncontrolled” condition, the tailwater at each weir location was assumed to be equal to the Mean High Water (MHW) tidal elevation that causes the weirs to be fully submerged with headwater and discharge influenced by the tailwater elevation and degree of submergence of the weir.

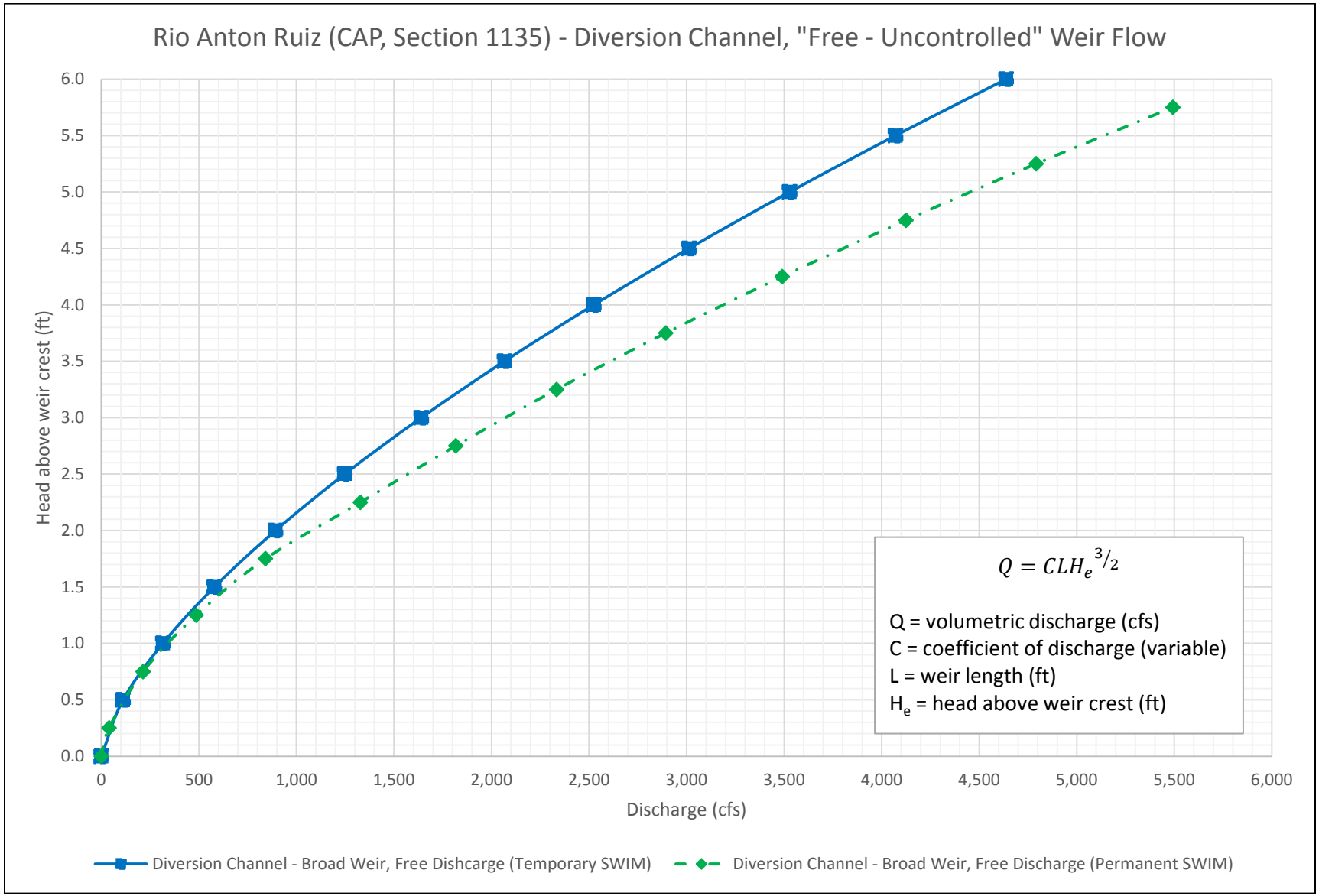

Figure 13. Diversion Channel, "Free – Uncontrolled" discharge rating

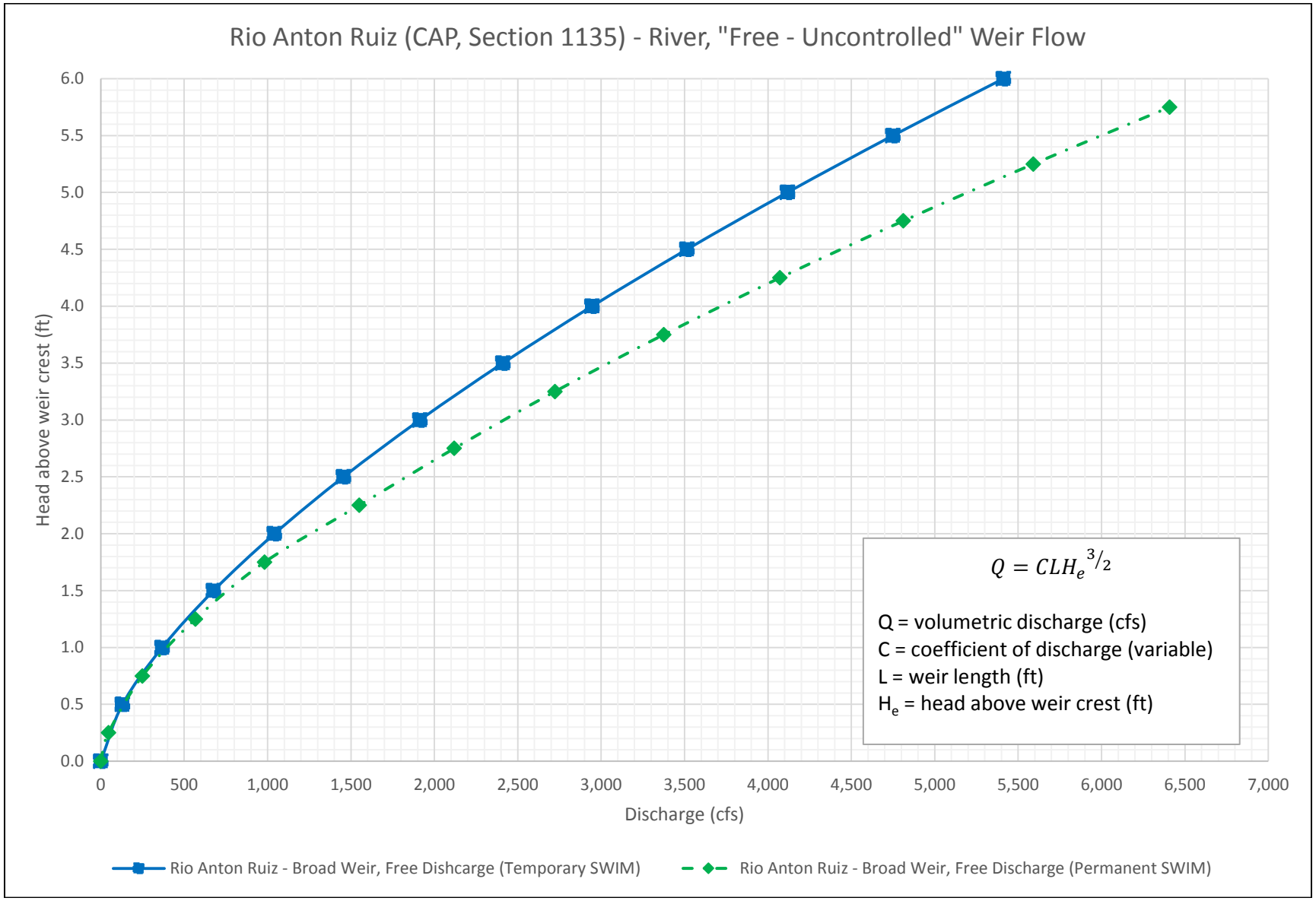

Figure 14. Rio Anton Ruiz, "Free – Uncontrolled" discharge rating

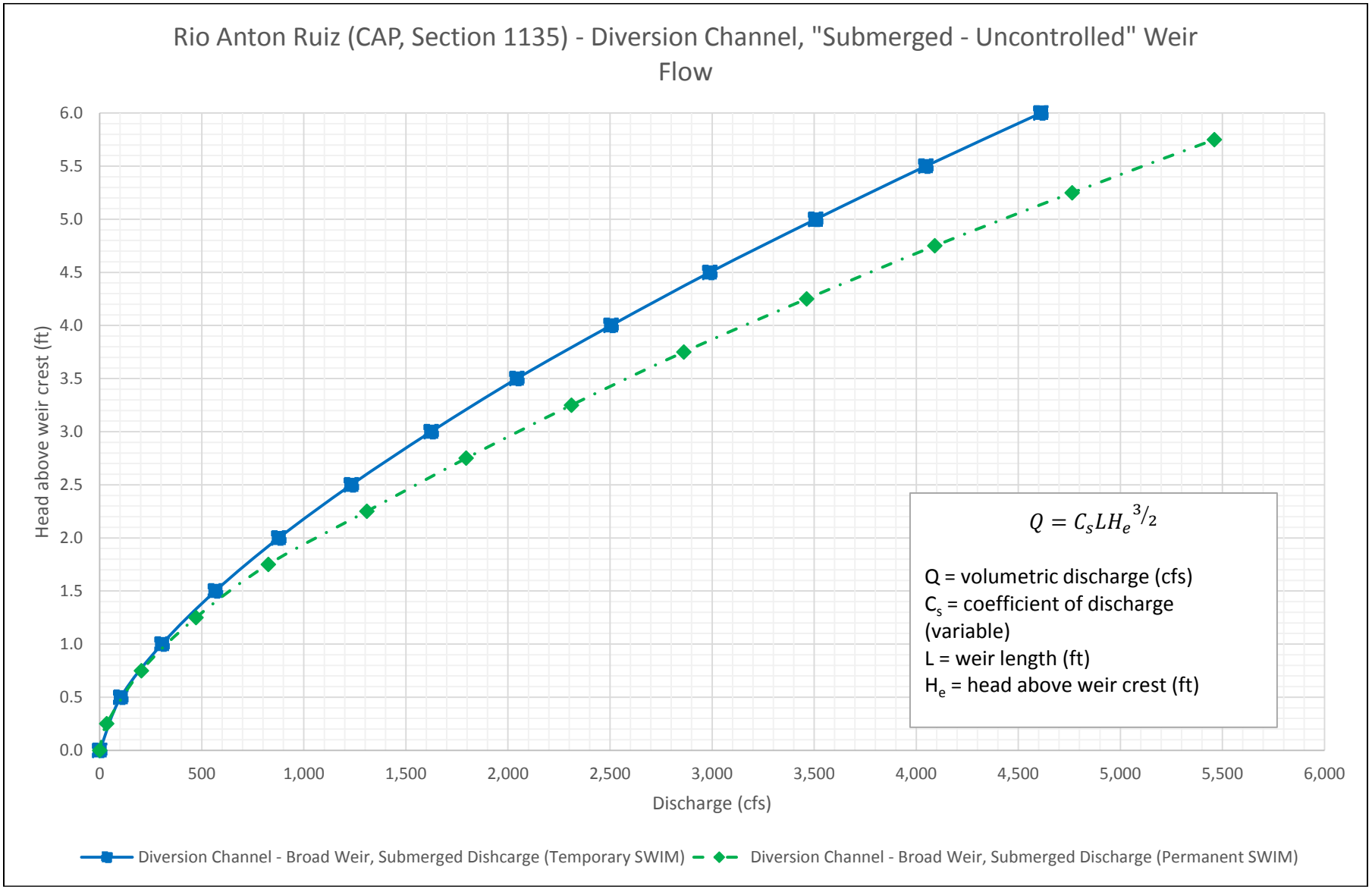

Figure 15. Diversion Channel, "Submerged – Uncontrolled" discharge rating

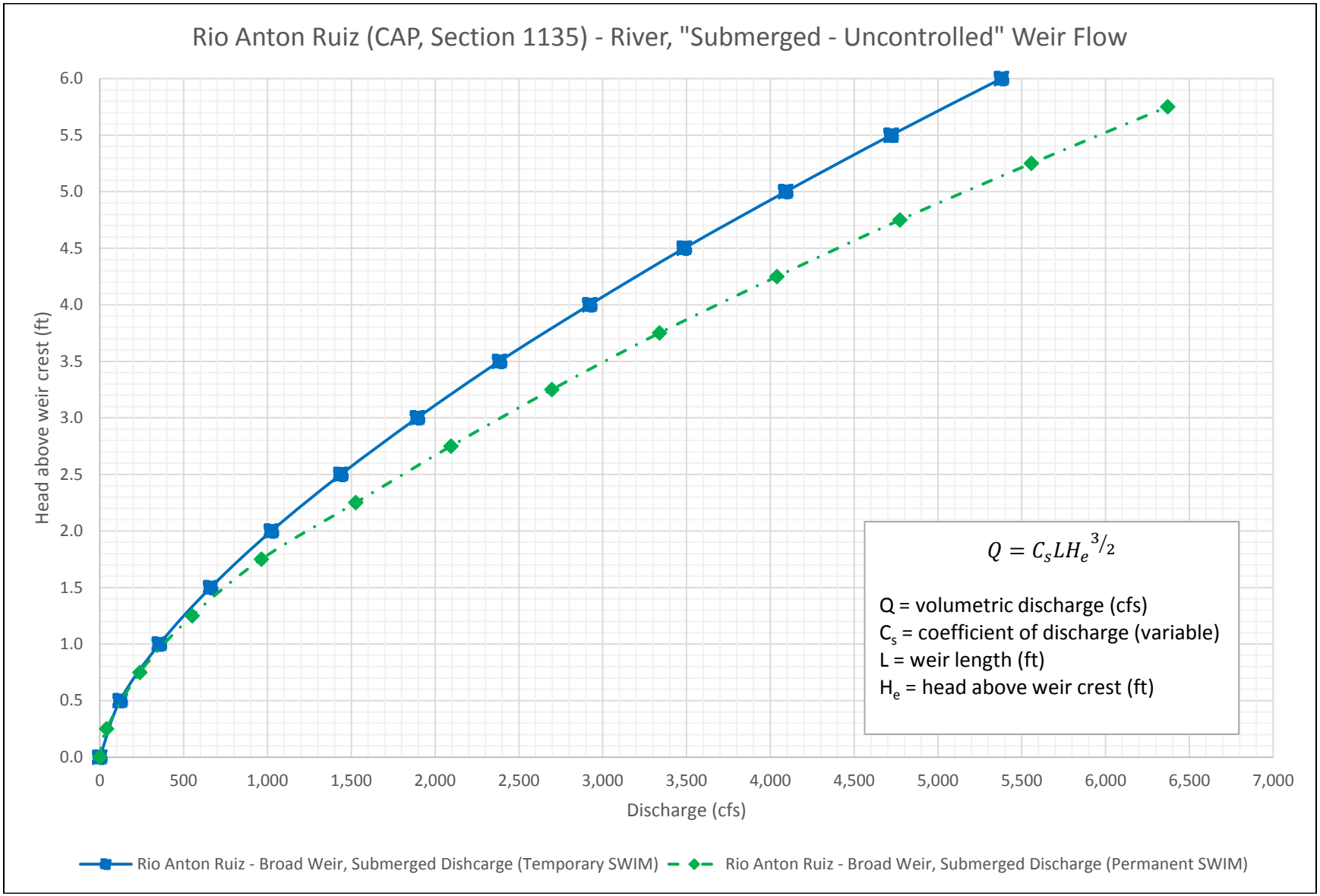

Figure 16. Rio Anton Ruiz, "Submerged – Uncontrolled" discharge rating

Figures 13 through **16** clearly indicate that the permanent SWIM weirs match discharge performance of the temporary SWIM weirs with head above the weir crest between 0.1 and 1.0 feet. As head above the SWIM weirs exceed 1.0 feet, the permanent SWIM weirs outperform the temporary SWIM weirs; thus showing no degradation of system functionality by implementation of the permanent SWIM weirs.

Alternative 2 Plan (see Attachment A, Alternative 2 Site Layout) is to install a single permanent SWIM consisting of a sheet pile, concrete capped weir downstream of the confluence of the Rio Anton Ruiz and diversion channels. Top of weir is intended to be 0.25 ft above Mean Low Water (MLW) elevation with a 15 foot wide by 3 foot deep "notch" within the center of the channel. Top elevation of the notch section will be 2.75 ft below MLW to allow navigation of the diversion channel and river at low water elevations while mitigating salt water intrusion into the Mandri lagoon system and further upstream of the Rio Anton Ruiz. An identical hydraulic analysis as was performed for two weirs would also apply to Alternative 2 Plan as the design and elevation for the sheet pile weir would be the same. However, the one weir located prior to the confluence of both channels would reduce the flood reduction benefits from the original Section 205 project by impeding flows out from the drainage culvert, as well as being located within a cultural resource area.

The non-structural plan is to place sand at the existing sand bar to increase natural formation of the sand bar, which has been noted not to form as quickly. This would require consistent maintenance efforts and higher maintenance costs. The sandbar should also be able to naturally wash out during high water or storm events and is preferred by the local sponsor to remain natural forming, making this plan not a permanent feature.

3.3.1 Permanent SWIM Weirs with "Notch"

The permanent SWIM weirs will each include a 15 foot wide by 3 foot deep "notch" within the center of the diversion and Rio Anton Ruiz channels. When the water surface elevation both upstream and downstream of the permanent weirs is at or below elevation -0.31 ft, PRVD02, discharge through the weir is possible via the "notch" section. Discharge through the "notch" section can be approximated using **Equation 2**.

$$Q = C_s L' H_e^{3/2} \qquad \text{(Equation 2)}$$

Where:

Q = Volumetric discharge (cfs)

Cs = Coefficient of discharge (variable)*

L' = Effective Weir Length (ft)

H_e = Energy head above weir crest (ft)

$$L' = L(0.1NH_e)$$

Where:

L = Total weir Length (ft)

N = Number of contractions (#)

*C_s is the variable coefficient of discharge resulting from the degree of submergence of the weir crest that has been discussed previously within this document.

Figure 17 is a discharge rating for flows possible through the "notch" section when the headwater elevation is exactly 3.0 ft above the weir "notch" crest (i.e. headwater elevation = -0.31 ft, PRVD02), and tailwater varies within the 3.0 ft "notch" opening range. It should be noted that while Figure 16 displays discharge possible through the weir "notch" under a 3.0 ft range of tailwater fluctuation, it is anticipated that the tailwater elevation will rarely fall below the MLW elevation. The following are "depths of submergence" of the weir "notch" crest at various tailwater elevations:

MTL (mean tide level): 2.99 ft above weir "notch" crest

MLW (mean low water): 2.75 ft above weir "notch" crest

MLLW (mean lower low water): 2.54 ft above weir "notch" crest

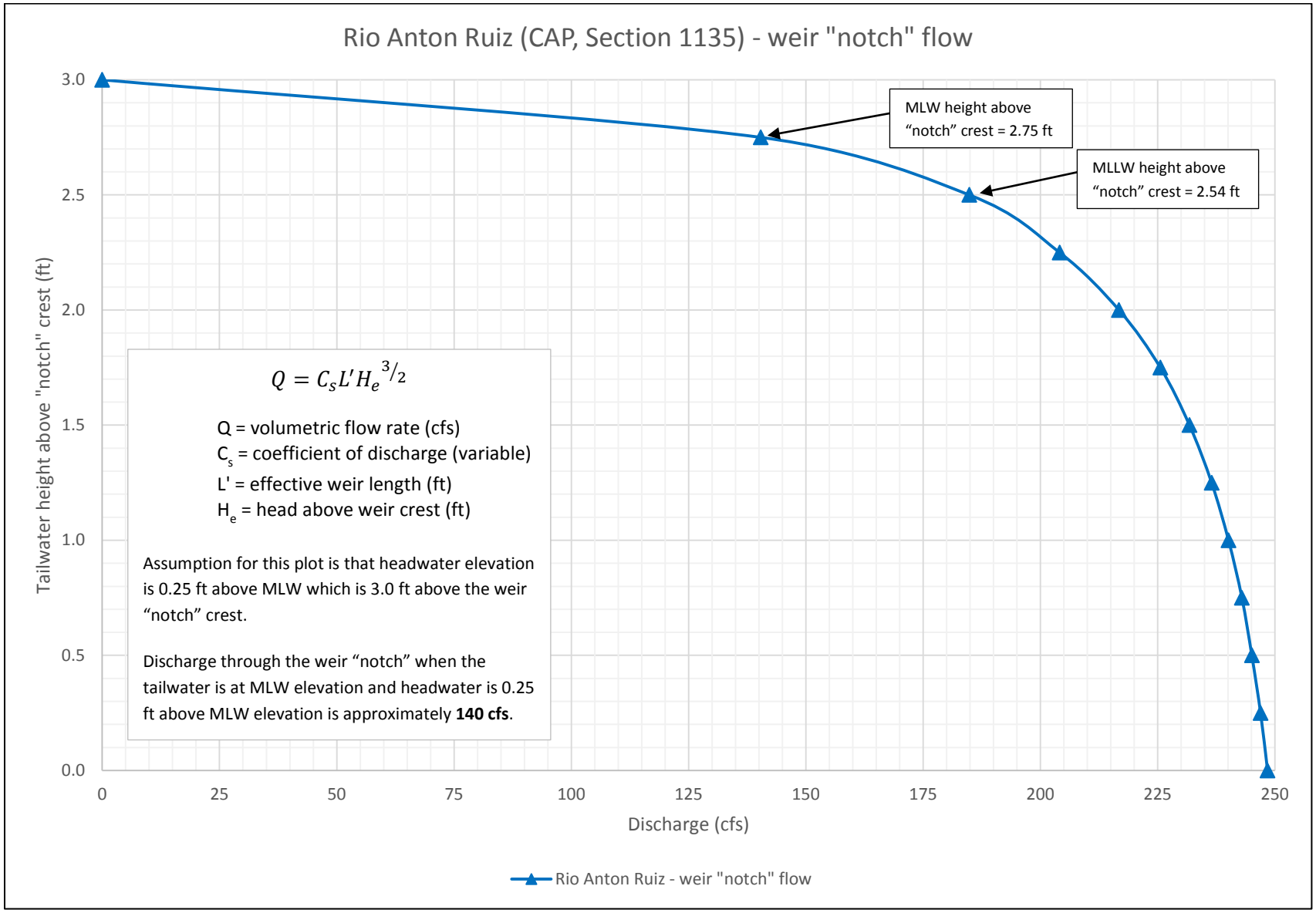

Figure 17. Permanent SWIM weir "notch" flow

Table 2 contains discharge flow rates possible through the weir "notch" section when the headwater elevation is -0.31 ft, PRVD02 and tailwater elevations vary within the 3.0 ft "notch" opening range. Where applicable the corresponding tidal elevation designation is annotated.

Table 2. Permanent SWIM weir "notch" flow

HW (ft, PRVD02)	TW (ft, PRVD02)	tidal designation	Q (cfs)
-0.31	-0.31		0
-0.31	-0.56	MLW	140
-0.31	-0.81	MLLW	184
-0.31	-1.31		217
-0.31	-2.31		240
-0.31	-3.31		248

The weir "notch" will allow for navigation of the diversion channel and river to DNER salinity monitoring stations within the Humacao Natural Reserve (HNR) (see **Figure 18**) at low water elevations while also mitigating saltwater intrusion further upstream of the weirs. It is anticipated that the permanent SWIM weirs will function to meet target salinity levels (below 10 parts per thousand (ppt)) within the HNR that was the purpose for installing the temporary SWIM plugs.

Figures 19 and 20 are the final comparison plots of the pre-project (temporary SWIM weirs) and post-project (permanent SWIM weirs with "notch") features where "total" weir flow i.e., the entire weir including "notch" flow for the permanent SWIM is calculated. These plots serve to confirm that the permanent SWIM weirs outperform the temporary SWIM weirs with respect to potential discharge; thus displaying no degradation of system functionality by implementation of the permanent SWIM weirs. It should be noted that tailwater elevation was assumed to be 0.545 ft, PRVD02 (MHW) for these computations therefore discharge over the weir is "submerged, uncontrolled" with the coefficient of discharge "Cs" varying based upon the degree of submergence.

Reverse flow conditions will occur when water surface elevations within the lagoon system are lower than those on the tidal (ocean) side of the weir. Flow through the notch section can be approximated using equation 2 and should be expected to be identical to those that would occur if head differential were reversed. Thus, tide (ocean) is considered headwater and lagoon is considered tailwater. This condition is relevant not only to the notch section, but the entire weir under both existing and proposed replacement conditions.

To reiterate, it is recommended that buoy's or some other form of channel marker or navigational aids be included with the project to direct boat traffic toward the weirs notched opening.

Figure 18. DNER salinity monitoring stations (approximate locations)

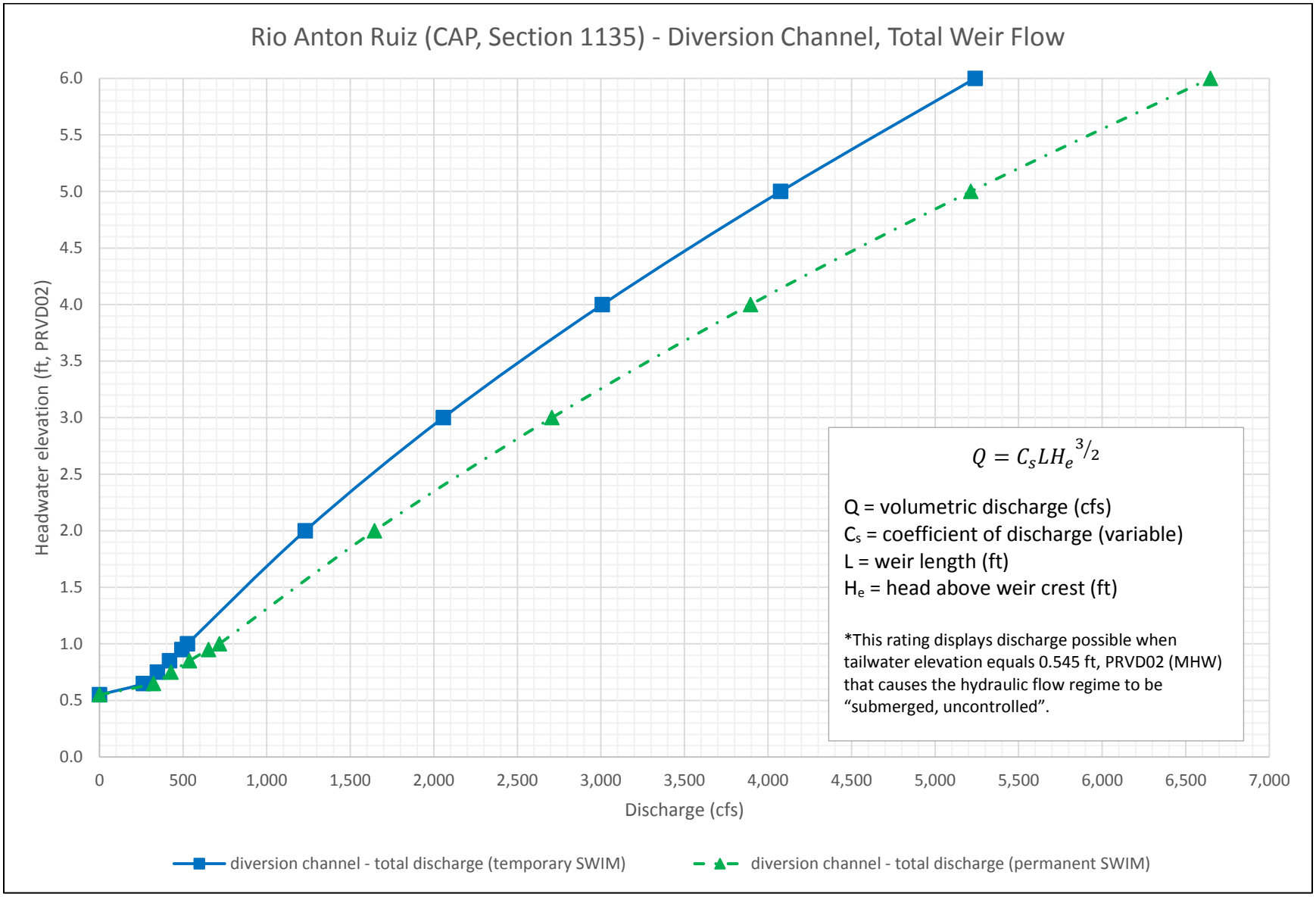

Figure 19. Diversion Channel, "Total" weir flow discharge rating, "submerged, uncontrolled" regime

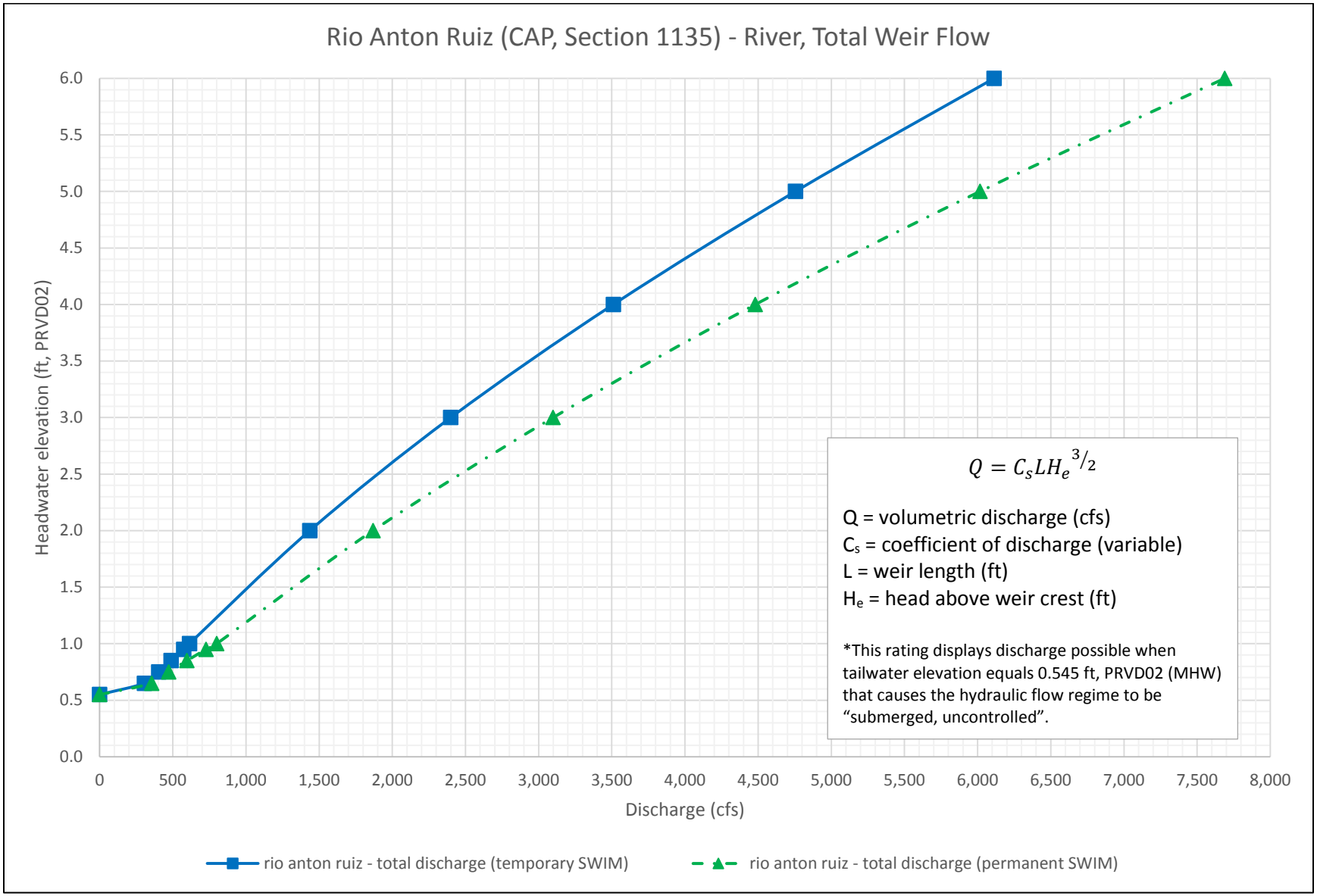

Figure 20. Rio Anton Ruiz, "Total" weir flow discharge rating, "submerged, uncontrolled" regime

3.4 Sea Level Rise Adaptability

Over the next 100 years, it is possible that rising sea levels associated with climate change could have a dramatic impact on the project area. The magnitude of those impacts will depend on which of three projected trends adopted by the USACE occurs. **Figure 21** displays the low, intermediate, and high sea level range projections (graphic and tabular) relative to NOAA station 9755371 (San Juan, PR).

Estimated Relative Sea Level Change from 2016 To 2116
9755371, San Juan, PR
NOAA's Published Rate: 0.00541 feet/yr
All values are expressed in feet

Year	USACE Low	USACE Int	USACE High
2016	0.00	0.00	0.00
2020	0.02	0.04	0.10
2025	0.05	0.09	0.24
2030	0.08	0.15	0.40
2035	0.10	0.22	0.57
2040	0.13	0.28	0.77
2045	0.16	0.36	0.99
2050	0.18	0.43	1.22
2055	0.21	0.51	1.47
2060	0.24	0.60	1.74
2065	0.27	0.69	2.03
2070	0.29	0.78	2.33
2075	0.32	0.88	2.66
2080	0.35	0.98	3.00
2085	0.37	1.09	3.37
2090	0.40	1.20	3.75
2095	0.43	1.32	4.15
2100	0.46	1.44	4.57
2105	0.48	1.57	5.00
2110	0.51	1.70	5.46
2115	0.54	1.83	5.93
2116	0.54	1.86	6.03

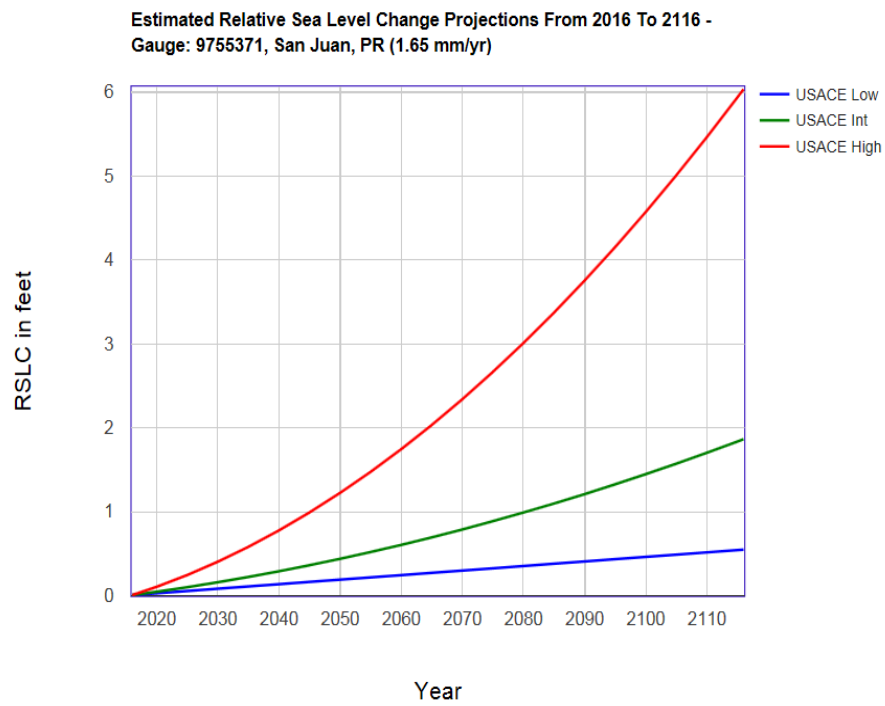

Figure 21. Relative Sea Level Change Projection (retrieved from http://corpsclimate.us)

Based on sea level projections, it is anticipated that within 50 years sea level rise will be approximately 0.3 feet for the low rate, 0.8 feet for the intermediate rate, and 2 feet for the high rate. Within 100 years, the sea level rise will be approximately 0.5 feet for the low and up to 6 feet for the high rate. The project is designed to be able to be adapted to sea level rise as needed. To mitigate for anticipated sea level rise, the permanent SWIM weirs shall be constructed such that additional height can be added uniformly across the entire length of the respective weir via additional concrete or weir boards bolted on. This feature shall ensure the project functions as designed both under existing and future sea level conditions. The adaptive management that would be required for any future sea level rise would be the sponsor's responsibility. The project can adapt to the low and intermediate rates of rise for the 50 year projection, and still serve as an effective

saltwater intrusion measure. The high rates of rise are high enough that waters would begin to flank the channel banks and protected areas, reducing both the saltwater intrusion and flood reduction benefits.

3.5 Climate Change Analysis

The overarching USACE climate change policy document, USACE Climate Preparedness and Resilience Policy Statement (June 2014), requires consideration of climate change at every step in the project life cycle for all existing and planned USACE projects to reduce vulnerabilities and enhance the resilience of our water-resource infrastructure. Guidance for incorporating climate change and hydrologic analyses is provided in Engineering And Construction Bulletin (ECB) No. 2016-25 (16 Sept 2016), Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects. This applies to all current and future studies and any completed projects for which Federal funds are being used to rehabilitate a project, but does not apply to short-term water management decisions. The analysis provides for consideration of specific climate change projections in the project area and potential impacts to the particular hydrologic analysis.

The required qualitative analysis involves two phases. Current climate change trends are analyzed during Phase I, and projected future changes to hydrology is analyzed during Phase II. Phase I consists of literature review and investigation of annual maximum stream flow trends using the USACE Climate Hydrology Assessment and USACE Nonstationarity Detection Tools. Phase II consists of investigating projected future trends in annual maximum stream flows using the same two USACE tools mentioned previously, and performing a vulnerability assessment using the USACE Watershed Vulnerability Assessment Tool. The Climate Change assessment for this project are presented in the following sections.

3.5.1 Phase I: Relevant Current Climate and Climate Change.

Humacao, Puerto Rico.

Humacao, Puerto Rico has a tropical climate characterized by relatively high temperatures and approximately 75% humidity. The warmest month is August, with an average maximum temperature of 88°F; and the coolest month is December, with an average maximum temperature of 83°F. The rainy season spans from May through December. May is the wettest month with an average monthly precipitation of 6

inches, and February is the driest month with an average monthly precipitation of approximate 2 inches. The HUC for this watershed is 21010005.

According to USACE (2015a), which references the results of numerous climate studies in Puerto Rico and the Caribbean, reports an increasing trend in observed nightly and daily maximum air temperatures in the study region over the period of record between 1950 – 2004. The third NCA report (Carter et al., 2014) presents a study finding by the Puerto Rico Climate Change Council (PRCCC) that the annual average temperature in Puerto Rico has experienced an increase of 1. 8°F between 1900 and 2010. Station analyses during the same period across Puerto Rico show an increase of annual average temperatures at a rate of 0.022-0.025 °F/yr. It was noted that some areas of the island have experienced a faster warming trend than others due to the urban heat island effect.

With respect to precipitation as reported (USACE 2015a), trend results vary between different reports, as well as across Puerto Rico. For example, the USACE study reported one analysis of station data showed no changes, while another indicated a 0.003 in/day/year decrease in rainfall between 1948 and 2007. Overall however, numerous literature syntheses reported in increased amount of rainfall during isolated extreme events, with an overall decrease in annual total precipitation (USACE 2015a). According to USACE 2015a, the precipitation trends in Puerto Rico differ both regionally and seasonally. The southern region of Puerto Rico has experienced an increase in precipitation, while the northern and western areas of have experienced a decrease. Additionally, summers appear to be trending dryer, while winters are trending wetter (USACE 2015a).

Observed Changes.

The USACE Climate Hydrology Assessment Tool was utilized to examine observed streamflow trends in the vicinity of the example project. However, the Climate Hydrology Assessment Tool did not contain stream gage information for HUCs in Puerto Rico at the time of the assessment.

The Nonstationarity Detection Tool was also utilized to examine the hydrologic time series at a gage in Rio Anton Ruiz. However, the Nonstationarity Detection Tool did not contain stream gage information in Puerto Rico at the time of the assessment. During the time of writing this report, SAJ was in the process of providing rainfall information for incorporation into the Nonstationarity Tool.

Projected Changes in Climate.

The NOAA National Environmental Satellite, Data and Information Service (NESDIS) released a report in January 2013 assessing climate trends and scenarios into the next 50–100 years for the Southeast CONUS region (NOAA 2013). The report indicates that over the period of hydroclimatological record for the Southeastern United States, both temperature and precipitation have shown either a statistically insignificant trend or no trend in change. The only trend noted was a slight increase in precipitation in the Gulf region. To account for climate change, the projected meteorological conditions in the region considers the past temperature and precipitation records, as well as the modeled future conditions in the area through 2099. According to the NESDIS report, a warming trend of approximately 2-5°F and no discernable precipitation trend can be expected over the next 50 years, although these estimates have significant uncertainty.

3.5.2 Phase II: Projected Changes to Watershed Hydrology and Assessment of Vulnerability to Climate Change.

The USACE Climate Hydrology Assessment Tool was used to examine observed and projected trends in watershed hydrology to support the qualitative assessment. However, the Climate Hydrology Assessment Tool did not contain stream gage information for HUCs in Puerto Rico at the time of the assessment.

The USACE Watershed Vulnerability Assessment (VA) Tool was used to examine the vulnerability of the project area to future flood risk. The VA Tool did not contain any watersheds in Puerto Rico at the time of the analysis. However, the tool did contain data on precipitation and temperature trends in the Southeastern United States, with some specific data for the island of Puerto Rico. The Regional Overview for the Southeast United States (which includes Puerto Rico) discusses threats to three key topics; increased sea level rise threats, increasing temperatures, and decreased water availability. For specific precipitation trends, this tool shows that Puerto Rico has experienced a 33% increase between 1958 and 2012 in precipitation amount during very heavy rain events (Figure 22). The tool also reports a modeled prediction of an over 30% increase in consecutive dry days in southeast Puerto Rico for the years 2070-2099 (as compared to the years between 1971-2000), if continued emissions increases (Figure 23). Regarding temperature trends, the VA Tool shows an average increase in the annual number of frost-free days between 10-14 days in Puerto Rico (Figure 24). The increased number of consecutive dry days combined with the higher temperatures and increased severity in

large rainfall events has significant implications for native Puerto Rico flora and fauna, increased soil erosion, and human health.

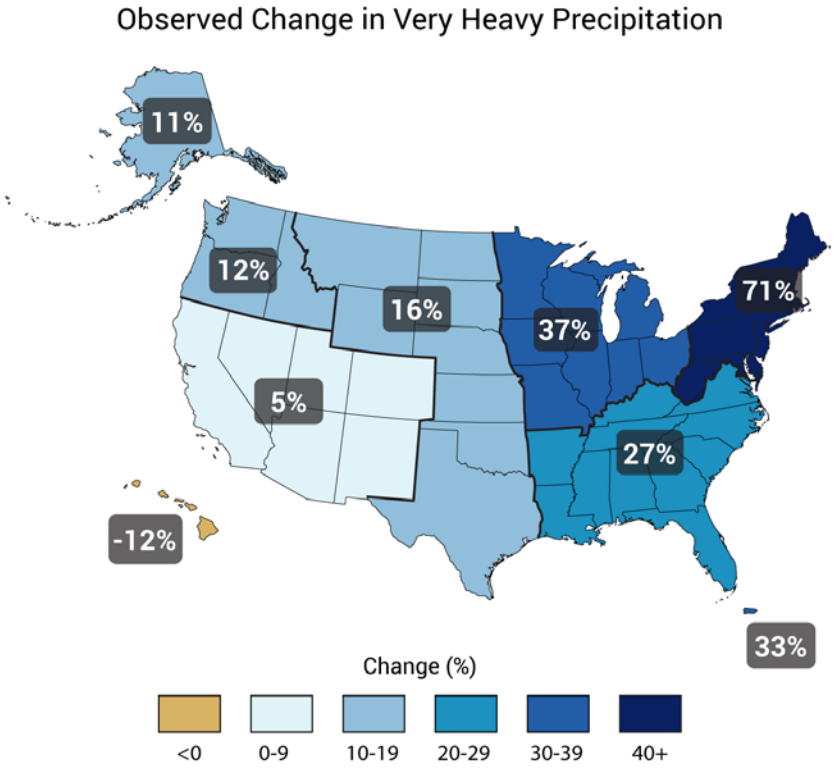

Figure 22. Observed Change in Very Heavy Precipitation

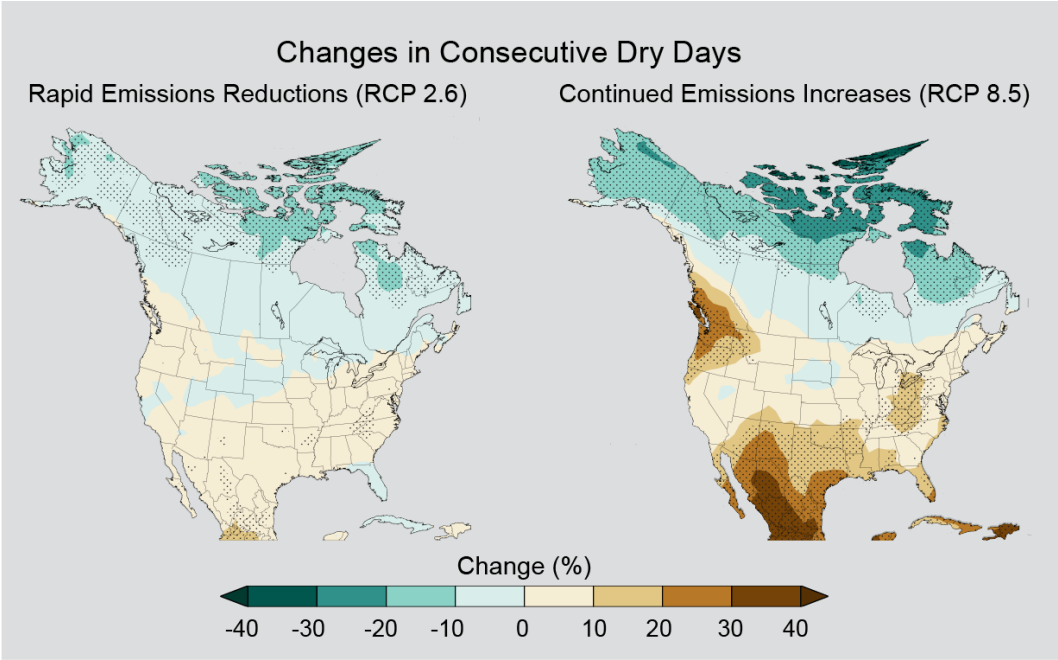

Figure 23. Observed Changes in Consecutive Dry Days

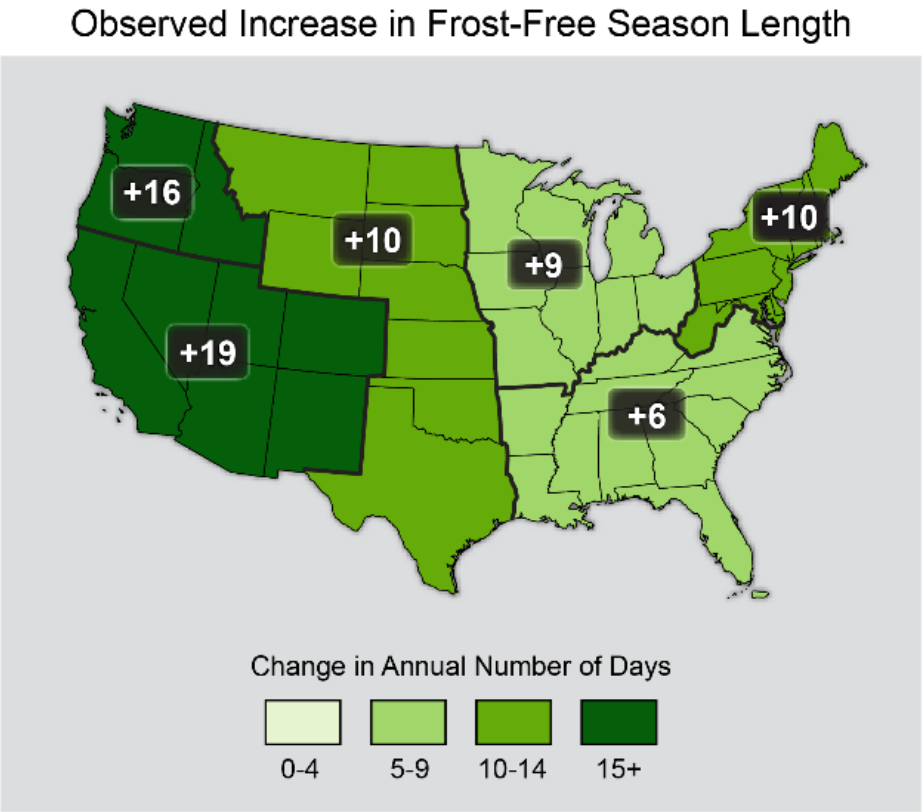

Figure 24. Observed Increase in Frost-Free Season Length

The actions that can be taken in the context of the current study to make the community more resilient to higher future flows, overall wetter conditions, and higher temperatures are similar to those to be taken in the event of sea level change.

3.6 Design Phase

During the design and implementation phase, it is recommended to acquire additional survey of the channel to include set interval hydrographic cross sections within the channel and topographic survey along the channel banks. This additional information will be used to verify all of the current design elevations with a hydraulic model.

4.0 Surveying and Mapping Requirements

Survey was collected for the original Section 205 project during design phase. Hydrographic survey was collected (February 2016) within the diversion channel and the Rio Anton Ruiz at just the temporary plug locations for current elevations of the SWIMs. The construction plans from the Section 205 (and survey for design and implementation phase of Section 205) along with the current hydrographic survey of the temporary plugs was used for analyses and design for this feasibility phase. Additional survey of the diversion channel and Rio Anton Ruiz will be collected during design and implementation phase to verify channel widths, depths, and elevations.

5.0 Geotechnical

This portion of the report addresses the geotechnical design and considerations with respect to the permanent salt water intrusion alternative of the Río Antón Ruiz Restoration project. Since completion of the Río Antón Ruiz authorized flood control project in 2001, the lagoon system and its surrounding environment have been affected by saltwater intrusion. Two temporary salt water intrusion measures (SWIM) plugs were installed at the end of March 2007. The plugs consisted of heavy (high-density polyethylene and UV resistant) lift bag barriers and sand bags placed on the channel and river beds in water depths of 5 to 6 feet at the diversion channel and up to 10 feet in the Río Antón Ruiz location. The plugs were armored with riprap on the upstream and downstream sides to resist damage during storm discharge. The temporary SWIM reduced salinity levels to the initial target rate (less than 10 ppm). Over time, however, the temporary SWIM features have deteriorated and salinity levels in the lagoon system have increased once again.

A screening of alternatives was conducted using plan formulation objectives and response criteria to determine the possible permanent measures. Three alternative plans were proposed as the permanent solution: 1) Sheetpile weir at two locations - the diversion channel and Rio Anton Ruiz; 2) Sheetpile weir at only one location - the mouth of the channel; and 3) Non-structural sand placement at the mouth of the diversion channel (no erosion protection is anticipated for this alternative as the sand would need to be able to wash out during a flood event to allow water flows out of the channel). Although the first two alternatives were intrinsically the same when comparing the type of structure and design, the location of Alternative 2 included a cultural resources area. In addition, the designated location in Alternative 2 would impact the flood risk reduction objectives of the initial flood control project. On the other hand, Non-structural plan would result in high maintenance costs, with no confirmation that the measure would reduce the

salinity level. Alternative 1 would be installed at the locations where temporary SWIM had been placed. Based on the salinity measurements after the previous SWIM were placed, it was confirmed that these locations were adequate to minimize the saltwater intrusion into the lagoon. For the reasons described above, Alternatives 2 and 3 were not considered for the project. Therefore, Alternative 1 was selected as the proposed permanent measure. Alternative 1 consists of a sheet pile wall with top elevation of -0.31 feet to a tip elevation -24.0 feet driven across the channel. The wall includes a 15 feet wide, 3 feet deep rectangular notch within the center of the channel to accommodate small boat traffic. Upstream and downstream sides of the wall include stone protection to resist damage during storm discharge.

Any elevations mentioned are referenced, in feet, the Puerto Rico Vertical Datum of 2002 (PRVD02), unless noted otherwise.

5.1 Geology

5.1.1 Regional Geology

The site is located within the Central Igneous Province (CIP) of Puerto Rico. The CIP is further divided by the Cerro Mula Fault Zone (CMFZ). Río Antón Ruiz is located within the CMFZ, and its geomorphic expression is highly influenced by the fault zone. To the south of the CMFZ, the area is characterized by plutonic rocks of the San Lorenzo Batholith, and surrounded by metamorphosed rocks, which are overlain by quaternary alluvium and beach deposits. To the north of the CMFZ, the east coast is dominated by a comfortable sequence of Early Cretaceous basaltic-andesitic lavas and volcanoclastic sedimentary rocks overlain by alluvium and beach deposits. Intrusive and extrusive volcanoclastic rocks range in age from Cretaceous to Eocene.

5.1.2 Local Geology

Locally, the area is comprised by beach and swamp deposits. The beach deposits are unconsolidated fine to coarse-grained sand and pebble deposits of Quaternary age. They are mostly composed of quartz, feldspars grains as well as plutonic and volcanic rock fragments, with some marine sand (i.e., composed of shell, algal, and coral fragments). Swamp deposits are also of Quaternary age, and are characterized as black to dark brown, organic-rich soils, and muck located in poorly drained parts of the alluvial plain. Large part of these deposits are covered by mangroves. Both of these deposits are gradational in nature, and partially overlain each other with other alluvial deposits.

5.2 Field Exploration and Laboratory Testing

5.2.1 Encountered Materials

A field exploration was not performed as part of this Section 1135 study. Instead, existing field data from previous design efforts, were utilized to evaluate site conditions. Three previously (1990) drilled Standard Penetration Test (SPT) borings conducted under the original Section 205 project are located within the study area as shown in **Figure 22**, and as summarized in Table 3. Unconsolidated material was sampled to a depth of 30 feet, continuously, every 3 feet. **Figure 22** shows the approximate location of the borings. Boring logs are included at the end of this document in Attachment B.

Table 3. Approximate location of SPT borings within the Study Area

SPT boring Designation	State Plane, PR State Plane, NAD1927*		Project Location
	X	Y	
CB-AR-10	737082	122451	Río Antón Ruiz, Humacao, P.R.
CB-AR-11	738476	123228	
CB-AR-12	739959	122743	
* Coordinates presented correspond to the project coordinate system and datum			

Materials encountered consisted of fill, sands and silts, with lesser amounts of clay. Fill material is characterized by gravelly silts to sands and silts with some rock fragments. Sands are characterized as poorly graded to silty sands, with some pebble-sized rock, and shell fragments. Silty material also contains shell fragments. Some clay is also found occurring with silt. While the visual classification of the soils show large deposits of clay material, laboratory testing indicate that this material is predominantly silt.

5.2.2 Laboratory Testing

Sieve analysis, consolidation tests, triaxial tests and Atterberg limits were performed on select samples. A summary of the testing results is shown in Table 4. Consolidation and triaxial tests results and detailed laboratory results are included at the end of this document in Attachment B.

Table 4. Summary of laboratory results for select samples

Boring Designation	Sample Designation	Sample Depth (ft)	Water Content (%)	USCS
CB-AR-10	2	1.5-3.0	26	SM
CB-AR-10	8	10.5-12.0	39	SP
CB-AR-10	11	15.0-16.5	34	ML
CB-AR-10	13	18.0-19.5	-	SM
CB-AR-10	18	25.5-27.0	29	ML
CB-AR-11	1	0.0-1.5	21	SM
CB-AR-11	4	4.0-6.5	-	SM
CB-AR-11	11	15.0-16.5	50	SM
CB-AR-11	-	25.0-27.0	32.1	SM*
CB-AR-12	4	4.0-6.5	-	SM
CB-AR-12	11	15.0-16.5	35	SP

USCS: Unified Soil Classification System
*Atterberg limits tests performed, results were non-plastic

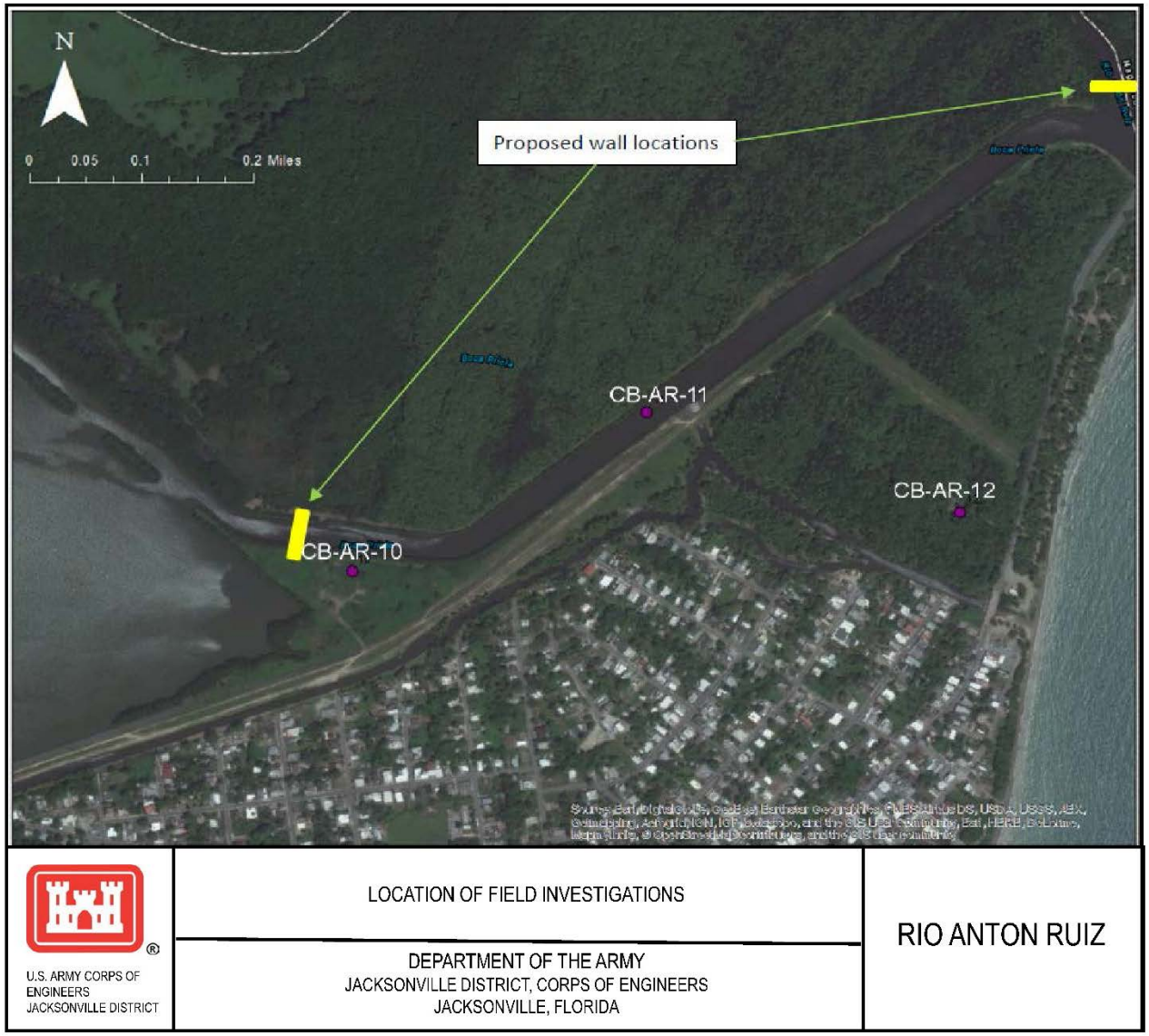

Figure 25. Boring locations

5.3 Geotechnical Evaluation

Geotechnical analyses for this project included stability, sheet pile, and seismic evaluation for the proposed wall. Global stability analyses were performed using the Spencer's method of slices and the circular search routine of the SLOPE/W computer program. The SLOPE/W program is part of the GeoStudio suite of software developed by Geo-Slope International Ltd. In addition to the analyses mentioned above, the CWALSHT software the stability requirements of the wall. The CWALSHT software was developed by the US Army Corps of Engineers Waterways Experiment Station, CASE program. Details of the geotechnical analyses performed are detailed below.

5.3.1 Soil Parameters

Although data was available for the three borings within the project area, the estimated soil parameters for the proposed sheet pile wall were based only on boring CB-AR-11 as it was determined to represent the most critical or worst soil conditions and is the closest to the project area. However, it should be noted that no new subsurface investigations were performed for this project, thus, soil conditions could vary given, thus, site specific data should be collected in the future. The wall was evaluated using long-term soil strength parameters due to the presence of mostly granular material, hence, *S* soil strength parameters were used. The table below presents the simplified soil profile along the Boca Prieta diversion channel based on the information available; these are the parameters used in the evaluation of the wall. The estimated soil properties are based on the SPT data, in particular, blow count per foot, limited laboratory test data, typical values of similar materials within the Humacao area, and engineering judgment.

Table 5. Rio Anton Ruiz Restoration Project Soil Parameters

Elevation (NAVD 88)		Soil Classification (USCS)	γ_{sat} (pcf)	γ' (pcf)	Undrained (Q)		Drained (S)	
From	To				ϕ (deg.)	c (psf)	ϕ' (deg.)	c' (psf)
3.5	-2.5	FILL SM	110	105	28	0	28	0
-2.5	-19	SM	115	110	30	0	30	0
-19	-30	SM	110	105	29	0	29	0

5.3.2 Stability Analyses

Considerations to evaluate the stability of the proposed wall include global and lateral stability. Global stability analyses were only considered for a sudden high water event equal to Standard Project Flood (SPF) conditions.

During SPF, water levels upstream would suddenly rise approximately to elevation 7.8 feet, while downstream conditions would be at the Mean High Higher Water (MHHW) level of 0.8 feet. Other global stability analyses were not deemed necessary as loading conditions on both sides of the proposed wall would be approximately the same as the weirs would be submerged.

Lateral stability was evaluated considering the impact force of a small boat which was assumed to be 500 pounds per foot applied to the top of the wall. The boat impact force was calculated using the kinetic energy principle and stopping distance. Calculations and assumptions are presented in Attachment B.

5.3.3 Stone Protection Design

Stone protection is included as a component of the proposed wall design. No flow analyses were available or performed for this project by the Hydrology and Hydraulics (H&H) group. Thus, the stone protection design was initially based on the previous design from Río Antón Ruiz authorized flood control project (2001). According to the previous design, all stone used should have a minimum unit weight of 160 pounds per cubic feet. The original riprap and bedding stone thickness was a minimum of 12 and 6 inches, respectively, well graded and the maximum riprap stone weight was 35 pounds. However, when comparing previous gradation to standard sizes from ASTM D6092, it was concluded that these gradations were customized for the project because there is no standard gradation that meets the same requirements for riprap stone and bedding layer. Moreover, for the new design, it was determined that additional protection was required to protect a potential scour zone that would result from a SPF event. It is estimated that this zone will extend approximately 25 feet downstream from the location of the wall. The scour zone would require a minimum average stone size from 8 to 10 inches which would be a larger size than the original riprap design. Therefore, the new riprap gradation was revised to meet the scour zone requirement as shown below in Tables 3 and 4. The riprap to be considered is an R-60 standard riprap gradation following ASTM D6092, with a bedding layer of No. 1 stone, with maximum aggregate size of 4 inches. The thickness of the riprap should be revised to 1.5 feet and be increased by 50% if placed in the wet or under water to provide for uncertainties associated with this type of placement. The new bedding layer should be 9 inches thick as a minimum.

Table 6. Rip Rap Gradation

R-60 Riprap Standard Gradation	
Percent Finer by Weight	Stone Size (inches)
100	13.6
50	10.0
15	8.0
0	5.5

Table 7. Bedding Stone Gradation

No. 1 Bedding Stone	
Stone Size (inches)	Percent Finer by Weight
4	100
3 1/2	95
2 1/2	42.5
1 1/2	7.5
3/4	2.5

5.3.4 Sheet Pile Design

The CWALSHT software was used to estimate the minimum required sheet pile tip elevation considering a cantilever type sheet pile wall system to satisfy the structural stability of the wall system. Usual and impact loading cases were evaluated using the *S* soil strength parameters as discussed earlier. The water level in the channel used in the analyses was the Mean Lower Low Water level (MLLW) at elevation of -0.768 feet. The safety factor used for design of the wall was 1.5 based on Table 5-1 from Engineering Manual, EM-1110-2-2504, *Design of Sheet Pile Walls*. The results of the design indicate the tip of the wall should be embedded to an elevation of -24.0 feet.

5.3.5 Seismic Evaluation

The project is located within the Cerro Mula Fault Zone (CMFZ). Therefore, seismicity should be evaluated in the design. Engineering Regulation, ER 1110-2-1806, *Earthquake Design and Evaluation for Civil Works Projects*, "Table B-1", established a hazard potential classification for civil work projects. Based on this criteria, the potential hazard related to failure of the wall during a major seismic event is in the low category. Failure would not likely result in loss of life from inundation, should not significantly affect lifelines or critical structures, should not result in property losses, and would result in minimal incremental damage with respect to environmental impacts.

Based on the United States Geological Survey (USGS) seismic hazard map, spectral accelerations for the Humacao area with a period of 0.3 seconds and an earthquake recurrence of approximately every 500 years or 10% in 50 years, ranges between 0.30g and 0.40g. For a period of 0.3 seconds and an earthquake recurrence of approximately every 2,500 years or 2% in 50 years, spectral acceleration ranges between 0.70g and 0.9g.

5.3.6 Liquefaction

Liquefaction potential was evaluated using the ground accelerations discussed above for a 500 years event and an estimated earthquake magnitude of 5.8 based on historical earthquakes reported by the Puerto Rico Seismic Network at the Humacao station between years 2008 and 2010 with magnitudes between 5.4 and 6.1. Analysis results indicated factors of safety between 0.26 and 1.1 using a correction factor for overburden. These results indicate liquefaction is likely given the granular foundation and seismic conditions as earlier discussed. Estimated liquefaction induced settlement values using the correlation between corrected N values and cyclic stress ratio (Seed et al., 1984), indicated an approximately 16 inches of settlement. Calculations are included in the Appendix.

5.4 Design Phase Recommendations

This section describes the considerations to be taken into account for the design and implementation phase of the project.

5.4.1 Subsurface Investigations

Soils information used for this feasibility study was from investigations taken in the prior Section 205 project in the vicinity of the current project site. In order to obtain site specific conditions and narrow soil parameters of the area, it is recommended that site specific investigations are performed.

5.4.2 Seismic

Seismic evaluation specific to the site was not available. However, studies on the Cerro Mula Fault and nearby faults indicate no recent fault movement or displacement have occurred. Conversely, the seismic history of Puerto Rico indicate tremors could be expected, although should be minor. Seismic evaluation should be considered in the wall design including the Design Earthquake and Most Credible Earthquake values as well as measures to prevent potential liquefaction.

5.4.3 Stone Protection

Stone protection was based on previous design of the project and assumptions made for the scour zone downstream from the wall. Conditions could have changed throughout the years following the construction. Therefore, flow evaluation and hydraulic conditions should be evaluated in order to determine the corresponding flow velocities within project limits. Knowing the associated flow velocities in the canal would aid in designing the required stone protection.

6.0 Civil/Site

6.1 Site Layout

The site layout for the permanent notched weir structures will be placed at the same locations as the temporary SWIMs for Alternative 1, as shown in Attachment A drawing. The location for the one permanent weir structure (Alternative 2) will be placed near the mouth of the diversion channel, as shown in Attachment A drawing. The existing project right-of-way/easement will be used and can accommodate the project features. No additional lands or easements are anticipated.

6.2 Access

The previous Section 205 Flood Damage Reduction Project right-of-way/easement will be utilized for this project. The right-of-way allows for approximately 20 ft of access on either side of the levee that is adjacent to the diversion channel. The levee itself has a crown width of 12 ft with 1V:3H side slopes and can be used for access as well. Integrity of the levee for use as an access route will be assessed during the design phase. No additional lands or easements are anticipated for construction or maintenance of the project features.

Navigational aids and/or channel markers should be provided within the channel to direct boat traffic through the notches in the sheet pile weirs.

6.3 Staging/Stockpiling Areas

There are areas along either side of the levee (approximately 20 ft on either side) that can be used as staging or stockpiling areas for the limited amount of equipment and materials that will be used for this project. There is also an approximately 1 acre triangular area between the diversion channel and the levee, where the diversion channel veers further north away from the levee. This area was a previous disposal and borrow area for both the prior Section 205 project and temporary SWIM construction project, and can be used for staging/stockpiling areas for this project. It is not anticipated that any additional staging or stockpiling areas will be needed for the project construction or maintenance.

6.4 Relocations

There are no known or observed utilities or facilities within the project right-of-way.

7.0 Structural Requirements

7.1 Design Basis

Options for the Rio Anton Ruiz Restoration include a single, notched weir (Alternative 2) and two notched weirs (Alternative 1). The notched weirs will have soil at equal elevations on both sides; thus, they do not typically resist a load from retained soil. Two load cases were investigated: 1) 5-foot scour occurring on one side of the weir; and 2) impact by a small commercial watercraft. The weir was designed as a cantilever sheet pile wall in accordance with USACE criteria, EM 1110-2-2504, *Design of Sheet Pile Walls* (March 1994).

7.2 Design Analysis

Soil properties were obtained from prior geotechnical investigations for use in sheet pile analysis software CWALSHT. For design, a simplified single soil layer was assumed, using the properties of the worst condition soil layer detailed. Wall friction was ignored during design. Both load cases were considered Usual in accordance with EM 1110-2-2504. A stability design with associated safety factor for the sheet pile was performed only; structural design was conservatively based on results of the stability analysis. Results of the sheet pile design can be found in the structural Attachment C. A more refined, less conservative approach to the design analyses may be beneficial during design and implementation phase to obtain a more optimized design. The design was checked for correctness and conformance with USACE design criteria.

7.3 Sheet Pile

Due to its wide availability and history of use, hot rolled steel sheet pile was selected. A PZC-13 steel sheet pile section was assumed for design. Since the weir will be permanently submerged, marine grade ASTM A690 sheet pile was selected for its resistance to corrosion.

7.4 Concrete Cap

The weir will have a typical 1.5-ft by 1.5-ft reinforced concrete cap. Effects of the concrete cap are negligible and thus were ignored during design.

7.5 Design Phase Recommendations

During the design phase, more data should be collected for analysis including refined soil strata parameters, wave effects, scour depths, and additional anticipated impact forces.

Additional load cases should be analyzed including both stability and structural analyses. The sheet pile material should be investigated during final design including the use of cold rolled steel or vinyl sheet pile sections to possibly reduce costs.

8.0 Recommended Plan

Alternative 1 provides for permanent notched weirs at the existing temporary SWIM locations. These SWIM features at the locations and design elevations being used for Alternative 1 were monitored for salinity levels. The salinity monitoring stations showed a decrease in the salinity levels, indicating the temporary SWIM features performed as needed.

Alternatives 1a and 1b both provided some benefits with less cost. However, neither meet all of the project objectives and did not provide additional or same benefits for less cost. Thus, they were screened out.

Alternative 2 is providing for a less costly alternative by placing only one weir, near the mouth of the diversion channel. To make use of one weir, it was placed at prior to the confluence to Rio Anton Ruiz and the diversion channel. This ideally would reduce salinity levels in both channels. However, that location places it downstream of the discharge culvert that passes through the levee. This could impact a portion of the originally authorized Section 205 by reducing the level of flood protection provided by the culverts discharging into the diversion channel from Punta Santiago community. In addition, the location of the weir placed it in a cultural resource area, near a highway bridge and sandbar limiting locations for the weir to be placed. Thus, Alternative 2 was screened out.

The non-structural plan is placement of sand at the mouth of the channel, basically recreating the natural sand bar that develops there. The Sponsor was in favor of the natural occurring sand bar where it develops over time but “blows out” during large storm events to allow the flows to discharge. This alternative would not be a permanent feature. Once constructed, it would serve its purpose until a large storm event occurred. After a large storm event, the Sponsor would have to recreate the sand bar with additional sand placement as an operation and maintenance activity. It would be difficult to create a maintenance schedule that would mimic that of a naturally forming sandbar and would create higher long term maintenance costs. The natural ability of it to wash out during high water or storm events would also render it immediately ineffective after such an event, until the maintenance activity could be moved out to correct it. Sand is also not an easily accessible source on the island and would further increase long term maintenance costs. The alternative is not be a locally preferred plan. This alternative was screened out due to the higher long term maintenance costs, and would also not act as a permanent feature.

Based on the monitoring data gathered, the temporary SWIM features successfully functioned as designed. Thus, Alternative 1 was selected as the recommended plan for the permanent features.

9.0 Construction Procedures

The construction sequence for the project is anticipated to be installation of erosion and sediment control features including silt fence along the work perimeters and floating turbidity barriers within the Rio Anton Ruiz and diversion channels, upstream and downstream of the structure

locations. The structures will be sheet pile driven from the bank of the Rio Anton Ruiz and the diversion channel. The sheet pile weirs will have a concrete cap. Depending on the tidal conditions, there may be the need to draw down the water level directly adjacent to the sheet pile in order to construct the concrete cap. Sheet pile or other means to create a small dewatering cell and use of pumping directly back into the channel should be sufficient if the concrete cap is placed in sections. No diversion of water (diversion channel) is anticipated for the dewatering efforts.

10.0 Environmental Objective and Requirements

Environmental objectives and requirements are discussed in the main body of the Feasibility Report. The objectives include reducing salinity levels to below 10-12ppt, improving and increasing pterocarpus forest habitat, increasing submerged and emergent aquatic vegetation spatial extent, and improving habitat for beneficial freshwater fish species previously in the project area.

11.0 Operation and Maintenance

The operation and maintenance manual for the previous Section 205 project will still apply. The Rio Anton Ruiz and diversion channels shall be kept clear of debris and vegetation with regular clearing of the channel. The new sheet pile weirs shall be monitored for any cracking or spalling on the concrete; evidence of significant corrosion or tilting of the sheet pile; or any observed damage to the project features.

12.0 Access Roads

Access to the site will be via existing public roadways, and then via the existing project right-of-way. No additional temporary or permanent access roads are anticipated.

13.0 Cost Estimates

Cost estimates for each alternative are provided in the Cost Appendix to the Feasibility Report, separate from this engineering appendix. The estimated construction cost for each alternative is listed below (construction cost only, does not include contingency):

- Alternative 1 $2,100,000
- Alternative 1a $1,571,000
- Alternative 1b $1,264,000
- Alternative 2 $1,350,000

A cost estimate was not conducted on Non-structural plan as it would be an O&M plan and cost and not a construction cost. It was screened out as previously discussed. Other measures or features (such as replacing culvert) that were screened out in early in the plan formulation process did not proceed on for costs. The recommended plan, Alternative 1, construction cost with contingency is $2,167,000. While it is the most costly alternative, it is the only one that meets all

of the objectives, provides full benefits, and also provides for more benefits (output or habitat units) for the cost.

14.0 Schedule for Design and Construction

The design including review periods is expected to take approximately 6-7 months to complete. Construction of the project is anticipated to take 282 days (approximately 9-10 months) to complete.

15.0 References

References used or referenced, not already referenced within text above:

Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear. (2014). Ch. 17: Southeast and the Caribbean. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 396-417.

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NOAA. 2013. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite Data, and Information Service: Washington, DC. http://www.nesdis.noaa.gov/technical_reports/142_Climate_Scenarios.html

United States Army Corps of Engineers. (2016). Engineering and Construction Bulletin No. 2016-25: Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects. US Army Corps of Engineers: Washington, DC.

White, K.D., J.R. Arnold. (2015). Recent US Climate Change and Hydrology Literature Applicable to US Army Corps of Engineers Missions – Caribbean Region 21. US Army Corps of Engineers: Washington, DC.

ER 1110-1-12, Engineering and Design Quality Management

EC 1165-2-214, Civil Works Review Policy

ER 1110-2-1150, Engineering and Design for Civil Works (Appendix C covers EN Appendix to Feasibility Report)

Memorandum, 9 April 2015, CESAD-CG, subject: South Atlantic Division Regional Programmatic Review Plan for the Continuing Authorities Program

Memorandum, 19 January 2011, CECW-p, subject: Continuing Authority Program Planning Process Improvements

Agency Technical Review Guidance for Cost Engineering Products, 30 April 2010

00600-SAJ Documents and Records

02614-SAJ Quality Control of In-House Products: Civil Works Feasibility

33500-SAJ After Action Review and Lessons Learned

ATTACHMENT B

COST ENGINEERING AND RISK ANALYSIS

US Army Corps of Engineers®

Rio Anton Ruiz, Humacao, Puerto Rico

CAP Section 1135 – Restoration Project

Project Cost Abbreviated Risk Analysis Report

Prepared by:

U.S. Army Corps of Engineers
Jacksonville District

JUNE 2017

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EXECUTIVE SUMMARY

This Project Cost and Abbreviated Risk Analysis (ARA) Report has been completed by the US Army Corps of Engineers (USACE), Jacksonville District. The ARA was developed with tools provided by the Cost Engineering Mandatory Center of Expertise (MCX) for Civil Works. The ARA was reviewed internally by Jacksonville District Cost Engineering before being presented for Agency Technical Review (ATR). This report presents a recommendation for the total project cost contingency for cost certification of the Rio Anton Ruiz project. In compliance with Engineer Regulation (ER) 1110-2-1302 CIVIL WORKS COST ENGINEERING, dated June 30, 2016, an abbreviated risk analysis study was conducted for the development of the contingency to be applied to the total project cost. The purpose of this risk analysis was to establish a project contingency by identifying and measuring the cost impact of project uncertainties with respect to the estimated total project cost.

Specific to Rio Anton Ruiz, the most likely total project cost (at project first cost) is at approximately $3,957k. Based on the results of the analysis, the Jacksonville District recommends a contingency value of approximately $678K or 26% for construction costs; $48K or 19% for Planning, Engineering, and Design costs; and $44K or 18% for Construction Management costs. An ARA was developed to model the remaining work concerning scope growth, potential for mods and claims, and other concerns as seen in the risk register.

The Jacksonville District Cost Engineering Section performed the risk analysis for this project and it has been internally reviewed, as required, via the ATR process.

MAIN REPORT

1.0 PURPOSE

This report presents a recommendation for the total project cost contingencies for the cost certification of Rio Anton Ruiz Restoration Project.

2.0 BACKGROUND

This estimate is primarily based upon the August 2016 Final Feasibility Report, for assistance in a permanent slat water intrusion measures (SWIM) to the lagoon system and Rio Anton Ruiz.

Location - The Rio Anton Ruiz is located in the Municipality of Humacao on the southeast coast of Puerto Rico. The project area includes a brackish lagoon system and a Pterocarpus Forest in the Humacao Natural Reserve. Six lagoons encompassing approximately 615 acres, compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas. The coastal communities of Punta Santiago, Verde Mar, and Villa Palmira are the main populated areas within the watershed.

2001 – Rio Anton Flood Control Project (Section 205) is constructed. Since the completion of the diversion channel, the lagoon system and its surrounding environment have been adversely affected by saltwater intrusion.

2007 - USACE installed temporary impermeable plugs (SWIM) across the diversion channel near the lagoon and across the Rio Anton Ruiz that demonstrated the effectiveness of the control measures.

This Section 1135 project involves two new design and construct permanent measures to reduce the salinity levels within the diversion channel (and thus lagoon system and Pterocarpus Forest).

During the feasibility study the project delivery team (PDT) evaluated another four alternatives to attempt solve some of the problems from different avenues of approach. After a delivered evaluation discussed on the Engineer Appendix the alternative were screen out leaving alternative 1 as the tentative selected plan. Refer to the Engineer Appendix for more information about the other screened out alternatives.

A. Previous alternative overview:

1. Alternative 1 - Two sheet-pile, concrete cap weirs at same location as originally placed temporary SWIM plugs. Top of weirs, 0.25 ft above Mean Low Water (MLW) elevation with a 15 ft wide by 3 ft deep "notch" within the center of diversion channel and Rio Anton Ruiz respectively. Top elevation of notch section will be 2.75 ft below MLW to allow navigation of diversion channel and river at low water elevations.

2. Alternative 1a – One sheet-pile, concrete capped weir at the same location of the temporary SWIM plug at the Rio Anton Ruiz. Top of weir, 0.25 ft above MLW elevation with a 15 foot wide by 3 foot deep "notch" within the center Rio Anton Ruiz respectively. Top elevation of notch section will be 2.75 ft below MLW to allow navigation of river at low water elevations. This alternative is derived from Alternative 1.

3. Alternative 1b - One sheet-pile, concrete capped weir at the same location of the SWIM plug at the diversion channel near the lagoon. Top of weir, 0.25 ft above MLW elevation with a 15 ft wide by 3 ft deep "notch" within the center of diversion channel respectively. Top elevation of notch section will be 2.75 ft below MLW to allow navigation of diversion channel at low water elevations. This alternative is derived from Alternative 1.

4. Alternative 2 – One sheet-pile, concrete cap weir near mouth of river/diversion channel outlet (upstream of PR HWY 3 Bridge). Top of weir, 0.25 ft above MLW elevation with a 15 ft wide by 3 ft deep "notch" within the center of the channel outlet. Top elevation of notch section will be 2.75 ft below MLW to allow navigation of diversion channel and river at low water elevations. Alternative 2 was not carried forward for analysis due to impacts to the 2001 Anton Ruiz Flood Control project

Table 1: Alternative Cost Comparison

Alternative	(Construction Cost Only) 18 AUG 2016	Refined Construction Cost Only including Contingency [WBS 15 Only]
Alternative 1	$2,100,000	$2,924,000
*Alternative 1a	$1,571,000	
*Alternative 1b	$1,264,000	
Alternative 2	$1,350,000	

Notes:
1) *Cost for Alt 1a and Alt 1b were subtracted from Alternative 1
2) None of the construction cost include the "Adaptive Management" neither "Cultural Resources".

3.0 REPORT SCOPE

The scope of this report is to facilitate a technical overview of the tentative selected plan. Part of the report includes the risk analysis report used to calculate and present the cost contingency at the 80% confidence level using the risk analysis processes, as mandated by U.S Army Corps of Engineers (USACE) Engineer Regulation (ER) 1110-2-1150, and Engineer Technical Letter 1110-2-573, Construction Cost Estimating Guide for Civil Works. The study and presentation does not include consideration for life cycle costs.

This report is based on the alternative 1. It consists of two concrete-capped sheet pile weirs, located at the current temporary SWIM locations. One location is within the Rio Anton Ruiz and the other location is within the diversion channel, approximately ½ mile from the mouth of the diversion channel.

3.1 Project Scope

The selected alternative 1 consists of the construction of two concrete-capped sheet pile weirs and the removal of the existing temporary weirs. The weir identification is as follow:

- Weir #1: Rio Anton Ruiz at Confluence with diversion Channel (approximately 180 ft wide)
- Weir #2: Madri Lagoon/ Boca Prieta diversion Channel (approximately 140 ft wide)

Figure 1: Aerial photo of the project site

A. <u>Preparatory Work Weir #1:</u>

1. Construction of a temporary access road as needed
2. Staging area preparation
3. Installation of sediment control features
4. Turbidity barrier installation
5. Temporary cofferdam installation and dewatering system in place

B. <u>Foundation Work Weir #1:</u>

1. 180 lft of sheet pile for the permanent weir at Rio Anton Ruiz at confluence with diversion Channel. The weir has a notch with the follow dimension (3 ft deep x 15 ft wide)
2. Concrete cap of 2 ft x 1 ft

C. <u>Earthwork for Weir #1:</u>

1. Removal of existing sandbags
2. Geotextile installation
3. Stone protection

D. Preparatory Work Weir #2:

1. Remove temporary cofferdam from the Weir #1 location
2. Construction of a temporary access road as needed
3. Staging area preparation
4. Installation of sediment control features
5. Turbidity barrier installation
6. Temporary cofferdam installation and dewatering system in place

E. Foundation Work Weir #2:

1. 140 lft of sheet pile for the permanent weir at Madri Lagoon/ Boca Prieta diversion Channel. The weir has a notch with the follow dimension (3 ft deep x 15 ft wide)
2. Concrete cap of 2 ft x 1 ft

F. Earthwork for Weir #2:

1. Removal of existing sandbags
2. Geotextile installation
3. Stone protection

G. General work:

1. Channel markers and navigation aids for both weirs

H. Project Assumption used for the cost estimate:

1. Construction will be executed during daylight hours and only five days a week.
2. The site layout for the permanent notched weir structures will be placed at the same locations as the temporary SWIMs.
3. Contractor will maintain the water quality monitoring during the construction and will maintain the turbidity barrier.
4. The project will have an adaptive management plan. The assumption is the adaptive management could be extended up to five years.
5. Access to the site will be via existing public roadways, and then via the existing project right-of way.
6. There are areas along either side of the levee (approximately 20 ft on either side) that can be used as staging or stockpiling areas for the limited amount of equipment and materials that will be used for this project.
7. There are no known or observed utilities or facilities within the project right-of-way.
8. The existing project right-of-way/easement will be used and can accommodate the project features. No additional lands or easements are anticipated.
9. There will be water pumps available during the construction to allow dewatering and water flow as needed.

10. Navigational aids and/or channel markers should be provided within the channel to direct boat traffic through the notches in the sheet pile weirs.
11. The construction method is using a crane with a pile hammer to drive the temporary and permanent sheet pile during the construction. The assumption is that the contractor will construct the weir one at the time to allow reused the temporary sheet pile for the cofferdam.
12. Any deviations from these assumptions will impact costs. The magnitude of those impacts will vary.
13. Bubble Curtain Requirements:
    a. Limit sheet pile driving to 10 steel sheets a day during daylight hours only.
    b. An observer looking for protected species within 100 yrds of the project area, with work ceasing within an animal coming within 50 feet of the project area.
    c. Bubble curtain 2 rings high - surrounding the construction area each day is require for a pile hammer.

I. Major Project Features includes:

1. Removal and disposal of the current SWIMS (Sandbags)
2. Installation of the temporary cofferdam
3. Construction of the two permanent weirs
4. Rip rap installation
5. Channel markers and navigation aids

J. Construction Sequence:

The construction sequence for the project is anticipated to be installation of erosion and sediment control features including silt fence along the work perimeters and floating turbidity barriers within the Rio Anton Ruiz and diversion channels, upstream and downstream of the structure locations. The structures will be sheet pile driven from the bank of the diversion channel. The sheet pile weirs will have a concrete cap. Depending on the tidal conditions, there may be the need to draw down the water level directly adjacent to the sheet pile in order to construct the concrete cap. Sheet pile or other means to create a small dewatering cell and use of pumping directly back into the channel should be sufficient if the concrete cap is placed in sections.

The construction is anticipated to be conducted in sequence starting by Weir #1 and eventually move to Weir #2. Temporary cofferdam will be installed and re-used to allow the construction of the permanent weirs. The estimated construction duration for this projects about 293 calendar days.

4.0 ABBREVIATED RISK ANALYSIS METHODOLOGY/PROCESS

The risk analysis process for this estimate is intended to determine the probability of various cost outcomes and to quantify the required contingency needed in the cost estimate to achieve the desired level of cost confidence. In simple terms, contingency is an amount added to an estimate to allow for items, conditions or events for which the occurrence or impact is uncertain and that experience suggests will likely result in additional costs being incurred or additional time being required. The amount of contingency included in project control plans depends, at least in part, on the project

leadership's willingness to accept risk of project overruns. The less risk that project leadership is willing to accept the more contingency should be applied in the project control plans. The risk of overrun is expressed, in a probabilistic context, using confidence levels.

Contingency for the cost estimate has been developed using materials provided by the USACE Cost Center of Expertise located in Walla Walla District. The cost estimator assigned risk factors based upon the project Work Breakdown Structure. The contingency was developed using a condensed format since the total project cost is below the threshold for completing a Cost and Schedule Risk Analysis. The contingency was primarily affected by the weight of most likely and possible risks with regards to utilities, ramps, and levee work. Their impacts ranged from marginal to significant.

The primary steps, in functional terms, of the risk analysis process are described in the following subsections. Risk analysis results are provided in Appendix.

4.1 Identify and Assess Risk Factors

Identifying risk factors is considered a qualitative process that results in establishing a risk register that serves as the basis for the resulting contingency percentage. Risk factors are events and conditions that may influence or drive uncertainty in project performance. They may be inherent characteristics or conditions of the project or external influences, events, or conditions such as weather or economic conditions. Risk factors may have either favorable or unfavorable impacts on project cost and schedule. A risk brainstorming session was conducted November 09, 2016, to discuss all possible risks and impacts. The Project Delivery Team (PDT) attendees are listed on the PDT Involvement tab of the ARA spreadsheet.

Contingency is analyzed using formulas within the spreadsheet, as opposed to the more complex analysis of the Crystal Ball software's *Monte Carlo* simulations used in a formal cost and schedule risk analysis. Contingencies are calculated according to the likelihood and impact of each factor identified in the risk register.

The Abbreviate Risk Analysis was developed with input of the PDT and with the sponsor. The highest risk level identified during the development of the Risk Register was level 4. This risk was associated with the potential problems during the construction in the water channel due to adverse weather conditions. The concern is expected to be reduced with the implementation of a temporary cofferdam and the acquisition of water pumps for the construction duration. Another major concern is the potential change on the selected construction material but it will be handled during design and implementation. The rest of the concern risk levels are level 2 and under.

A. <u>Some of the concerns registered in the Risk Register are:</u>

1. Possible construction schedule delays due to season restrictions and possible environmental constraints. This concerns have been addressed in the Risk Register.
2. Possible delays on the weir construction due to adverse weather conditions. This concern has been addressed in the Risk Register.
3. Potential encounter cultural resource

This tool helped the development of the contingency for the project and provides essential information that could be used for establishment of control measures. The Risk Register will

continue be updated during the project live cycle.

5.0 KEY ASSUMPTIONS AND LIMITATIONS

Key assumptions and limitations are those that are most likely to significantly affect the determinations of contingency presented in the CSRA. The key assumptions and limitations are important to help ensure that project leadership and other decision makers understand the steps, logic, and decisions made in the risk analysis, as well as any resultant implications on the use of outcomes and results.

A. Key assumptions:

1. The site layout for the permanent notched weir structures will be placed at the same locations as the temporary SWIMs
2. Construction will be executed during day light hours and only five days a week.
3. Contractor will maintain the water quality monitoring during the construction and will maintain the turbidity barrier.
4. Access to the site will be via existing public roadways, and then via the existing project right-of way.
5. There are no known or observed utilities or facilities within the project right-of-way.
6. The existing project right-of-way/easement will be used and can accommodate the project features. No additional lands or easements are anticipated.

6.0 RESULTS

6.1 Risk Register

An abbreviated risk register, provided in Appendix A, is a tool commonly used in project planning and risk analysis. It is important to note that a risk register can be an effective tool for managing identified risks throughout the project life cycle. As such, it is generally recommended that risk registers be updated as the designs, cost estimates, and schedule are further refined, especially on large projects with extended schedules.

Specific to this abbreviated risk register, it should be noted that there are events reported in the register, but not included in the calculations. That is, the risk register shows the risk events, but they do not contribute to the contingency calculations. In a formal risk analysis, such a practice is commonly used on risks/opportunity events with a Low Risk Level (typical for cost and schedule events with some combination of, for example, Very Unlikely/Unlikely Likelihoods and Negligible/Marginal Impacts). These are documented, but excluded from the calculations in order to better prevent skewed results. Under Risk Level, these show with a Zero (0).

As mentioned in the Executive Summary, tools/materials from the MCX were used throughout the process of acknowledging this risk, trying to account for it, running into the calculation issue, and coming up with the resolution.

6.2 Cost Contingency

The contingency was calculated based off the likelihood and impact of the risk concerns. Some of the major areas of concern were seen under the Construction Elements and External Project Risks categories. For example, the risks for utilities could have a significant impact on the cost, as there

has been a history of issues pertaining to utilities for this project area.

Table 1 provides the raw contingencies percentages calculated based upon the factors assigned in the risk register.

Table 2: Project Cost Contingency Summary

Totals	% Contingency
Real Estate	15 %
Construction	28 %
Planning, Engineering & Design	19%
Construction Management	18%
Combined Contingency	25%

APPENDIX A: TOTAL PROJECT COST SUMMARY (TPCS)

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 452782

SAJ – Rio Anton Ruiz - Section 1135
Project Modifications to Improve the Environment

The Rio Anton Ruiz – Section 1135 Project as presented by Jacksonville District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of June 28, 2017, the Cost MCX certifies the estimated total project cost:

FY 2018 Project First Cost:	$3,957,000
Total Project Cost:	$4,107,000
Estimated Federal Cost:	$3,256,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal participation.

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Date: 2017.06.28 13:45:16 -07'00'

For: Kim C. Callan, PE, CCE, PM
Chief, Cost Engineering MCX
Walla Walla District

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Rio Anton Ruiz Restoration - CAP Section 1135**
PROJECT NO: **452782**
LOCATION: **Puerto Rico**

DISTRICT: **JACKSONVILLE DISTRICT** PREPARED: **6/27/2017**

POC: **CHIEF, COST ENGINEERING, MATTHEW CUNNINGHAM**

This Estimate reflects the scope and schedule in report; Integrated Feasibility Report & Environmental Assessment - February 2017

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
									Program Year (Budget EC):	2018					
									Effective Price Level Date:	1-Oct- 17					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	REMAINING COST ($K)	Spent Thru: 10/1/2016 ($K)	TOTAL FIRST COST ($K)	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE (Adaptive Mgmt)	$117	$13	11%	$130	1.9%	$119	$13	$132		$132	10.5%	$132	$15	$146
15	FLOODWAY CONTROL	$2,240	$631	28%	$2,871	1.9%	$2,282	$642	$2,924		$2,924	3.6%	$2,363	$665	$3,029
18	CULTURAL RESOURCES	$200	$22	11%	$222		$204	$23	$226		$226	1.1%	$206	$23	$229
	CONSTRUCTION ESTIMATE TOTALS:	$2,557	$666	26%	$3,223	1.9%	$2,604	$678	$3,283		$3,283	3.7%	$2,701	$703	$3,404
01	LANDS AND DAMAGES	$72	$11	15%	$83	1.9%	$73	$11	$84		$84	1.1%	$74	$11	$85
30	PLANNING, ENGINEERING & DESIGN (9.6%)	$246	$47	19%	$293	3.1%	$254	$48	$302		$302	2.8%	$261	$50	$310
31	CONSTRUCTION MANAGEMENT (9.2%)	$236	$43	18%	$279	3.1%	$243	$44	$288		$288	7.1%	$261	$48	$308
	PROJECT COST TOTALS:	$3,111	$767	25%	$3,878		$3,175	$782	$3,957		$3,957	3.8%	$3,296	$811	$4,107

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CHIEF, OPERATIONS, CANDIDA BRONSON

CHIEF, CONSTRUCTION, STEPHEN DUBA

CHIEF, CONTRACTING, TIMOTHY BLACK

CHIEF, PM-PB, KAREN SMITH

CHIEF, DPM, TIM MURPHY

ESTIMATED TOTAL PROJECT COST:		**$4,107**
ESTIMATED FEDERAL COST:	75%	$3,081
ESTIMATED NON-FEDERAL COST:	25%	$1,027
22 - FEASIBILITY STUDY (CAP studies):		**$250**
ESTIMATED FEDERAL COST:		$175
ESTIMATED NON-FEDERAL COST:		$75
ESTIMATED FEDERAL COST OF PROJECT		**$3,256**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Rio Anton Ruiz Restoration - CAP Section 1135
LOCATION: Puerto Rico
This Estimate reflects the scope and schedule in report; Integrated Feasibility Report & Environmental Assessment - February 2017

DISTRICT: JACKSONVILLE DISTRICT
POC: CHIEF, COST ENGINEERING, MATTHEW CUNNINGHAM
PREPARED: 6/27/2017

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 6/27/2017 Estimate Price Level: 10/1/2016				Program Year (Budget EC): 2018 Effective Price Level Date: 1 -Oct-17								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
06	FISH & WILDLIFE (Adaptive Mgmt)	$117	$13	11.1%	$130	1.9%	$119	$13	$132	2023Q1	10.5%	$132	$15	$146
15	FLOODWAY CONTROL	$2,240	$631	28.2%	$2,871	1.9%	$2,282	$642	$2,924	2019Q4	3.6%	$2,363	$665	$3,029
18	CULTURAL RESOURCES	$200	$22	11.1%	$222	1.9%	$204	$23	$226	2018Q3	1.1%	$206	$23	$229
	CONSTRUCTION ESTIMATE TOTALS:	$2,557	$666	26.0%	**$3,223**		$2,604	$678	$3,283			$2,701	$703	$3,404
01	LANDS AND DAMAGES	$72	$11	15.0%	$83	1.9%	$73	$11	$84	2018Q3	1.1%	$74	$11	$85
30	PLANNING, ENGINEERING & DESIGN													
1.35%	Project Management	$35	$7	19.0%	$42	3.1%	$36	$7	$43	2018Q3	1.8%	$37	$7	$44
0.75%	Planning & Environmental Compliance	$19	$4	19.0%	$23	3.1%	$20	$4	$23	2018Q3	1.8%	$20	$4	$24
4.00%	Engineering & Design	$102	$19	19.0%	$121	3.1%	$105	$20	$125	2018Q3	1.8%	$107	$20	$127
0.50%	Engineering Tech Review ITR & VE	$13	$2	19.0%	$15	3.1%	$13	$3	$16	2018Q3	1.8%	$14	$3	$16
0.50%	Contracting & Reprographics	$13	$2	19.0%	$15	3.1%	$13	$3	$16	2018Q3	1.8%	$14	$3	$16
1.00%	Engineering During Construction	$26	$5	19.0%	$31	3.1%	$27	$5	$32	2019Q4	7.1%	$29	$5	$34
0.75%	Planning During Construction	$19	$4	19.0%	$23	3.1%	$20	$4	$23	2019Q4	7.1%	$21	$4	$25
0.75%	Project Operations	$19	$4	19.0%	$23	3.1%	$20	$4	$23	2018Q3	1.8%	$20	$4	$24
31	CONSTRUCTION MANAGEMENT													
7.00%	Construction Management	$179	$33	18.2%	$212	3.1%	$185	$34	$218	2019Q4	7.1%	$198	$36	$234
1.00%	Project Operation:	$26	$5	18.2%	$31	3.1%	$27	$5	$32	2019Q4	7.1%	$29	$5	$34
1.20%	Project Management	$31	$6	18.2%	$37	3.1%	$32	$6	$38	2019Q4	7.1%	$34	$6	$40
	CONTRACT COST TOTALS:	$3,111	$767		**$3,878**		$3,175	$782	$3,957			$3,296	$811	**$4,107**

FINAL

APPENDIX C

RIO ANTON RUIZ
CONTINUING AUTHORITY PROGRAM (CAP)
SEC 1135 PROJECT MODIFICATION
HUMACAO, PUERTO RICO

INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

REAL ESTATE PLAN

RIO ANTON RUIZ

CONTINUING AUTHORITY PROGRAM (CAP)

SEC 1135 PROJECT MODIFICATION

HUMACAO, PUERTO RICO

INTEGRATED FEASIBILITY REPORT AND

ENVIRONMENTAL ASSESSMENT

REAL ESTATE PLAN

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FINAL

APPENDIX C

RIO ANTON RUIZ

CONTINUING AUTHORITY PROGRAM (CAP)
SEC 1135 PROJECT MODIFICATION
HUMACAO, PUERTO RICO

INTEGRATED FEASIBILITY REPORT AND
ENVIRONMENTAL ASSESSMENT

REAL ESTATE PLAN

1. STATEMENT OF PURPOSE.

This Real Estate Plan (REP) is provided in support of the Rio Anton Ruiz Feasibility Study. The purpose of the study is to recommend a plan for a solution to reduce the salinity levels for the Rio Anton Ruiz Restoration Project located in Humacao, Puerto Rico. This is a Continuing Authorities Program (CAP) Section 1135 Project Modifications for Improvements to the Environment project that was introduced after construction of the CAP Section 205 flood control project of 2001. Upon approval, this document will be included as an appendix to the Final Integrated Feasibility Report.

This report is preliminary and is intended for planning purposes only. Both the final real property lines and land value estimates are subject to change even after approval of this report. There may be modifications to the plans that occur during Pre-construction, Engineering and Design (PED) phase, thus changing the final acquisition area(s) and/or administrative and land costs.

2. PROJECT AND STUDY AUTHORIZATION.

This study was authorized under Continuing Authority Program (CAP) Section 1135 of the Water Resources Development Act (WRDA) of 1986 (33 USC 2309a), as amended. This authority provides for the review and modification of water resources projects built by the U.S. Army Corps of Engineers (USACE)

for the purpose of improving environmental quality. In addition, if it is determined that a Corps water resources project has contributed to environmental degradation, restoration measures may be implemented as long as if these measures do not conflict with the authorized project purposes. The Federal Interest Determination (FID) was approved on February 26, 2016.

3. PROJECT LOCATION

Río Antón Ruiz river basin is located in the Municipality of Humacao on the southeast coast of Puerto Rico. The project area includes a brackish lagoon system and a Pterocarpus Forest in the Humacao Natural Reserve (HNR), as indicated in Figure 1.

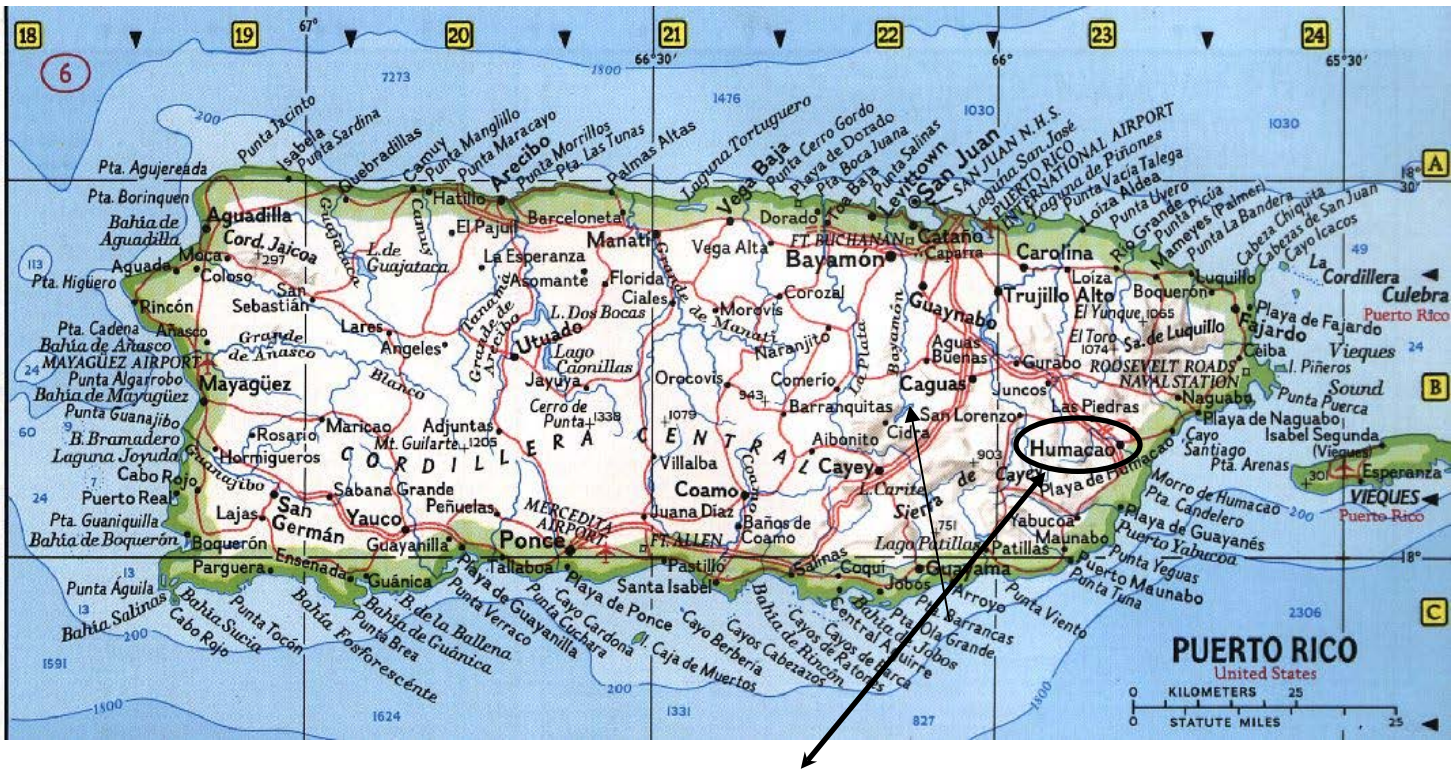

Figure No. 1 - Project Location

4. PROJECT DESCRIPTION

The Recommended Plan, Alternative 1, consists of constructing two sheet-pile notched concrete cap weirs at the same location as the original Salt Water Improvement Measures (SWIM) plugs. One weir location is within the Rio Anton Ruiz, just north of the confluence of the Rio Anton Ruiz and the diversion channel. The other weir location is within the diversion channel, approximately ½ mile from the mouth of the diversion channel at the lagoon.

5. REAL ESTATE REQUIREMENTS.

Department of Natural and Environmental Resources (DNER) of the Commonwealth of Puerto Rico, the non-federal sponsor, acquired the lands for a previous CAP Section 205 project in fee and will certify that the lands are available for construction for this project. The construction area will be available via a temporary work area easement. The staging area will be available via a temporary work area easement from the non-federal sponsor. Access to the temporary work area will be provided via a perpetual road easement from the non-federal sponsor. Refer to Figure 2.

6. ESTATE TO BE AQUIRED.

a. Temporary Work Area Easement

A temporary easement and right-of-way in, on, and over across (the land described in Schedule A) (Tracts Nos _____, _____ and _____), for a period not to exceed _____, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agent, and contractors as a work area to move, store, and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _____ Project, together with the right to trim, cut fell and remove therefrom all trees, underbrush , obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowner, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridge the rights and easements hereby required ; subject however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

b. Road Easement:

A perpetual easement and right-of-way in, on over and across (the land described in Schedule A) (Tracts Nos, _____, _____and _____) for the location, construction, operation, maintenance, alteration replacement of (a) road (s) and appurtenances therein; together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the right-of way; (reserving, however, to the owners, their heirs and assigns, the right to cross over or under the right-of way as access to their adjoining land at the locations indicated in Schedule B;) subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

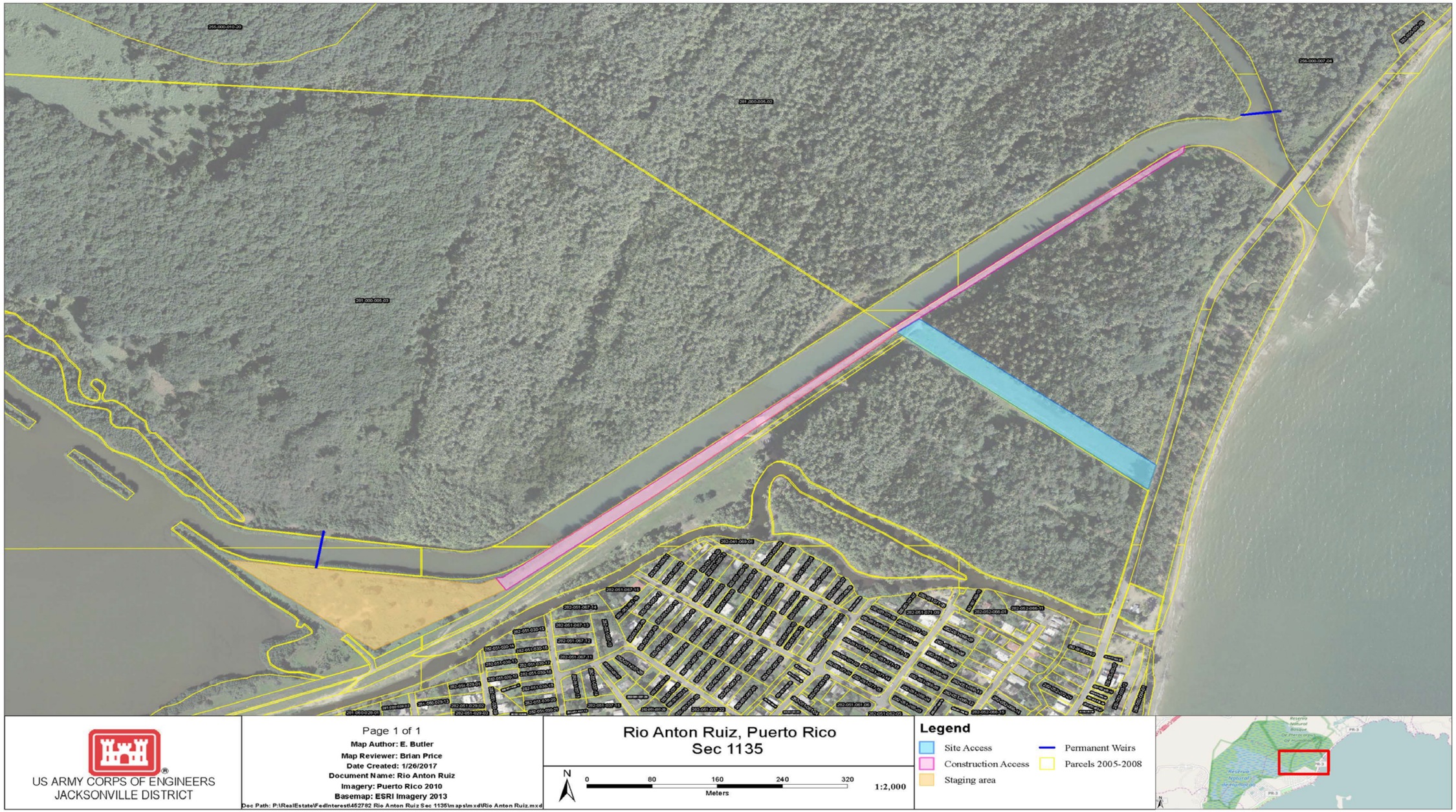

Figure No. 2 - Real Estate Map

7. FEDERALLY-OWNED LAND

There are no Federal owned lands within project limits.

8. NON-FEDERALLY-OWNED LAND

Project lands are owned by Department of Natural and Environmental Resources (DNER) of the Commonwealth of Puerto Rico, the non-Federal sponsor.

9. NON-FEDERAL OPERATION AND MAINTENACE RESPONSIBILITIES

The Non-Federal Sponsor will be required to provide without cost to the United States the aforementioned lands, access routes for ingress/egress, and staging areas, necessary for project construction of the project. Access authorization for entry for Construction will be provided by the non-Federal Sponsor to USACE prior to solicitation for a construction contract in order to identify and validate that sufficient real property interests are available. Operation and maintenance is a 100% non-federal responsibility.

10. NON-FEDERAL AUTHORITY TO PARTICIPATE IN PROJECT

Non-Federal Sponsor's authority to participate in projects comes from Puerto Rico Law 23 of June 20, 1972, Section 5(e), as amended:

"Article 5. Faculties and obligations of the Secretary

The Secretary of Natural Resources shall have, in addition to those transferred by this chapter, the following functions and duties:

(e) Execute the agreements necessary and convenient in order to achieve the objectives of the Department and its programs with bodies from the government of the United States of America, with state governments, with other departments, agencies or instrumentalities of the Government of the Commonwealth, its municipalities and with private institutions; [he/she] is also thus empowered to accept and receive any donations or funds on account of appropriations, advances or any other kind of assistance or benefit when these originate from said government bodies or from nonprofit institutions."

11. NAVIGATION SERVITUDE

Navigation servitude does not apply to this project. In accordance with CECW-PB memorandum dated 8 December 2004, Application of Navigation Servitude in Ecosystem Restoration Projects, navigation servitude should only be asserted when the environmental measures directly impact navigation.

12. ATTITUDE OF OWNERS

The Department of Natural Environmental Resources the project sponsor, fully supports the project. All indications to date are that the public support the project.

13. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

No signs of potential HTRW problems were identified and no sites with potential for HTRW contamination were found.

14. INDUCED FLOODING

There will be no induced flooding directly associated with this project.

15. ZONING ORDINACES

Applications or enactment of zoning ordinances will not be used in lieu of acquisition.

16. RELOCATIOS ASSISTANCE (PUBLIC LAW 91-646)

No persons or businesses will be impacted by the project. There are no benefits anticipated under PL 91-646, codified in U.S.C. Title 42 – The Public Health and Welfare, Chapter 61 – Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs which are implement in the Uniform Regulations contained in 49 Code Of Federal Regulation, Part 24.

17. RELOCATIONS, ALTERATIONS, VACATIONS, AND ABANDONMENTS

No relocations, alterations, vacations or abandonments of utilities, structures, facilities, cemeteries, or towns have been identified within the proposed construction limits of the recommended plan.

18. STANDING TIMBER AND VEGETATIVE COVER

Topography is primarily flat, low lying grassy land with scattered wetlands, mainly mangroves. The project alignment passes through two abandoned coconut groves. There is no standing timber or other vegetative cover that has significant value.

19. RECREATION RESOURCES

There are no separable recreational lands identified for the project.

20. CULTURAL RESOURCES

There are no known cultural resources identified as being affected by this project.

21. OUTSTANDING RIGHTS

There are no known outstanding rights in the project area.

22. MITIGATION

There is no mitigation for the Recommended Plan.

23. AQUISITION ADMINISTRATIVE COSTS

The estimate of the Federal real estate administrative cost is **$ 36,500.00**. This figure includes project real estate planning, mapping, review, oversight, monitoring, analysis of real estate requirements and estates. The non-Federal sponsor will receive credit towards its share of real estate administrative project cost incurred for certifications. Non-Federal acquisition/administrative costs are estimated to be **$ 36,500.00.**

24. SUMMARY OF PROJECT REAL ESTATE COSTS.

The following cost figures are subject to change prior to construction.

a. Lands and Damages		$ 0
b. Acquisition Administrative cost		$73,000.00
Federal	$36,500.00	
Non-Federal	$36,500.00	
c. Public Law 91-646		$ 0
d. Condemnations		$ 0
e. Total Estimated Real Estate Cost		$73,000.00
f. Contingency (15%)		$11,00.00
g. Total Real Estate Costs		$84,000.00

25. CHART OF ACCOUNTS FOR PROJECT

01 - Lands & Damages		$ 0
01B-- Acquisitions		$73,000.00
01B20 - Non-Federal	$36,500.00	
01B40 – Federal	$36,500.00	
01B10 - By Govt	$ 0	
01B20 - By Local sponsor	$ 0	
01E10 - By Govt (In-House)	$ 0	
01M00 – Contingency (15%)		$ 11,000.00
Total Estimated Real Estate Cost:		**$** 84,000.00

Exhibit C-1

REAL ESTATE CAPABILITY ASSESSMENT

ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE ACQUISITION CAPABILITY

CONTINUING AUTHORITY PROGRAM (CAP) RIO ANTON RUIZ

SEC 1135 PROJECT MODIFICATION

I. Legal Authority:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **YES**
b. Does the sponsor have the power of eminent domain for this project? **YES**
c. Does the sponsor have "quick-take" authority for this project? **YES**
d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? **NO**
e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? **NO**

II. Human Resource Requirements:

a. Will the sponsor's in-house staff require technical training to become familiar with the real estate requirements of Federal projects including P.L. 91·646, as amended? **NO**
b. If the answer to IIa. is "yes," has a reasonable plan been developed to provide such training? **NO**
c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **YES**
d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? **YES**
e. Can the sponsor obtain contractor support, if required in a timely fashion? **YES**
f. Will the sponsor likely request USACE assistance in acquiring real estate? **NO**

III. Other Project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site? **YES**

b. Has the sponsor approved the project/real estate schedule/milestones? **YES**

IV. Overall Assessment:

a. Has the sponsor performed satisfactorily on other USACE projects? **YES**
b. With regard to this project, the sponsor is anticipated to be: H**ighly Capable/fully**.

V. Coordination:

a. Has this assessment been coordinated with the sponsor? **YES**
b. Does the sponsor concur with this assessment? **YES**

Date: 12 June 2017

Prepared by:

Jerome Morgan
Realty Specialist, Acquisition Branch
Real Estate Division

Reviewed by:

Hansler A. Bealyer
Chief, Acquisition Branch
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Reviewed and approved by:

Tori K. White
Acting Chief, Real Estate Division
Real Estate Division

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
701 SAN MARCO BLVD
JACKSONVILLE, FLORIDA 32207-8175

Real Estate Division

Ms. Mabel Rivera
Department of Natural Environmental Resources
P. 0. Box 366147
San Juan, Puerto Rico 00936

Dear Ms. Rivera:

The intent of this letter is to formally advise Department of Natural Environmental Resources, as the non-Federal sponsor for the Río Antón Ruíz Continuing Authority Program (CAP) SEC 1135 Project Modifications for Improvements to the Environment Feasibility Study, of the risks associated with land acquisition prior to the execution of the Project Partnership Agreement (PPA) or prior to the Government's formal notice to proceed with acquisition. If a non-Federal sponsor deems it necessary to commence acquisition prior to an executed PPA for whatever reason, the non-Federal sponsor assumes full and sole responsibility for any and all costs, responsibility, or liability arising out of the acquisition effort.

Generally, these risks include, but may not be limited to, the following:

1. Congress may not appropriate funds to construct the proposed project;

2. The proposed project may otherwise not be funded or approved for construction;

3. A PPA mutually agreeable to the non-Federal sponsor and the Government may not be executed and implemented;

4. The non-Federal sponsor may incur liability and expense by virtue of its ownership of contaminated lands, or interests therein, whether such liability should arise out of local, state, or Federal laws or regulations including liability arising out of CERCLA, as amended;

5. The non-Federal sponsor may acquire interests or estates that are later determined by the Government to be inappropriate, insufficient, or otherwise not required for the project;

6. The non-Federal sponsor may initially acquire insufficient or excessive real property acreage which may result in additional negotiations and/or benefit payments

under P.L. 91-646 as well as the payment of additional fair market value to affected landowners which could have been avoided by delaying acquisition until after PPA execution and the Government's notice to commence acquisition and performance of LERRD; and

7. The non-Federal sponsor may incur costs or expenses in connection with its decision to acquire or perform LERRD in advance of the executed PPA and the Government's notice to proceed which may not be creditable under the provisions of Public Law 99-662 or the PPA.

We appreciate the Commonwealth of Puerto Rico's participation in this project. Should you have questions or concerns pertaining to this letter please feel free to contact Mr. Jerome Morgan at jerome.g.morgan@usace.army.mil (904) 232-1146.

Sincerely,

Tori K. White
Acting Chief, Real Estate Division

APPENDIX E

Monitoring and Adaptive Management Plan

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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1 PURPOSE

Section 2039[1] of Water Resources Development Act (WRDA) 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project (or component of a project) under the U.S. Army Corps of Engineers (USACE) ecosystem restoration mission, that the recommended project includes a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction adaptive management should proceed, if needed. An adaptive management plan is required by U.S. Army Corps of Engineers (USACE) implementation guidance for the Water Resources Development Act (WRDA) 2007 Section 2039[2].

This monitoring and adaptive management plan will be used following implementation of the Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) project located in Humacao, Puerto Rico. This plan includes a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met. The plan provides strategies to address project uncertainties that will be faced as the project progresses toward achieving restoration goals and objectives while remaining within identified constraints. Each strategy follows a scientific approach that uses performance measures, monitoring, triggers and/or thresholds to inform restoration progress and support decisions regarding the need to adjust to improve restoration performance.

Due to the documented success of the temporary saltwater intrusion measures (SWIMs) installed in 2007, the uncertainty is low for this project and adaptive management is not anticipated for this project. Monitoring data will be used to assess restoration success. Monitoring plans will be reviewed during design and implementation to ensure that they incorporate any new scientific understanding of typha marsh and Pterocarpus recovery and mangrove reduction needs. If necessary, adjustments may be made to the monitoring plans, not to exceed the cost estimates provided in the integrated feasibility report and environmental assessment (IFR/EA).

2 INTRODUCTION

Uncertainty exists in every natural resource management and restoration effort. Many processes in the ecosystem are not linear; they work synergistically and will unfold in a future climate that is likely different than the one used to formulate the initial plan. The monitoring and adaptive management plan will address key uncertainties identified during plan formulation that relate to achieving restoration success and making adjustments of project features and operations if determined to be necessary to improve performance.

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[1] Title 2, Water Resources Development Act of 2007 § 2039 (2007). https://www.gpo.gov/fdsys/pkg/PLAW-110publ114/pdf/PLAW-110publ114.pdf

[2] USACE, 2009. USACE HQ Implementation Guidance on Section 2039 of Water Resources Development Act. http://www.mvr.usace.army.mil/Portals/48/docs/Environmental/EMP/Key%20Docs/2007_Implementation_Guidance_WRDA07_Sec_2039.pdf

Definitions that will help the reader in understanding the project monitoring and adaptive management plan include the following:

- **Adaptive Management** – A scientific process for continually improving management policies and practices by learning from their outcomes; Adaptive management links science to decision making to improve restoration performance, efficiency, and probability of success. In the context of the Rio Anton Ruiz 1135 CAP project, adaptive management is a structured approach for addressing uncertainties by testing hypotheses about the best project designs and operations to achieve restoration goals and objectives, linking science to decision making, and adjusting implementation, as necessary, to improve the probability of restoration success.
- **Uncertainty** – A question faced during planning or implementation regarding the best actions to achieve desired goals and objectives within constraints, which cannot be fully answered with available data or modeling.
- **Adaptive Management Options** – Potential structural, non-structural, and operational alternatives to be undertaken to improve restoration performance. Adaptive management plans contain potential management action "options" that may be taken to improve performance if project/program goals and objectives are not met.
- **Strategies** – A plan to address one or more uncertainties identified. The adaptive management strategies fit into the following approaches:
  - *Passive Adaptive Management* (see **Figure E-1**) – All of the Rio Anton Ruiz 1135 CAP project strategies are considered passive adaptive management approaches. One project component or set of operational criteria is implemented to test its ability to achieve desired goals and objectives. Results are monitored, assessed, and communicated to implementing agencies and the appropriate participating agencies to determine how best to adjust project component designs, operations, project contingency options, or inform future environmental restoration projects.

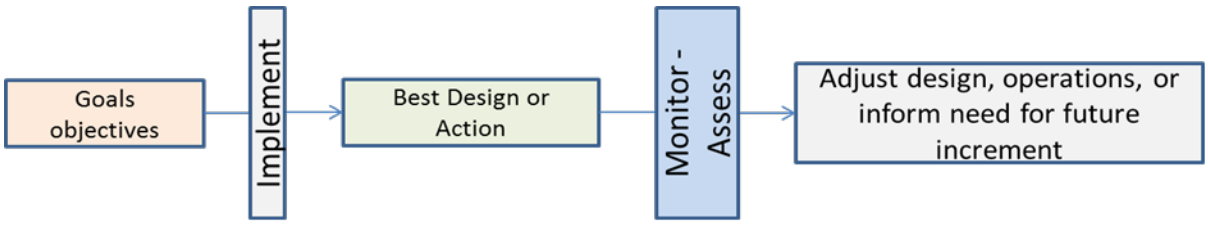

Figure E-1. Passive Adaptive Management.
Diagram illustrates that the best design or management action is implemented to achieve project goals and objectives with associated monitoring and results are assessed to adjust other project component designs, adjust operations and inform the need for a future project change.

Prior to development of this monitoring and adaptive management plan, existing monitoring from similar environmental restoration projects were evaluated to provide a frame of reference for the Rio Anton Ruiz 1135 CAP project. The monitoring recommended is what is needed beyond the other sources to address key uncertainties (key questions) identified during planning that relate to achieving project goals and objectives. Due to the documented success of the temporary

SWIMs installed in 2007, the uncertainty is low for this project; therefore, this project is monitoring restoration success, and there are no adaptive management options included.

3 ADAPTIVE MANAGEMENT UNCERTAINTIES AND PROJECT OBJECTIVES

The uncertainties in this section target prioritized needs and opportunities to learn in order to make scientifically sound recommendations to refine the project design, construction, and operations. The strategies provided in the following sections address each uncertainty and are intended to guide the Rio Anton Ruiz 1135 CAP project performance in the face of inevitable unknowns, with existing knowledge and knowledge that will be gained through monitoring and assessment. The strategies are focused on the Rio Anton Ruiz 1135 CAP project, but designed to contribute to future changes to environmental restoration projects as well in order to maximize 'return on investment' for resources invested in pursuing the adaptive management activities. The monitoring proposed was guided in part by two objectives: to be complete from a Rio Anton Ruiz 1135 CAP project perspective by providing the monitoring required to address the project-specific uncertainties; and to integrate with other environmental monitoring to take advantage of existing monitoring efforts, knowledge and information and thereby leverage dollars committed and spent elsewhere to avoid redundancies and insure cost-effectiveness. *Where possible, the Rio Anton Ruiz 1135 CAP project adaptive management strategies rely on existing monitoring resources such as physical instrumentation, stations, locations, servicing and analysis efforts funded by partner agencies. Therefore, the monitoring requirements described here are limited to the additional, marginal increase in monitoring resources and analysis efforts needed to address Rio Anton Ruiz 1135 CAP project-specific adaptive management questions.*

3.1 Project Uncertainties

The project plans were reviewed to identify key uncertainties related to achieving project goals and objectives. The project objectives and constraints are outlined in Rio Anton Ruiz 1135 CAP project Management Measure Matrix and the project objectives are listed in **Table E-1**. The overarching objective of Rio Anton Ruiz 1135 CAP is to preserve the Pterocarpus forest and the biodiversity of both the freshwater and saltwater fauna and flora within the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The plan consists of constructing two permanent sheetpile weirs with a notched concrete cap at the location of the existing temporary SWIM structures, thus limiting the saltwater intrusion into both the Pterocarpus forest and the lagoon systems.

Table E-1. Rio Anton Ruiz 1135 CAP Project Objectives

O1	Reduce salinity levels to below 10 ppt in the HNR lagoon system while considering future effects of sea level rise
O2	Improve and increase spatial extent and overall health of the Pterocarpus forest habitat
O3	Improve fishery habitat within the lagoon system

The uncertainties of the project implementation are listed here for reference.

1. *How will the Rio Anton Ruiz 1135 CAP project affect recovery of Typha marsh in the project area?*
2. *How will the Rio Anton Ruiz 1135 CAP project affect recovery of the Pterocarpus officinalis stand in the HNR?*
3. *How will the Rio Anton Ruiz 1135 CAP project reduce the current and future occurrence of mangroves in the project area?*

Due to the documented success of the temporary SWIMs installed in 2007, the uncertainty is low for this project; therefore, this project is monitoring restoration success, and there are no adaptive management options included.

4 PROJECT MONITORING AND ADAPTIVE MANAGEMENT STRATEGIES

Strategy descriptions for each uncertainty and summary tables of suggested management actions to improve restoration performance, as illustrated in **Table E-2**, are listed in this section**.** The following strategies describe and address each uncertainty and inform project implementation and operations based on the body of existing scientific knowledge. The strategy write-ups include information on drivers of the uncertainty, restoration targets, and project targets for particular attributes of the ecosystem associated with the uncertainty (such as a key species or ecological features). Additionally, the strategies include monitoring plans for each uncertainty, including how the attributes will be monitored to track progress toward the targets, the timeframe[3] in which changes in these attributes will be measurable, and identification of a trigger or threshold that would give early warning that project performance is veering from restoration expectations. An annual summary report will be drafted to briefly summarize the monitoring data and other information collected to determine if adaptive management is needed. A final report will be drafted that details the outcomes of the restoration project.

[3] The "timeframe in which changes will be measurable" does not imply that changes will be *complete* in that timeframe; rather, the timeframes provide an estimate of time needed to *begin* to be able to distinguish effects. For practicality, the screening criteria included the need to have attributes measurable within the timeframe of the monitoring plan, which in some cases necessitated a 'proxy' attribute to be measured that would represent expected changes on a longer time scale. In addition, the triggers and thresholds were identified with the best available information, however, these should be updated to keep current with best available science.

Table E-2. Rio Anton Ruiz 1135 CAP Project Adaptive Management Strategies: Template and Definitions

Rio Anton Ruiz 1135 CAP Project Adaptive Management Uncertainty. *The uncertainty is a question faced during planning or implementation regarding the best restoration actions to achieve desired goals and objectives within constraints, which cannot be fully answered with available data or modeling.*

Rio Anton Ruiz 1135 CAP Project Objective or Constraint. *Uncertainties need to be related to the project's objectives or constraints, among other criteria, to be included in the monitoring and adaptive management plan. This linkage focuses the scope of the Monitoring and adaptive management plan.*

Expectations or hypotheses to be tested to address the uncertainty, and attribute(s) that will be measured to test each. *A scientific approach begins with a well-informed, pointed, detailed statement that will be tested. For the purposes of the Rio Anton Ruiz 1135 CAP project's monitoring and adaptive management plan, the statement can be referred to as an expectation or hypothesis. Approaching uncertainties scientifically is efficient because it is targeted; a properly identified hypothesis statement is the most important step to lead to effective, efficient methodology to address an uncertainty. It leads to proper identification of what to measure, how, how often, how to analyze, etc.*

Monitoring methodology for testing each expectation or hypothesis (including frequency of monitoring) and for reporting: *More information on what to measure, how, how often, how to analyze, and when and how to report results. PLEASE NOTE: the Rio Anton Ruiz 1135 CAP project's monitoring and adaptive management plan varies in the level of methodology detail provided; methodology will be reviewed, updated and adjusted if needed by agency subject experts, before initiation, to best meet the intent of the monitoring and adaptive management plan.*

Triggers/thresholds that indicate restoration success. *Triggers or thresholds are a point, range, or limit that signifies when restoration performance is trending toward a successful outcome. Triggers/thresholds should be described per attribute to be monitored.*

4.1 Typha marsh

Rio Anton Ruiz 1135 CAP Project Adaptive Management Uncertainty. *How will the Rio Anton Ruiz 1135 CAP project affect recovery of Typha marsh in the project area?*

Rio Anton Ruiz 1135 CAP Project Objective or Constraint. This uncertainty is related to the Rio Anton Ruiz 1135 CAP project objectives O1 and O3.

Expectations and hypotheses to be tested to address uncertainty, and attribute(s) that will be measured to test each. Recovery of at least 15 acres of Typha marsh in the Rio Anton Ruiz 1135 CAP project is expected to occur within 5 years. Since Typha marsh is already established in the HNR, it is anticipated that natural recruitment will successfully occur. Following completion of the weir construction, annual monitoring will be performed to assess Typha marsh recovery in the HNR.

Monitoring methodology for testing each expectation or hypothesis. Typha marsh monitoring will occur for area covered and density. Monitoring will include annual benthic and terrestrial habitat surveys, photographic evidence to document the current state, and change analysis and mapping to illustrate year to year progress. The annual monitoring plan will conclude in 5 years. Salinity data collected by the project sponsor, DNER, will be utilized from existing gauges in the project area to verify expected salinity changes by project (e.g. salinity reduced below 10 ppt). Monitoring will be reviewed during design and implementation to ensure that the plans incorporate any new scientific understanding of typha marsh recovery needs. If necessary, adjustments may be made to the monitoring, not to exceed the cost estimates provided in the IFR/EA.

Triggers/thresholds that indicate restoration success. The recovery of Typha marsh at the Rio Anton Ruiz 1135 CAP project will be deemed successful when at least 15 acres are re-established. Based on achieved results from implementation of the SWIMs, natural recovery of the Typha marsh at the Rio Anton Ruiz 1135 CAP project is expected to be successful and no adaptive management option is anticipated.

4.2 Pterocarpus officinalis

Rio Anton Ruiz 1135 CAP Project Adaptive Management Uncertainty. *How will the Rio Anton Ruiz 1135 CAP project affect recovery of the Pterocarpus officinalis stand in the HNR?*

Rio Anton Ruiz 1135 CAP PROJECT Objective or Constraint. This uncertainty is related to Rio Anton Ruiz 1135 CAP project objective O1, O2, and O3.

Expectations and hypotheses to be tested to address uncertainty, and attribute(s) that will be measured to test each. Recovery of at least 93 acres of Pterocarpus forest in the Rio Anton Ruiz 1135 CAP project is expected to occur within 5 years. Since Pterocarpus forest is already established in the HNR, it is anticipated that recovery will naturally and successfully occur.

Following completion of the weir construction, annual monitoring will be performed to assess Pterocarpus forest recovery in the HNR.

Monitoring methodology for testing each expectation or hypothesis. *Pterocarpus officinalis* monitoring will occur for area covered and density. Monitoring will include annual benthic and terrestrial habitat surveys, photographic evidence to document the current state, and change analysis and mapping to illustrate year to year progress. The annual monitoring plan will conclude in 5 years. Salinity data collected by the project sponsor, DNER, will be utilized from existing gauges in the project area to verify expected salinity changes by project (e.g. salinity reduced below 10 ppt). Monitoring will be reviewed during design and implementation to ensure that the plans incorporate any new scientific understanding of Pterocarpus recovery needs. If necessary, adjustments may be made to the monitoring, not to exceed the cost estimates provided in the IFR/EA.

Triggers/thresholds that indicate restoration success. The recovery of *Pterocarpus officinalis* at the Rio Anton Ruiz 1135 CAP project will be deemed successful when at least 93 acres are exhibiting signs of recovery, e.g. – no signs of stress (peeling bark, die off of leaves or twigs and branches, discoloration of leaves), and signs of recruitment. Based on achieved results from implementation of the SWIMs, natural recovery of the Pterocarpus at the Rio Anton Ruiz 1135 CAP project is expected to be successful and no adaptive management option is anticipated.

4.3 Mangroves

Rio Anton Ruiz 1135 CAP Project Adaptive Management Uncertainty. *How will the Rio Anton Ruiz 1135 CAP project reduce the current and future occurrence of mangroves in the project area?*

Rio Anton Ruiz 1135 CAP Project Objective or Constraint. This uncertainty is related to Rio Anton Ruiz 1135 CAP project objective O2 and O3.

Expectations and hypotheses to be tested to address uncertainty, and attribute(s) that will be measured to test each. A loss of at least 15 acres of mangroves in the Rio Anton Ruiz 1135 CAP project is expected to occur within 5 years. Mangrove species will be documented after completion of the project construction and prior to the start of monitoring. Natural decline of the species is expected to occur due to the transition from the existing saline environment (approximately 35ppt) to a brackish environment (less than 10ppt). The species with the highest sensitivity to freshwater, such as red mangrove, will be selected as an indicator of desired salinity reduction. Following completion of the weir construction, annual monitoring will be performed to assess mangrove loss in the HNR.

Monitoring methodology for testing each expectation or hypothesis. Mangrove monitoring will occur for area covered and density. Monitoring will include annual benthic and terrestrial habitat surveys, photographic evidence to document the current state, and change analysis and mapping to illustrate year to year progress. The annual monitoring plan will conclude in 5 years. Salinity data collected by the project sponsor, DNER, will be utilized from existing gauges in the project

area to verify expected salinity changes by project (e.g. salinity reduced below 10 ppt). Monitoring will be reviewed during design and implementation to ensure that the plans incorporate any new scientific understanding of mangrove reduction needs. If necessary, adjustments may be made to the monitoring, not to exceed the cost estimates provided in the IFR/EA.

Triggers/thresholds that indicate Restoration success. The loss of mangroves at the Rio Anton Ruiz 1135 CAP project will be deemed successful when at least 15 acres of mangroves die off. Based on achieved results from implementation of the SWIMs, natural reduction of the mangroves at the Rio Anton Ruiz 1135 CAP project is expected to be successful and no adaptive management option is anticipated.

5 RESTORATION SUCCESS CRITERIA

The Restoration Success Criteria table (see **Table E-3** below) helps link monitoring to success criteria. Monitoring from this project may inform potential future projects in the area.

Table E-3 is a quick reference intended to inform decision-makers, partner agencies, and the public on the project's monitoring plan and success criteria.

Table E-3. Rio Anton Ruiz 1135 CAP Restoration Success Criteria

Uncertainty	Timeframe to detect change of attributes*	Attribute or Indicator	Specific Property to be Measured and Frequency	Restoration Success
Typha marsh	1-2 years	Typha marsh	Annual monitoring of area coverage and density	At least 15 acres of recovery after 5 years following project completion
Pterocarpus officinalis	1-2 years	*Pterocarpus officinalis*	Annual monitoring of area coverage and density; vegetation characteristics and recruitment	At least 93 acres of recovery after 5 years following project completion; signs of stress and lack of recruitment
Mangroves	1-2 years	Mangroves	Annual monitoring of area coverage and density	At least 15 acres of mangroves loss after 5 years following the project completion

*The "timeframe to detect changes…" does not imply that changes will be complete in that timeframe; rather, they provide an estimate of time needed to begin to be able to distinguish effects of Rio Anton Ruiz 1135 CAP project. These time frames are indications of response speeds, not limits on how long the monitoring will be conducted.

5.1 Monitoring Costs

Monitoring frequency and success criteria for Rio Anton Ruiz 1135 CAP project are captured within **Table E-3**. Costs in **Table E-4** are based upon previously completed studies.

Table E-4. Rio Anton Ruiz 1135 CAP Project Monitoring Costs

Monitoring	Monitoring Cost
Annual Monitoring of Typha marsh, *Pterocarpus officinalis*, and mangroves	$132,000
Salinity Monitoring*	DNER

*Please note that ongoing salinity monitoring by DNER will be used to verify salinity targets are met to support success determination. However, it is not a component of the project that will be cost-shared. Monitoring plans will be reviewed during design and implementation. If necessary, adjustments may be made to the monitoring, not to exceed the cost estimates provided in the IFR/EA.

CAP Feasibility Report
SUBMITTAL PACKAGE CHECKLIST

PROJECT NAME/AUTHORITY/DISTRICT Rio Anton Ruiz Restoration/Section 1135/CESAJ

Send original and 2 copies of submittal package

N/A 1. Feasibility Report cover memo (including funding needs for Design and Implementation. Include proposed schedules for PPA execution, DI Review Plan submittal, contract award, construction completion, and total project modification cost.

X 2. The Feasibility Report
X a. All necessary Environmental Compliance **/1** (see ER 200-2-2).
X b. Updated Fact Sheet (Tab B)
X c. Cost Certification with Estimate (M-CACES is preferred) and Cost Schedule Risk Analysis.
X d. Signed Certificate of Legal Review (for the report) **/2**
X e. Signed Certification of Agency Technical Review and, if applicable, IEPR, as appropriate
_____ f. Certification of model approval or authorization, with PCX comments

N/A 3. Letter of Intent from sponsor stating the draft PPA has been negotiated with them and they agree with the project as described in the Feasibility report for the estimated total cost of $_____

X 4. Real Estate Plan. (See requirements in Chapter 12 of ER 405-1-12).

N/A 5. Negotiated Draft PPA (state how it will be deviated, nature of the changes, and which model it was based on.)
(Be sure to fill-in all signature blanks as required with the appropriate names/titles).

/1 All NEPA documentation and compliance with environmental regulation must be complete prior to project approval.
/2 If the Certification of ATR has an Office of Counsel signature block, this is not needed.

N/A - PPA to be negotiated with Non-Federal Sponsor once report is approved.

Enclosure 1
Checklist

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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Enclosure 2
Fact Sheet

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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7/14/2017

South Atlantic Division
Jacksonville District

CONTINUING AUTHORITIES PROGRAM PROJECT FACT SHEET

1. **Río Antón Ruíz** - Project 452782 - Hon. Jennifer Gonzalez, Resident Commissioner for Commonwealth of Puerto Rico

2. Authority

The authority for conducting this feasibility study is the Continuing Authorities Program (CAP), Section 1135 of the Water Resource Developmental Act (WRDA) of 1986, as amended, "Project modifications for the improvement of the environment." The Federal Interest Determination (FID) was approved on February 26, 2016.

3. Location

Río Antón Ruíz is located in the Municipality of Humacao on the southeast coast of Puerto Rico (**Figure 1**). The project area includes a lagoon system and a Pterocarpus forest in the Humacao Natural Reserve (HNR). Six lagoons, encompassing approximately 615 acres (249 hectares), compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas (**Figure 2**). The Mandri lagoons and the low coastal floodplain serve as detention areas during floods. The coastal communities of Punta Santiago, Verde Mar, and Villa Palmira are the main populated areas within the watershed.

Figure 1. Map of project location.

Figure 2. Map of Humacao National Reserve

4. **Problems and Opportunities**

a. <u>Problems</u>:

- Increased salinity levels as a result of the 2001 Río Antón Ruíz Flood Control project have adversely impacted the HNR Pterocarpus forest, lagoon system, and associated Typha marsh.

b. <u>Opportunities</u>:

- The reduction of salinity levels in the HNR by installing permanent measures to improve habitat for the Pterocarpus trees.
    - Such reduction of salinity levels may support freshwater aquatic vegetation growth in the ecosystem, improve the habitat for desirable freshwater fauna.
- Natural reduction of the saltwater mangroves on the northern perimeter of the Mandri 1 and 2 lagoons will increase the available habitat for Pterocarpus trees.

c. <u>Objectives to Solve Problems or Realize Opportunities</u>:

- O1: Reduce salinity levels to below 10 ppt in the HNR lagoon system while considering the future effects of sea level rise
- O2: Improve and increase spatial extent and overall health of the Pterocarpus forest habitat
- O3: Improve freshwater fishery habitat within the lagoon system

5. **Initial Management Measures and Alternative Plans That Have Been Considered**

The following management measures have been considered:

- Non-Structural, NS-1: O&M plan for the sandbar near the outlet of the diversion channel
- Structural, S-1: sheetpile weirs (with a concrete cap)
- Structural, S-2: Temporary sandbag SWIM structures

The O&M plan for the sandbar, NS-1, was screened out because it is not a long-lasting or efficient measure with high O&M costs for the continued maintenance of the sandbar. It would also be difficult to mimic the natural formation of a sandbar in a planned maintenance schedule. In addition, by creating a sandbar instead of allowing natural formation, the sandbar could create a restriction on the outfall, causing untended impacts to the original flood reduction project (205). The temporary sandbag SWIM structures, S-2, were screened out due to the fact that it is not a lasting complete measure and would require continued maintenance after storm events, as well as from boating wear and tear. They were effective as a temporary means, but have proven to not be a viable longer lasting, more permanent solution.

The initial array of alternatives is described below:

- No Action – The no action alternative, no management measures would be implemented and the saltwater intrusion and loss of the freshwater Pterocarpus ecosystem caused by the USACE 205 flood control project would continue.

- Alternative 1 – Construct two permanent sheetpile weirs with a notched concrete cap at the location of the existing temporary SWIM structures, thus limiting the saltwater intrusion into both the Pterocarpus forest and the lagoon systems.

- Alternative 1A – Construct a permanent sheetpile weir with a notched concrete cap at the location of the temporary SWIM structure located on the Rio Anton Ruiz. This will reduce the inflow of saltwater intrusion into the Pterocarpus forest only.

- Alternative 1B – Construct a permanent sheetpile weir with a notched concrete cap at the location of the temporary SWIM structure located on the diversion channel at the lagoon. This will reduce the inflow of saltwater intrusion into the Mandri lagoon only.

- Alternative 2 – Construct one sheetpile notched concrete cap weir downstream of the confluence of the diversion channel and the Rio Anton Ruiz. The existing bridge, the sandbar, and a cultural resource area would preclude placement of a weir in this location. This alternative was screened out due to these constructability issues, as well as the possibility of affecting the original 205 construction project by causing flooding**.**

Alternative 2 was not carried forward for analysis due to impacts to the 2001 Río Antón Ruíz Flood Control project. The remaining alternatives were screened down to Alternatives 1, 1A and 1B based on a cost effective and incremental cost analysis (CE/ICA) and habitat unit calculations (Table 1), where Alternative 1 was determined to be the “Best Buy” plan and the NER plan, has the highest lift and satisfies all the project objectives. (Table 3)

Alternative*	Plan Cost (Budget Estimate, Class 3)	Average Annual Cost CRF (i=2.875%, n=50)	Average Annual NER Benefits	Average Annual Cost per Unit Output	Cost Effective (Yes/No)
No Action Plan	$0		-	N/A	N/A
Alternative 1B	$1,745,500	$66,200	459	$144	Yes
Alternative 1A	$2,336,200	$88,700	201	$441	No
Alternative 1	$2,978,400	$113,000	815	$139	Yes
* Alternatives are displayed in order of increasing cost.					
Plan costs include construction cost; Planning, Engineering & Design; and construction management costs.					

Table 1. Cost effective analysis for initial array of alternatives

Alternative	Average Annual Plan Cost (Budget Estimate, Class 3)	Average Annual Plan Outputs (Habitat Units)	Incremental Cost	Incremental Habitat Unit	Average Annual Incremental Cost per Habitat Unit
No Action Plan	$0	0	$0	0	$0
Alternative 1b	$66,200	459	$66,200	459	$144
Alternative 1	$113,000	815	$46,800	356	$131

Table 2. Incremental Cost Analysis of Final Array

Alternatives	Objectives			Output		CE/ICA	
	O1: Reduce salinity: HNR system	**O2: Pterocarpus recovery**	**O3: Improve Fishery**	**NER Benefits**	**Cost per Unit Output**	**Cost-effectiveness**	**Incremental Cost**
Alternative 1	**Yes**	**Yes**	**Yes**	**815**	**$139**	**Yes**	**$131**
Alternative 1A	**No**	**Yes**	**No**	**201**	**$441**	**No**	**0**
Alternative 1B	**No**	**No**	**Yes**	**459**	**$144**	**Yes**	**$144**
No Action	**No**	**No**	**No**	**0**	**0**	**-**	**0**

Table 3. Alternative Summary Matrix

6. Views of Federal, State, and Regional Agencies

The proposed recommended plan supports the interests of the non-federal sponsor and public.

A public notice with links to the draft integrated feasibility report and environmental assessment and associated appendices was available for review and comment for 30 days from the date of the Notice of Availability, 31 March 2017. No comments were received through the public notice process.

Consultation to comply with Section 106 responsibilities under the National Historic Preservation Act (NHPA) is ongoing and will be completed prior to project implementation. An Essential Fish Habitat (EFH) Assessment is included within the integrated feasibility report and environmental assessment. Coordination for Section 7 of the Endangered Species Act (ESA) with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) was initiated on March 31, 2017. A copy of the USFWS Section 7 ESA concurrence letter was received on April 17, 2017. A final response from NMFS for concurrence on Section 7 ESA and EFH coordination is pending. Listed and protected species that may occur in the vicinity of the proposed work include:

- Puerto Rican Boa (*Epicrates inornatus*)
- Antillean Manatee (*Trichechus manatus*)
- Loggerhead Sea Turtle (*Caretta caretta*)
- Green Sea Turtle (*Chelonia mydas*)
- Hawksbill Sea Turtle (*Eretmochelys imbricata*)
- Leatherback Sea Turtle (*Dermochelys coriacea*)
- Nassau Grouper (*Epinephelus striatus*)
- Pillar Coral (*Dendrogyra cylindrus*)
- Rough Cactus Coral (*Mycetophyllia ferox*)
- Lobed Star Coral (*Orbicella annularis*)
- Mountainous Star Coral (*Orbicella faveolata*)
- Boulder Star Coral (*Orbicella franksi*)
- Elkhorn Coral (*Acropora palmata*)
- Staghorn Coral (*Acropora cervicornis*)
- Migratory Birds

USACE has concluded the project will have no effect on the seven listed coral species. The project may affect, but is not likely to adversely affect (MANLAA) the other species listed above, and will not affect any designated critical habitat (DCH). This project will be performed in compliance with Puerto Rico's water quality standards. An application for a water quality certification will be submitted to the Puerto Rico Environmental Quality Board (EQB) during the design and construction phase. In compliance with the Coastal Zone Management Act, a Federal Consistency Determination (FCD) was submitted to the Commonwealth of Puerto Rico for concurrence during the public notice phase of the draft integrated report. A copy of the Puerto Rico Planning Board's concurrence with the FCD was received on July 6, 2017.

7. Significant Effects of the Proposed Project

The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary SWIM structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel. The entire system is 1,046 acres of freshwater lagoons, cattails (Typha marsh), and Pterocarpus forest. Besides temporary impacts from construction activities, there are no anticipated negative significant effects of this project.

8. Estimated Schedule and Costs:

a. Study Schedule

Event	Date (or Projected Date)
Environmental Coordination	31 March – ONGOING
SAD Review	14 July – 14 Aug
SAD Final report approval and EA/FONSI complete	8 Sept

b. Remaining Study Costs

- Mods to Report post MDM & DQC Review: $0
- Coordination w/Agencies: $0
- Cost Refinement: $0 (MCACES, Risk Analysis, TPC Summary, etc.)
- MCX Review: $0
- ATR Report Package: $0
- Travel: $0
- Contingency: $0

Total: $ 0

c Project Costs

Study Costs To Date including 100% Federal FID/FCSA: $270,000

- Federal non-cost-shared: $270,000
- Federal cost-shared: $0
- Non-federal: $0
- $455,000 exemption as per Section 1032, WRDA14

Funds for remaining work - $0

- Available Federal cost-shared: $0
- Non-federal: $0
- Remaining Non-Federal cash required: $0

Total - $270,000

9. Supplemental Information

a. Real Estate Summary

Temporary Work Area Easement:

Department of Natural and Environmental Resources (DNER) of the Commonwealth of Puerto Rico, the non-federal sponsor, acquired the lands for a previous CAP Section 205 project in fee and will certify that the lands are available for construction for this project. The construction area will be available via a temporary work area easement. The staging area will be available via a temporary work area easement from the non-federal sponsor. Access to the temporary work area will be provided via a perpetual road easement from the non-federal sponsor.

Preliminary estimated value of LERRD, including incidental and administrative costs.

Estimated RE Admin cost:
FED $ 63,000
NON FED $21,000

At present there should not be cost for credit because lands were provided from the previous project.

b. Estimated Monitoring Period and Monitoring and O&M costs –

Annual monitoring plan for Pterocarpus, Typha marsh, mangrove habitat and freshwater fish recovery
Annual benthic & terrestrial habitat surveys
Annual photographic evidence demonstrating current state
Change analysis and mapping to illustrate year over year progress
Monitoring Plan will conclude in 5 years at an annual cost of $132,000

c. Project Specific Legislation and/or Report Language – NA

Enclosure 3
Remaining Tasks

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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Rio Anton Ruiz Restoration Section 1135 Schedule of Reamaining Tasks	
Initiate D&I Phase	11-Sep-17
Initiate P&S	9-Oct-17
Execute Project Partnership Agreement	9-Feb-18
Complete P&S and Permitting	16-May-18
BCOE	16-Jul-18
Advertise	17-Jul-18
Bid Open	17-Aug-18
Award	17-Sep-18
Complete Construction	17-Sep-19
Fiscal Completion	17-Sep-20

COMPLETION OF DISTRICT QUALITY CONTROL

District Quality Control (DQC) of **The Rio Anton Ruiz 1135 CAP Integrated Feasibility Report and EA** has been completed per direction of EC 1165-2-209. All concerns resulting from the DQC review of the project have been mutually resolved and comments incorporated.

SIGNATURE Date _____
Brooke Hall
Study Manager (PTL)
PD-PW

SIGNATURE Date_____
Jim Suggs
Project Manager *(home district)*
PM-WN

SIGNATURE Date_____
Ann Cassata
Engineer Project Manager *(ETL)*
PM

SIGNATURE Date_____
Jim Suggs
CAP Program Manager
PM-WN

CERTIFICATION OF DISTRICT QUALILTY CONTROL

Significant concerns and the explanation of the resolution are as follows:

Plan Formulation:
Andy Loschiavo (pg 7)
Potentially Critical: I'm unsure if CAP 1135 projects need to pass the Federal significance test to compete for limited funding, but this wouldn't hurt. Please identify if this habitat type/ecosystem is rare, what endangered species would benefit (support maintaining populations or recovery), and any other Federal resource that might be encompassed in this area. Quick google, HNR developed a Habitat Conservation Plan with FWS input, but didn't review what endangered species were listed.

Response: Agree. Verbiage is being added throughout the report to emphasize the importance of the HNR ecosystem and the Pterocarpus forest.

Kevin Wittmann Critical: (pg 8)
Critical: It is critical to provide the link between our project is causing the problem for an 1135.

Response: Paragraph was written at the beginning of the Purpose and need section. This may eliminate the need to make continued connections throughout the document.

David Dudley (pg 9)
Critical - From this discussion it sounds like we don't know if the SWIMs were damaged or not. I think we should know for certain before we recommend a solution. Could it be that sea level rise and not damage is causing the increase in salinity?

Response: Sentence will be revised… "As reported by DNER, the deterioration of the sandbag weirs was caused by boat propellers."

Kevin Wittmann (pg 11)
I would leave that at not being an effective (long lasting) and efficient measure and not talk about the burden on the non-federal sponsor.

Response: Agree. This statement has been removed.

Andy Loschiavo (pg 9)
Critical: This figure is not referenced in the document. Reference it with statements indicating high salinity change occurring due to federal flood risk management project.

Response: Reference has been added.

Andy Loschiavo ((pg 11)
Critical: Please rewrite for clarity of no action (consultation purposes and NEPA). No management measures would be implemented and the saltwater intrusion and loss of the freshwater Pterocarpus ecosystem caused by the USACE flood control project would continue.

Response: Statement has been rewritten.

Environmental:
Andy Loschiavo (pg 10)
Critical: Reference this figure as well. In addition, why do we see a downward trend in salinity from 2004 to 2007 prior to temporary swims being complete? Did Puerto Rico DNR experiment with these? Need to tell whole story. Outside viewers will wonder why target was almost met prior to the USACE temporary SWIMS under the 206 project (25 to 10or 13 ppt)? Post 2007 project there is a clear drop to 5 ppt. Is it because of wetter conditions (precipitation) in 2005 and 2006?

Response: Figure has been referenced. Mandri 2 is really the focus as that would be the station most affected. In addition, it is likely that some of the lower times were during off months (dry season)? Maybe some years were wetter than others, etc. There should probably be some language added just to clarify the peaks are the focus - that they were significantly and consistently above the original (pre-project) but also explaining the lower portions. But without the months, it's hard to make any statements or assumptions.

Andy Loschiavo (pg 10)
Critical: How diverse? Give numbers for SAD. X number faunal species, x number fish species. Rarity of ecosystem in Puerto Rico, Caribbean, world?

Response: Unfortunately, there is not a reliable source to be able to specifically list the number of faunal and fish species. The Pterocarpus officinalis stand located in the HNR is the largest known stand of its type in Puerto Rico. According to the USDA's Natural Resource Conservation Service plant database, Pterocarpus officinalis is not located anywhere in the United States except for Puerto Rico (USDA 2016).
Recommend updating to read:
[...allows more direct access to the ocean.]
The Pterocarpus forest located in the HNR is the largest known stand of its type in Puerto Rico. According to the USDA's Natural Resource Conservation Service plant database, Pterocarpus officinalis is not located anywhere in the United States except for Puerto Rico (USDA 2016). The Puerto Rican boa (Epicrates inornatus), a federally listed species, makes its home in the HNR. Another federally listed species, the Antillean manatee (Trichechus manatus), has been sighted in the HNR system. Additionally, the forest supports the only known nesting area in Puerto Rico for the locally endangered West Indian whistling duck (Dendrocygna arborea). Other locally endangered species include the white-cheeked pintail (Anas bahamensis), Caribbean coot (Fulica caribaea), ruddy duck (Oxyura jamaicensis), and the peregrine falcon (Falco peregrins). These species appear to be nesting and feeding in the HNR. Failure to protect the Pterocarpus stand could lead to impacts to essential habitat for these federally and locally listed species.

Andy Loschiavo (pg 10)
Critical: Add. "threatened and endangered". Encourage listing names of species as well.

Response: See updated language in first ENV critical comment (above).

Andy Loschiavo (pg 13)
Critical: List these threatened and endangered species in the significance section. Also, state as threatened and endangered listed species, not just listed.

Response: […freshwater lagoons and freshwater Pterocarpus forest.] Remove remainder of paragraph since that information has been moved to page 10.

Kevin Wittmann (pg 13)
Critical: This is the only place that I see cattail listed. If this is significant enough to list on the figure I would expect to see some text.

Response: Include cattails in the sentence below and delete duplicative "freshwater":
[…from saltwater intrusion as a result of the diversion channel.] The entire system is 1,046 acres of freshwater lagoons, cattails, and freshwater Pterocarpus forest. Cattails and Typha marsh can be used interchangeably.

Andy Loschiavo (pg 35)
Critical: Refer to prior comment on figure ES-2 and decreasing salinity trend prior to project installation

Response: Figure has been referenced. Mandri 2 is really the focus as that would be the station most affected. In addition, it is likely that some of the lower times were during off months (dry season)? Maybe some years were wetter than others, etc. There should probably be some language added just to clarify the peaks are the focus - that they were significantly and consistently above the original (pre-project) but also explaining the lower portions. But without the months, it's hard to make any statements or assumptions.

Andy Loschiavo (pg 33)
Critical: EFH Final Rule was 2002, just quote that regulation. 1996 was Act. 1997 I don't even think was the interim rule. Trust me, I worked on it at NMFS!

Response: Delete "1997 and" so the sentence reads "The rules promulgated by the NMFS in 2002 further clarify EFH with the following definitions:"

Economics:
Kevin Wittmann (pg 12)
Critical: The cost of Alternatives 1b and 1A added together is over $4M. The cost of Alternative 1 is only $2.7M. Where does the economy of scale come from?

Response: The combination of the two alterative never going to get to the $2.7M because alternative 1b and 1a have their own JOOH, HOOH, mobilization, temporary cofferdam, etc.. If both alternative are added together we are assuming double HOOH, double mobilization, double material for the temporary cofferdam that in alternative 1 is re-used for the two weirs. The values for 1A and 1B came from Alternative 1 (MII) by omitting the task related to the appositive alternative. Example: For Alternative 1A, all the task related to 1B where omitted to obtain a cost estimate for ALT1A.

Kevin Wittmann (pg 14)
Critical: We need to be displaying project first cost, not fully funded costs. Cost listed in the table is substantially higher than the cost in the CE/ICA three pages earlier.

Response: Project first cost is now being used.

Kevin Wittmann (pg 15)
Critical: It is unclear why only construction costs are included

Response: During screening the cost estimate were developed for the construction cost only because the non-construction cost during that stage were unclear. Once the team selected an Alternative to move forward the cost estimate got refine and the non-construction cost was develop for the selected alternative.
The construction cost only have been used to allow the comparison of screening values with the refine cost.
Possible solution is used the current non-construction cost from the current TPCS of the selected alternative and add it to the original alternatives construction cost from 18AUG16.

As noted above, all concerns resulting from the DQC of the project have been fully resolved.

SIGNATURE
Eric Summa
Chief, Planning Division *(home district)*
PD

Date _____

SIGNATURE
Laureen Borochaner
Chief, Engineering Division *(home district)*
EN

Date _____

Add appropriate additional signatures (Operations, Construction, principal for DQC, etc.).

SIGNATURE
Dennis Zeveney
Chief, Geotechnical Engineering Branch
EN-G

Date _____

SIGNATURE
Jason Engle
Chief, Water Resources Engineering Branch
EN-W~~C~~

Date _____

SIGNATURE
David Dudley
Chief, Design Engineering Branch
EN-D

Date _____

SIGNATURE
Kim Brooks-Hall
Chief, Engineering Technical Services Branch
EN-T

Date _____

SIGNATURE
Mike Renacker
Chief, Watershed Resources Branch
PM-W

Date _____

SIGNATURE
Kevin Wittman
Chief, SAD Regional Socioeconomics
PD-D

Date _____

SIGNATURE
Dave Tipple
Chief, Plan Formulation Branch
PD-P

Date _____

SIGNATURE
Gina Ralph
Chief, Environmental Branch
PD-E

Date _____

SIGNATURE
Brooks Moore
Supervisory Civil Works Attorney
OC

Date _____

SIGNATURE
Audrey Ormerod
Chief, Real Estate Division
RE

Date _____

SIGNATURE
Melissa Reynolds
CAP Engineering Lead
EN-WH

Date _____

SIGNATURE Date _____ _____

Dan Vogler
CAP Planning Lead
PD-PW

Enclosure 4
Draft DQC certification

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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COMPLETION OF DISTRICT QUALITY CONTROL

Final District Quality Control (DQC) of **The Rio Anton Ruiz 1135 CAP Integrated Feasibility Report and EA** has been completed per direction of EC 1165-2-209. All concerns resulting from the DQC review of the project have been mutually resolved and comments incorporated.

SIGNATURE
Brooke Hall
Study Manager (PTL)
PD-PW

Date _____

SIGNATURE
Jim Suggs
Project Manager *(home district)*
PM-WN

Date_____

SIGNATURE
Melissa Reynolds
Engineer Project Manager *(ETL)*
EN-WH

Date_____

SIGNATURE
Jim Suggs
CAP Program Manager
PM-WN

Date_____

CERTIFICATION OF DISTRICT QUALILTY CONTROL

There were no critical comments resulting from the Final DQC.

SIGNATURE
Eric Summa
Chief, Planning Division *(home district)*
PD

Date _____

SIGNATURE
Laureen Borochaner
Chief, Engineering Division *(home district)*
EN

Date _____

Add appropriate additional signatures (Operations, Construction, principal for DQC, etc.).

SIGNATURE
Dennis Zeveney
Chief, Geotechnical Engineering Branch
EN-G

Date _____

SIGNATURE
Jason Engle
Chief, Water Resources Engineering Branch
EN-WC

Date _____

SIGNATURE
David Dudley
Chief, Design Engineering Branch
EN-D

Date _____

ACTING FOR:

SIGNATURE
Kim Brooks-Hall
Chief, Engineering Technical Services Branch
EN-T

Date _____

SIGNATURE
Mike Renacker
Chief, Watershed Resources Branch
PM-W

Date _____

SIGNATURE
Kevin Wittman
Chief, SAD Regional Socioeconomics
PD-D

Date _____

SIGNATURE
Dave Tipple
Chief, Plan Formulation Branch
PD-P David P. Apple signing for David A. Tipple

Date _____

SIGNATURE
Gina Ralph
Chief, Environmental Branch
PD-E

Date _____

SIGNATURE
Tori White
Chief, Real Estate Division (Acting)
RE

Date _____

SIGNATURE
Dan Vogler
CAP Planning Lead
PD-PW

Date _____

SIGNATURE
Melissa Reynolds
CAP Engineering Lead
EN-WH

Date _____

Enclosure 5
Final DQC certification

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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Enclosure 6
Agency Technical Reveiw Certification

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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Agency Technical Review
Review Report

March 27, 2017

Rio Anton Ruiz Restoration, CAP Section 1135 –Humacao, Puerto Rico

Prepared By:

Coraggio Maglio, P.E., ATR Team Lead

US Army Corps of Engineers ®

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AGENCY TECHNICAL REVIEW REPORT

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CHIEF PLANNING DIVISION, CESAJ-PD 68

TABLES

Table 1: ATR Team Members 3

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Agency Technical Review Report

1. SUBJECT

Review Report for the Rio Anton Ruiz Restoration Project: Draft Integrated Feasibility Report and Environmental Assessment, Jacksonville District

2. SCOPE AND PURPOSE OF REVIEW

The purpose of this review report is to document the Agency Technical Review (ATR) of the Integrated Feasibility Report and Environmental Assessment for Review Report for the Rio Anton Ruiz Restoration, Continuing Authorities Program (CAP) Section 1135 Project for compliance and consistency with USAGE policies and technical guidance. The review was conducted at the request of the United States Army Corps of Engineers (USAGE) Jacksonville District (SAJ). The primary points of contact for SAJ was Al Walker, CESAJ-PD-PW, Dan Vogler, CESAJ-PD-PW, and Jim Suggs, CESAJ-PM-WN. The ATR team was led by Coraggio Maglio, CESWG-EC-HB.

3. REFERENCES

This review report was prepared in reference to, in association to, and in accordance with the following:

a. EC 1165-2-214, 15 December 2012, Water Resources Policies and Authorities, CIVIL WORKS REVIEW.
b. South Atlantic Division Regional Programmatic Review Plan for the Continuing Authorities Program (CAP)

4. PROJECT DESCRIPTION

Río Antón Ruiz is located in the Municipality of Humacao on the southeast coast of Puerto Rico (Figure 1-1). The project area includes a lagoon system and a Pterocarpus forest in the HNR. Six lagoons, encompassing approximately 615 acres (249 hectares), compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas (Figure 1-2). The Mandri lagoons and the low coastal floodplain serve as detention areas during floods. The coastal communities of Punta Santiago, Verde Mar, and Villa Palmira are the main populated areas within the watershed.

Figure 1-1: Map of project location.

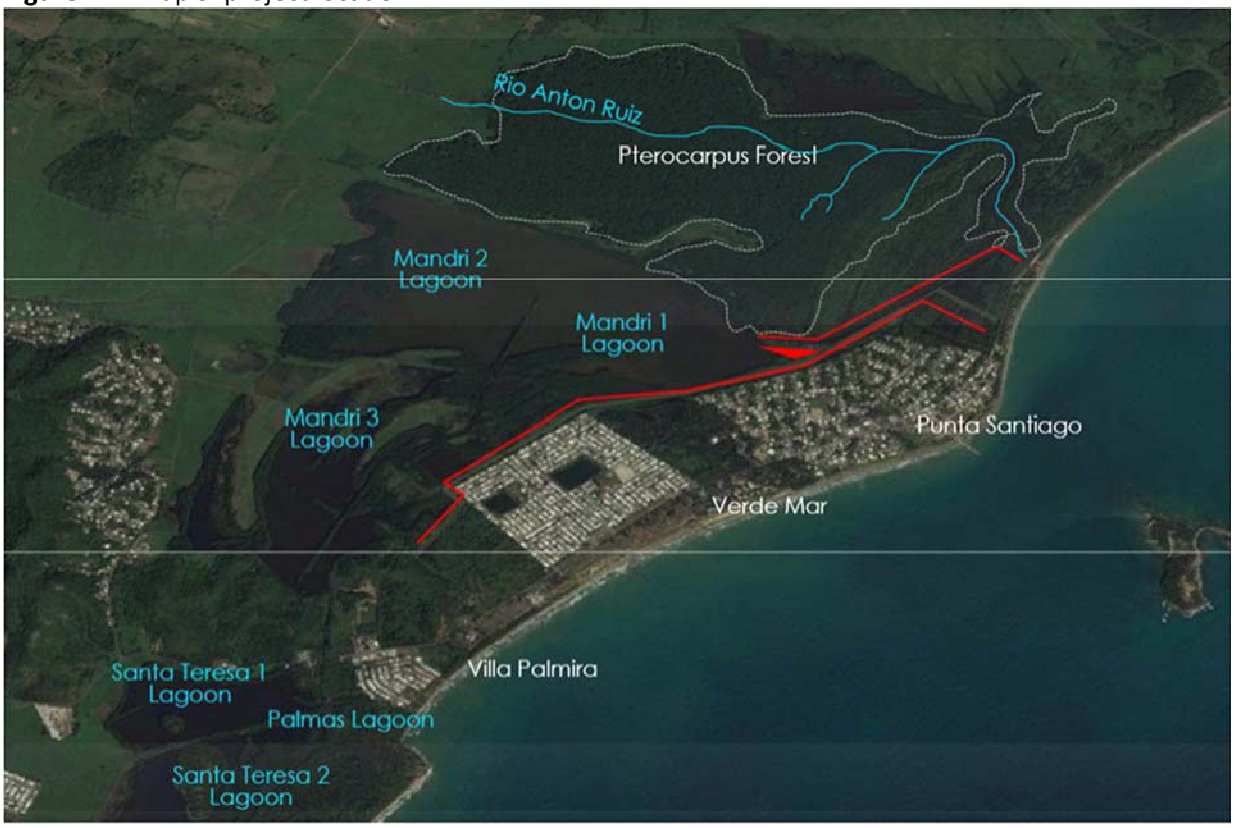

Figure 1-2: Map of project location.

The purpose of the Río Antón Ruiz Restoration Project is to preserve the Pterocarpus forest and the biodiversity of both the freshwater and saltwater fauna and flora within the HNR in Humacao, Puerto Rico. The United States Army Corps of Engineers (USACE) completed a Section 205 Flood Control Project in 2001 which was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. The 205 project included construction of a levee, interior drainage canal and diversion channel. The 205 flood control project was successful in protecting the coastal communities from flooding however, the construction of the diversion channel has had negative impacts to the Humacao Natural Reserve ecosystem. The diversion channel has allowed the increase of salt water intrusion into the freshwater ecosystem thus changing the biodiversity of the lagoon system and deteriorating the overall health of the Ptercarpus Forest and ultimately leading to the fatality of Pterocarpus trees. The authority for conducting this feasibility study is the Continuing Authorities Program (CAP), Section 1135 of the Water Resource Developmental Act (WRDA) of 1986, as amended, "Project modifications for the improvement of the environment." The Federal Interest Determination (FID) was approved on February 26, 2016.

5. REVIEW TEAM

The following ATR team members (Table 1) met the discipline requirements in the Review Plan and are on the respective approved Community of Practice reviewer lists or other appropriate lists. Refer to ENCLOSURE 3: ATR TEAM BIOGRAPHIES AND CONTACT INFORMATION for full biographies and contact information of ATRT.

Table 1: ATR Team Members

Coraggio Maglio	ATR Lead / Engineer	Galveston District(SWG)
Colton Bowles Michael Malsom Bill Bolte Diane Karnish Russell Blount	Plan Formulation Environmental/NEPA Cost Engineer Economics Real Estate	Charleston District (SAC) Mobile District (SAM) Walla Walla District(NWW) Rock Island District (MVN) Mobile District (SAM)

6. CHARGE TO REVIEWERS

The review team was charged with the review of draft study documentation, both directly and indirectly related to their field of expertise. The team was encouraged to review all documents in the submission package and to verify overall consistency of report information among technical disciplines.

The purpose of this ATR was to ensure that technical analyses meet the requirements of technical regulations and to ensure policy compliance. The review should also ensure that appropriate problems and opportunities are addressed; confirm that a reasonable array of solutions are considered; confirm that an appropriate solution is recommended; assure that appropriate costs, schedules, and risks are presented; confirm the recommended solution warrants Federal participation; is in accord with policies; can be implemented in accordance with environmental laws and statutes; has a sponsor willing and able to fulfill the non-Federal responsibilities; and ensure that the decision document appropriately represents the views of USAGE, the Army, and the President.
Accordingly, the review should:

- Identify, examine, and comment upon assumptions that underlie analyses (i.e. public safety, economic, engineering, environmental, and others)

- Evaluate the appropriateness of models selected for use in evaluations, the application of data within those models, and the interpretation of and conclusions drawn from model results.
- Bring important issues to the attention of decision makers.

Review Criteria for ATR:

- Products were reviewed for compliance with guidance, including Engineering Regulations, Engineering Circulars, Engineering Manuals, Engineering Technical Letters, Engineering Construction Bulletins, Policy Guidance Letters, implementation guidance, project guidance memoranda, and other formal guidance memoranda issued by HQUSACE.
- Approved waivers should have been obtained from HQUSACE for any deviations from USACE guidance and documented in the review materials.

Key Review Considerations:

- The project meets the customer's scope, intent and quality objectives as defined in the PMP.
- Formulation and evaluation of alternatives are consistent with applicable regulations and guidance.
- Concepts and project costs are valid.
- The recommended alternative is feasible and will be safe, functional, constructible, environmentally sustainable, within the Federal interest, and economically justified according to policy.
- All relevant engineering and scientific disciplines have been effectively integrated.
- Appropriate computer models and methods of analysis were used and basic assumptions are valid and used for the intended purpose.
- The source, amount, and level of detail of the data used in the analysis

are appropriate for the complexity of the project.

- The project complies with accepted practice within USACE.
- Content is sufficiently complete for the current phase of the project and provides an adequate basis for future development effort.
- Project documentation is appropriate and adequate for the project phase.

Additional considerations for Decision Documents:

- Recognizing that the quality of each decision document has a direct and immediate impact on the credibility of USACE and the Department of the Army, ATR on decision documents should address the basic communication aspects of the documents.
- The main decision document and appendices should form an integrated and consistent product.
- As an initial guide, the ATR team should consider the Project Study Issue Checklist in Exhibit H-2, Appendix H, ER 1105-2-100, which includes many of the more frequent and sensitive policy areas encountered in studies.

- Composition of Technical Comments (DrChecks). Comments should follow a four part structure, composed of the following:
  - A clear statement of the ATRT concern.
  - The basis for the concern (often a reference to guidance).
  - The significance of the concern.
  - A suggested action that would resolve the concern.
- General guidance or suggestions by the ATRT for future PDT consideration are acceptable as a technical comment. However, the commenter should indicate that "a PDT evaluation of 'noted' will be sufficient".

Coordination of Editorial Comments:

- Editorial comments about errors, such as spelling, composition, missing or erroneous table or graphic references, or about writing or documentation suggestions were noted by the ATRT and provided to the ATR lead for coordination with the PDT study manager or project manager.

Coordination of reviewer questions was directed through the review team lead and the project manager, who coordinated the questions with the appropriate project delivery team member(s).

7. SUMMARY

Overview Summary of the Review

Critical / High Significance

There was two (2) High Significance ATR comments. The following provides a brief summary of these comments

1. Cost Engineering (Comment 6880586)

a. Concern - Weir Concrete Cap. CONCERN: Was the cost engineer provided a typical structural cross section? The overall cost for concrete pier cap may be captured but the individual components of the estimate may not reflect actual work. As an example, the structural steel will likely require shear studs to be welded to the sheet pile to allow a bond with the concrete. The formwork for the pile cap concrete placement will also be much more costly and difficult than the four use plywood scaffolding 8'high assumed in the estimate. But the estimate also includes an additional $50K or more for bridge scaffolding which may be excessive (offsetting the potential insufficient cost in formwork). But if a gangway style scaffolding is required, $50K probably isn't sufficient as attaching scaffolding to vertical sheet pile is much more difficult than sidewalk scaffolding attached to a bridge. Most crew activities will also need to be supported with either onshore crane or barge. SIGNIFICANCE: HIGH RESOLUTION: Please review the structural cross section and construction requirements. In addition, include crane and/or barge support for over water construction activities.

b. Resolution - Concur, the weir concrete cap item will be re-evaluated to establish a clear construction method as recommended. There are not a detailed structural cross section of the concrete cap. The construction method was selected based on typical concrete cap. The crew was adjusted by adding the additional support of Equipment and Labor (Crane, Fork Lift). The Scaffolding was adjusted to use brackets bolt to the sheet pile to allow the establishment of the work form and a walking platform.

2. Cost Engineering (Comment 6880593)
   a. Concern - Acquisition Strategy. CONCERN: Abbreviated Risk Analysis rates Acquisition Strategy as a relatively low risk, with only "0" and "1" risk level assignments. A small project such as this would be very likely to be awarded to a Small Business contract, in which case costs could increase "Significantly". SIGNIFICANCE: HIGH RESOLUTION: Speak with a representative from contracting to determine the likelihood this project could be awarded to a Small Business. Depending on contracting's response, adjust the Risk Analysis accordingly.

   b. Resolution - Concur, The Acquisition Strategy risk analysis will be revise and adjust accordingly. Risk register has been updated. The end result for all the Acquisition Strategy is a low risk level of 1 because the JOOH was evaluated and increased to account for the administrative cost on small project. The updated contingency was used to update the TPCS and Cost Appendix.

All high significant comments were resolved and closed. There were no unresolved comments from previous reviews that were deferred to the ATR.

Unresolved.
All ATR comments have been resolved.

Summary of Cost Engineering
Cost certification was processed by Bill Bolte with the Cost Engineering MCX.

8. PROJNET™DRCHECKS REPORT

Projnet™ DrChecks report of all comments is attached as **ENCLOSURE 1:** PROJNETTM DRCHECKS REPORT OF ALL COMMENTS.

9. ATR COMPLETION STATEMENT

ENCLOSURE 4: COMPLETION STATEMENT OF AGENCY TECHNICAL REVIEW contains the completion statement of a draft Agency Technical Review for this study.

ENCLOSURE 1: PROJNET™ DRCHECKS REPORT OF ALL COMMENTS

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Comment Report: All Comments
Project: Planning ATR's
Review: Rio Anton Ruiz 1135 CAP ATR
Displaying 43 comments for the criteria specified in this report.

Id	Discipline	Section/Figure	Page Number	Line Number
6874399	Environmental	n/a	n/a	n/a

Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Feasibility Report/Environmental Assessment document)

There is very little about the biology of the T&E species in the draft Feasibility Report/Environmental Assessment document. Is there some reason for this? I would recommend adding a summary paragraph on each species in Chapter 2 or 5.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**
A summary paragraph on individual species will be included under section 2.3.3 (Threatened, Endangered, and Protected Species). Each paragraph will include more specific information on the species' listing date, physical features, diet, geographic range, habitat, and other information that may be pertinent to the project.

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017

Current Comment Status: **Comment Closed**

6874406	Environmental	n/a	3-2	n/a

Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Feasibility Report/Environmental Assessment document)

There are several places in the draft Feasibility Report/Environmental Assessment document where you reference improving fishery habitat (page 3-2). Some people might like the saltwater fish that have moved into the area. I would recommend that you state you are improving freshwater fishery habitat within the lagoon.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**
Updates will made throughout the document to incorporate the recommended change.

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6874415 Environmental n/a 4-1 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Feasibility Report/Environmental Assessment document)

On Page 4-1 of the draft Feasibility Report/Environmental Assessment document there are discussions about installing weirs to aid in reduction of saltwater intrusion. Many people in the general public are not familiar with weirs. Somewhere in the draft FR/EA it would be good to place a concept diagram of what the weir will look like installed in the waterway.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**
A conceptual weir figure will be incorporated into the document as recommended.

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6874417 Environmental n/a 4-1 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Feasibility Report/Environmental Assessment document)

On Page 4-1 of the draft Feasibility Report/Environmental Assessment document

there are discussions about installing weirs to aid in reduction of saltwater intrusion. Many people in the general public are not familiar with weirs. Somewhere in the draft FR/EA it would be good to place a concept diagram of what the weir will look like installed in the waterway.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**
Duplicate comment. See response to comment #6874415.

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6874427 Environmental n/a 4-4 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Feasibility Report/Environmental Assessment document)

On page 4-4 of the draft Feasibility Report/Environmental Assessment document there is a discussion about environmental permits. It would be good to have a table of the permits you are applying for in this section that states when the permit application was submitted and its current status. I have seen this work well in other reports.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Non-concurred**
The project's permit applications will be submitted during the Design and Implementation phase. Including a permit summary table at this point in the project would not provide much benefit to the reader.

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6874433 Environmental n/a 5-3 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Feasibility Report/Environmental Assessment document)

On page 5-3 Section 5.3.6 Water Quality did not mention applying for water quality certification. Is that a requirement for Puerto Rico? If so, I would reference that in this section.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**

The requirement for water quality certification is mentioned in under Federal responsibilities and Permits in section 4.2.2, however, it makes sense to mention it under the Water Quality section as well. Section 5.3.6 will be updated to include the following: An application for a water quality certification will be submitted to the Puerto Rico's EQB.

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6874438 Environmental n/a 6-6 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Feasibility Report/Environmental Assessment document)

On page 6-6 of the draft Feasibility Report/Environmental Assessment document, it glosses over the potential of invasive/non-native species moving into your project area after the weirs are installed and there is a reduction in salinity. One of the most significant stressors in an ecosystem is the presence of invasive and non-native species. I would recommend looking into this a little deeper and to have a plan if they start to appear. You may want to consider this in your adaptive management plan and reference it in the Table E-3 Management Options Matrix.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**

Section 6.4.6 will be updated to read:
No new or invasive species would be introduced due to this project. Cattails are often considered invasive, however, Typha marsh has been historically present in this area and repopulation of the marsh will reestablish the previously existing waterfowl habitat. Following implementation of the temporary SWIMs, no new or unwanted invasive species were identified as migrating into the area. Since CAP projects do not include an operations and maintenance component, the NFS would be responsible for invasive species control following project completion. The project is in compliance with this EO.

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6874442 Environmental n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Feasibility Report/Environmental Assessment document)

Overall, the reports do an excellent job of explaining the past, current situation and recommended plan. I don't have any real issues with the information provided. The draft Feasibility Report/Environmental Assessment and attachments paint a complete picture for me to understand the problem and issues. From an environmental perspective, all important issues appear to be covered. NEPA documentation (Section 7, cultural resources and CZM) is currently being coordinated. Impacts to fish, wildlife, and T&E species appear to be minimal. This should be a very successful restoration project. I learned a lot from reading the information. Great job.

Submitted By: Michael Malsom (251-690-2023). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**

Thank you for your responses. Your comments were very insightful and helpful. The team appreciates your accolades for a job well done!

Submitted By: Kristen Scheler (9042322918) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Michael Malsom (251-690-2023) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6875605 Real Estate n/a C-4 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Recommend referencing the previous REPs and describe this one as a supplement to since this project is a modification to a previous project. This helps the VT gain a better understanding that the real estate for this project has already been acquired / provided for the project.

Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**
Will take under advisement in accordance with SAJ RE-A and management guidance.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

1-2 Backcheck Recommendation **Close Comment**
ER 405-1-12-16 (1) states that REP should provide brief description of prior REPs prepared for the project with approval status and the relationship of the subject REP to such prior project REPs (e.g. supplement). Since this is obviously a repair job from a previous project, it seems fitting to cite previous REP to bolster this report.

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017

2-1 Evaluation **Concurred**
Will revise report to state that RE will be required for the project.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017

2-2 Backcheck Recommendation **Close Comment**

Concur. Revision will assist SAJ w/ gaining approvals since NFS has already acquired the required lands in fee as a result of the initial project and the NFS can easily certify land availability for this supplemental project.

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

68756185	Real Estate n/a	n/a	C-

Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Recommend adding the following to stay consistent w/ the main report and removing the last sentence in this paragraph. The authority for conducting this feasibility study is the Continuing Authorities Program (CAP), Section 1135 of the Water Resource Developmental Act (WRDA) of 1986, as amended, "Project modifications for the improvement of the environment." The Federal Interest Determination (FID) was approved on February 26, 2016.

Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**
Will take under advisement in accordance with SAJ RE-A management guidance.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

1-2 Backcheck Recommendation **Close Comment**
Recommend advisement be obtained.

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017

2-1 Evaluation **Concurred**
We will add the statement as suggested. Per RE review the first statement will remain.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017

2-2 Backcheck Recommendation **Close Comment**
Concur w/ revisions

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6875621 Real Estate n/a C-6 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Again recommend staying consistent w/ main report. The Recommended Plan, Alternative 1, consists of concrete-capped sheetpile weirs located at the two existing temporary SWIM sites. One location is within the Rio Anton Ruiz, just north of the confluence of the Rio Anton Ruiz and the diversion channel. The other location is within the diversion channel, approximately Yz mile from the mouth of the diversion channel at the lagoon.

Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-0 Evaluation **Concurred**
Will take under advisement in accordance with SAJ RE-A and management advisement.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
Will add location as suggested.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017

2-2 Backcheck Recommendation **Close Comment**
Concur

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6875623 Real Estate 5 C-6 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

in the RE requirements section, recommend adding information as to the previous lands acquired for the CAP 205 to allow the reader to better understand

how/why the lands already exist for this modification to the project.

Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-0 Evaluation **Concurred**

Will take under advisement in accordance with SAJ RE-A and management guidance.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

Backcheck not conducted

2-1 Evaluation **Non-concurred**

Lands are required for this project and will be certified prior to contract advertisement.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017

2-2 Backcheck Recommendation **Close Comment**

Concur. Reference my previous statement concerning previous sponsor land acquisition on behalf of this project. All lands are owned by the NFS and will be made available to the project prior to construction contract solicitation.

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6875627 Real Estate Figure 2 C-8 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Replace w/ legible map and might show the lands owned and being provided by the NFS.

Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-0 Evaluation **Concurred**

Will take suggestion under consideration in accordance with SAJ RE-A and management guidance.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

Backcheck not conducted

2-1 Evaluation **Concurred**

will make sure map is legible in the report.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017

2-2 Backcheck Recommendation **Close Comment**
Concur w/ revision

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6875648 Real Estate 11 C-9 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Since the modifications will be constructed w/in the river banks to stop the salt intrusion, elaborate as to why the nav. servitude does not apply to this project (i.e. two step determination of availability).

Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-0 Evaluation **Concurred**
Will take under advisement in accordance with SAJ RE-A and management guidance.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
RE and OC discussed and IAW CECW-PB Memo dated 8 December 2004 navigation servitude does not apply to ecosystem restoration projects.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017 (Attachment: Nav_Serv_CECW_Memo_-_8-Dec-2004.pdf)

2-2 Backcheck Recommendation **Close Comment**
Thank you for providing the memorandum from ASACW regarding this issue. Concur w/ your counsel opinion as it relates to this issue.

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6875652 Real Estate n/a C-13 n/a

Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: RE Capability Assessment as Exh. C-1)

A reoccurring theme for for these assessments throughout the nation is that they are being sent in by the NFS w/ just a yes/no answer. These answers need to be elaborated upon. For ex: does NFS have legal authority to acquire and hold real property for project purposes? Yes. By virtue of such and such public law / local authority etc...

I realize that may not be an issue for this particular project b/c of the nature of these circumstances, but best to cite the additional information.

Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-0 Evaluation **Concurred**
Will take suggestion under advisement with the guidance of the RE-A and management guidance.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

Backcheck not conducted

2-1 Evaluation **For Information Only**
SAJ provides yes/no determination based on conversation with the NFS. This is not needed.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017

2-2 Backcheck Recommendation **Close Comment**
Understood. I will close comment since no land acquisition is necessary for the project. I pointed this out b/c Division reviews across the country have begun requesting additional information on these assessments (e.g. citing the actual legal authority the sponsor has to acquire/hold real property) instead of only yes/no answer. For future reference, in my experience, if you require the NFS to sign this document, it creates more accountability on the part of the NFS and they are more likely to get the answers right.

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6875661 Real Estate n/a

n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: REP w/ comments attached)

See attached reference comments listed in this ATR along w/ some other minor comments.

(Attachment: Appendix_C_(DRAFT)_RE_Plan_Appendix_(ATR_Comments_3-8-17).pdf) Submitted By: Russell Blount (251-694-3675). Submitted On: Mar 10 2017

1-0 Evaluation **Concurred**

Will review for changes as needed and directed by management.

Submitted By: Jerome Morgan (904-232-1146) Submitted On: Mar 18 2017

Backcheck not conducted

2-1 Evaluation **For Information Only**
We appreciate your edits and will make sure that the report is spell checked and reviewed.

Submitted By: Lynn Zediak (9042323811) Submitted On: Mar 21 2017

2-2 Backcheck Recommendation **Close Comment**
Concur. Thank you for opportunity to review.

Submitted By: Russell Blount (251-694-3675) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6875764 Economics n/a

n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

comment: there is no cost for salinity monitoring. is it assumed that the sponsor will monitor salinity with and without the project? if this is not the case then a cost should be included in this analysis.

Basis: ER 1105-2-100,
NED cost manual Low
significance

possible solution: state this assumption/fact in the document

Submitted By: Diane Karnish (309-794-5006). Submitted On: Mar 10 2017

1-1 Evaluation **Concurred**
The sponsor currently monitors salinity every 2 weeks and will do so with or without the project in place.

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Diane Karnish (309-794-5006) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6879751 6 | Planning - Plan Formulation n/a | 1.5.2 | 1-

Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

It is mentioned that the temporary SWIMs were impacted by small boats. With the exception of the last sentence in Paragraph 2 of Section 4.2.1, I could find no other mention of the projects impacts to boating or navigation. If boaters repeatedly hit the temporary SWIMS, they will probably hit the permanent ones also. It may be beneficial to have a discussion of current boat traffic/uses in the Existing Conditions section and a determination of what impacts the proposed project will have on boating and navigation in Section 5.

Submitted By: Colton Bowles (803-240-2573). Submitted On: Mar 14 2017

1-1 Evaluation **Concurred**
Additions to the text will be made throughout the document to clarify that the notches are a design feature to allow for navigation and provide safe transit for aquatic species.

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 17 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Colton Bowles (803-240-2573) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6880579 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Receipt of Documents)

This Cost ATR review is based upon MCACES MII file for the Rio Anton Ruiz - CAP Section 1135 - Restoration Project; dated 5 December 2016. The MII estimate for construction totals
$2,740,636 including 30 and 31 accounts but without contingency. The review comments are primarily based upon the following Corps regulations and Guidance that must be adhered to:

ER 1110-2-1150, Engineering and Design for Civil Works Projects ER 1110-2-1302, Civil Works Cost Engineering
ETL 1110-2-573, Construction Cost Estimating Guide for Civil Works

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
Concur and agreed to follow the ATR's reviewer recommendations based on the Corp Regulations and guidance's.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
Documents were update as recommended to ensure the cost estimate is adhered with the Corp Regulations and Guidance.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**
Comment provided for documentation only. No response required.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880581 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Receipt of Documents)

Documents received included MCACES MII files, Total Project Cost Summary (TPCS), Abbreviated Risk Analysis, Cost Appendix, Cost DQC and project schedule. Cost Appendix, Cost DQC and project schedule.

Please provide a copy of the entire Feasibility Report so reviewer can understand all project scope.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
The document has been provided. Pending any additional request.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
No additional documentation was required for the

initial review. Updated documents version were

submitted for final review.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**
Feasibility Report has been provided.

Submitted By: William Bolte (509 527 7585) Submitted On:
Mar 24 2017 Current Comment Status: **Comment Closed**

6880582 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: MCACES MII Estimate)

OBSERVATION: MII Estimate uses current Cost Book (2015) and Equipment Library (2014). Labor Library is based on Davis Bacon and local Puerto Rico

rates.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-1 Evaluation **Concurred**

The statement is correct. The MII is based on the Cost Book 2015 and Equipment Library 2014 region XI. In addition, the Labor library is based on Davis Bacon and the Puerto Rico Local labor rates.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Comment provided for documentation only. No response required.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880584 Cost Engineering n/a

n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: MCACES MII Estimate)

Contractor Markups: CONCERN: MII estimate assumes prime contractor markups of 18% JOOH, 10% HOOH, 7% Profit, 1.13% Bond and 5% Municipal Taxes. The reviewer is unfamiliar with local Puerto Rico market.
SIGNIFICANCE: MODERATE RESOLUTION: Please explain the Municipal tax markup applied to all Prime Contractor costs. In addition, consider if 7% profit is sufficient. For budgetary purposes, typically recommend 10% profit. Suggest applying any
SAJ-Jacksonville experience gained from other Puerto Rico projects to this project.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**

Concur, Profit will be increased to 10%. I will attach the backup document that explain the Municipal Taxes in Puerto Rico.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**

Profit was increased to 10%.

Attached the Backup document about the Municipal Taxes in Puerto Rico.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017 (Attachment: Pages_from_Specs_Volume_1(Reference_for_Municipality_Tax_in_PR.pdf)

2-2 Backcheck Recommendation **Close Comment**
Thank you for the additional explanation.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017

Current Comment Status: **Comment Closed**

6880585 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: MCACES MII Estimate)

Mob/Demob. CONCERN: MII estimate mob/demob crews do not include any pieces of equipment, only the trucks and lowboys for equipment delivery. SIGNIFICANCE: MODERATE RESOLUTION: Please include all required equipment standby costs to the MII mob/demob.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
Concur, the MII mob/demob will be updated as recommended.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
The equipment was added as standby for the two mobilization/Demobilization. It was added 16 hrs per equipment as standby for each MOB/DEMOB. There are two MOB/DEMOB because there are two project site. The second MOB is a very short distant to move the equipment from one job site to the second job site.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**

Equipment has been added.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880586 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: MCACES MII Estimate)

Weir Concrete Cap. CONCERN: Was the cost engineer provided a typical structural cross section? The overall cost for concrete pier cap may be captured but the individual components of the estimate may not reflect actual work. As an example, the structural steel will likely require shear studs to be welded to the sheet pile to allow a bond with the concrete. The formwork for the pile cap concrete placement will also be much more costly and difficult than the four use plywood scaffolding 8'high assumed in the estimate. But the estimate also includes an additional $50K or more for bridge scaffolding which may be excessive (offsetting the potential insufficient cost in formwork). But if a gangway style scaffolding is required, $50K probably isn't sufficient as attaching scaffolding to vertical sheet pile is much more difficult than sidewalk scaffolding attached to a bridge. Most crew activities will also need to be supported with either onshore crane or barge. SIGNIFICANCE: HIGH RESOLUTION: Please review the structural cross section and construction requirements. In addition, include crane and/or barge support for over water construction activities.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
Concur, the weir concrete cap item will be re-evaluated to establish a clear construction method as recommended.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
There are not a detailed structural cross section of the concrete cap. The construction method was selected based on typical concrete cap. The crew was adjusted by adding the additional support of Equipment and Labor (Crane, Fork Lift). The Scaffolding was adjusted to use brackets bolt to the sheet pile to allow the establishment of the work

form and a walking platform.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**
Scaffolding has been adjusted and support crane added.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880587 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: MCACES MII Estimate)

Planning, Engineering and Design. CONCERN: MII estimate notes are conflicting. Folder notes state 9% design cost and $230K. Item cost is defined as $244k and Item detail notes state 11%. SIGNIFICANCE: MODERATE RESOLUTION: Update MII estimate notes.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
Concur, The MII notes will be updated along with the expected changes from the other comments.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
MII notes were updated. Final value = 9.6%

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**
Cost Engineer coordinated with PM, 9.6% PED was directed.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880588 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: MCACES MII Estimate)

Construction Management. CONCERN: MII estimate notes are conflicting. Folder notes state 7% design cost and $159K. Item cost is defined as $200k and Item detail notes state 9%.
SIGNIFICANCE: MODERATE RESOLUTION: Update MII estimate notes.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
Concur, The MII notes will be updated along with the expected changes from the other comments.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
MII Notes were updated. Final value = 9.2%

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**
Cost Engineer coordinated with PM, 9.2% S&A was directed.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880591 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Abbreviated Risk Analysis)

Project Development Stage/Alternative. CONCERN Abbreviated Risk Analysis has been set to a "Feasibility (Recommended Plan)" for the Project Development Stage. It is recommended that the Development Stage be set to "Feasibility (Alternatives)" for a CAP project on Input & Results tab. CAP projects aren't typically developed to the same level as a Non-CAP recommended plan. "Feasibility (Alternatives)" typically matches the level of development for CAP projects TSP. SIGNIFICANCE: MODERATE RESOLUTION: Please set Development Stage to "Feasibility (Alternatives)".

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-1 Evaluation **Concurred**
Concur, Action completed. The development stage has been change to "Feasibility (Alternative)".

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Feasibility (Alternatives) has been selected. Project contingency increased from 21% to 23%.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880593 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Abbreviated Risk Analysis)

Acquisition Strategy. CONCERN: Abbreviated Risk Analysis rates Acquisition Strategy as a relatively low risk, with only "0" and "1" risk level assignments. A small project such as this would be very likely to be awarded to a Small Business contract, in which case costs could increase "Significantly". SIGNIFICANCE: HIGH RESOLUTION: Speak with a representative from contracting to determine the likelihood this project could be awarded to a Small Business. Depending on contracting's response, adjust the Risk Analysis accordingly.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
Concur, The Acquisition Strategy risk analysis will be revise and adjust accordingly.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
Risk register have been updated. The end result for all the Acquisition Strategy is a low risk level of 1 because the JOOH was evaluated and increased to account for the administrative cost on small project. The updated contingency was used to update the TPCS and Cost Appendix.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**
MII calculated JOOH increased to some 45% to better reflect anticipated contractor JOOH. Revised baseline JOOH more closely reflects small business acquisition reducing cost risk.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880594 Cost Engineering n/a n/a n/a n/a

Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Total Project Cost Summary)

Account 22 - FEASIBILITY STUDY (CAP studies). CONCERN: TPCS shows $250K in Federal spent costs for the feasibility study. Federal spent costs are typically responsible for the first $100K and the remainder cost shared between the Federal and Non-Federal sponsor. SIGNIFICANCE: MODERATE RESOLUTION: Confirm with Budget Office or Resource Management the cost sharing associated with the Feasibility Study costs.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**
Puerto Rico has a waiver for the CAP Projects. I will attach the backup information that will explain better how it work.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**
Puerto Rico has a waiver. Here is the information.
The cost share ratio for a Section 1135 CAP project is 75% Federal, 25% non-federal. However, the Commonwealth of Puerto Rico has an exemption of $455,000 as per Section 1032, WRDA 2014. Paragraph 3 of the implementation guidance states:
3. Application of the Waiver Amount. Section 1156 applies to American Samoa, Guam, Commonwealth of the Northern Mariana Islands, the Virgin Islands and Puerto Rico. The adjusted waiver amount under Section 1156 will be applied only to those studies for which a Feasibility Cost Sharing Agreement (FCSA) is executed on or

after June 10, 2014 and to those projects for which the initial construction contract is awarded on or after June 10, 2014. As applicable, the adjusted waiver amount is separately applied to both study and construction of a project as follows: 1) up to $455,000 is applied toward the non-Federal sponsor's cash requirement for the study; and, 2) up to $455,000 is applied toward the non-Federal sponsor's cash requirement for design and construction of the project, including the 5 percent minimum cash contribution required for structural flood damage reduction projects. For the study and for the construction of a project, cost sharing is first calculated using the general cost sharing criteria. Then the non-Federal sponsor's cash requirement is reduced by $455,000, or to zero if the non-Federal cash requirement is less than $455,000. If the cash requirement waived for a study is less than
$455,000, the remaining balance of the study waiver is not applied to increase the amount of the waiver applied to construction of the project.
The project receives the exemption in Feasibility phase and in the Design & Implementation (DI) phase as per the appropriate cost share defined in the FCSA and PPA, which is 50-50 feasibility and 75-25 DI.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**
Thank you for the additional information.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6880596 Cost Engineering n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**
(Document Reference: Total Project Cost Summary)

30 - Planning, Engineering & Design. CONCERN: TPCS shows $244K in Planning, Engineering and Design or roughly 11% of the construction costs. Consider if this cost is sufficient. Project has already spent $250K for the study costs. Significant design work remains. In addition, has all required geotechnical testing been completed? SIGNIFICANCE: MODERATE RESOLUTION: Discuss with Project Manager and Technical Lead to confirm sufficient funding is available to complete project design.

Submitted By: William Bolte (509 527 7585). Submitted On: Mar 14 2017

1-0 Evaluation **Concurred**

Concur, once the MII, Risk Register, and TPCS get updated based on the ATR's comments I will ensure that the PM revise the documents before the TPCS get finalized.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

Backcheck not conducted

2-1 Evaluation **Concurred**

Confirmed with the PM that the current values are enough and the concern was previously discussed within the PDT.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 23 2017

2-2 Backcheck Recommendation **Close Comment**

30 Account has been adjusted to 9.6% based on discussions with PM.

Submitted By: William Bolte (509 527 7585) Submitted On: Mar 24 2017 Current Comment Status: **Comment Closed**

6881183 Planning - Plan Formulation n/a 3-1 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Constraints)

Constraints 2 and three seem very similar. Suggest adding text clarifying the difference between the two in the document.

Submitted By: Colton Bowles (803-240-2573). Submitted On: Mar 15 2017

1-1 Evaluation **Concurred**

Agree. Text will be added to clarify the difference between the two constraints.

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 17 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Colton Bowles (803-240-2573) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6881185 Planning - Plan Formulation n/a 3-2 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Objectives)

Suggest adding language in this section to clarify timing and how the objectives will be measured. (A lot of this information was already in the adaptive monitoring appendix.)

Submitted By: Colton Bowles (803-240-2573). Submitted On: Mar 15 2017

1-1 Evaluation **Concurred**

Text from the Adaptive monitoring appendix regarding timing and how the objectives will be measured will be added to section 3.3.1

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 17 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Colton Bowles (803-240-2573) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6881190 Planning - Plan Formulation n/a 3-9 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: HSI)

Suggest you add text providing more detail on how the HSI's were developed and existing conditions were scored.

Submitted By: Colton Bowles (803-240-2573). Submitted On: Mar 15 2017

1-1 Evaluation **Concurred**

Text will be added to describe the process of developing the HSI's and how the existing conditions were scored to section 3.5.6.1

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 17 2017

6881230 Planning - Plan Formulation n/a 3-3 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Structural Measures)

Structural measures are physical modifications designed to alter the flow of water. Although temporary, the SWIM sandbags can be considered a structural measure. Suggest classifying this measure as structural.

Submitted By: Colton Bowles (803-240-2573). Submitted On: Mar 15 2017

1-1 Evaluation **Concurred**

You are correct. The temporary sandbag SWIM structures will be changed to a structural measure.

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 17 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Colton Bowles (803-240-2573) Submitted On: Mar 21 2017 Current Comment Status: **Comment Closed**

6881302 Planning - Plan Formulation n/a 3-3 n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

(Document Reference: Managment measures)

Were any other management measures considered (however briefly) besides the ones listed in the report?

Submitted By: Colton Bowles (803-240-2573). Submitted On: Mar 15 2017

1-1 Evaluation **Concurred**

No, all the management measures considered were included in the document.

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 17 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Colton Bowles (803-240-2573) Submitted On:

Mar 21 2017 Current Comment Status: **Comment Closed**

6885046 Cost Engineering n/a n/a n/a

Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Appendix C shows construction cost of $1.9M, total actual project cost of $2.7M, and with a 21% contingency, total cost of $3.3M. Executive Summary ES-9 shows current cost estimate of $4.1M. What is the difference of $800,000 for? The Cost Appendix C does not show this.

Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **Concurred**

The $1.9M is the actual construction cost under the WBS #15 Floodway Control. The
$2.7M is the combination of the Adaptive Management, Flood Control, and Cultural Resources plus it already have the 21% contingency. The $3.3M is the last cost including the construction and non-construction cost.

I will look on page ES-9 for the $4.1M. I think that number was the previous value before we did some adjustments on the non-construction cost.

Additional note: This value will change once the ATR's comments get implemented in the cost estimate.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6885047 Hydraulics n/a n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Several computations were accompanied with the statement that H&H was not available. (Engr.App. p. 46 "No flow analyses were available or performed for this project by the Hydrology and Hydraulics (H&H) group." and on scanned

sheet of "Rip Rap Assumptions and Calcs": "No flow analysis available") And yet riprap, scour, and boat-impact analyses were performed, but apparently not by H&H

Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **For Information Only**

Intent of statement on pg 46 "No flow analysis were available or performed for this project by the H&H group" referred to "new" or "updated" hydrologic study. H&H analysis focused on flow over weirs with the intent of matching or exceeding hydraulic capacity of the SWIM plugs with steel sheetpile. Velocity for revetment design was coordinated between Geotech and H&H.

Submitted By: Brian Dillehay (904-232-1141) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6885048 Structural n/a

n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

3. Liquefaction (Engr.App. p. 48): The silty sand conditions at this site are a textbook case of sediment that will become quick. Since it is confined, it will not flow, but anything denser than the sand will sink, which the designers clearly recognize. Safety factors for this failure mode are in the range of 0.3-1.1, which means that when the design earthquake happens, the wall will sink. Hopefully the sinking will not be so excessive as to lower the wall completely into the riverbed, in which case a completely new wall would be needed. The designers estimate a sinking of 16 inches (EA p. 48) Calculations are on sheet 83. You, might also want to consider using vinyl sheet pile to reduce sinking as it is significantly lighter than steel and will not corrode. Vinyl SG = 1.43 and saturated sand SG = 2.65. You might also be able to avoid a concrete cap if you use vinyl sheetpiling.

Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **For Information Only**
Will consider and evaluate the potential use of vinyl sheet piling during the design phase.

Submitted By: Josinell Serrano-Canals ((904) 232-1112) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6885049 Structural n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Sheetpile Depth (Engr.App. p. 19-20): The cross-sections of the diversion channel both upstream and downstream of the sandbags are much greater, and the depths are much deeper (12 ft deep) than the sandbag cross-section (6 ft). It is unclear why this is true, since the diversion channel does not divert until downstream of the river's sandbags. Why would the river form a cross-section much larger upriver than at the sandbags? Are the bags still forcing a smaller cross-section? The reason for bringing this up is that if either the diversion channel or the river return to their natural upriver cross-sections (-10 to -12.5 ft elevations), then the sheetpiles will not penetrate deep enough to be stable. (Penetration into the bed on these deeper cross-sections would be about equal to the above-bed portion.)
Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **Concurred**
Sheet pile tip elevations were determined considering a grade elevation of -12.5 ft and safety factors of 1.0 and 1.5 for active and passive pressures, respectively. Penetrations depth meet this criteria for design.

Submitted By: Josinell Serrano-Canals ((904) 232-1112) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6885050 Hydrology n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

In the river the downstream and sandbag cross-sections are similar (EA, p. 20), but the upstream cross-section is much greater. Presumably this is because the diversion channel is diverting the flow.

Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **For Information Only**

Unclear if this is a complete comment or if there was more to the question.

Diversion channel serves the Mandri Lagoon(s) in place of the Boca Prieta outlet that was blocked by construction of the protection levee. The Rio Anton Ruiz River flows through the Pterocarpus Forest.

Submitted By: Brian Dillehay (904-232-1141) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6885051 Structural n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Boat Impact Analysis: (EA sheet 76) How was stopping distance of 200 feet determined?

Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **For Information Only**

The 200 ft for stopping distance was a conservative assumption based on average commercial boat data available for a small boat impact.

Submitted By: Josinell Serrano-Canals ((904) 232-1112) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6885054 Construction Management n/a
n/a n/a Comment

Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Construction Schedule: A construction schedule of 9-10 months (Engr.App. p. 53) seems long for this simple project. But as long as the construction is planned to be completed before hurricane season, this should not matter.

Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **Concurred**
There are some small evaluations on the MII file that could impact the construction schedule. I will provide more details about the reasons the project is projected to take 9-10 month for construction. Some of the reason included number of crews, weather days and procurement of the sheet pile.

Submitted By: Rafael Torres Pagan (904-232-3608) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

6885057 Planning - Plan Formulation n/a
n/a
n/a Comment Classification: **Unclassified\\For Official Use Only (U\\FOUO)**

Non-Structural Alternatives: Sandbars and sandbags were considered. Have we considered the option of putting this area's buildings on stilts? There are several reasons for seriously considering this option:
• This project was not needed until a diversion canal was built for flood protection. The river system now drains more efficiently during storms, but also is more efficient on normal tides, allowing saltwater intrusion, which has resulted in significant changes to the ecosystem.
• This project is being built to replace a temporary sandbag fix, which also would not have been needed, if the ecosystem had not been altered by the

original project.

• The original project (diversion flood control) would not have been needed, if a non-structural alternative had been implemented.

• The more efficient drainage system will not protect the population from hurricane surge. This area is in the direct path of the main approach for hurricanes, so even with these projects, buildings will flood.

Submitted By: Coraggio Maglio (6016344150). Submitted On: Mar 17 2017

1-1 Evaluation **For Information Only**

As discussed via email, we recognize the original 205 project adversely impacted the ecosystem which has generated the need for the 1135 project as proposed. However, the non-structural measures listed in the comment are better suited for a flood control 205 project and do not meet the objectives of an 1135 project.

Submitted By: Brooke Hall (904-232-1061) Submitted On: Mar 20 2017

1-2 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Coraggio Maglio (6016344150) Submitted On: Mar 22 2017 Current Comment Status: **Comment Closed**

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ENCLOSURE 2: CRITICAL / HIGH SIGNIFICANCE COMMENTS DEFERRED TRACKING LIST

CRITICAL / HIGH SIGNIFICANCE COMMENTS DEFERRED TRACKING LIST

This table tracks and documents previously agreed upon ATR Critical / High Significance Closed Comments that require changes to the review document, but were deferred to this ATR review. These deferred comments are tracked by the ATR Lead and added as new comments for back check and validation of the comment close out during this ATR.

THERE WERE NO DEFERRED COMMENTS

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ENCLOSURE 3: ATR TEAM BIOGRAPHIES AND CONTACT INFORMATION

ATR Lead - Coraggio Maglio SWG-EC-HB - 601-634-4150, Coraggio.k.maglio@usace.army.mil

Mr. Coraggio Maglio is a Professional Engineer with 12 years of specialized experience in coastal processes, and freshwater and estuarine systems. He attained a Masters in Ocean Engineering from the Florida Institute of Technology as well as a Bachelors of Natural Sciences from New College of Florida. Born and raised in Florida, his hobbies include surfing, gardening, and native landscaping. He is a strong, sensible environmentalist and lover of nature, especially coastal areas.

In his current position at the U.S. Army Corps of Engineers, Galveston District, as the Hydraulics and Hydrology Branch Chief, he incorporates his knowledge and love of sensible sustainability into every project he manages, researches, or on which he advises. The diversity of his work experience ranges from storm damage reduction projects, beach and ecosystem restoration, navigation dredging, and flood protection. His diverse and accomplished knowledge of physical and biological science, field data collection, engineering and permitting processes, project management, and construction techniques allows for improved practical inclusive resolutions.

He is recognized for his “out of the box” thinking and innovative approach to project solutions. Given his innovations as a design engineer and researcher, combined with talented listening and communication skills, difficult and complex issues are efficiently resolved. His passion inspires those around him and promotes his teams to exceed expectations. As a result, he is viewed as solution oriented and capable of “fixing” sensitive and intricate problems.

Plan Formulation – Colton Bowles, CESAC-PM-PL – 843-329-8051, Colton.B.Bowles@usace.army.mil

Colton serves as Plan Formulator for water resource studies. Conducts water resources study as team leader, investigating and devising solutions to problems of water quality, water supply, recreation, fish and wildlife enhancement, hydropower, navigation and flood risk management. Determines impacts of various plans on National Economic Development (NED), Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects. Coordinates with various government agencies, commercial and local interests for water resource studies. Devises project schedules and budges for water resources studies in coordination with team members and project managers. Prepares correspondence and is the principal author of major reports and studies. Serves as Study Manager for the Charleston District for South Carolina Hurricane Evacuation Study Update. Provides support to EM activities when necessary.

Environmental Resources – Michael Malsom, CESAM-PD-EC, 251-690-2023
Michael.F.Malsom@usace.army.mil

Mike Malsom is a Biologist with the Planning and Environmental Division of the Corps, Mobile District, Mobile, Alabama. His significant projects for the Mobile District include Mobile Harbor maintenance of the shipping channels and all associated dredging activities, Alabama and Mississippi Coastal Improvements Programs, along with supporting most major military bases in the southeastern part of the U.S. Additional projects include supporting a variety of Operations Division dredging projects, regional sediment management, ecosystem restoration, living shorelines, marsh creation, environmental permitting, and disaster response. He currently serves as the Project Manager for the Deadman's Island Estuary Restoration Project in Gulf Breeze, Florida and is a Planning Associates Class of 2016 graduate.

Real Estate –Russell W. Blount III, USACE-SAM-RE-A, 251-694-3675,
Russell.w.blountiii@usace.army.mil.

Mr. Blount, BS, MPA, Realty Specialist, serves as a national real estate consultant, and has accumulated 17 years of real estate experience, both in the public and private sectors. Since 2012, Mr. Blount has served as a real estate ATR Reviewer. Mr. Blount is also the team leader for the Planning & Purchase Section, Real Estate Division, Mobile District. His experience includes military and civil works project management and real estate with pertinent USACE and IRWA training certifications. He has specialized in deep draft navigation and coastal storm damage reduction projects, but he has been involved in various other civil works projects related to flood risk management and ecosystem restoration. Mr. Blount developed the District's current civil works non-Federal Sponsor guide to land acquisition for post-study responsibilities. Mr. Blount has been a part of many ATRs and numerous PDTs in reviewing or developing real estate plans and data.

Cost Engineering – William Bolte, CENWW-EC-X, 509-527-7585
Wiliiam.G.Bolte@usace.army.mil

William Bolte has been employed as a civil engineer with the US Army Corps of Engineers since 2003, first as a Structural Engineer with the Kansas City District Corps of Engineers before transferring to Walla Walla District in 2006. William is currently a senior cost engineer in the Walla Walla Cost Engineering Branch. He has been the lead cost engineer on various cost projects in Washington, Oregon, Idaho and California. From 2009 to 2011 he was deployed as the Lead Cost Engineer for Afghanistan Engineering District – North in support of Operation Enduring Freedom. William currently serves as a Technical Specialist assisting districts with estimates, schedules and Cost and Schedule Risk Analysis throughout the Corps.

William graduated from Missouri University of Science and Technology in 2001 with a BS in Civil Engineering, and in 2003 with a MS in Structural Engineering. William is a licensed Professional Engineer in the State of Washington.

Economics – Diane Karnish, CEMVN-PD-E – 309-794-5006, Diane.E.Karnish@usace.army.mil

Diane is currently the Chief of the Flood Risk Management – Riverine Section of the Economics Branch in the Regional Planning and Environmental Division South, New Orleans District with duty station at the Rock Island District.

I have 28 years of technical and management experience in planning; plan formulation; environmental planning; environmental compliance and impact assessment; programs and project management; and economics. I have worked in Rock Island, Omaha, St. Louis, Walla Walla and New Orleans Districts as well as the North Atlantic Division. I have a B.B.A. in Management and a B.S. in Economics from Iowa State University, Ames, Iowa.

ENCLOSURE 4: COMPLETION STATEMENT OF AGENCY TECHNICAL REVIEW

COMPLETION OF AGENCY TECHNICAL REVIEW

RIO ANTON RUIZ RESTORATION, CONTINUTING AUTHORITIES PROGRAM (CAP) SECTION 1135, PROJECT FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT
Decision Document and Related Appendices
29 March 2017

Agency Technical Review (ATR) has been completed for the Rio Anton Ruiz Restoration, Continuing Authorities Program (CAP) Section 1135 Project decision document and related appendices. This ATR were performed in compliance with the requirements of EC 1165-2-214.

A panel of six reviewers was established by the Jacksonville District. The review commenced on 8 March 2017 and was completed on 29 March 2017. During the ATR, compliance with established policy, principles, and procedures was verified. This included review of assumptions, methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing U.S. Army Corps of Engineers policy.

Thirty seven (37) comments resulted from the general ATR of the draft documents, all of which were closed without controversy. The Cost Engineering MCX has signed off on cost calculations and coordination with them will continue through the study process.

Agreed upon analysis revisions and report updates as documented in Dr. Checks have been verified.

Coraggio Maglio

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DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MAGLIO.CORAGGIO.K.1369565768
Date:2017.03.27 21:05:43-05'00'

ATR Team Lead, SWG-EC-HB

SUGGS.JAMES.LUCINE.1232229701

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Date:2017.03.30 10:56:13-04'00'

Project Manager, CESAJ-PM-WN

HALL.BROOKE.ANNE.1280351446

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Date:2017.03.28 09:50:38-04'00'

Study Manager, CESAJ-PD-PW

Review Management Office Representative, CESAD-PDP

ENCLSOURE 5: CERTIFICATION OF AGENCY TECHNICAL REVIEW

CERTIFICATION OF AGENCY TECHNICAL REVIEW

We certify that the ATR of the Section 1135 Decision Document and Related Appendices has been performed as required by EC 1165-2-214. All concerns resulting from ATR of the RIO ANTON RUIZ RESTORATION, CONTINUTING AUTHORITIES PROGRAM (CAP) SECTION 1135, PROJECT FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT report have been fully resolved.

_____ _____

Laureen Borochaner, P.E.
Chief, Engineering Division,
CESAJ-EN

Date

_____ _____

Eric Summa
Chief Planning
CESAJ

Date

Enclosure 7
Final Legal Certification

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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CERTIFICATION OF LEGAL REVIEW

The Final Integrated Feasibility Report and Environmental Assessment for the Rio Anton Ruiz Restoration Continuing Authorities Program Section 1135 Study has been fully reviewed by the Office of Counsel, USACE, Jacksonville District and the decision documentation is legally sufficient.

_____
Brooks Moore,
Supervisory Attorney for Civil Works

Date: 6/21/2-17

Enclosure 8
Value Engineering certification

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207

REPLY TO ATTENTION OF

CESAJ-PM-WN 30 March 2017

MEMORANDUM FOR RECORD

SUBJECT: Value Engineering Study Certification for Rio Anton Ruiz Restoration, Continuing Authorities Program Section 1135 Project, Integrated Feasibility Report and Environmental Assessment, P2#452782

I, James L. Suggs, certify that this decision document has completed the Value Engineering process as required by ER 11-1-321, Army Programs Value Engineering. Based on the scope and complexity of the project, a decision was made not to perform a value analysis during the feasibility phase. A determination as to whether value analysis will be performed during the implementation phase will be made at a future date and documented in the Value Management Plan for the project. Because the project cost is below $10 million, additional value analysis during the feasibility phase is not required.

JAMES L. SUGGS
Project Manager
Jacksonville District

AUTUMN N. ZIEGLER, P.E.
Value Engineering Officer
Jacksonville District

APPENDIX D

ATTACHMENT 1

Environmental Coordination Documents

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

F/SER31: KL
SER-2017-18556

AUG 22 2017

Chief, Environmental Branch
Jacksonville District Corps of Engineers
Department of the Army
701 San Marco Boulevard
Jacksonville, Florida 32207

Ref.: USACE, Permanent Salt Water Intrusion Measures (SWIMs) Humacao, Puerto Rico – EXPEDITED TRACK

Dear Sir or Madam:

This letter responds to your August 16, 2017, request pursuant to Section 7 of the Endangered Species Act (ESA) for consultation with the National Marine Fisheries Service (NMFS) on the subject action.

We reviewed the action agency's consultation request document and related materials. Based on our knowledge, expertise, and the action agency's materials, we concur with the action agency's conclusions that the proposed action is not likely to adversely affect the NMFS ESA-listed species and/or designated critical habitat. This concludes your consultation responsibilities under the ESA for species and/or designated critical habitat under NMFS's purview. Reinitiation of consultation is required and shall be requested by the action agency or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and (a) take occurs; (b) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this consultation; (c) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered in this consultation; or (d) if a new species is listed or critical habitat designated that may be affected by the action.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation, please contact Kelly Logan, Consultation Biologist, at (727) 460-9258 or by email at Kelly.Logan@noaa.gov.

Sincerely,

for Roy E. Crabtree, Ph.D.
Regional Administrator

File: 1514-22.F.4

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

August 4, 2017 F/SER47:PW/jar

(Sent via Electronic Mail)

Colonel Jason A. Kirk, Commander
Jacksonville District Corps of Engineers (CESAJ)
P.O. Box 4970
Jacksonville, FL 32232-0019

Attention: Kristen L. Scheler

Dear Colonel Kirk:

NOAA's National Marine Fisheries Service (NMFS) reviewed the *Draft Integrated Feasibility Report and Environmental Assessment Río Antón Ruíz Restoration Continuing Authorities Program (CAP) Section 1135 Project* dated April 2017. The purpose of the Río Antón Ruíz Restoration Project is to preserve the *Pterocarpus* forest and the biodiversity of both the freshwater and saltwater fauna and flora within the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The Jacksonville District completed a Section 205 Flood Control Project in 2001 designed to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao. The Section 205 project included construction of a levee, interior drainage canal and diversion channel and was successful in protecting the coastal communities from flooding; however, construction of the diversion channel has had negative impacts to the HNR ecosystem. The diversion channel has allowed the increase of salt water intrusion into the freshwater ecosystem thus changing the biodiversity of the lagoon system and deteriorating the overall health of the *Pterocarpus* forest, ultimately leading to the fatality of *Pterocarpus* trees. The Jacksonville District's initial determination is that the proposed weirs would not have a significant adverse impact on essential fish habitat (EFH) or federally managed fisheries in the U.S. Caribbean. As the nation's federal trustee for the conservation and management of marine, estuarine, and anadromous fishery resources, the NMFS provides the following comments and recommendations pursuant to authorities of the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The Río Antón Ruíz Restoration Project has three main objectives: 1) reduce salinity to below 10 ppt in the HNR lagoon system while considering the future effects of sea level rise; 2) improve and increase spatial extent and overall health of the *Pterocarpus* forest habitat; and 3) improve freshwater fishery habitat within the lagoon system. To accomplish the objectives, the proposed preferred alternative would build two weirs. The first weir would measure 180 linear feet, and the second weir would measure 140 linear feet. Both would have a notch that is 3 feet deep by 15 feet wide allowing boat and fish transit while limiting salt water intrusion into the freshwater lagoon system.

On July 14, 2017, the NMFS visited the site and met with Luis Encarnacíon, a biologist with the Puerto Rico Department of Natural and Environmental Resources (PRDNER). The project site has both freshwater and saline waters in its lagoons. The HNR management plan for 2009 documents 37 species of fish utilizing the lagoons. Three of these species, Horse-eye jack (*Caranx latus*), dog snapper (*Lutjanus jocu*), and grey snapper (*Lutjanus griseus*) are listed under the Reef Fish Management Plan by the Caribbean Fishery Management Council (CFMC). The lagoons impacted by saline waters also have black, white, and red mangrove habitats. The lagoons also have silty/muddy sediments. Mr. Encarnacíon

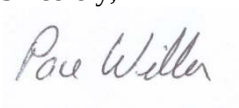
mentioned the presence of Widgeon seagrass (*Ruppia maritima*) in some shallow pond areas connected to the lagoons. The water column in the lagoons and the Antón Ruíz River, the mangrove, seagrass, and muddy habitats are all considered EFH by the CFMC. The CFMC provides additional information about EFH and its support of fishery species in *Essential Fish Habitat (EFH) Generic Amendment to the Fishery Management Plans (FMPs) of the U.S. Caribbean*[1].

NOAA's National Marine Fisheries Service agrees with the Jacksonville District's finding that the proposed project would have no significant adverse impact on EFH. The project construction objectives should help conserve the *Pterocarpus* forest if PRDNER provides the report-recommended Sea Level Rise (SLR) adjustments to the weir heights in the future. The NMFS strongly recommends mapping and characterizing seagrass habitat within the HNR be part of the project monitoring so the project impacts and benefits to this habitat are determined and documented.

Species protected under the Endangered Species Act (ESA) and under the jurisdiction of the NMFS may occur in vicinity of the proposed project. Impacts to endangered or threated species and their critical habitat may require consultation with the NMFS Protected Resources Division. The Jacksonville District initiated consultation with the NMFS Protected Resources Division by letter dated March 7, 2017.

The NMFS appreciates the opportunity to provide these comments. Please direct related questions or comments to the attention of Mr. José A. Rivera at NOAA HCD, c/o U.S. Army Corps of Engineers, Fundacíon Angel Ramos, Annex Building, #383 Franklin Delano Roosevelt Avenue, Suite 202, San Juan, Puerto Rico, 00918. He may be reached by telephone at 787-729-6829 or by e-mail at Jose.A.Rivera@noaa.gov.

Sincerely,



/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: COE, Kristen.L.Scheler@usace.army.mil
PRDNER, Lencarnacion@prdrna.pr.gov
CFMC, Graciela_CFMC@yahoo.com
F/SER3, Mark.Lamb@noaa.gov
F/SER4, David.Dale@noaa.gov
F/SER47, Jose.A.Rivera@noaa.gov

[1] Available at *caribbeanfmc.com/fmp_efh.html.*

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Caribbean Ecological Services
Field Office
P.O. Box 491
Boqueron, PR 00622

APR 17 2017

Dr. Gina Paduano Ralph
Chief, Environmental Branch, Planning Division
US Army Corps of Engineers
701 San Marco Blvd.
Jacksonville, Florida 32207-0019

Re: Informal consultation request for the Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) project – Humacao, Puerto Rico

Dear Dr. Paduano:

This is in reply to the March 31, 2017, email from Ms. Kristen Scheler of your office requesting our review of the US Army Corps of Engineers (Corps) proposed Río Antón Ruíz salt water intrusion restoration plan. Our comments are provided in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act (16 U.S.C. 1531 et seq. as amended).

The Río Antón Ruíz Flood Control Project was designed with an open channel which allowed salt water intrusion up into the freshwater wetlands associated with the Puerto Rico Department of Natural and Environmental Resources Humacao Natural Reserve. As a temporary measure the Corps placed saltwater intrusion measures (SWIM) in the form of sand bag barriers in 2007 to keep the salt water from intruding into the wetlands. This measure worked and salinities dropped. However the structures have degraded over time and a more permanent solution is being considered.

The Corps recommended plan is to construct two permanent sheetpile weirs with a notched concrete cap at the location of the existing temporary SWIM structures, limiting the saltwater intrusion into both the *Pterocarpus* forest and the lagoon systems (See Figure 1). It is estimated that the construction work will take about 10 months to complete. Weir #1 will be approximately 180 linear feet. Weir #2 will be approximately 140 linear feet. Both weirs will have a notch that is 3 feet deep by 15 feet wide with a 2 feet by 1 foot concrete cap. Access for the project will be via the existing project limits, within the berms along the channel and adjacent to the levee. An existing disposal/borrow area will be used for the staging/stockpiling.

Figure 1. Proposed location of permanent SWIM structures.

Based on the information provided, we have the following comments and recommendations:

1) We agree with the Corps proposed action to reduce the amount of saltwater reaching the wetlands. This would restore salinities within the forested Pterocarpus swamp and freshwater lagoons.

2) The document states that the existing SWIM structures were slowly degraded due to prop damage from boaters navigating into the river and flood control channel. The Corps should consider marking the permanent SWIM structures with visual aids to avoid damage to the structure or boat propellers.

Listed species which may occur in the vicinity of the proposed work and are under the jurisdiction of the USFWS include the West Indian (Antillean) manatee (*Trichechus manatus manatus*) and the Puerto Rican boa (*Epicrates inornatus*). As conservation measures the Corps is proposing to use standard manatee and indigo snake protection measures. The Service has developed standard conditions for the Antillean manatee and PR boa (see attached) we recommend that these be used in lieu of the Florida species measures.

Provided that the attached measures are incorporated, we concur with the Corps determination that the construction of the proposed SWIM structures are not likely to adversely affect the Antillean manatee or the PR boa.

Thank you for the opportunity to comment on this proposed project. If you have any questions please contact Felix Lopez of my staff at 787 851-7297 x210.

Sincerely,

Edwin E. Muñiz
Field Supervisor

fhl
encl (2)
cc:
DNER, Secretary, San Juan
EPA, San Juan
EQB, San Juan
PRPB, San Juan

U.S. FISH & WILDLIFE SERVICE
CARIBBEAN ECOLOGICAL SERVICES FIELD OFFICE
JANUARY 2012

TECHNICAL ASSISTANCE TO EVALUATE EFFECTS ON ANTILLEAN MANATEES

The Service considers shallow coastal areas, bays, estuaries, river mouths and mangrove lagoon ecosystems as important for the conservation of the Antillean manatee because these areas contain all the natural elements preferred by manatees: abundant sea grass relatively calm waters, sheltered spots, and freshwater sources, as well as a relatively low number of boats within the bay. Actions proposed for these areas should be carefully examined, to ensure that elements required by this species are not compromised.

To evaluate the potential effect of proposed action on manatees, we need the applicants to address the following issues:

1. Type and amount of watercraft associated to the project
2. Amount of boat facilities (e.g. ramps, piers, dry-stacks, buoys, among others)
3. Amount of habitat to be affected (e.g. acres of sea grasses and/or mangroves)
4. Provisions / restrictions to be taken to prevent collisions with manatees (e.g. delineation of an entrance channel, marking buoys, navigation aids, among others).
5. Outreach efforts to be implemented concerning boat operation. One of the main components of a successful operation of facilities that implement mechanisms to safeguard threatened and endangered species is a comprehensive outreach program that clearly indicates to the public 1) the actions that the facility is undertaking to protect such species (including assurances on the implementation of protection measures), and 2) the activities that the public should take to minimize or prevent impacts to sensitive species and their habitats. Guidelines for safe operation of watercrafts should be included as part of the outreach/education component of the proposed project (example attached below).
6. Any other site-specific conservation measure applicable for the project.

EXAMPLE OF CONSERVATION MEASURES FOR IN-WATER PROJECTS (INCLUDING DREDGING ACTIVITIES)

The following manatee conservation measures are recommended:

1. The contractor instructs all personnel associated with construction of the facility of the presence of manatees and the need to avoid collisions with manatees.
2. All construction personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972. The permit holder and/or contractor will be held responsible for any manatee harmed, harassed, or killed as a result of construction of the project.

3. The project work area shall be surveyed for the presence of manatees at least one hour before any dredging starts and prior to the installation of the silt fence. If manatees are found before any in-water project activity starts, the contractor shall wait for the manatee to leave the area by itself and be at least 100 feet from the project in-water area. Manatees must not be herded or harassed into leaving the area.

4. Siltation barriers will be made of material in which manatee cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers must not block manatee entry to or exit from essential habitat.

5. All vessels associated with the project construction will operate at “no-wake/idle” speed at all times while in water within manatee areas and vessels will follow routes of deep water whenever possible.

6. If manatees are seen within 100 yards (300 feet) of the in-water work area, all appropriate precautions shall be implemented to ensure protection of the manatees. These precautions shall include operating all equipment in such a manner that moving equipment does not come any closer than 50 to 100 feet of any manatee. If a manatee is within 50 feet of in-water work, all in-water activities must shut down, until manatee moves on its own at least 100 feet away from the in-water work area. Manatees must not be herded or harassed into leaving the area.

7. Any collision with and/or injury to a manatee shall be reported immediately to the Department of Natural and Environmental Resources Law Enforcement (787-724-5700) and the USFWS Caribbean Ecological Services Field Office (787-851-7297).

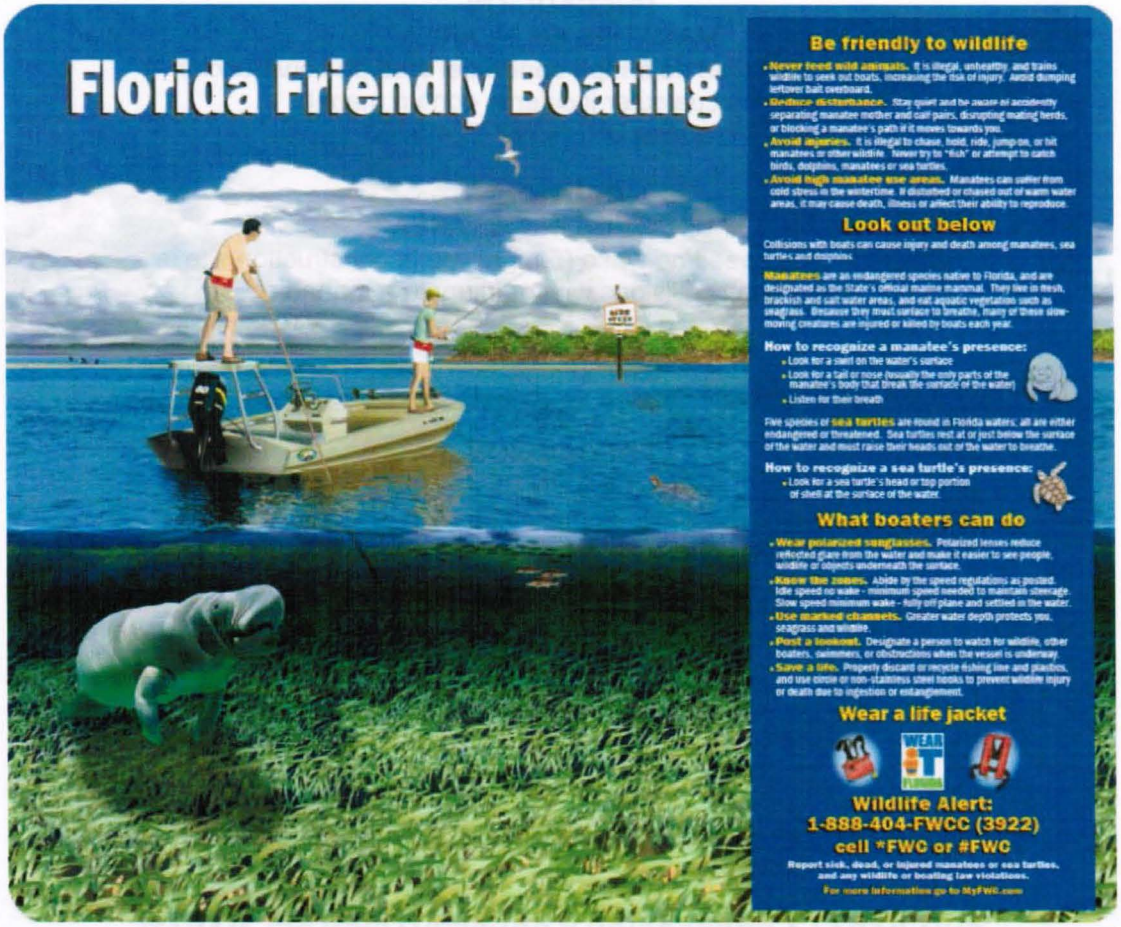
8. The contractor shall keep a log detailing sightings, collisions, or injury to manatees, which have occurred during the contract period. Following project completion, a report summarizing the above incidents and sightings will be submitted to the U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, P.O. Box 491, Boquerón, Puerto Rico 00622.

9. The permit holder and/or contractor shall install and maintain temporary and permanent manatee signs as recommended by the following guidelines:

    a. Signs must be placed in a prominent location for maximum visibility. Areas that are recommended include: dock walkways, dock master offices, near restrooms or other high patron foot traffic areas.
    b. Signs must be replaced when faded, damaged or outdated.
    c. If the facility is large or has multiple docks with separate walkways that are a considerable distance apart, multiple signs should be installed.
    d. These signs must not face the water, must never be attached to pilings or navigational markers in the water. Some exceptions to signs facing the water exist for temporary signs during in-water work.
    e. For durability, all signs should be fiberglass, PVC or metal with rounded corners (hand-sanded to remove all sharp edges and burrs), constructed of 0.08 Gauge 5052-H38 Aluminum with an Alodine 1200 conversion coating and Engineer Grade Type I reflective sheeting. Signs constructed to other specifications may not provide durability acceptable to the consumer.
    f. Signs other than depicted may be considered, but should be approved by USFWS.

10. A permanent bilingual manatee educational sign should be installed and maintained prior to mooring occupancy at a prominent location to increase the awareness of boaters using the facility of boats to these animals. The numbers of educational signs that may be installed will depend on the docking facility design. One manatee educational sign is recommended at each boat ramp or travel lift (if applicable). Manatee educational signs remain the responsibility of the owner(s) and the Service recommends the signs be maintained for the life of the docking facility in a manner acceptable to the Corps of Engineers.

EXAMPLE MANATEE EDUCATIONAL SIGN



This **permanent** educational sign should have a minimum size of at least 30" inches tall by 36" inches wide with rounded corners.

PRECAUCIÓN: HÁBITAT DE MANATÍ
CAUTION: MANATEE HABITAT

Toda embarcación

VELOCIDAD MÁXIMA 5MPH

All project vessels **IDLE SPEED/NO WAKE**

Si observa un manatí a 50 pies o menos del área de trabajo, toda actividad en el agua debe

DETENERSE

When a manatee is within 50 feet of work all in-water activities must **SHUT DOWN**

Informe cualquier accidente con un manatí.

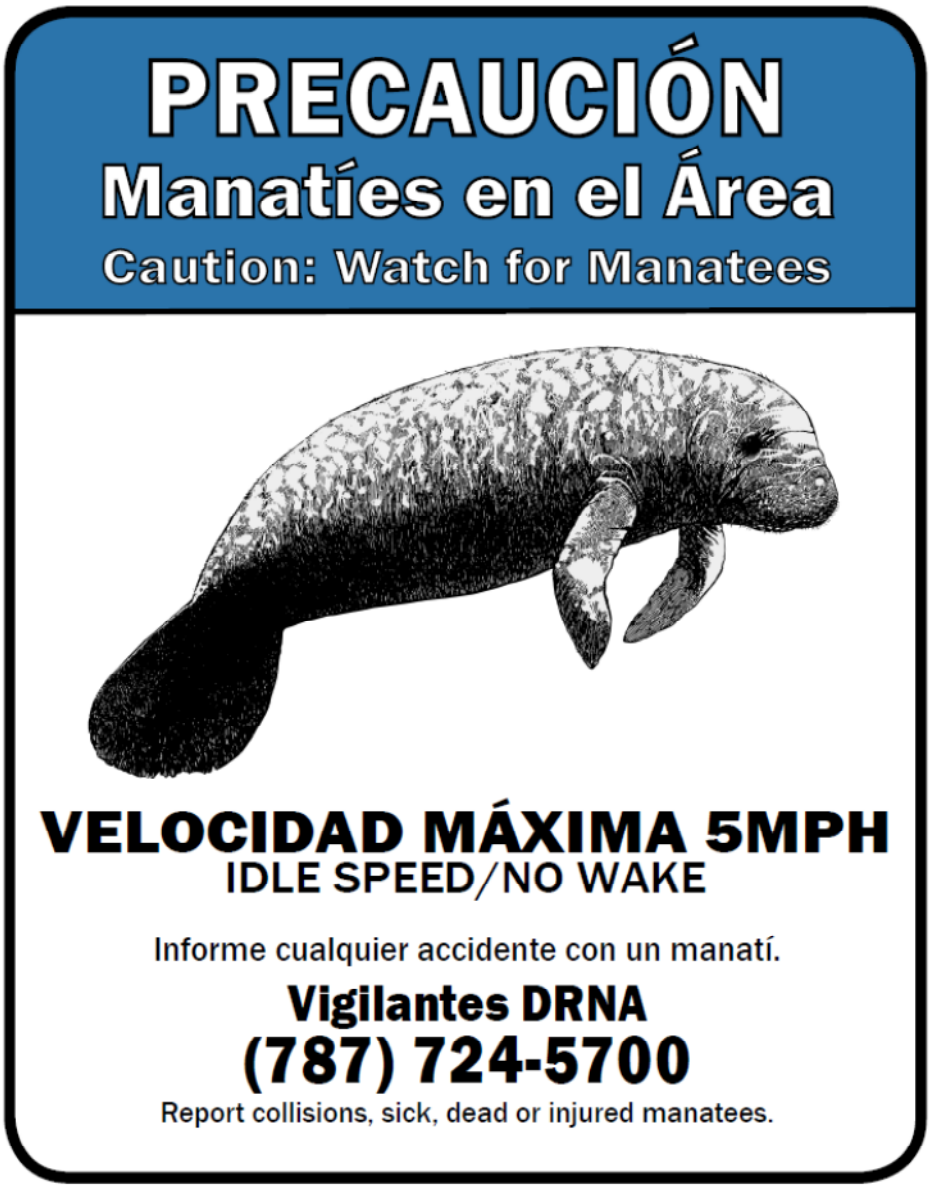
Report any collision with or injury to a manatee.

Vigilantes DRNA

(787)724-5700

This **temporary** bilingual sign is required as part of the standard manatee construction conditions and is intended to be placed near dredge, tugboat and work boat operators. Minimum size should be at least 8½" inches tall by 11" inches wide, and besides the above recommendation, the sign may be in laminated paper. This sign shall be installed or distributed prior to the initiation of construction. Temporary signs will be removed by the permit holder upon completion of construction.

To obtain a ready to print copy of this sign, please contact the USFWS Caribbean Ecological Services Field Office at 787-851-7297 ext. 220 or by email at jan_zegarra@fws.gov



This **permanent** bilingual sign is required as part of the standard manatee construction conditions and is intended to be placed within docking and launching facilities. Minimum size should be at least 30” inches tall by 24” inches wide with rounded corners. This sign shall be installed prior, during or after project construction. This permanent sign may not be required for coastal projects that **do not** have docking and/or launching facilities.

To obtain a ready to print copy of this sign, please contact the USFWS Caribbean Ecological Services Field Office at 787-851-7297 ext. 220 or by email at jan_zegarra@fws.gov

11. A notarized verification letter stating that permanent signs have been installed at designated locations shall be forwarded to the Corps of Engineers, Antilles Regulatory Section, as soon as they are installed. Signs and pilings remain the responsibility of the owner(s) and are to be maintained for the life of the docking and launching facility in a manner acceptable to the Corps of Engineers.

12. Signs other than depicted above may be considered, but should be approved by USFWS. Signs shall have at least the following minimal recommend information:

    a. Temporary bilingual signs:

PRECAUCIÓN
MANATÍES EN EL ÁREA
Mantenga velocidad de 5 mph dentro del área de construcción
Informe cualquier incidente con un manatí
Vigilantes DRNA 787-724-5700

CAUTION
MANATEES IN THE AREA
Maintain idle speed/no wake (5 mph) within construction site
Report any collisions with or injury to a manatee

    b. Permanent bilingual signs:

PRECAUCIÓN
MANATÍES EN EL ÁREA
Velocidad máxima 5 mph
Informe cualquier incidente con un manatí
Vigilantes DRNA 787-724-5700

CAUTION
MANATEES IN THE AREA
Idle speed/No wake (5 mph) zone
Report collisions, sick, dead or injured manatees

    c. Permanent bilingual educational sign and some of the of the recommended information it should include:

GUÍA PARA LA PROTECCIÓN Y CONSERVACIÓN DEL MANATÍ
(*MANATEE PROTECTION AND CONSERVATION GUIDELINES*)

1. Utilice gafas polarizadas mientras navega. Éstas ayudan a detectar mejor al manatí, las áreas llanas y cualquier obstáculo en el mar. (*Use polarized sunglasses while navigating. These help to detect any manatee, shallow waters and any other obstacle in the wáter.*)

2. Si usted ve un manatí en la trayectoria de su embarcación, reduzca la velocidad a 5 mph y conduzca la embarcación fuera del paso del manatí o espere a que el manatí salga del área poniendo su embarcación en neutro. (*If you see a manatee within the*

path of your vessel, reduce the velocity to 5 mph and turn your vessel away from the manatee's path or wait until the manatee has moved from the area by putting your vessel in neutral.)

3. Luego de asegurarse de que el manatí esté fuera de la trayectoria de su embarcación, continúe navegando despacio (no más de 5 mph) hasta que su embarcación se encuentre a no menos de 50 pies (15 metros) del manatí. (*After you are certain that the manatee is well outside of the path of your vessel, resume navigation slowly (not more than 5 mph) until your vessel is not less than 50 feet (15 meters) away from the manatee.*)

4. Obedezca las zonas con límites de velocidad y reduzca la velocidad en aguas llanas menores a 10 pies de profundidad en particular cerca de la costa, en las desembocaduras de ríos, en praderas de hierbas marinas y manglares. (*Obey regulatory speed zones and reduce velocity in shallow waters less than 10 feet, particularly close to the coast, in river mouths, in sea grass beds and mangroves.*)

5. Si observa un manatí mientras usted está en el agua, obsérvelo pasivamente, no lo persiga, acose o lo toque. (*If you observe a manatee while in the water, passively observe it, do not follow it, nor harass or touch.*)

6. No tire basura al agua. El manatí puede ingerirla o enredarse en ella, lo cual podría causarle heridas o la muerte. (*Do not throw trash in the water. Manatees may ingest or entangle on trash, which may injure or kill it.*)

7. Nunca alimente o le ofrezca agua a un manatí. Es ilegal y los malacostumbra a acercarse a lugares donde pueden ser lastimados. (*Never feed or give water to a manatee. It is illegal and will wrongly habituate them to approach areas where they can be injured.*)

Informe accidentes con un manatí inmediatamente. Si encuentra un bebé manatí solo, en peligro, herido o muerto, llame al Cuerpo de Vigilantes del Departamento de Recursos Naturales y Ambientales al 787-724-5700 o al Programa de Rescate de Mamíferos Marinos al 787-833-2025, 787-538-4684 ó 787-645-5593. (*Inform any accident with a manatee immediately. If you find a baby manatee alone, in danger, injured or dead, call the Department of Natural and Environmental Resources Law Enforcement of at 787-724-5700 or the Marine Mammal Rescue Program at 787-833-2025, 787-538-4684 or 787-645-5593.*)

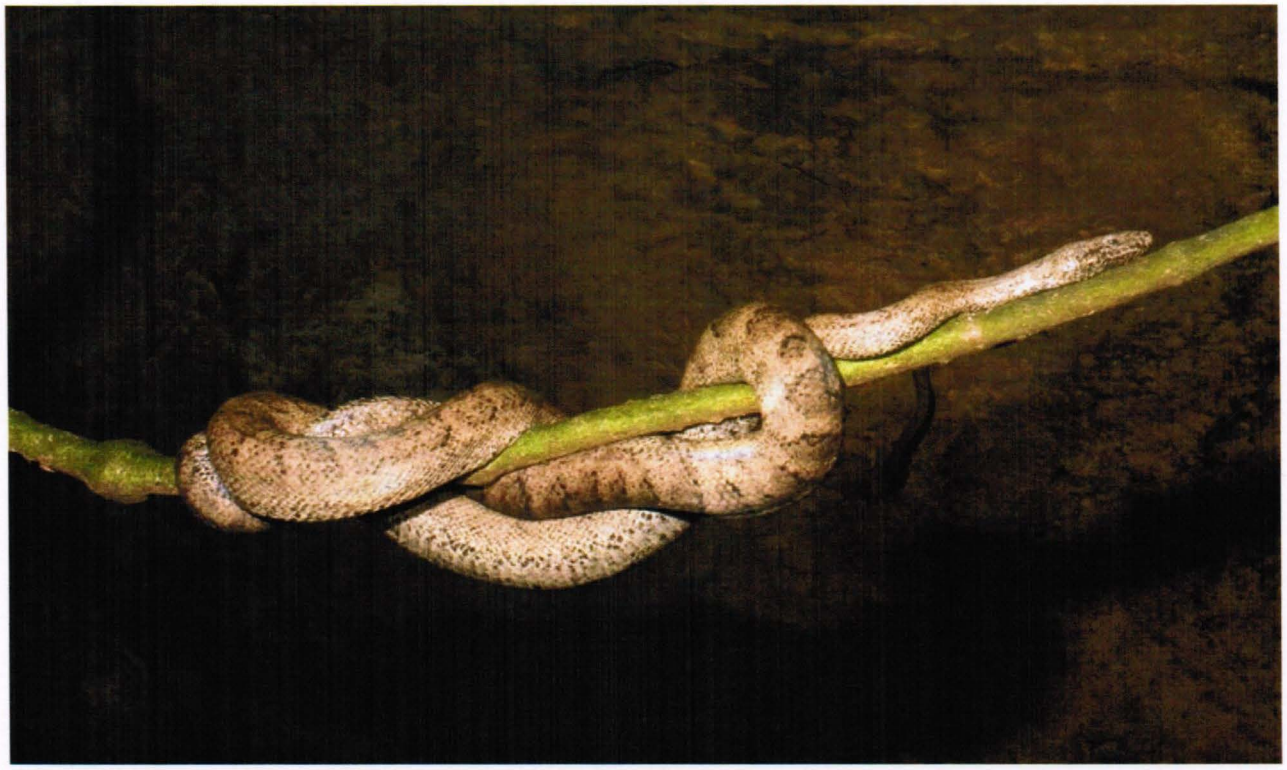
Herir o matar un manatí puede conllevar multas de más de $50,000 y/o no menos de dos años de cárcel. ¡EVÍTESE ESE RIESGO!
(*Harming or killing a manatee could carry fines of more than $50,000 and/or not less than two years in prison. AVOID THIS RISK!*)

GRACIAS POR AYUDAR A SALVAR LOS MANATÍES
THANKS FOR HELPING SAVE THE MANATEES

CONSERVATION MEASURES FOR THE PUERTO RICAN BOA - USFWS

General Information:

The Endangered Puerto Rican boa (Epicrates inornatus) is an endemic species and it is the largest snake that inhabits the Puerto Rico Island Shelf. The color and pattern of the Puerto Rican boa is highly variable. The species color can range from tan to dark brown with irregular diffuse marking on the dorsum but some individuals lack marking and are uniformly dark. Juveniles have reddish brown ground color with numerous pronounced markings. The Puerto Rican boa can be found in the habitat range from the sea level to about 400 m of elevation. The boa tolerates a wide variety of habitat types ranging from wet montane to subtropical dry forest and can be found from virgin forest to areas that exhibit various degrees of human disturbance like roadside or out buildings. Boas are more active at night, remaining less active concealed or basking in the sun during the day. The U.S. Fish and Wildlife Service (Federal Register October 13, 1970) listed the Puerto Rican boa (Epicrates inornatus) as endangered in 1970 and it is protected by the Endangered Species Act of 1973, as amended. Any person that injures, captures, or kills a Puerto Rican boa is subject to penalties under federal law of up to $100,000, one year in prison or a combination of both.



Recommendations:

The U.S. Fish and Wildlife Service (hereafter the Service) has developed recommendations to avoid or minimize impacts on the boa during a project development in an area where the boa may occur. The recommendations are the following:

1. Prior to any earth movements or vegetation clearing, the boundaries of the project area, the buffer areas and areas to be protected should be clearly marked in the project plan and in the field.

2. A pre-construction meeting should be conducted to inform supervisors and employees about the conservation of protected species, as well as penalties for harassing or harming such species.

3. Prior to any use of machinery on areas where the boa may occur, the vegetation should be cleared by hand to provide time to the boa, if present, to be detected or move away from the area. All personnel involved in site clearing must be informed of the potential presence of the snake, and the importance of protecting the snakes.

4. Site personnel should be conscious of the possibility of boas sunning in open areas.

5. Before activities commence each workday during the vegetation clearing phase, the experienced personal in identifying and searching for boas should survey the areas to be cleared that day, to ensure that boas are not present or affected within the work area. If boas are found within the working area, activities should stop at the area where the boas are found until the boas move out of the area on their own. Activities at other work sites, where no boas have been found after surveying the area, may continue. If relocation of the species is necessary, any relocated boas should be transferred by authorized personnel of the Department of Natural and Environmental Resources (DNER) to appropriate habitat close to the project site. Any findings should be reported to the Service and to the DNER Ranger office so they can further assist you in developing sound conservation measures and specific recommendations to avoid, minimize and/or compensate for any impacts to this species.

6. Strict measures should be established to minimize boa casualties by motor vehicles or other equipment. Before operating or moving equipment and vehicles in staging areas near potential boa habitats (within 25 meters of potential boa habitat), these should be thoroughly inspected to ensure that no boas are lodged in the standing equipment or vehicles. If boas are found within vehicles or equipment, authorized personnel of DNER must be notified immediately for proper handling and relocation. Any relocated boas should be transferred to appropriate habitat close to the project site.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

CESAJ-PD-E (ER 200-2-2) 31 MAR 2017

MEMORANDUM FOR RECORD

SUBJECT: Coordination Act Report for the Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project in the Humacao Natural Reserve in Humacao, Puerto Rico

1. **PURPOSE**. To document an informal understanding between the U.S. Army Corps of Engineers (Corps), Jacksonville District, and the U.S. Fish and Wildlife Service (Service), Caribbean Ecological Services Field Office.

2. **BACKGROUND**. The Corps completed construction of the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended, in 2001. The purpose of the 205 Flood Control Project was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. Historically, flooding occurred in these communities when runoff from the mountains within the watershed flowed into the Humacao Natural Reserve (HNR) lagoon system and the Pterocarpus forest before reaching the Caribbean Sea. The authorized flood control project protects those communities from flooding with a levee, interior drainage canal, and a diversion channel to the ocean. Since the completion of the authorized flood control project in 2001, the lagoon system and Pterocarpus forest ecosystem have been affected by high levels of salinity, resulting in changes to the biodiversity of the HNR lagoon system. Field observations indicate that a vast number of Pterocarpus trees on the north shore of the Rio Anton Ruiz exhibit signs of environmental stress such as wilting, loss of foliage, and dry bark. The purpose of the Rio Anton Ruiz Restoration Project is to preserve the Pterocarpus officinalis forest and the biodiversity of both the freshwater and saltwater fauna and flora in the HNR within the limited authority of the CAP 1135 Program.

3. In 2007, a series of temporary saltwater intrusion measures (SWIMs) were developed and constructed by the Corps under the authority of the original 205 Flood Control Project and funded 100% by the non-federal sponsor, Department of Natural and Environmental Resources (DNER). The intent of the SWIMs installation was to implement a temporary structure that could aid in determining if a permanent solution would be warranted. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 parts per thousand (ppt) to below 10 ppt. DNER salinity monitoring stations within the HNR system were used to monitor the salinity levels upon completion of the temporary SWIMs. After the installation of the SWIMs, salinity data gathered at the monitoring stations indicated that the initial target

salinities below 10 ppt had been met. At the end of 2008/beginning of 2009, the temporary SWIMs began losing their effectiveness and the salinity data exceeded 10 ppt.

4. **Tentatively Selected Plan (TSP)**. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary SWIM structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel.

5. **Coordination**. The Fish and Wildlife Coordination Act (FWCA; 16 U.S.C. 661 et seq., March 10, 1934, as amended 1946, 1958, 1978, and 1995) requires Federal agencies to consult with the Service regarding the impacts to fish and wildlife resources and the proposed measures to mitigate these impacts. Additional coordination authorities exist through the review process of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321-4347, January 1, 1970, as amended 1975 and 1982) and the consultations required under the Endangered Species Act of 1973 (ESA; 7 U.S.C. 136, 16 U.S.C. 1531 et seq. December 28, 1973). The Service continues to coordinate and consult with the Corps through NEPA and the ESA in which impacts to fish and wildlife resources are adequately addressed via these two authorities. The Service will include comments relevant to FWCA in the Services response to the Corps' ESA coordination letter.

6. **Agreement**. The undersigned, Corps and the Service, agree to utilize the Rio Anton Ruiz 1135 CAP Project NEPA review and ESA consultation processes to complete coordination responsibilities under the FWCA. This agreement will avoid duplicate analysis and documentation as authorized under 40 CFR section 1500.4 (k), 1502.25, 1506.4, and is consistent with Presidential Executive Order for Improving Regulation and Regulatory Review, released January 18, 2011.

Edwin Muñiz
Field Supervisor
Caribbean Ecological Services Field Office

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Planning and Policy Division

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

AUG 1 6 2017

Mr. David Bernhart
Assistant Regional Administrator
Protected Resources Division
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Mr. Bernhart,

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers (Corps), Jacksonville District, respectfully requests a letter of concurrence from the National Marine Fisheries Service (NMFS) on the Río Antón Ruiz Section 1135 Continuing Authorities Program (CAP) project. The Río Antón Ruiz Project is located in the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary saltwater intrusion measures (SWIM) structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Antón Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

Included with this letter is additional information describing the proposed action, the action area, listed species and/or designated critical habitat (DCH) that may be affected by the action, and an analysis of the potential routes of effect on any listed species or DCH. The Corps has determined that the proposed project may affect, but is not likely to adversely affect, the following federally-listed species:

a. Loggerhead Sea Turtle (*Caretta caretta*);

b. Green Sea Turtle (*Chelonia mydas*);

c. Hawksbill Sea Turtle (*Eretmochelys imbricata*);

d. Leatherback Sea Turtle (*Dermochelys coriacea*);

e. Nassau Grouper (*Epinephelus striatus*).

The Corps has determined the proposed project will have no effect on the following federally-listed species as they are not found in the action area:

a. Pillar Coral (*Dendrogyra cylindrus*);

b. Rough Cactus Coral (*Mycetophyllia ferox*);

c. Lobed Star Coral (*Orbicella annularis*);

d. Mountainous Star Coral (*Orbicella faveolata*);

e. Boulder Star Coral (*Orbicella franksi*);

f. Elkhorn Coral (*Acropora palmata*);

g. Staghorn Coral (*Acropora cervicornis*);

h. Scalloped Hammerhead Shark (*Sphyrna lewini*).

The Corps is requesting concurrence with our determinations pursuant to Section 7 of the ESA of 1973, as amended (16 U.S.C. § 1536), and the consultation procedures at 50 C.F.R. Part 402. The Corps appreciates your cooperation in completing this informal Section 7 consultation by concurring with the Corps' effect determination(s) within 30 days of the receipt of this letter. If NMFS disagrees with the Corps' effect determination(s) and requests formal Section 7 consultation, please contact the below referenced contact to discuss suggested modifications to the action to avoid potential adverse effects and NMFS' additional information needs. The Corps will continue to coordinate with NMFS office via email to provide the requested information and, if warranted, a revised effects determination. If you have any questions, or need additional information, please contact Kristen Scheler by email at Kristen.L.Scheler@usace.army.mil or telephone 904-232-2918. Thank you for your assistance.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Planning and Policy Division

Enclosure

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers (Corps), Jacksonville District, respectfully requests a letter of concurrence within 30 days of the date of this letter from the National Marine Fisheries Service (NMFS) on the Rio Anton Ruiz section 1135 Continuing Authorities Program (CAP) project.

The Rio Anton Ruiz Project is located in the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary saltwater intrusion measures (SWIM) structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

The Corps has determined that the proposed project will either have no effect or may affect, but is not likely to adversely affect, federally-listed species under NMFS purview, as described in Table 1. We are therefore requesting NMFS concurrence with our determinations pursuant to Section 7 of the ESA of 1973, as amended (16 U.S.C. § 1536), and the consultation procedures at 50 C.F.R. Part 402.

Pursuant to our request for informal consultation, the Corps is providing the following information:

- A description of the action to be considered;
- A description of the action area;
- A description of any listed species or designated critical habitat (DCH) that may be affected by the action; and
- An analysis of the potential routes of effect on any listed species or DCH.

1. PROPOSED ACTION

a. Description of the proposed action:

The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary SWIM structures (Figure 1). One location is within the Rio Anton Ruiz, just north of the confluence of the Rio Anton Ruiz and the diversion channel (Weir #1). The other location (Weir #2) is within the diversion channel, approximately ½ mile from the mouth of the diversion channel at the lagoon. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

Figure 1. Action area and project location

During the design phase, additional soil borings and hydrographic/topographic survey will be collected for use in refined analysis of the riprap, sheetpile, and hydraulic designs. The sheetpile material should be investigated during final design, including the use of cold rolled steel or vinyl sheetpile sections, to possibly reduce costs.

The construction effort will take approximately 10 months to complete. Weir #1 will be approximately 180 linear feet. Weir #2 will be approximately 140 linear feet. Both weirs will have a notch that is 3 feet deep by 15 feet wide with a 2 foot by 1 foot concrete cap. The construction sequence for the project will start at Weir #1 and progress to Weir #2. Construction will include the installation of erosion and sediment control features including silt fence along the work perimeters and floating turbidity barriers within the Rio Anton Ruiz and diversion channels, upstream and downstream of the structure locations. The sheetpile structures will be driven from the bank of the diversion channel either by impact hammer or by vibratory hammer. Access for the project will be via the existing project limits, within the berms along the channel and adjacent to the levee (Figure 2). An existing disposal/borrow area will be used for the staging/stockpiling. All construction and maintenance access can use the existing project limits from the original 2001 Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended, project boundary. All construction will be during daylight hours only. Turbidity curtains will only enclose small areas at any one time in the project area, and will be removed upon project completion. If an impact driver is used for pile driving, a bubble curtain and cushion blocks will be deployed as noise abatement measures. A ramp-up/soft-start procedure will also be used. In this procedure, the force exerted by the hammer is gradually increased to maximum power with the intent to provide a stimulus for mobile species, including sea turtles and Nassau grouper, to leave the area before the single strike sound exposure level reaches an injury-causing threshold.

Additionally, the project will adhere to NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions*, dated March 23, 2006, which will provide additional protection by requiring work to stop if sea turtles are observed within 50 feet of operating machinery. Resumption of work will occur only after the animal departs the area of its own volition.

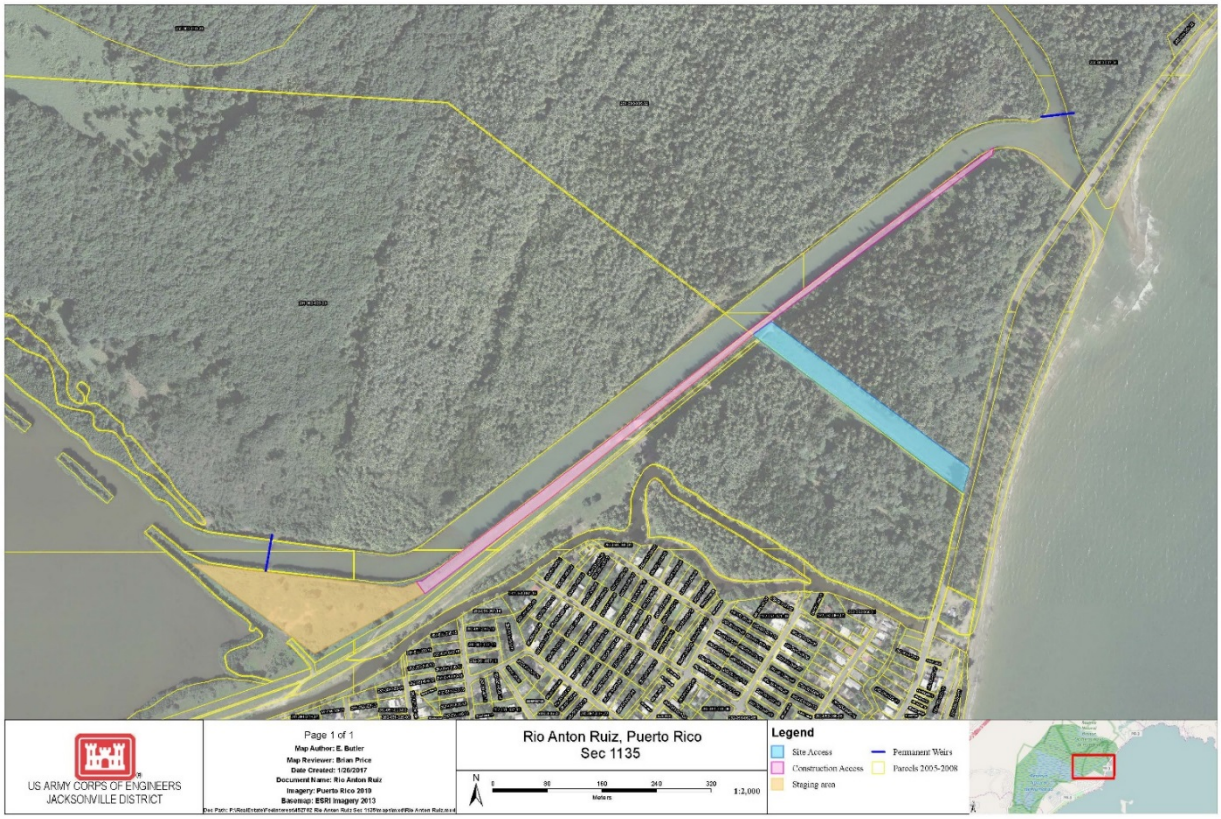


Figure 2. Project access and staging

b. Description of the project purpose:

The purpose of the Rio Anton Ruiz Restoration Project is to preserve the *Pterocarpus officinalis* forest and the biodiversity of both the freshwater and saltwater fauna and flora in the HNR within the limited authority of the CAP 1135 Program. In 2001, the Corps completed construction of the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended. The purpose of the 205 Flood Control Project was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. Historically, flooding occurred in these communities when runoff from the mountains within the watershed flowed into the HNR lagoon system and the *Pterocarpus* forest before reaching the Caribbean Sea. The authorized flood control project protects those communities from flooding with a levee, interior drainage canal, and a diversion channel to the ocean. Since the completion of the authorized flood control project in 2001, the lagoon system and *Pterocarpus* forest ecosystem have been affected by high levels of salinity, resulting in changes to the biodiversity of the HNR lagoon system. Field observations indicate that a vast number of *Pterocarpus* trees on the north shore of the Rio Anton Ruiz exhibit signs of environmental stress such as wilting, loss of foliage, and dry bark.

In 2007, a series of temporary SWIMs were developed and constructed in by the Corps under the authority of the original 205 Flood Control Project and funded 100% by the non-federal

sponsor, Department of Natural and Environmental Resources (DNER). The intent of the SWIMs installation was to implement a temporary structure that would aid in determining if a permanent solution would be warranted. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 parts per thousand (ppt) to below 10 ppt. DNER salinity monitoring stations within the HNR system were used to monitor the salinity levels upon completion of the temporary SWIMs. After the installation of the SWIMs, salinity data gathered at the monitoring stations indicated that the initial target salinities below 10 ppt had been met. At the end of 2008/beginning of 2009, the temporary SWIMs began to degrade, losing their effectiveness, and the salinity data exceeded 10 ppt.

c. Description of minimization measures:

Applicable standard protective measures will be taken during in-water construction activities to ensure the safety of sea turtles in the project vicinity. These measures are recommended by NMFS and are described in the 2006 *Sea Turtle and Smalltooth Sawfish Construction Conditions* (see Attachment 1).

2. ACTION AREA

Pursuant to 50 C.F.R. § 402.02, the term *action area* is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Accordingly, the action area typically includes the affected jurisdictional waters and other areas affected by the authorized work or structures within a reasonable distance.

For the purposes of this consultation, the action area includes the Rio Anton Ruiz, a lagoon system, and a *Pterocarpus* forest in the Humacao Natural Reserve (HNR) as well as the noise radius of up to 2,814 feet, an area offshore of the river that may be affected by noise during sheetpile installation. Six lagoons, encompassing approximately 615 acres (249 hectares), compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas (Figure 1). Rio Anton Ruiz is located in the Municipality of Humacao on the southeast coast of Puerto Rico. The weirs are located at 18.175786°N, 65.739709°W, and 18.169828°N, 65.750783°W, North American Vertical Datum, 1983.

Degradation from the loss of freshwater habitat has likely caused a decline in the number of freshwater species present in the action area, which can impact life cycles, community structures, population densities, and the overall biodiversity of fauna located in the lagoon system. No corals, coral reefs, or hardbottoms are currently present in the project area.

3. AFFECTED SPECIES/HABITAT

Project activities have the potential to affect the listed species as shown in Table 1 below. Table 2 provides the species use of the action area.

Table 1: Species in the action area

Species	ESA Listing Status	Listing Rule/Date	Most Recent recovery plan date	USACE Effect Determination (Species)
Green sea turtle[1]	T	81 FR 20057/ April 6, 2016	October 1991	MANLAA
Leatherback sea turtle	E	35 FR 8491/ June 2, 1970	April 1992	MANLAA
Loggerhead sea turtle[2]	T	76 FR 58868/ September 22, 2011	January 2009	MANLAA
Hawksbill sea turtle	E	35 FR 8491/ June 2, 1970	December 1993	MANLAA
Nassau Grouper	T	81 FR 42268/ 06/29/2016	N/A	MANLAA

Table 2: Species use of the Action Area

Species	Species Use of the Action Area and/or Designated Critical Habitat (DCH) Description
Green sea turtle	Foraging and transit, no DCH in action area
Leatherback sea turtle	Foraging and transit, no DCH in action area
Loggerhead sea turtle	Foraging and transit, no DCH in action area
Hawksbill sea turtle	Foraging and transit, no DCH in action area
Nassau grouper	Foraging and transit, no DCH in action area

Sea Turtles

Four species of sea turtles have been sighted in the action area. Sea turtles may use the action area for transit. There is no sea turtle DCH located in the action area. Sea turtle usage of the Rio Anton Ruiz may be temporarily interrupted due to potential avoidance of construction activities. These species are highly mobile and can easily avoid the area, therefore, effects are not anticipated to be significant. Applicable standard protective measures will be taken during in-water construction activities to ensure the safety of any sea turtles in the project vicinity. These measures are recommended by NMFS and are described in the 2006 Sea Turtle and Smalltooth Sawfish Construction Conditions (see Attachment 1).

Nassau Grouper

Nassau grouper may be found in and around the action area, specifically the area offshore of the river. Nassau grouper may use the action area for transit or foraging. Implementation of the proposed project may limit Nassau grouper foraging in the lagoon system since the lagoons will be restored to lower salinity. Nassau grouper usage of the Rio Anton Ruiz may be temporarily interrupted due to potential avoidance of construction activities. These species are highly mobile and can easily avoid the area, therefore, effects are not anticipated to be significant.

4. ROUTE(S) OF EFFECT TO SPECIES:

[1] North Atlantic and South Atlantic DPS
[2] Northwest Atlantic Ocean DPS

Direct, physical injury effects to these species are not anticipated from construction machinery or materials, because sea turtles and Nassau grouper have the ability to detect and move away from these types of construction activities. Additionally, required turbidity curtains act as a physical barrier to species presence during construction. The project will adhere to NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions*, dated March 23, 2006, which provide additional protection by requiring work to stop if a sea turtle is observed within 50 feet of operating machinery. Thus, direct physical effects are considered extremely unlikely to occur and the risk of adverse effects is therefore discountable.

Effects to listed species as a result of noise created by construction activities can physically injure animals in the affected areas or change animal behavior in the affected areas. Injurious effects can occur in 2 ways. First, immediate adverse effects can occur to listed species if a single noise event exceeds the threshold for direct physical injury. Second, effects can result from prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals, and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. Behavioral effects can be adverse if such effects prevent animals from migrating, feeding, resting, or reproducing, for example. Our evaluation of effects to listed species as a result of noise created by construction activities is based on the analysis prepared in support of the Biological Opinion for SAJ-82.[3] The noise analysis in this consultation evaluates effects to ESA-listed fish and sea turtles identified by NMFS as potentially affected in the table above.

Based on our noise calculations, installation of metal sheet piles by vibratory hammer will not result in any form of injurious noise effects. Yet, this installation method could result in behavioral effects at radii of 52 feet (16 meters) for sea turtles and 243 feet (74 meters) for Nassau grouper. Given the mobility of sea turtles and Nassau grouper, we expect them to move away from noise disturbances. Because there is similar habitat nearby, we believe this effect will be discountable. If an individual chooses to remain within the behavioral response zone, it could be exposed to behavioral noise effects during pile installation. Since installation will occur only during the day, these species will be able to resume normal activities during quiet periods between pile installations and at night. Therefore, installation of metal sheet piles by vibratory hammer will not result in any injurious noise effect, and we anticipate any behavioral effects will be insignificant.

Based on our noise calculations, installation of steel sheet piles by impact hammer will cause single-strike or peak-pressure injurious noise effects to sea turtles and Nassau grouper within 5 feet (1.5 meters) of the pile driving impact. However we expect this effect to be discountable for the following reasons. Sea turtles and Nassau grouper are highly mobile and are expected to the leave areas disturbed by construction activity. The ramp-up procedure is intended to provide a stimulus for mobile species, including sea turtles and Nassau grouper, causing them to leave the area before the single strike sound exposure level reaches an injury-causing threshold. In addition, if an impact driver is used for pile driving, a bubble curtain and cushion blocks will be deployed as noise abatement measures. Once they have left the area, it is expected that they will continue to avoid it. In the unlikely event that a sea turtle or Nassau grouper approaches the pile driving operation in spite of the construction activity, all in-water activity will cease until the animal is observed to leave the area. In accordance with NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions*, dated March 23, 2006, all construction workers will be required to continuously watch for sea turtles. If a sea turtle is observed within 50 feet of the construction

[3] NMFS. Biological Opinion on Regional General Permit SAJ-82 (SAJ-2007-01590), Florida Keys, Monroe County, Florida. June 10, 2014.

site, all in-water activities, including pile driving, will cease until the animal is observed to leave the area of its own accord. Because the area monitored for listed species is larger than the physical injury zone, we feel that observers will provide adequate protection for listed species in the area, making adverse effects extremely unlikely to occur.

The cumulative sound exposure level of multiple pile strikes over the course of a day may cause physical injury to sea turtles and Nassau grouper up to 430 feet (131 meters) from the impact location. Due to the mobility of sea turtles and Nassau grouper we expect them to move away from construction activity and noise disturbances. Because we anticipate that grouper and turtles will move away from the project area during the ramp-up period, we believe that an animal's suffering physical injury from cumulative noise exposure is extremely unlikely to occur. The project has adequate avenues for a grouper or sea turtle to leave or avoid the project area during pile-driving activities, and there is similar habitat outside of the cumulative sound exposure injury zone. Thus, we believe the risk of injury is extremely unlikely and is discountable. However, an animal's movement away from the injurious impact zone is a behavioral response, with the effects discussed below.

The installation of piles using an impact hammer could also result in behavioral effects for sea turtles at a distance of 606 feet (185 meters) from the impact location and for Nassau grouper at a distance of 2,814 feet (858 meters) from the impact location. Since installation will occur only during the day, these species will be able to resume normal activities during quiet periods between pile installations and at night. Individuals will be able to transit from the behavioral impact zone or resume normal activities during quiet periods between pile installations. Therefore, even if the animal remained within the behavior impact zone, we anticipate any potential effects to it will be insignificant.

There will be no effects to sea turtles and Nassau grouper from habitat loss. The area behind the weirs is a river and an artificial channel, which is not the natural habitat of sea turtles and Nassau grouper.

5. ROUTES OF EFFECT TO CRITICAL HABITAT

The noise radius encompasses an area that includes designated critical habitat for elkhorn and staghorn corals, however noise is not one of the potential routes of effects to coral DCH. The area where construction will occur is not located in DCH. Therefore, we believe there are no potential routes of effect to DCH.

6. DETERMINATION:

The Corps has concluded the project may affect, but is not likely to adversely affect the following federally-listed species:

- Loggerhead Sea Turtle (*Caretta caretta*);
- Green Sea Turtle (*Chelonia mydas*);
- Hawksbill Sea Turtle (*Eretmochelys imbricata*);
- Leatherback Sea Turtle (*Dermochelys coriacea*);
- Nassau grouper (*Epinephelus striatus*).

The Corps has determined that the project will have no effect on the following federally-listed species as they are not found in the action area:

- Pillar Coral (*Dendrogyra cylindrus*);
- Rough Cactus Coral (*Mycetophyllia ferox*);
- Lobed Star Coral (*Orbicella annularis*);
- Mountainous Star Coral (*Orbicella faveolata*);
- Boulder Star Coral (*Orbicella franksi*);
- Elkhorn Coral (*Acropora palmata*);
- Staghorn Coral (*Acropora cervicornis*).
- Scalloped Hammerhead Sharks (*Sphyrna lewini*).

This analysis was prepared based on the best scientific and commercial data available.

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project

ATTACHMENT 1:

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006
O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

MAR 0 7 2017

Mr. David Bernhart
Assistant Regional Administrator
Protected Resources Division
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Mr. Bernhart,

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers (Corps), Jacksonville District, respectfully requests a letter of concurrence from the National Marine Fisheries Service (NMFS) on the Río Antón Ruiz Section 1135 Continuing Authorities Program (CAP) project. The Río Antón Ruiz Project is located in the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary saltwater intrusion measures (SWIM) structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Antón Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

Included with this letter is additional information describing the proposed action, the action area, listed species and/or designated critical habitat (DCH) that may be affected by the action, and an analysis of the potential routes of effect on any listed species or DCH. The Corps has determined that the proposed project may affect, but is not likely to adversely affect, the following federally-listed species:

- Loggerhead Sea Turtle (*Caretta caretta*);
- Green Sea Turtle (*Chelonia mydas*);
- Hawksbill Sea Turtle (*Eretmochelys imbricata*);
- Leatherback Sea Turtle (*Dermochelys coriacea*).

The Corps has determined the proposed project will have no effect on the following federally-listed species:

- Pillar Coral (*Dendrogyra cylindrus*);
- Rough Cactus Coral (*Mycetophyllia ferox*);
- Lobed Star Coral (*Orbicella annularis*);
- Mountainous Star Coral (*Orbicella faveolata*);
- Boulder Star Coral (*Orbicella franksi*);
- Elkhorn Coral (*Acropora palmata*);
- Staghorn Coral (*Acropora cervicornis*).

The Corps is requesting concurrence with our determinations pursuant to Section 7 of the ESA of 1973, as amended (16 U.S.C. § 1536), and the consultation procedures at 50 C.F.R. Part 402. The Corps appreciates your cooperation in completing this informal Section 7 consultation by concurring with the Corps' effect determination(s) within 30 days of the receipt of this letter. If NMFS disagrees with the Corps' effect determination(s) and requests formal Section 7 consultation, please contact the below referenced contact to discuss suggested modifications to the action to avoid potential adverse effects and NMFS' additional information needs. The Corps will continue to coordinate with NMFS office via email to provide the requested information and, if warranted, a revised effects determination. If you have any questions, or need additional information, please contact Kristen Scheler by email at Kristen.L.Scheler@usace.army.mil or telephone 904-232-2918. Thank you for your assistance.

Sincerely,

for

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Planning and Policy Division

Enclosure

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers (Corps), Jacksonville District, respectfully requests a letter of concurrence within 30 days of the date of this letter from the National Marine Fisheries Service (NMFS) on the Rio Anton Ruiz section 1135 Continuing Authorities Program (CAP) project.

The Rio Anton Ruiz Project is located in the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary saltwater intrusion measures (SWIM) structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

The Corps has determined that the proposed project will either have no effect or may affect, but is not likely to adversely affect, federally-listed species under NMFS purview, as described in Table 1. , We are therefore requesting NMFS concurrence with our determinations pursuant to Section 7 of the ESA of 1973, as amended (16 U.S.C. § 1536), and the consultation procedures at 50 C.F.R. Part 402.

Pursuant to our request for informal consultation, the Corps is providing the following information:

- A description of the action to be considered;
- A description of the action area;
- A description of any listed species or designated critical habitat (DCH) that may be affected by the action; and
- An analysis of the potential routes of effect on any listed species or DCH.

1. PROPOSED ACTION

a. Description of the proposed action:

The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary SWIM structures (Figure 1). One location is within the Rio Anton Ruiz, just north of the confluence of the Rio Anton Ruiz and the diversion channel (Weir #1). The other location (Weir #2) is within the diversion channel, approximately ½ mile from the mouth of the diversion channel at the lagoon. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

Figure 1. Action area and project location

During the design phase, additional soil borings and hydrographic/topographic survey will be collected for use in refined analysis of the riprap, sheetpile, and hydraulic designs. The sheetpile material should be investigated during final design, including the use of cold rolled steel or vinyl sheetpile sections, to possibly reduce costs.

The construction effort will take approximately 10 months to complete. Weir #1 will be approximately 180 linear feet. Weir #2 will be approximately 140 linear feet. Both weirs will have a notch that is 3 feet deep by 15 feet wide with a 2 feet by 1 foot concrete cap. The construction sequence for the project will start at Weir #1 and progress to Weir #2. Construction will include the installation of erosion and sediment control features including silt fence along the work perimeters and floating turbidity barriers within the Rio Anton Ruiz and diversion channels, upstream and downstream of the structure locations. The structures will be sheetpile driven from the bank of the diversion channel. Access for the project will be via the existing project limits, within the berms along the channel and adjacent to the levee. An existing disposal/borrow area will be used for the staging/stockpiling. All construction and maintenance access can use the existing project limits from the original 2001 Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended, project boundary.

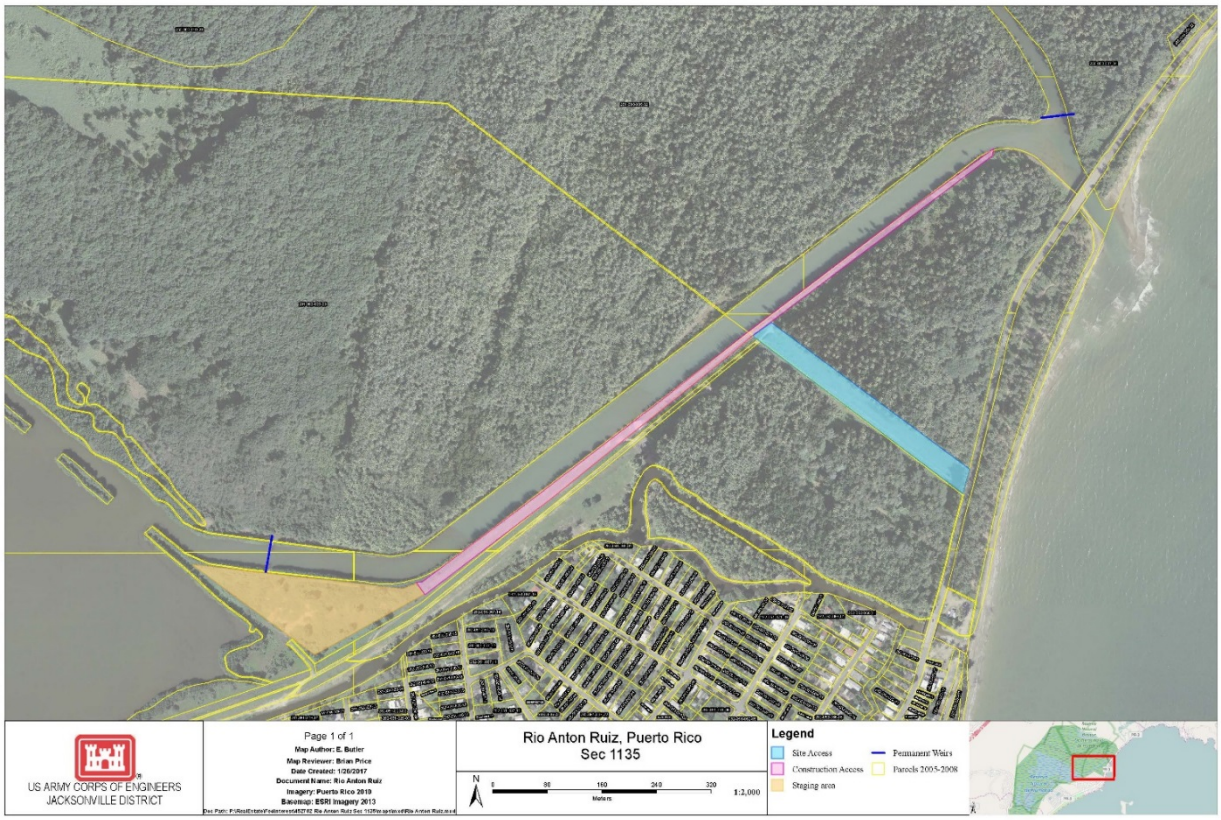


Figure 2. Project access and staging

b. Description of the project purpose:

The purpose of the Rio Anton Ruiz Restoration Project is to preserve the *Pterocarpus officinalis* forest and the biodiversity of both the freshwater and saltwater fauna and flora in the HNR within the limited authority of the CAP 1135 Program. In 2001, the Corps completed construction of the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended. The purpose of the 205 Flood Control Project was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. Historically, flooding occurred in these communities when runoff from the mountains within the watershed flowed into the HNR lagoon system and the Pterocarpus forest before reaching the Caribbean Sea. The authorized flood control project protects those communities from flooding with a levee, interior drainage canal, and a diversion channel to the ocean. Since the completion of the authorized flood control project in 2001, the lagoon system and Pterocarpus forest ecosystem have been affected by high levels of salinity, resulting in changes to the biodiversity of the HNR lagoon system. Field observations indicate that a vast number of Pterocarpus trees on the north shore of the Rio Anton Ruiz exhibit signs of environmental stress such as wilting, loss of foliage, and dry bark.

In 2007, a series of temporary SWIMs were developed and constructed in by the Corps under the authority of the original 205 flood control project and funded 100% by the non-federal sponsor, Department of Natural and Environmental Resources (DNER). The intent of the SWIMs installation was to implement a temporary structure that could aid in determining if a permanent solution would be warranted. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 parts per thousand (ppt) to below 10 ppt. DNER salinity monitoring stations within the HNR system were used to monitor the salinity levels upon completion of the temporary SWIMs. After the installation of the SWIMs, salinity data gathered at the monitoring stations indicated that the initial target salinities below 10 ppt had been met. At

the end of 2008/beginning of 2009, the temporary SWIMs began losing their effectiveness and the salinity data exceeded 10 ppt.

c. Description of minimization measures:

Applicable standard protective measures will be taken during in-water construction activities to ensure the safety of sea turtles in the project vicinity. These measures are recommended by NMFS and are described in the 2006 Sea Turtle and Smalltooth Sawfish Construction Conditions (see Attachment 1).

2. ACTION AREA

Pursuant to 50 C.F.R. § 402.02, the term *action area* is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Accordingly, the action area typically includes the affected jurisdictional waters and other areas affected by the authorized work or structures within a reasonable distance.

For the purposes of this consultation, the action area includes the Rio Anton Ruiz, a lagoon system, and a Pterocarpus forest in the Humacao Natural Reserve (HNR). Six lagoons, encompassing approximately 615 acres (249 hectares), compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas (Figure 1). Rio Anton Ruiz is located in the Municipality of Humacao on the southeast coast of Puerto Rico.

Degradation from the loss of freshwater habitat has likely caused a decline in the number of freshwater species present in the action area, which can impact life cycles, community structures, population densities, and the overall biodiversity of fauna located in the lagoon system. No corals, coral reefs, or hardbottoms are currently present in the project area.

3. AFFECTED SPECIES/HABITAT

Project activities have the potential to affect the listed species as shown in Table 1 below. Table 2 provides the species use of the action area.

Table 1: Species in the action area

Species	ESA Listing Status	Listing Rule/Date	Most Recent recovery plan date	USACE Effect Determination (Species)
Green sea turtle[1]	T	81 FR 20057/ April 6, 2016	October 1991	MANLAA
Leatherback sea turtle	E	35 FR 8491/ June 2, 1970	April 1992	MANLAA
Loggerhead sea turtle[2]	T	76 FR 58868/ September 22, 2011	January 2009	MANLAA
Hawksbill sea turtle	E	35 FR 8491/ June 2, 1970	December 1993	MANLAA
Elkhorn coral	T	71 FR 26852/ May 9, 2006	March 2015	NE
Staghorn coral	T	71 FR 26852/ May 9, 2006	March 2015	NE
Boulder star coral	T	79 FR 53852/ September 10, 2014	N/A	NE
Mountainous star coral	T	79 FR 53852/ September 10, 2014	N/A	NE
Lobed star coral	T	79 FR 53852/ September 10, 2014	N/A	NE
Rough cactus coral	T	79 FR 53852/ September 10, 2014	N/A	NE
Pillar coral	T	79 FR 53852/ September 10, 2014	N/A	NE

Table 2: Species use of the Action Area

Species	Species Use of the Action Area and/or DCH Description
Green sea turtle	Foraging and transit, no DCH in action area
Leatherback sea turtle	Foraging and transit, no DCH in action area
Loggerhead sea turtle	Foraging and transit, no DCH in action area
Hawksbill sea turtle	Foraging and transit, no DCH in action area
Johnson's seagrass	Present in action area, not present in project area DCH present in action area, no DCH present in project footprint
Elkhorn coral	Present in the region, not present in the action area, no DCH in action area
Staghorn coral	Present in the region, not present in the action area, no DCH in action area
Boulder star coral	Present in the region, not present in the action area, no DCH in action area

[1] North Atlantic and South Atlantic DPS
[2] Northwest Atlantic Ocean DPS

Species	Species Use of the Action Area and/or DCH Description
Mountainous star coral	Present in the region, not present in the action area, no DCH in action area
Lobed star coral	Present in the region, not present in the action area, no DCH in action area
Rough cactus coral	Present in the region, not present in the action area, no DCH in action area
Pillar coral	Present in the region, not present in the action area, no DCH in action area

Sea Turtles
Multiple species of sea turtles have been sighted in the action area. Sea turtles may use the action area for transit. There is no sea turtle DCH located in the action area. While freshwater seagrasses are present, the increased salinity levels have likely reduced the available foraging habitat. Implementation of the proposed project may beneficially impact sea turtle foraging in the lagoon system. Sea turtle usage of the Rio Anton Ruiz may be temporarily interrupted due to potential avoidance of construction activities. These species are highly mobile and can easily avoid the area, therefore, impacts are not anticipated to be significant. Applicable standard protective measures will be taken during in-water construction activities to ensure the safety of any sea turtles in the project vicinity. These measures are recommended by NMFS and are described in the 2006 Sea Turtle and Smalltooth Sawfish Construction Conditions (see Attachment 1).

Federally Listed Corals
Although the seven federally-listed coral species are not present within the project footprint and are not likely present within the action area, the corals can be found in this region. Best Management Practices (BMPs) and methods to manage the placement of concrete caps and sheetpile driving will ensure minimized and controlled turbidity. Final details for BMPs and methods will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods.

4. ROUTE(S) OF EFFECT TO SPECIES:
The structures will be sheetpile driven from the bank of the diversion channel. The sheetpile weirs will have a concrete cap. Depending on the tidal conditions, there may be the need to draw down the water level directly adjacent to the sheetpile in order to construct the concrete cap. Sheetpile or use of other means to create a small dewatering cell and then pumping directly back into the channel should be sufficient if the concrete cap is placed in sections. No diversion of water (diversion channel) is anticipated for any dewatering efforts. Temporary turbidity will occur as a result of sheetpile driving. Impacts will be temporary and localized, lasting only as long as construction takes place, approximately 10 months. Best Management Practices (BMPs) and methods to manage the placement of concrete caps and sheetpile driving will ensure minimized and controlled turbidity. Final details for BMPs and methods will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods.

5. ROUTES OF EFFECT TO CRITICAL HABITAT
There is no DCH located in the action area. No potential routes of effect are anticipated to impact DCH outside of the action area.

6. DETERMINATION:
The Corps has concluded the project may affect, but is not likely to adversely affect the following federally-listed species:

- Loggerhead Sea Turtle (*Caretta caretta*);
- Green Sea Turtle (*Chelonia mydas*);
- Hawksbill Sea Turtle (*Eretmochelys imbricata*);
- Leatherback Sea Turtle (*Dermochelys coriacea*).

The Corps has determined that the project will have no effect on the following federally-listed species:

- Pillar Coral (*Dendrogyra cylindrus*);
- Rough Cactus Coral (*Mycetophyllia ferox*);
- Lobed Star Coral (*Orbicella annularis*);
- Mountainous Star Coral (*Orbicella faveolata*);
- Boulder Star Coral (*Orbicella franksi*);
- Elkhorn Coral (*Acropora palmata*);
- Staghorn Coral (*Acropora cervicornis*).

This analysis was prepared based on the best scientific and commercial data available.

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project

ATTACHMENT 1:

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006
O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

MAR 0 7 2017

Planning and Policy Division
Environmental Branch

Mr. Edwin Muñiz
Field Supervisor
Caribbean Ecological Services Field Office
U.S. Fish and Wildlife Service
Road 301 Km 5.1
Boquerón, Puerto Rico 00622

Dear Mr. Muñiz:

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers (Corps), Jacksonville District, respectfully requests a letter of concurrence from the U.S. Fish and Wildlife Service (USFWS) on the Río Antón Ruiz Section 1135 Continuing Authorities Program (CAP) Project.

The Río Antón Ruiz Project is located in the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary saltwater intrusion measures (SWIM) structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Antón Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

The Corps has determined that the proposed project may affect, but is not likely to adversely affect, the Antillean manatee (*Trichechus manatus manatus*) and the Puerto Rican boa (*Epicrates inornatus*). Included with this letter is additional information describing the project background, project location and proposed action, listed species under USFWS jurisdiction, potential effects to listed species, and efforts to eliminate/avoid impacts.

The Corps respectfully requests that USFWS provide a letter of concurrence within 30 days of the receipt of this letter. If you have any questions, or need additional information, please contact Kristen Scheler by email Kristen.L.Scheler@usace.army.mil or telephone 904-232-2918. Thank you for your assistance.

Sincerely,

for Gina Paduano Ralph, Ph.D.
Environmental Branch
Planning and Policy Division

Enclosure

Rio Anton Ruiz Section 1135 Continuing Authorities Program (CAP) project

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers (Corps), Jacksonville District, respectfully requests a letter of concurrence within 30 days of the date of this letter from the U.S. Fish and Wildlife Service (USFWS) on the Rio Anton Ruiz section 1135 Continuing Authorities Program (CAP) Project. The Corps has determined that the proposed project may affect, but is not likely to adversely affect the Antillean manatee (*Trichechus manatus manatus*) and the Puerto Rican boa (*Epicrates inornatus*).

Pursuant to our request, the Corps is providing the following information:

- Description of the Project Background;
- Description of the Project Location and Proposed Action;
- Listed Species Under USFWS Jurisdiction;
- Potential Effects to Listed Species and Efforts to Eliminate/Avoid Impacts;
- Effect Determination;

Description of the Project Background

The Corps completed construction of the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended, in 2001. The purpose of the 205 Flood Control Project was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near Humacao, Puerto Rico. Historically, flooding occurred in these communities when runoff from the mountains within the watershed flowed into the Humacao Natural Reserve (HNR) lagoon system and the Pterocarpus forest before reaching the Caribbean Sea. The authorized flood control project protects those communities from flooding with a levee, interior drainage canal, and a diversion channel to the ocean. Since the completion of the authorized flood control project in 2001, the lagoon system and Pterocarpus forest ecosystem have been affected by high levels of salinity, resulting in changes to the biodiversity of the HNR lagoon system. Field observations indicate that a vast number of Pterocarpus trees on the north shore of the Rio Anton Ruiz exhibit signs of environmental stress such as wilting, loss of foliage, and dry bark. The purpose of the Rio Anton Ruiz Restoration Project is to preserve the *Pterocarpus officinalis* forest and the biodiversity of both the freshwater and saltwater fauna and flora in the HNR within the limited authority of the CAP 1135 Program.

In 2007, a series of temporary saltwater intrusion measures (SWIMs) were developed and constructed in by the Corps under the authority of the original 205 flood control project and funded 100% by the non-federal sponsor, Department of Natural and Environmental Resources (DNER). The intent of the SWIMs installation was to implement a temporary structure that could aid in determining if a permanent solution would be warranted. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 ppt to below 10 ppt. DNER salinity monitoring stations within the HNR system were used to monitor the salinity levels upon completion of the temporary SWIMs. After the installation of the SWIMs, salinity data gathered at the monitoring stations indicated that the initial target salinities below 10 ppt had been met. At the end of 2008/beginning of 2009, the temporary SWIMs began losing their effectiveness and the salinity data exceeded 10 ppt.

Description of the Project Location and Proposed Action

The Rio Anton Ruiz Project is located in the HNR in Humacao, Puerto Rico. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the

location of the temporary SWIM structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel.

Listed Species Under USFWS Jurisdiction

Listed species which may occur in the vicinity of the proposed work and are under the jurisdiction of the USFWS include the West Indian (Antillean) manatee (*Trichechus manatus*) - Endangered and the Puerto Rican boa (*Epicrates inornatus*) – Endangered.

Potential Effects to Listed Species and Efforts to Eliminate/Avoid Impacts

Antillean Manatee

Federal law, specifically the Marine Mammal Protection Act of 1972 (MMPA) and the 1973 ESA protects manatees. Critical habitat is defined under the ESA as specific areas within and/or outside a geographical area that are occupied by a species at the time of listing, that contain physical or biological features essential to the conservation of the species and therefore require special management considerations or protection for the benefit of the species. Although critical habitat for the Antillean manatee was described in 1976 in 50 CFR 17.95 for Florida, no areas in Puerto Rico were identified. In 2008, the UWFWS petitioned to revise critical habitat for the manatee. While a revision was warranted, it was precluded due to other priorities (USFWS 2016). Habitat requirements currently present in the Rio Anton Ruiz project area to sustain manatees' essential life history functions likely include:

- Shallow, secluded water areas for resting, mating, and calving
- Submerged, emergent, and floating vegetation for foraging
- Freshwater source for drinking (natural or artificial sources)

Construction of the two sheetpile notched concrete cap weirs will occur within areas where manatees may be present, however, the construction will occur at the same location of the temporary SWIM structures and the notch in the concrete cap will allow for the manatees to continue to travel through the area. The weirs will result in reduced salinity in the historically freshwater lagoons, which may be used by the manatees as a freshwater source. Applicable standard protective measures will be taken during in-water construction activities to ensure the safety of manatees that may be in the project vicinity (see Attachment 1).

Puerto Rican Boa

The Puerto Rican boa was listed as endangered in 1970. No areas have been specifically designated or identified as critical habitat for the Puerto Rican boa, however, the species is widespread in its distribution across the island. The Puerto Rican boa is found in a variety of habitats and is arboreal and terrestrial. It is abundant in protected and inaccessible areas of the island. According to a study in 2008 (Gould et al) focused on species distribution and habitat preference, the Puerto Rican boa predicted habitat model specifically includes *Pterocarpus* forest.

Construction of the two sheetpile notched concrete cap weirs will occur near areas where Puerto Rican boas may be present, however, the construction will occur at the same location of the temporary SWIM structures, which is subtidal and not likely used by the boas. The weirs will result in reduced salinity in the historically freshwater lagoons, which will enable recovery of the *Pterocarpus officinalis* forest, which may be used by the Puerto Rican boas.

Although specific standard protection measures have not been established for Puerto Rican boas, the following measures, pulled from the 2013 standard protection measures for the eastern indigo snake (USFWS 2013), should be taken to ensure minimization of impacts:

Pre-Construction Activities:

Prior to the onset of construction activities, educational posters will be displayed in the construction office and in strategic locations throughout the construction site, including along any proposed access roads. Posters must be clearly visible to all construction staff and should include the following information: species description, life history, protection under federal law, instructions for live and dead snake encounters, and telephone numbers of personnel to contact if a live or dead snake is encountered. The sponsor or a designated agent will conduct a meeting with construction staff to discuss identification of the snake, its protected status, what to do if a snake is observed within the project area, and applicable penalties that may be imposed if regulations are violated. An educational brochure including color photographs of the snake will be provided to the staff and the construction office will maintain additional copies.

Instructions for Encounters:

If a live Puerto Rican boa is encountered on the site, all activities should cease to allow the snake sufficient time to move away from the site without interference. Personnel must not attempt to touch or handle the snake due to the protected status. If possible, photographs should be taken for identification and documentation purposes. Location information, photographs, and condition of the snake should be provided by the Corps to the appropriate USFWS office.

If a dead Puerto Rican boa is encountered on the site, all activities should cease, and the applicant's designated agent and appropriate USFWS office should be immediately notified of the location information and condition of the snake. If possible, photographs should be taken for identification and documentation purposes. The snake should be thoroughly soaked in water and frozen. An appropriate wildlife agency will retrieve the dead snake.

Post-Construction Activities:

Regardless of whether Puerto Rican boas are observed during construction activities, a monitoring report should be submitted to the appropriate USFWS office within 60 days of project completion.

Effect Determination

The Corps determination is that the proposed action may affect, but is not likely to adversely affect, Antillean manatee and the Puerto Rican boa.

References:

USFWS. (2016). "West Indian Manatee (Trichechus manatus)." Accessed February 2017. https://www.fws.gov/southeast/wildlife/mammal/manatee/

USFWS. (2011). "Puerto Rican boa. (*Epicrates inornatus*)." Accessed December 2016. https://www.fws.gov/southeast/5yearreviews/5yearreviews/puertoricanboa.pdf

USFWS. (2013). "Standard protection measures for the eastern indigo snake." Accessed March 2017. https://www.fws.gov/northflorida/indigosnakes/20130812_EIS%20Standard%20Protection%20Measures_final.pdf

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project

ATTACHMENT 1:

MANATEE STANDARD CONDITIONS FOR IN-WATER WORK (2011)

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK
2011

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida, and to FWC at ImperiledSpecies@myFWC.com

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to the email address listed above.

APPENDIX D

ATTACHMENT 2

404(b)(1) Guidelines Evaluation

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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Final Evaluation of 404(b)(1) Guidelines Contained in Vol. 45 No. 249 of the Federal Register dated 24 December 1980

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
February 2017

1. Technical Evaluation Factors

a. Physical and Chemical Characteristics of the Aquatic Ecosystem (230.20-230.25)(Subpart C)

	N/A	Not Significant	Significant
(1) Substrate impacts	☐	☒	☐
(2) Suspended particulates/turbidity impacts	☐	☒	☐
(3) Water Quality Control	☐	☒	☐
(4) Alteration of current patterns and water circulation	☐	☒	☐
(5) Alteration of normal water fluctuations/hydroperiod	☐	☒	☐
(6) Alteration of salinity gradients	☐	☒	☐

The purpose of the Rio Anton Ruiz Restoration Project is to preserve the *Pterocarpus officinalis* forest and the biodiversity of both the freshwater and saltwater fauna and flora in the Humacao Natural Reserve (HNR) within the limited authority of the CAP section 1135. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs over the same locations as the temporary saltwater intrusion measures (SWIM) structures, which were constructed in 2007. Temporary turbidity will occur as a result of sheetpile driving. Impacts will be temporary and localized, lasting only as long as construction takes place. Best Management Practices (BMPs) and methods to manage the placement of concrete caps and sheetpile driving will ensure minimized and controlled turbidity. Final details for BMPs and methods will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods. During the design phase, additional soil borings and hydrographic/topographic survey will be collected for use in refined analysis of the riprap, sheetpile, and hydraulic designs.

b. Biological Characteristics of the Aquatic Ecosystem(230.30-230.32) (Subpart D)

	N/A	Not Significant	Significant
(1) Effect on threatened/endangered species and their habitat	☐	☒	☐
(2) Effect on the aquatic food web	☐	☒	☐
(3) Effect on other wildlife (mammals, birds, reptiles, and amphibians)	☐	☒	☐

The sheetpile weirs will be constructed over the same locations as the temporary SWIMs. The Corps has concluded that the project may affect, but is not likely to adversely affect, the following federally listed species:

- West Indian (Antillean) manatee (*Trichecus manatus manatus*);
- Puerto Rican boa (*Epicrates inornatus*);
- Loggerhead Sea Turtle (*Caretta caretta*);
- Green Sea Turtle (*Chelonia mydas*);
- Hawksbill Sea Turtle (*Eretmochelys imbricata*);
- Leatherback Sea Turtle (*Dermochelys coriacea*).

The Corps has determined that the project will have no effect on the following federally-listed species:

- Pillar Coral (*Dendrogyra cylindrus*);
- Rough Cactus Coral (*Mycetophyllia ferox*);
- Lobed Star Coral (*Orbicella annularis*);
- Mountainous Star Coral (*Orbicella faveolata*);
- Boulder Star Coral (*Orbicella franksi*);
- Elkhorn Coral (*Acropora palmata*);
- Staghorn Coral (*Acropora cervicornis*).

c. Special Aquatic Site (230.40-230.45) (Subpart E)

	N/A	Not Significant	Significant
(1) Sanctuaries and refuges	☒	☐	☐
(2) Wetlands	☒	☐	☐
(3) Mud flats	☒	☐	☐
(4) Vegetated shallows	☒	☐	☐
(5) Coral reefs	☒	☐	☐
(6) Riffle and pool complexes	☒	☐	☐

There are no special aquatic sites located in the project area; therefore, no impacts are anticipated.

d. Human Use Characteristics (230.50-230.54) (Subpart F)

	N/A	Not Significant	Significant
(1) Effects on municipal and private water supplies	☒	☐	☐
(2) Recreational and Commercial fisheries impacts	☐	☒	☐
(3) Effects on water-related recreation	☐	☒	☐
(4) Aesthetic impacts	☐	☒	☐
(5) Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves	☒	☐	☐

The sheetpile weirs will be constructed over the same locations as the temporary SWIMs. No new impacts are anticipated as a result of replacement.

2. Evaluation of Dredged or Fill Material (230.60) (Subpart G)

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (**Check only those appropriate**)

☐ (1) Physical characteristics
☒ (2) Hydrography in relation to known or anticipated sources of contaminants
☐ (3) Results from previous testing of the material in the vicinity of the project
☐ (4) Known, significant, sources of persistent pesticides from land runoff or percolation
☐ (5) Spill records for petroleum products or designated (Section 311 of CWA) hazardous substances
☐ (6) Other public records of significant introduction of contaminants from industries, municipalities or other sources
☐ (7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge
☒ (8) Other sources (specify)
The structures being constructed are sheetpile weirs with a concrete cap.

No dredging, disposal, or fill is being used for this project. There is no reason to suspect contamination.

b. An evaluation of the appropriate information in 2a above indicated that there is reason to believe the proposed dredged or fill material is not a carrier of contaminants, of that levels of contaminants are substantively similar at extraction and disposal sites and not likely to exceed constraints. The material meets the testing exclusion criteria.

YES ☒ NO ☐

3. Disposal Site Delineation (Section 230.11(f))

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

☐ (1) Depth of water at disposal site
☐ (2) Current velocity, direction, and variability at disposal site
☒ (3) Degree of turbulence
☐ (4) Water volume stratification
☐ (5) Discharge vessel speed and direction
☐ (6) Rate of discharge
☐ (7) Dredged material characteristics (constituents, amount, and type of material, settling velocities)
☐ (8) Number of discharges per unit of time
☒ (9) Other factors affecting rates and patterns of mixing (specify)
No dredging, disposal, or fill is being used for this project. Construction activities involve the following: The structures will be sheetpile driven from the bank of the diversion channel. The sheetpile weirs will have a concrete cap. Depending on the tidal conditions, there may be the need to draw down the water level directly adjacent to the sheetpile in order to construct the concrete cap. Sheetpile or use of other means to create a small dewatering cell and then pumping directly back into the channel should be sufficient if the concrete cap is placed in sections. No diversion of water (diversion channel) is anticipated for any dewatering efforts. Temporary turbidity will occur as a result of sheetpile driving. Impacts will be

temporary and localized, lasting only as long as construction takes place. BMPs and methods to manage the placement of concrete caps and sheetpile driving will ensure minimized and controlled turbidity. Final details for BMPs and methods will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods. Access for the project will be via the existing project limits, within the berms along the channel and adjacent to the levee. An existing disposal/borrow area will be used for the staging/stockpiling. All construction and maintenance access can use the existing project limits from the original 205 project.

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable.

YES ☒ NO ☐

4. Actions to Minimize Adverse Effects (Section 230.70-230.77)(Subpart H)

All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.

YES ☒ NO ☐

5. Factual Determination (Section 230.11)

A review of appropriate information as identified in items 2-5 above indicates that there is minimal potential for short or long-term environmental effects of the proposed discharge as related to:

☒ a. Physical substrate at the disposal site (review sections 2a, 3, 4, & 5)
☒ b. Water circulation, fluctuation & salinity (review sections 2a 3, 4, & 5)
☒ c. Suspended particulates/turbidity (review sections 2a, 3, 4, & 5)
☒ d. Contaminant availability (review sections 2a, 3, & 4)
☒ e. Aquatic ecosystem structure and function (review sections 2b, c; 3, & 5)
☒ f. Disposal site (review sections 2, 4, & 5)
☒ g. Cumulative impact on the aquatic ecosystem
☒ h. Secondary impacts on the aquatic ecosystem

6. Review of Compliance (230.10(a)-(d) (Subpart B)

A review of the permit application indicates that:

a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and information gathered for EA alternative);

YES ☒ NO ☐

b. The activity does not appear to 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally designated marine

sanctuary(if no, see section 2b and check responses from resource and water quality certifying agencies; YES ☒ NO ☐

c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values (if no, see section 2); YES ☒ NO ☐

d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5); YES ☒ NO ☐

No dredging, disposal, or fill is being used for this project. The structures being constructed are sheetpile weirs with a concrete cap. There is no reason to suspect contamination. During the design phase, additional soil borings and hydrographic/topographic survey will be collected for use in refined analysis of the riprap, sheetpile, and hydraulic designs. Construction of the recommended plan will protect the freshwater Pterocarpus forest and the Mandri lagoon system from saltwater intrusion, which was a result of the diversion channel constructed in 2001 under the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended.

7. Findings

☒ a. The proposed disposal site for discharge of dredged or fill material complies with the Section 404 (b)(1) guidelines

☐ b. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines with the inclusion of the following conditions:

c. The proposed disposal site for discharge of dredged or fill material does not comply with the Section 404(b)(1) guidelines for the following reason(s):

☐ (1) There is a less damaging practicable alternative

☐ (2) The proposed discharge will result in significant degradation of the aquatic ecosystem

☐ (3) The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem

APPENDIX D

ATTACHMENT 3

Coastal Zone Management Act (CZMA)
Federal Consistency Determination (FCD)

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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DESPACHADO
JUL 06 2017
UNIDAD DE CORREO

GOVERNMENT OF PUERTO RICO
OFFICE OF THE GOVERNOR
PUERTO RICO PLANNING BOARD

June 21, 2017

CZ-2017-0424-044
Federal Consistency Certificate with the
Puerto Rico Coastal Zone Management Program

RESOLUTION

TO NOTIFY PARTIES ABOUT THE EMMISSION OF A FEDERAL CONSISTENCY CERTIFICATE ACCORDING TO COASTAL ZONE MANAGEMENT ACT FEDERAL CONSISTENCY REGULATIONS AT 15 CFR Part 930

The U.S. Army Corps of Engineers (USACE) submitted a Federal Consistency Determination for the Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) project. This project consists in the implementation of permanent measures to control and manage the saline water intrusion problem that is adversely affecting the Humacao Pterocarpus Forest Reserve. In 2001 the USACE completed construction of the Rio Anton Ruiz CAP Section 205 Flood Control Project to protect the coastal communities of Punta Santiago, Verde Mar and Villa Palmira in Humacao from flooding events. Since the completion of this project, The Pterocarpus Forest Reserve in Humacao has been affected by the saline water intrusion that reaches the lagoons through the diversion channel. Field observations indicate that a vast number of Pterocarpus trees on the north of the shore of the Rio Anton Ruiz exhibit signs of environmental stress such as wilting, loss of foliage, and dry bark. Changes in biodiversity were also observed in the area. According to salinity data collected from the lagoons before year 2001, the natural salinity levels of the lagoon were under 10 parts per thousand (ppt), but after completion of the flood control project the salinity concentrations increased through 35 ppt. In 2007, the Department of Natural and Environmental Resources, in collaboration with the U.S. Army Corps of Engineering developed and constructed Salt Water Intrusion Measures (SWIMs) as an intent to implement a temporary structure that could aid in determining if a permanent solution would be warranted. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 parts per thousand (ppt) to below 10 ppt. After the installation of the SWIMs, salinity data gathered at the monitoring stations indicated that the initial target salinities below 10 ppt had been met, but at the end of 2008/beginning of 2009, the temporary SWIMs began losing their effectiveness as expected due to its natural deterioration and the passage of fishermen boats. Having proven that temporary SWIMs served their purpose, the USACE designed and proposes to construct two permanent concrete-capped sheet pile weirs. The weir # 1 will measure approximately 180 linear feet and will be located north of the confluence between the Anton Ruíz River and the diversion channel. The weir # 2 will measure about 140 linear feet will be located within the diversion channel, half a mile to its connection with the Mandri's lagoons. The top of the weirs is intended to be 0.25 ft above Mean Low Water (MLW) elevation with a 15-foot-wide by 3-foot-deep "notch" within the center of the diversion channel and Rio Anton Ruiz respectively. The construction phase of the project will take about 10 months to be completed at an approximate cost of $3,152,000. Sedimentation control measures will be implemented during the construction phase and access to the work area will be through the berms along the drainage canal and adjacent to levee. According to the Appendix A of Feasibility Report and Environmental Assessment provided by the USACE, the hydraulic analysis performed resulted in a weir design that ensures that the proposed structures will match, at minimum, the effectiveness in reducing salinity values upstream while not adversely impacting flood discharges.

The proposed project is located within the Pterocarpus Forest Natural Reserve property, adjacent to the communities of Punta Santiago, Verde Mar and Villa Palmira. The proposed barriers will be located north of the confluence of the Anton Ruíz River and at one mile from the connection of the diversion channel with the Mandri lagoons. Access to the area is via the PR-3 highway in the Punta Santiago neighborhood of Humacao, Puerto Rico.

The application and submitted documents were sent to the Department of Natural and Environmental Resources (DNER), the Puerto Rican Culture Institute (PRCI), the Environmental Quality Board (EQB), the State Historic Preservation Office (SHPO), and the Fish & Wildlife Service (FWS), for their review and comments. A public notice was also issued. During the granted comment period, the following comments were received:

- **FWS**: This agency agrees with the Corps proposed action to reduce the amount of saltwater reaching the wetlands. This would restore salinities within the forested Pterocarpus swamp and freshwater lagoons. The Corps should consider mark the permanent SWIM structures with visual aids to avoid damage to the structure by boats. Listed species wich may occur in the vicinity of the proposed work and are under the FWS jurisdiction include the West Indian (Antillean) manatee (Trichechus manatus manatus) and the Puerto Rican boa (Epicrates inornatus). As conservation measures, the Corps is proposing to use standard manatee and indigo snake protection measures. Since the indigo snake does not occur in the U.S. Caribbean, the FWS recommends to utilize the standard conditions for the Antillean manatee and PR boa developed by the Service in lieu of the Florida species measures.

- **SHPO**: this agency acknowledged receipt of the public notice disclosed by the Puerto Rico Planning Board on the application for Certification for the proposed project and informed that they have been issuing comments to the USACE about it.

After reviewing the submitted application, received comments, and information at file, the Puerto Rico Planning Board in its meeting of June 21, 2017 concurred with the U.S. Army Corps determination that the Rio Anton Ruiz 1135 CAP project **is Consistent with the Puerto Rico Coastal Zone Management Program**. The PRPB recommends completing the required procedures to obtain the state endorsement about compliance with Article 4B(3) of the Puerto Rico Environmental Policy Law from the PR Permit Management Office (OGPe). This endorsement is required by the PR Environmental Quality Board (PREQB) to emit a Water Quality Certificate in case that it is needed for the project.

This Federal Consistency Certificate does not exempt the project to comply with other federal or state requirements.

The following parties shall be notified: Gina Paduano Ralph, Chief, Environmental Branch, U.S. Army Corps of Engineer; **Tania Vázquez**, Secretary, Department of Natural and Environmental Resources; **Manuel Corvette,** Manager, Humacao Pterocarpus Forest Natural Reserve; **Ernesto Díaz,** Puerto Rico Coastal Zone Management Program, Department of Natural and Environmental Resources.

María del C. Gordillo Pérez
President

Certify: That this Resolution is copy of the agreement adopted by Puerto Rico Planning Board (PRPB) in its meeting of **June 21, 2017**. I expedite and notify this copy to the parties under my sign and official stamp of the Puerto Rico Planning Board stamp, for general use and knowledge.

In San Juan, Puerto Rico, today 06 JUL 2017

Loida E. Soto Nogueras
Secretary

GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

CHAPTER 4.0 RECOMMENDED PLAN

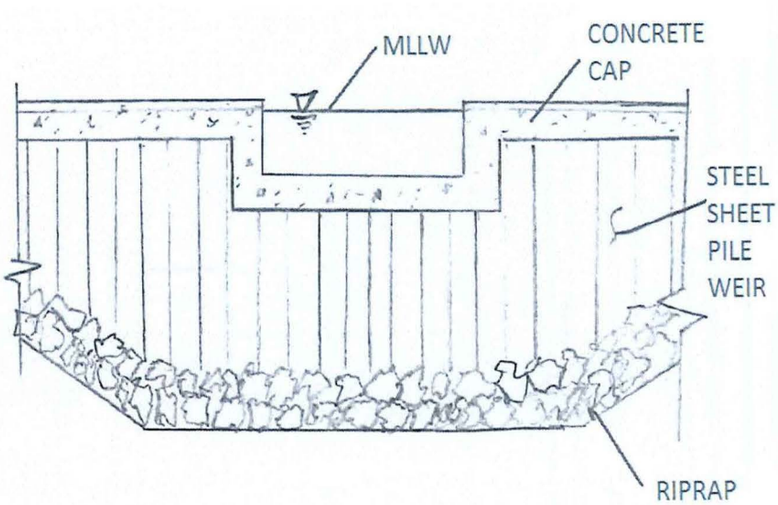

Figure 4-2: Conceptual Cross Section sketch of the weir

JP-815-RS
JUN 2003

Gobierno de Puerto Rico
Oficina del Gobernador
Junta de Planificación

DESPACHADO
JUL 06 2017
UNIDAD DE CORREO

Sello del Correo de la Junta de Planificación

CERTIFICACION DE NOTIFICACIONES

Certifico que, las siguientes personas y/o Agencias u Oficinas han sido notificadas mediante Resolución, del acuerdo tomado por la Junta de Planificación con relación al

Caso Número: **CZ-2017-0424-044** **Página:** **1 de 1**

	NOMBRE	DIRECCION
1)	KRISTEN L SCHELER REPRESENTANTE	JACKSONVILLE DISTRICT CORPS OF PO BOX 4970 JACKSONVILLE, FL 322320019
2)	GINA PADUANO RALPH DUEÑO	JACKSONVILLE DISTRICT CORPS OF PO BOX 4970 JACKSONVILLE, FL 322320019
3)	CARLOS RUIZ CORTES DIRECTOR EJECUTIVO INSTITUTO DE CULTURA PUERTORRIQUEÑA	APARTADO 9024184 SAN JUAN PR 00902-4184
4)	HON. MARCELO TRUJILLO PANISSE ALCALDE MUNICIPIO DE HUMACAO	PO BOX 178 HUMACAO PR 00792-0178
5)	ING. IAN CARLO SERNA DIRECTOR EJECUTIVO OFICINA DE GERENCIA DE PERMISOS (OGPE)	PO BOX 41179 ESTACIÓN MINILLAS SAN JUAN PR 00940-1179
6)	LCDA. TANIA VAZQUEZ PRESIDENTA JUNTA DE CALIDAD AMBIENTAL	PO BOX 11488 SAN JUAN PR 00910-2604
7)	SINDULFO CASTILLO CUERPO DE INGENIEROS DEL EJERCITO	ANNEX BUILDING, FUNDACION ANGEL R 2ND FLOOR SUITE 202 AVE ROOSEVELT SAN JUAN PR 00918
8)	SR. CARLOS RUBIO CANCELA DIRECTOR EJECUTIVO OFICINA ESTATAL DE CONSERVACION HISTORICA	PO BOX 9023935 SAN JUAN PR 00902-3935
9)	TANIA VAZQUEZ RIVERA SECRETARIA DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES	PO BOX 366147 SAN JUAN PR 00936
10)	SUPERVISOR US FISH & WILDLIFE SERVICE	CARIBBEAN FIELD OFFICE PO BOX 491 BOQUERON PR 00622-0491
11)	SRA. ROSE ORTIZ UNIDAD DE ZONA COSTANERA JUNTA DE PLANIFICACION	PO BOX 41119 MINILLAS STATION SAN JUAN PR 00940-1119
12)	ERNESTO DIAZ / PROG MANEJO DE LA ZONA COSTANERA PR	PO BOX 366147 SAN JUAN PR 00936
13)	MANUEL CORVETTE / RESERVA DEL PLATANO Y BOSQUE	272 CALLE ASABACHE URB. VERDE MAR PUNTA SANTIAGO 00741

Cantidad de Notificaciones: **13**

6 DE JULIO DE 2017
Fecha de Notificación
y Archivo en Autos

Lorraine
Funcionario que Notifica

CERTIFICO: Loida Soto Nogueras
Loida Soto Nogueras
Secretaria Junta Propia

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

JUN 0 1 2017

Planning and Policy Division
Environmental Branch

Ms. Suheidy Barreto Soto
Director, Physical Planning Program
Puerto Rico Planning Board
P.O. Box 41119, Minillas Station
San Juan, Puerto Rico

Dear Ms. Baretto Soto:

This letter acknowledges the U.S. Army Corps of Engineers (Corps) receipt of your May 3, 2017 letter regarding the Coastal Zone Management Act (CZMA) coordination for the Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) for the Rio Anton Ruiz Continuing Authorities Program (CAP) section 1135 project in Humacao, Puerto Rico. In that letter, the Puerto Rico Planning Board staff expressed concern regarding compliance of this Federal Activity with enforceable policies of the Puerto Rico Coastal Zone Management Program. The Corps has reviewed and considered the concerns presented by the Puerto Rico Planning Board in its letter and has prepared the enclosed responses to these concerns.

The Corps appreciates the input provided by the Puerto Rico Planning Board on this project. Any questions regarding this project should be directed to Ms. Kristen Scheler at the letterhead address or by telephoning 904-232-2918.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Enclosure

Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) for the Rio Anton Ruiz Continuing Authorities Program (CAP) section 1135 project in Humacao, Puerto Rico

U.S. Army Corps of Engineers (Corps) Responses to Puerto Rico Planning Board Coastal Zone Management Program Request for Additional Information

Puerto Rico Planning Board requests for additional information are listed below in italics, and the U.S. Army Corps of Engineers, Jacksonville District (Corps) response is provided below each request.

1. The USACE must submit the Feasibility Report and Environmental Assessment document to OGPe as soon as possible, including digital copy of the comment letters received during the NEPA public comment period. This must be done electronically through ogpe.pr.gov.

> The Corps will work with Puerto Rico Planning Board's point of contact to ensure that the electronic records are provided to OGPe through the ogep.pr.gov website.

2. The Special Flood Hazard Areas Regulation (Planning Regulation Number 13) establishes that any project within the floodway must comply with section 6.00, which establishes that no obstacles or substantial improvements are allowed as well as other developments unless a study demonstrate that (1) The proposal shall no result in an increase of the flooding levels in the floodway during a base flooding discharge event (1%) and that (2) The engineering study must be based on the current regulatory study. The methodologies must comply with state and federal FEMA standards. … Provide copy of the FEMA endorsement letter or inform about coordination with this agency to comply with above mentioned Federal and state regulations.

> 40 CFR 60.3(d)(3) states "When the Federal Insurance Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AO zones, AH zones, A99 zones, and A zones on the community's FIRM, and has provided data from which the community shall designate its regulatory floodway, the community shall: Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge."
>
> In 2001, the Corps completed construction of the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended. The purpose of the 205 Flood Control Project was to reduce flood damages to the coastal communities of Punta Santiago, Verde Mar, and Villa Palmira, near

Humacao, Puerto Rico. Historically, flooding occurred in these communities when runoff from the mountains within the watershed flowed into the HNR lagoon system and the Pterocarpus forest before reaching the Caribbean Sea. The authorized flood control project protects those communities from flooding with a levee, interior drainage canal, and a diversion channel to the ocean. Since the completion of the authorized flood control project in 2001, the lagoon system and Pterocarpus forest ecosystem have been affected by high levels of salinity, resulting in changes to the biodiversity of the Humacao Natural Reserve lagoon system. Field observations indicated that a vast number of Pterocarpus trees on the north shore of the Rio Anton Ruiz were exhibiting signs of environmental stress such as wilting, loss of foliage, and dry bark.

In 2007, a series of temporary saltwater intrusion measures (SWIMs) were developed and constructed by the Corps under the authority of the original 205 flood control project and funded 100% by the non-federal sponsor, Department of Natural and Environmental Resources (DNER). After the installation of the temporary SWIMs, salinity data gathered at the monitoring stations indicated that the initial target salinities below 10 ppt had been met. At the end of 2008/beginning of 2009, the temporary SWIMs began losing their effectiveness and the salinity data exceeded 10 ppt. The intent of the SWIMs installation was to implement a temporary structure that could aid in determining if a permanent solution would be warranted. Based on the SWIMs success, the currently proposed project is the permanent solution to the saltwater intrusion and will not result in a change to the flood levels. The draft IFR/EA was released for public and agency review and comment from March 31, 2017 to April 30, 2017. No comments were received from FEMA.

GOVERNMET OF PUERTO RICO
Planning Board
Office of the Governor

May 3, 2017

Gina Paduano
Environmental Branch
U.S. Army Corps of Engineers, Jacksonville District
PO Box 4970
Jacksonville, Florida 32203-4412

Application for Federal Consistency Review
CZ-2017-0424-044
Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
Humacao, Puerto Rico

Dear Ms. Paduano:

We have been evaluating the documents submitted for the application at reference. According to our review, the application is considered complete and the Federal Consistency review period began on **March 31, 2017** date in which the application documents were received. The number **CZ-2017-0424-044** has been assigned for this review; please make reference to it in your future communications.

The project at reference is a Federal Activity according to Federal Consistency regulations at 15 CFR Part 930. This regulation establishes a 60 day period to complete the Federal Consistency review for these activities. Therefore, for this application it will expire on **May 31, 2017**. After completing the evaluation of the Feasibility Report-Environmental Assessment and other provided documents, the Puerto Rico Planning Board have the following concerns regarding compliance of this Federal Activity with enforceable policies of the Puerto Rico Coastal Zone Management Program:

1- The proposed Project must comply with Article 4B(3) of the Puerto Rico Environmental Policy Law. According to this law, before a proposing agency reaches a final decision regarding a proposed action or project, it shall comply with the Puerto Rico state process of environmental planning by issuing an environmental document, either establishing that the actions involved will have an environmental impact or that they will not have such and impact. According to applicable state procedures, the corresponding environmental document must be submitted electronically at the PR Permit Management Office (OGPe) through ogpe.pr.gov. Projects that require to comply with the NEPA requirements and procedure can submit the same environmental document to obtain the state compliance. Therefore, the USACE must submit the Feasibility Report and Environmental Assessment document to OGPe as soon as possible, including digital copy of the comment letters received during the NEPA public comment period. This must be done electronically through **ogpe.pr.gov**. For any assistance with this procedure you may contact:

Jaime Green
Director
Environmental Compliance Division
PR Permit Management Office
Phone: 787-721-8282 ext. 16368
E-mail: jaimegreen@ogpe.pr.gov

2- According to information provided in Appendix A (Engineering), *"the hydraulic analysis performed resulted in a weir design that ensures that the permanent replacements for the temporary SWIM's will match, at minimum, the effectiveness in reducing salinity values upstream while not adversely impacting flood discharges to tide (i.e. no impact on flood damage reduction provided by original project)"*. Notwithstanding, we have the following concern:

- The Special Flood Hazard Areas Regulation (Planning Regulation Number 13) establishes that any project within the floodway must comply with section 6.00, which establishes that no obstacles or substantial improvements are allowed as well as other developments unless a study demonstrate that (1) The proposal shall not result in an increase of the flooding levels in the floodway during a base flooding discharge event (1%) and that (2)The engineering study must be based on the current regulatory study. The methodologies must comply with state and federal FEMA standards.

  According to panel 72000C1290J (effective since November 18, 2009) of the Digital Flood Insurance Rate Maps (DFIRM), the proposed project is located within Zone AE (Floodway of Boca Prieta). Regulations at 44 CFR 60.39d, establishes that when a community adopts its floodway, each project located within it must count with an encroachment review and an analysis to determine if the project will increase the flood height or cause an increase in flood heights adjacent to the project site. The "Encroach Certification" is required to ensure that the encroachment review is done right. The developer has to provide an encroachment certification or no-rise certificate, indicating that the proposed project will not affect flood heights. The certification must be supported by technical data, which should be based on the same computer model used to develop the floodway as established.

  The above mentioned analysis and Encroachment Certification should be referred to the Federal Emergency Management Agency (FEMA), Region II in New York in order to obtain the required endorsement letter from this agency. Considering this, provide copy of the FEMA endorsement letter or inform about coordination with this agency to comply with above mentioned Federal and state regulations.

As part of the established procedures for Federal Consistency review, the Puerto Rico Planning Board (PRPB) must provide adequate means for public participation. The PRPB edited a public notice in Spanish and English to be disclosed during this week among state government offices, fishermen, NGO´s and other stakeholders. Considering the above mentioned concerns and to provide adequate means for public participation, the PRPB requests an extension of 15 labor days, until June 21, 2017, to conclude the Federal Consistency review of this project. The proposed work schedule is as follows:

Date	Task
May 2, 2017 to May 26, 2017	Public notice disclosure and comment period for the consulted agencies and public
May 29, 2017 to June 9, 2017	Evaluation of received comments. If the consulted agencies and public raise concerns or provide recommendations, the PRPB will provide copy of the received letters to the USACE to address it. If the consulted agencies do not present concerns or matters to be addressed, the Puerto Rico Planning Board will proceed directly with the final evaluation and include the case in the PRPB agenda for presentation to emit the Federal Consistency Concurrence Determination (FCCD).
June 9, 2017 to June 21 , 2016	Final evaluation including USACE comments or additional information, PRPB presentation to emit the FCCD and edition and disclosure of the official document.

The Puerto Rico Planning Board recognizes the need and urgency of this project to protect the natural resources at the Pterocarpus Forest Reserve. We are in the best disposition to collaborate with the USACE in this effort. Please indicate as soon as possible if the U.S. Army Corps of Engineers agree with the above mentioned work schedule and requested extension. If you have any question or need assistance, do not hesitate to contact Rose A. Ortiz at (787) 722-0101, ext. 16012 or e-mail: ortiz_r@jp.pr.gov

Cordially,

Suheidy Barreto Soto
Director
Physical Planning Program

RAO

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

MAR 3 1 2017

Planning and Policy Division
Environmental Branch

Ms. Rose Ortiz
Coastal Zone Management Consistency Office
Puerto Rico Planning Board
P.O. Box 41119, Minillas Station
San Juan, Puerto Rico 00940

Dear Ms. Ortiz:

Enclosed with this letter is the U.S. Army Corps of Engineers (Corps), Jacksonville District's Federal Consistency Determination (FCD) for the Rio Anton Ruiz Section 1135 Continuing Authorities Program (CAP) project. The Rio Anton Ruiz project is located in the Humacao Natural Reserve (HNR) in Humacao, Puerto Rico. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary saltwater intrusion measures (SWIM) structures. By constructing both weirs, the entire HNR system will be protected from saltwater intrusion as a result of the diversion channel constructed in 2001 under the Rio Anton Ruiz Flood Control Project, CAP Section 205 of the Flood Control Act of 1948, as amended. Additional information, including a copy of the draft Integrated Feasibility Report and Environmental Assessment and associated appendices, will be available for review for 30 days on the Corps' environmental planning website, under Puerto Rico, from the date of this letter. For your convenience, the website link is:

http://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/

The Corps has determined that the proposed federal action has reasonably foreseeable effects on Puerto Rico's coastal uses and resources and is consistent to the maximum extent practicable with the enforceable policies of Puerto Rico's Coastal Zone Management Program. The Jacksonville District respectfully requests a letter of concurrence with our FCD determination within 30 days of the date of this letter for the Rio Anton Ruiz CAP project.

If you have any questions, or need additional information, please contact Kristen Scheler by email Kristen.L.Scheler@usace.army.mil or telephone 904-232-2918. Thank you for your assistance.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Planning and Policy Division

Enclosure

JP-833
Rev. MAR 2005

Commonwealth of Puerto Rico
Office of the Governor
Puerto Rico Planning Board
Physical Planning Area
Land Use Planning Bureau

Application for Certification of Consistency with the Puerto Rico Coastal Management Program

General Instructions:

A. Attach a 1:20,000 scale, U.S. Geological Survey topographic quadrangular base map of the site.

B. Attach a reasonably scaled plan or schematic design of the proposed object, indicating the following:

1. Peripheral areas

2. Bodies of water, tidal limit and natural systems.

C. You may attach any further information you consider necessary for proper evaluation of the proposal.

D. If any information requested in the questionnaire does not apply in your case, indicate by writing "N/A"(not applicable).

E. Submit a minimum of seven (7) copies of this application.

DO NOT WRITE IN THIS BOX

Type of application: _____ Application Number: _____

Date received: _____ Date of Certification: _____

Evaluation result: ☐ Objection ☐ Acceptance ☐ Negotiation

Technician: _____ Supervisor: _____

Comments: _____

1. Name of Federal Agency: US Army Corps of Engineers, Jacksonville District

2. Federal Program Catalog Number: _____

3. Type of Action:

☑ Federal Activity ☐ License or permit ☐ Federal Assistance

4. Name of Applicant: Gina Paduano Ralph, Ph.D., Chief, Environmental Branch

Postal Address: P.O. Box 4970, Jacksonville, FL 32232-0019

Telephone: 904-232-2336 Fax: 904-232-3442

5. Project name: Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project

6. Physical Description of Project Location (area, facilities such as vehicular access, drainage, storm and sanitary sewer placement, etc.): See attachment 1.

Lambert Coordinates: X = _____ Y = _____

7. Type of construction or other work proposed:

☐ drainage ☐ channeling ☐ landfill ☐ sand extraction

☐ pier ☐ bridge ☐ residential ☐ tourist

others (specify and explain) Sheetpile notched concrete cap weirs

Description of proposed work: See attachment 1.

8. Natural, artificial, historic or cultural systems likely to be affected by the project

Place an X opposite any of the systems indicated below that are in the project area or its surroundings, which are likely to be affected by that activity. Indicate the distance from the project to any outside system that would likely be affected.

System	Within Project	Outside Project	Distance (meters)	Local name of affected system
beach, dunes				
marshes	X			Typha marsh
coral, reefs				
river, estuary	X			Rio Anton Ruiz
bird sanctuary				
pond, lake, lagoon	X			Mandri lagoons
agricultural unit				
forest, wood	X			Pterocarpus forest
cliff, breakwater				
cultural or tourist area	X			Humacao Natural Reserve
other (explain)				

Describe the likely impact of the project on the identified system (s).

Positive ☑ Negative ☐

Explain:
See attachment 1.

9. Indicate permits, approvals and endorsements of the proposal by Federal and Puerto Rican government agencies. Evidence of such support should be attached to the proposal.

See attachment 1 for detailed information.	Yes	No	Pending	Application Number
a. Planning Board	☐	☐	☑	
b. Regulation and Permits Administration	☐	☐	☑	
c. Environmental Quality Board	☐	☐	☑	
d. Department of Natural Resources	☐	☐	☑	
e. State Historic Preservation Office	☐	☐	☑	
f. U.S. Army Corps of Engineers	☐	☐	☑	
g. U.S. Coast Guard	☐	☐	☑	
h. Other (s) (specify)	☐	☐	☐	

CERTIFICATION

I CERTIFY THAT (project name) Rio Antón Ruiz 1135 CAP project is consistent with the Puerto Rico Coastal Zone Management Program, and that to the best of my knowledge the above information is true.

Gina Paduano Ralph, Ph.D. for
Name (legible)

Signature

Chief, Environmental Branch
Position

3-7-2017
Date

6. Physical Description of Project Location (area, facilities such as vehicular access, drainage, storm and sanitary sewer placement, etc.):

The Rio Anton Ruiz Project is located in the Humacao Natural Reserve (HNR) in the municipality of Humacao on the southeast coast of Puerto Rico (Figure 1). The project area consists of the Rio Anton Ruiz, a lagoon system, and a Pterocarpus forest. Six lagoons, encompassing approximately 615 acres (249 hectares), compose the system: Mandri 1, 2, and 3; Santa Teresa 1 and 2; and Palmas. The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the same location as the temporary saltwater intrusion measures (SWIM) structures. One location is within the Rio Anton Ruiz, just north of the confluence of the Rio Anton Ruiz and the diversion channel (Weir #1). The other location (Weir #2) is within the diversion channel, approximately ½ mile from the mouth of the diversion channel at the lagoon.

Figure 1. Action area and project location

Access for the project will be via the existing project limits, within the berms along the channel and adjacent to the levee. An existing disposal/borrow area will be used for the staging/stockpiling. All construction and maintenance access can use the existing project limits from the original 2001 Rio Anton Ruiz CAP Section 205 project (see Figure 2 below).

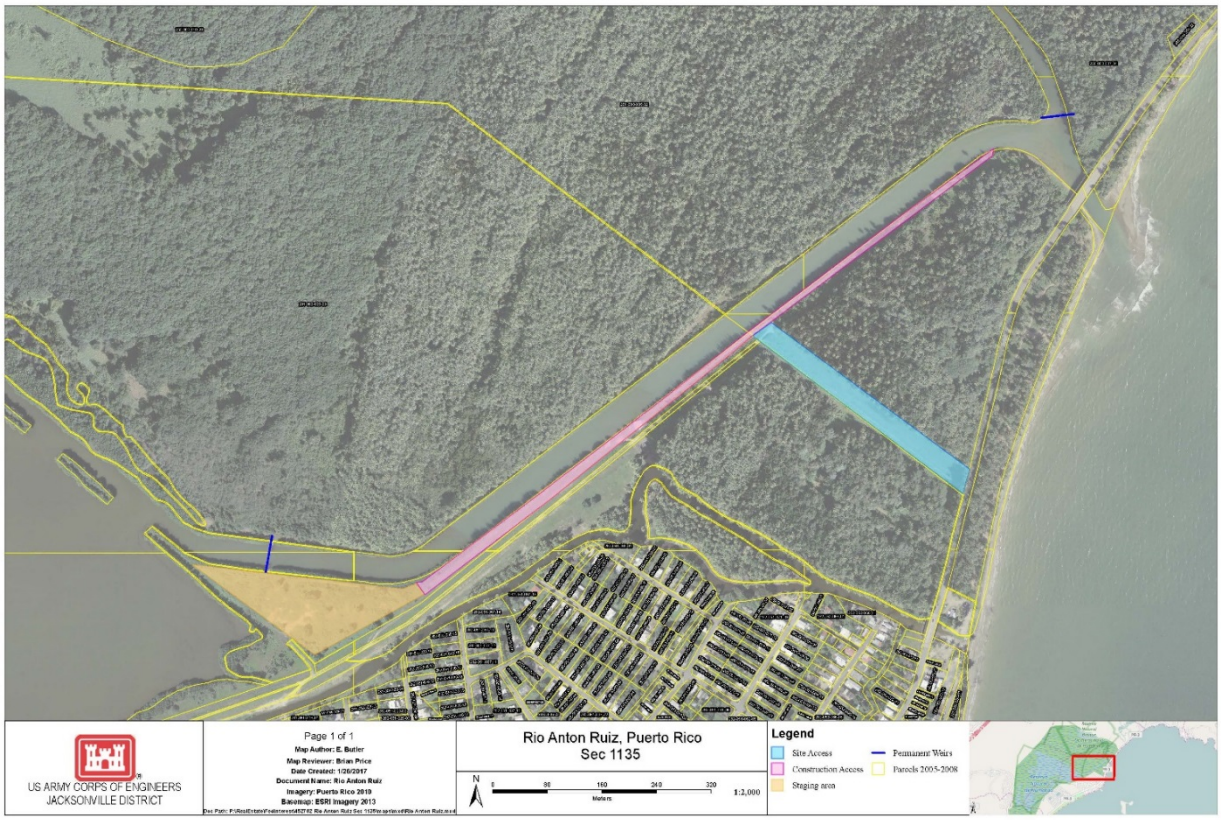

Figure 2. Project access and staging

7. Description of proposed work:

The Recommended Plan consists of constructing two sheetpile notched concrete cap weirs at the location of the temporary SWIMs. During the design phase, additional soil borings and hydrographic/topographic survey will be collected for use in refined analysis of the riprap, sheetpile, and hydraulic designs. The sheetpile material should be investigated during final design, including the use of cold rolled steel or vinyl sheetpile sections to possibly reduce costs.

The construction effort will take approximately 10 months to complete. Weir #1 will be approximately 180 linear feet. Weir #2 will be approximately 140 linear feet. Both weirs will have a notch that is 3 feet deep by 15 feet wide and a 2 feet by 1 foot concrete cap. The construction sequence for the project will start at Weir #1 and progress to Weir #2. Construction will include the installation of erosion and sediment control features including silt fence along the work perimeters and floating turbidity barriers within the Rio Anton Ruiz and diversion channels, upstream and downstream of the structure locations.

The structures will be sheetpile driven from the bank of the diversion channel. Depending on the tidal conditions, there may be the need to draw down the water level directly adjacent to the sheetpile in order to construct the concrete cap. Sheetpile or use of other means to create a small dewatering cell and then pumping directly back into the channel should be sufficient if the concrete cap is placed in sections. No diversion of water (diversion channel) is anticipated for any dewatering efforts. Temporary turbidity will occur as a result of sheetpile driving. Impacts will be temporary and localized, lasting only as long as construction takes place. Best Management Practices (BMPs) and methods to manage the placement of concrete caps and sheetpile driving will ensure minimized and controlled turbidity. Final details for BMPs and methods will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods.

8. Describe the likely impact of the project on the identified system(s).

The likely impact of the project on the identified systems is positive. The purpose of the Rio Anton Ruiz Restoration Project is to preserve the *Pterocarpus officinalis* forest and the biodiversity of both the freshwater and saltwater fauna and flora in the HNR within the limited authority of the CAP 1135 Program. Degradation from the loss of freshwater habitat has likely caused a decline in the number of freshwater species present in the action area, which can impact life cycles, community structures, population densities, and the overall biodiversity of fauna located in the lagoon system. No corals, coral reefs, or hardbottoms are currently present in the project area. Restoration of the freshwater habitat would allow for recovery of the Typha marsh, Pterocarpus forest, and various freshwater fauna and flora within the HNR.

Based on achieved success from the 2007 installation of the temporary SWIMs, it is anticipated that the construction of the permanent sheetpile weirs with notched concrete cap will inhibit saltwater intrusion into the freshwater systems. The salinity control target for the temporary SWIMs was a reduction in salinity concentrations from 35 ppt to below 10 ppt. The Department of Natural and Environmental Resources (DNER) salinity monitoring stations within the HNR system were used to monitor the salinity levels upon completion of the temporary SWIMs. After the installation of the SWIMs, salinity data gathered at the monitoring stations indicated that the initial target salinities below 10 ppt had been met. At the end of 2008/beginning of 2009, the temporary SWIMs began losing their effectiveness and the salinity data exceeded 10 ppt.

9. Indicate permits, approvals and endorsements of the proposal by Federal and Puerto Rican government agencies. Evidence of such support should be attached to the proposal.

Consultation to comply with Section 106 responsibilities under the National Historic Preservation Act (NHPA) is ongoing and will be completed prior to project implementation. Additionally, coordination under Section 7 of the Endangered Species Act (ESA) with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) is ongoing and will be completed prior to project implementation. This project will be performed in compliance with Puerto Rico's water quality standards. An application for a water quality certification will be submitted. All permits and approvals will be obtained prior to the start of construction.

APPENDIX D

ATTACHMENT 4

Distribution List

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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FEDERAL AGENCIES

Mr. Edwin Muñiz
Caribbean Ecological Services Field Office
U.S. Fish and Wildlife Service
Road 301 Km 5.1
Boquerón, Puerto Rico 00622

Caribbean Environmental Protection Division, US EPA Region 2
City View Plaza II – Suite 7000
#48 Rd. 165 km 1.2
Guaynabo, PR 00968

Commander
US Coast Guard
#5 Calle La Puntilla Final
San Juan, PR 00901

Mr. David Bernhart
NOAA/National Marine Fisheries Service
263 13th AVE S
St. Petersburg, FL 33701

COMMONWEALTH AGENCIES

Puerto Rico Department of Natural and Environmental Resources
ATTN: Carmen R. Guerrero Pérez
P. O. Box 366147
San Juan, Puerto Rico 00936

Puerto Rican Culture Institute
Jorge Irizarry Vizcarrondo, Executive Director
Apartado 9024184
San Juan, Puerto Rico 00902

Puerto Rico Economic Development Department
Alberto Bacó Bagué
PO Box 362350
San Juan, PR 00936

Puerto Rico Environmental Quality Board
Weldin Ortiz Franco, President
PO Box 11488
Santurce, Puerto Rico 00910

Puerto Rico Fire Department
Angel A. Crespo Ortiz, Chief
Apartado 13325
San Juan, Puerto Rico 00908

Puerto Rico Health Department
ATTN: Ana Ríus Armendáriz
PO Box 70184
San Juan, PR 00936

Puerto Rico National Guard
Coronel Marta Carcana
PO Box 9023786
San Juan, PR 00902

Puerto Rico Permits Management Agency
Alberto Lastra Power, Executive Director
PO Box 41179
San Juan, PR 00940

Puerto Rico Planning Board
Luis García Pelatti, President
Centro Gubernamental Roberto Sánchez Vilella
Apartado 41119
Santurce, Puerto Rico 00940

Puerto Rico Public Service Commission
Omar E. Negrón Judice, Executive Director
PO Box 190870
San Juan, PR 00919

Puerto Rico State Historic Preservation Officer
PO Box 9023935
San Juan, PR 00902

LOCAL AGENCIES

Municipality of Humacao
Honorable Marcel Trujillo-Panisse
City Hall, Miguel Casillas, St
Corner of Terminal Norte St.
Humacao, PR 00792-0178

APPENDIX D

ATTACHMENT 5

National Environmental Policy Act (NEPA)
Public and Agency Comments and Corps' Responses

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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No comments were received during the public comment period, March 31, 2017 through April 30, 2017.

APPENDIX D

ATTACHMENT 6

SHPO Coordination

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

Ms. Diana López Sotomayor
State Historic Preservation Officer
Office of the Governor
P.O. Box 9023935
San Juan, Puerto Rico 00902-3935

Dear Ms. López:

The U.S. Army Corps of Engineers (Corps), Jacksonville District is studying the environmental effects associated with the proposed Rio Anton Ruiz project. The Corps project will involve construction of concrete weirs in two areas to limit saltwater intrusion (Figure 1). In 2005, the Corps constructed temporary structures across the diversion channel and the lagoon and across the Rio Anton Ruiz above its confluence with the diversion channel. The plugs were designed to limit saltwater while allowing boat traffic to cross over the top of the temporary structures. The Corps is currently seeking to make the structures permanent as part of this project.

During the previous construction of the diversion channel, the Corps conducted data recovery at two sites (HU-6 and HU-7) in conjunction with our flood control project on the Rio Anton Ruiz, Humacao, Puerto Rico. Consultation under Section 106 of the National Historic Preservation Act on this project was concluded with a determination of No Adverse Effect. Your office concurred with this determination in a letter dated August 7, 1995 based upon the Corps' data recovery project and language within 36 CFR 800 that permitted a mitigated No Affect determination. The mitigation resulted in the following report: *Archaeological Data Recovery at Sites HU-6 and HU-7, Río Antón Ruíz Flood Control Project, Municipio de Humacao, Puerto Rico* by New South Associates.

The current project has been designed to minimize impacts to cultural resources; however, due to project needs, one of the weirs must be constructed across the Rio Anton Ruiz above its confluence with the diversion channel (Figure 2). This location will place the construction footprint at the very northeastern edge of site HU-6. While much of this area has been destroyed by the construction of the diversion channel, previous data recovery testing indicated that the outer edge of the site may still exist on the northeastern shoreline and that very low-density archaeological materials may be encountered during construction. The Corps recognizes that because the previous project concluded with a mitigated No Adverse Effect determination, site HU-6 remains eligible for inclusion in the National Register of Historic Places.

Based on a review of the project history and the current weir design, the Corps recognizes that while there is potential for archaeological materials to be present, these materials should be located on the site periphery, and if encountered, would be ephemeral in nature. Additionally, as previous data recovery has occurred in the immediate vicinity of the proposed constriction footprint, any materials present would be unlikely to yield new evidence or change our current understanding of the site. As such, the Corps has determined that the currently proposed project will have No Adverse Effects; however, the Corps will require an archaeological monitor be on site during all ground-disturbing activities related to the construction of the weirs. I request your comments on the determination of No Adverse Effect. If there are any questions, please contact Dr. Dan Hughes at 904-232-3028 or e-mail at daniel.b.hughes@usace.army.mil.

Sincerely,

for Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Google earth
Image U.S. Geological Survey
N
600 ft

ESTADO LIBRE ASOCIADO DE
PUERTO RICO
Oficina Estatal de Conservación Histórica
State Historic Preservation Office

August 30, 2016

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Jacksonville District Corps of Engineers
701 San Marco Boulevard
Jacksonville, FL 32207-8175

SHPO 08-01-16-01 CONSTRUCTION OF TWO CONCRETE WEIRS, RÍO ANTÓN RUIZ, HUMACAO, PUERTO RICO

Dear Dr. Ralph:

We acknowledge receipt on August 1, 2016 of your letter regarding the above referenced project. According to the information submitted, the construction footprint will extend into the northeastern edge of the archaeological site HU-6. While much of this site was destroyed during previous archaeological data recovery operations in 2000 and the subsequent construction of the diversion channel, it is not clear whether significant archaeological material remains still exist. Since 1995, 36 CFR Part 800 has been amended and no longer provides for a finding of *no adverse effect* through the process of archaeological data recovery. In light of this change, if HU-6 still contains important information regarding the prehistory or history of Puerto Rico and the new construction will damage or destroy that information, the criteria of *adverse effect* found in 36 CFR 800.5(a)(1) would have been met.

According to your letter, HU-6 remains eligible for inclusion in the National Register of Historic Places. If such is the case, further damage to the site meets the criteria of adverse effect and the U.S. Army Corps of Engineers and our Office would have to consult further to resolve the project effects, pursuant to §800.6(a).

If you have any questions regarding this matter, please contact Miguel Bonini at (787) 721-3737 or mbonini@prshpo.pr.gov.

Sincerely,

Nydia A. Préstamo Torres, M. Arch.
Deputy State Historic Preservation Officer

NPT/BRS/MB

Cuartel de Ballajá (Tercer Piso),
Calle Norzagaray, Esquina Beneficencia, Viejo San Juan, P.R. 00901

PO Box 9023935, San Juan, P.R. 00902-3935
Tel: 787-721-3737 Fax: 787-721-3773
www.oech.gobierno.pr

SHPO
OECH
OFICINA ESTATAL DE CONSERVACIÓN HISTÓRICA
OFICINA DEL GOBERNADOR
STATE HISTORIC PRESERVATION OFFICE
OFFICE OF THE GOVERNOR

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

FEB 2 2 2017

Mr. Carlos Rubio-Cancela
Acting State Historic Preservation Officer
Office of the Governor
P.O. Box 9023935
San Juan, Puerto Rico 00902-3935

Re: SHPO 08-01-16-01 Construction of Two Concrete Weirs, Río Antón Ruiz, Humacao, Puerto Rico

Dear Mr. Rubio-Cancela:

The U.S. Army Corps of Engineers, Jacksonville District (Corps) acknowledges receipt of your letter dated August 30, 2016 regarding the above referenced project. Currently the Corps is conducting an integrated Environmental Assessment and Feasibility report to assess potential environmental and cultural effects and determine the practicability of constructing the recommended plan. The recommended plan consists of the construction of two weirs that will aid in the reduction of saltwater intrusion into a Pterocarpus forest and a lagoon system in the Humacao Natural Reserve (Figure 1).

As stated in previous consultation letters, the location of one of the proposed weirs would extend into the northeastern edge of archaeological site HU-6. Although much of the site was destroyed during the 2000 archaeological data recovery and the subsequent construction of the diversion channel, it is not clear whether significant archaeological materials remain within the proposed project footprint. The Corps concurs that 36 CFR Part 800 no longer provides for a finding of no adverse effect through the process of data recovery, and if HU-6 still contains important information regarding the prehistory of Puerto Rico than construction has the potential to destroy or damage that information which would result in an adverse effect as defined in 36 CFR 800.5(a)(1).

Based on the conditions stated above, a cultural resources survey of the weir locations will be necessary to determine if this project will have an adverse effect on historic properties. As the project is currently within the feasibility phase, detailed designs or a final construction footprint have not been developed. Once the recommended plan is approved and funding is secured, detailed project plans and specific areas of potential effects will subject to a cultural resources survey to guarantee avoidance, minimization, or mitigation of adverse effects to historic properties.

Therefore, consultation and coordination with your office will continue and be concluded during the Pre-Construction Engineering Design (PED) phase of Río Antón Ruiz project. Further consultations will be conducted for compliance with Section 106 of the National Historic Preservation Act (NHPA). No construction will occur until all legal requirements have been met, including consultation under Section 106 of the NHPA. If there are any questions, please contact Ms. Meredith Moreno at 904-232-1577 or e-mail at Meredith.A.Moreno@usace.army.mil.

Sincerely,

for

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Enclosure

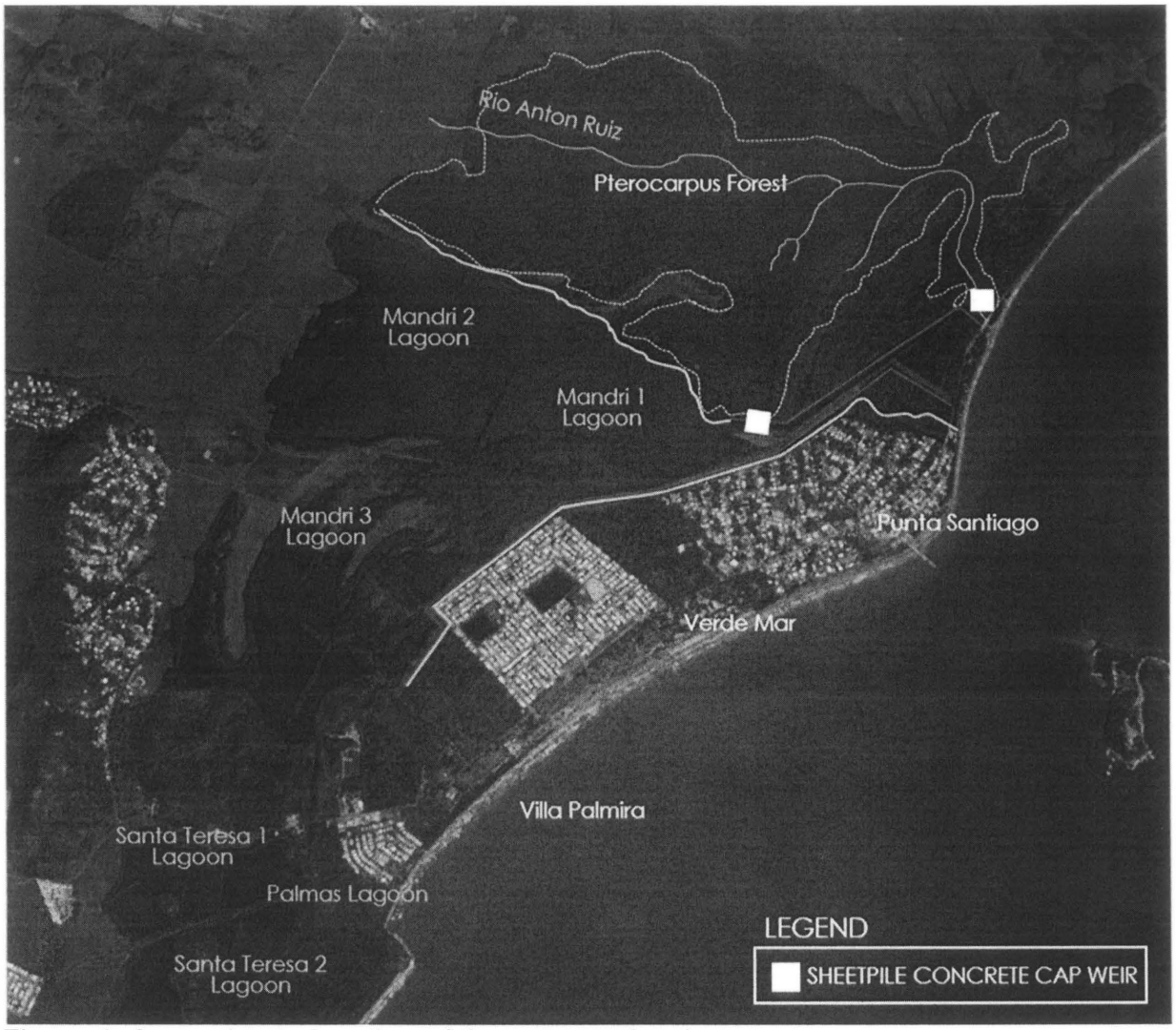

Figure 1. Approximate location of the proposed weirs.

GOBIERNO DE PUERTO RICO
Oficina Estatal de Conservación Histórica

March 17, 2017

Gina Paduano Ralph, Ph.D.
Department of the Army
Jacksonville District Corps of Engineers
701 San Marco Boulevard
Jacksonville, FL 32207-8175

SHPO 08-01-16-01 CONSTRUCTION OF TWO CONCRETE WEIRS, RÍO ANTÓN RUIZ, HUMACAO, PUERTO RICO

Dear Dr. Paduano,

Thank you for updating us on the status of the Río Antón Ruiz project. Once your funding is secured, we look forward to continuing consultation with the US Army Corps of Engineers, during the Pre-Construction Engineering Design phase, to take into account the effects of the undertaking on historic properties.

If you have any questions regarding this matter, please contact Miguel Bonini at (787) 721-3737 or mbonini@prshpo.pr.gov.

Sincerely,

Carlos A. Rubio Cancela
State Historic Preservation Officer

CARC/BRS/MB

APPENDIX D

ATTACHMENT 7

Humacao Natural Reserve 2014-2016 Fish Lists

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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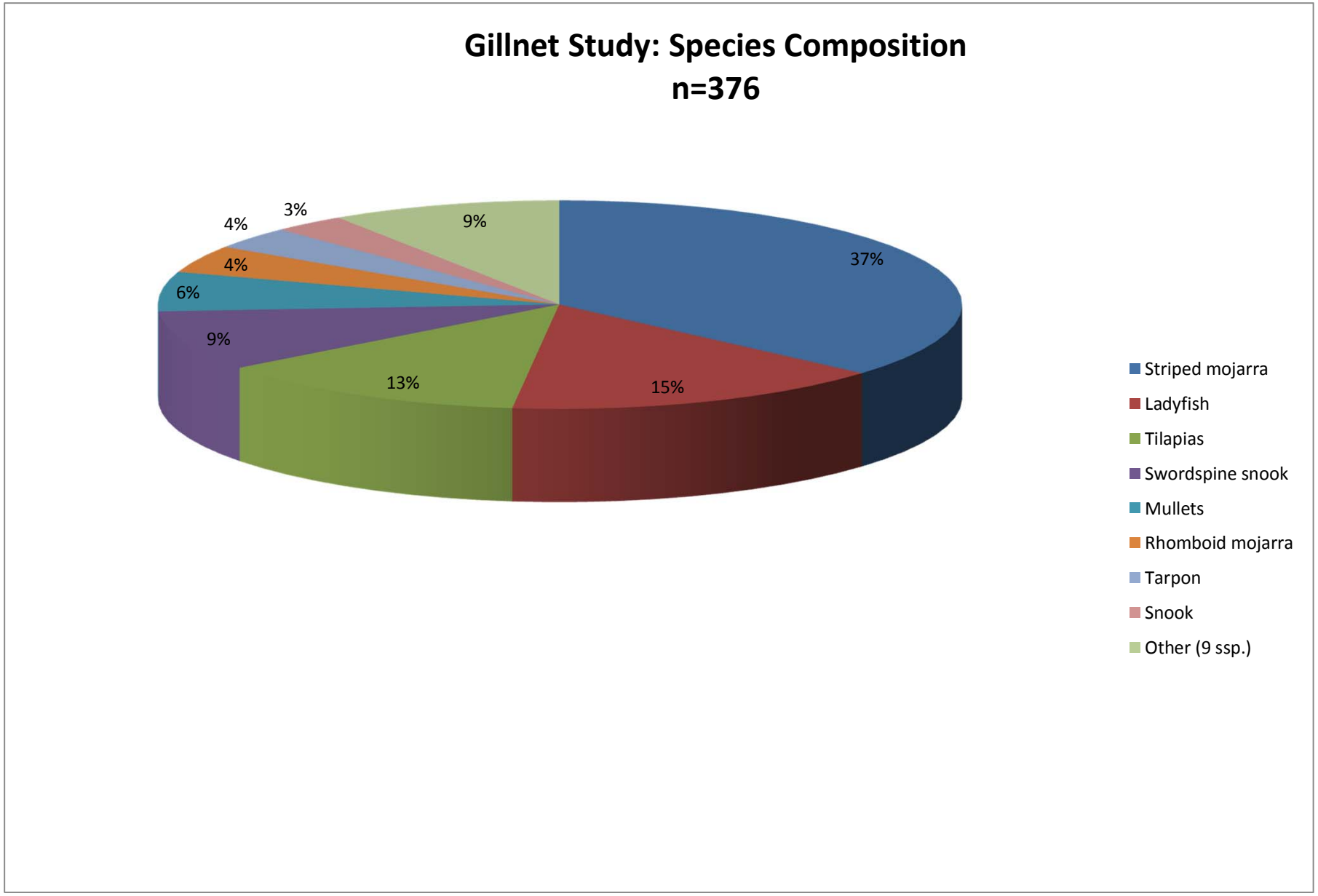

Gillnet Study: Species Composition
n=376
37%
15%
13%
9%
6%
4%
4%
3%
9%
Striped mojarra
Ladyfish
Tilapias
Swordspine snook
Mullets
Rhomboid mojarra
Tarpon
Snook
Other (9 ssp.)

Species	Quantity
Striped mojarra	137
Ladyfish	58
Tilapias	48
Swordspine snook	35
Mullets	23
Rhomboid mojarra	16
Tarpon	13
Snook	11
Other (9 ssp.)	35
Total	**376**

Tilapia		
length	number	percent
20-23	1	2.083333
23-26	0	0
26-29	3	6.25
29-32	11	22.91667
32-35	21	43.75
35-38	8	16.66667
38-41	4	8.333333
	48	

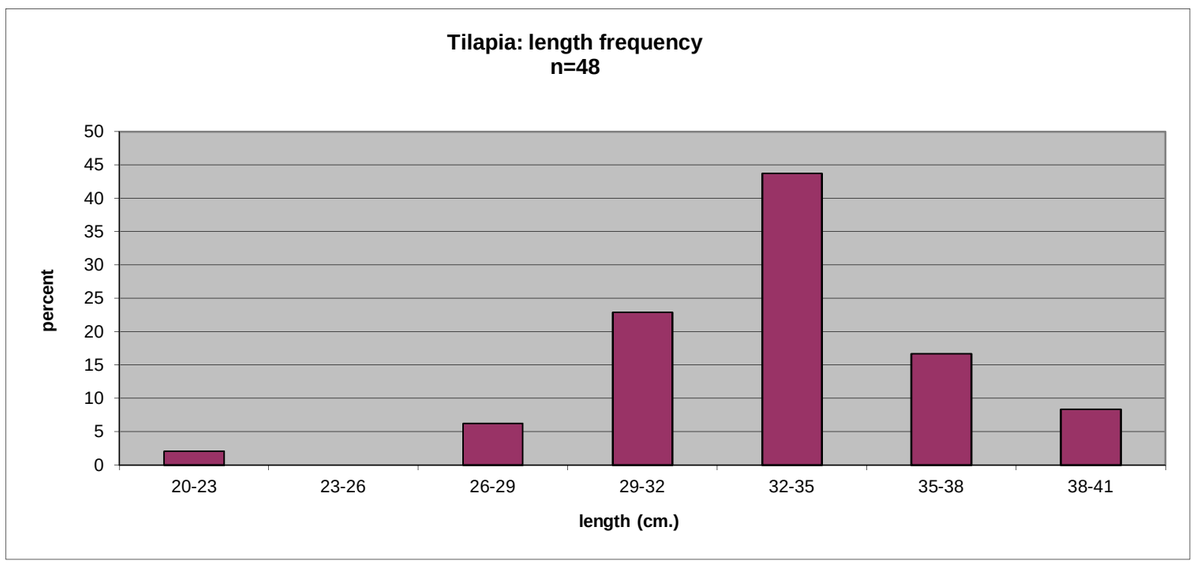
Mullet		
length	number	percent
20-24	3	13.63636
24-28	8	36.36364
28-32	1	4.545455
32-36	2	9.090909
36-40	4	18.18182
40-44	1	4.545455
44-48	0	0
48-52	0	0
52-56	2	9.090909
56-60	0	0
60-64	1	4.545455
	22	

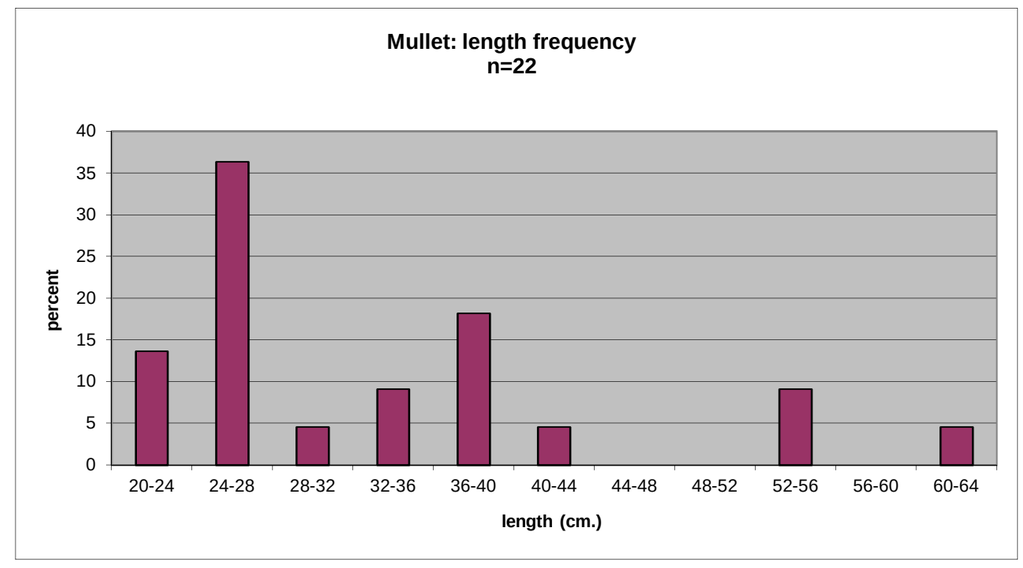
Sw. Snook		
length	number	percent
<20	1	2.857143
20-22	9	25.71429
22-24	12	34.28571
24-26	4	11.42857
26-28	2	5.714286
28-30	3	8.571429
30-32	1	2.857143
32-34	3	8.571429
	35	

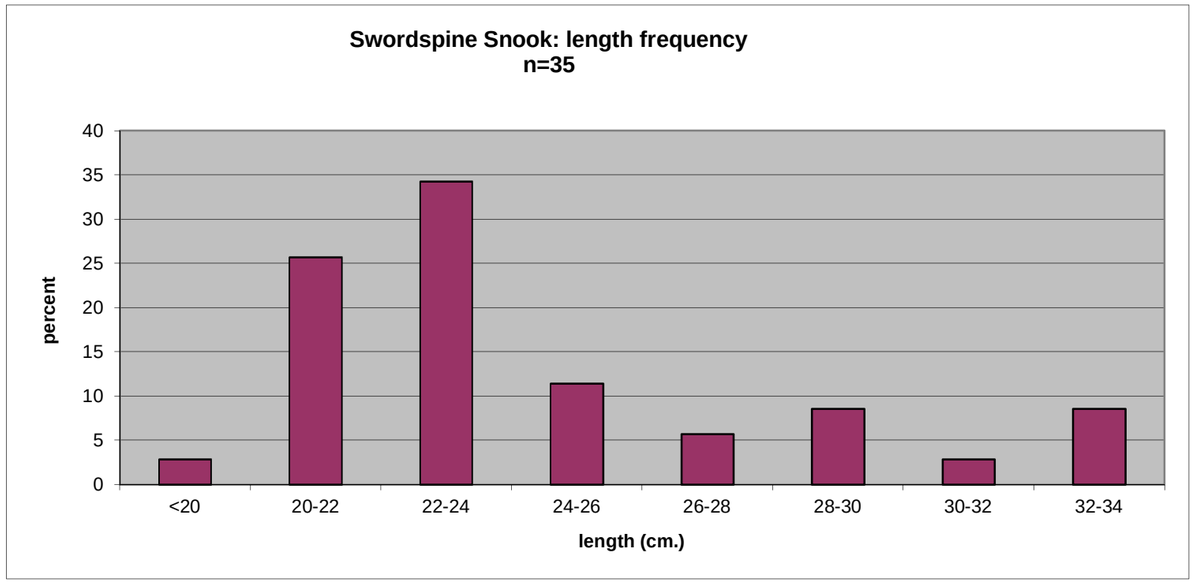
Ladyfish		
length	number	percent
25-29	1	1.754386
29-33	2	3.508772
33-37	12	21.05263
37-41	21	36.84211
41-45	11	19.29825
45-49	8	14.03509
49-53	2	3.508772
	57	

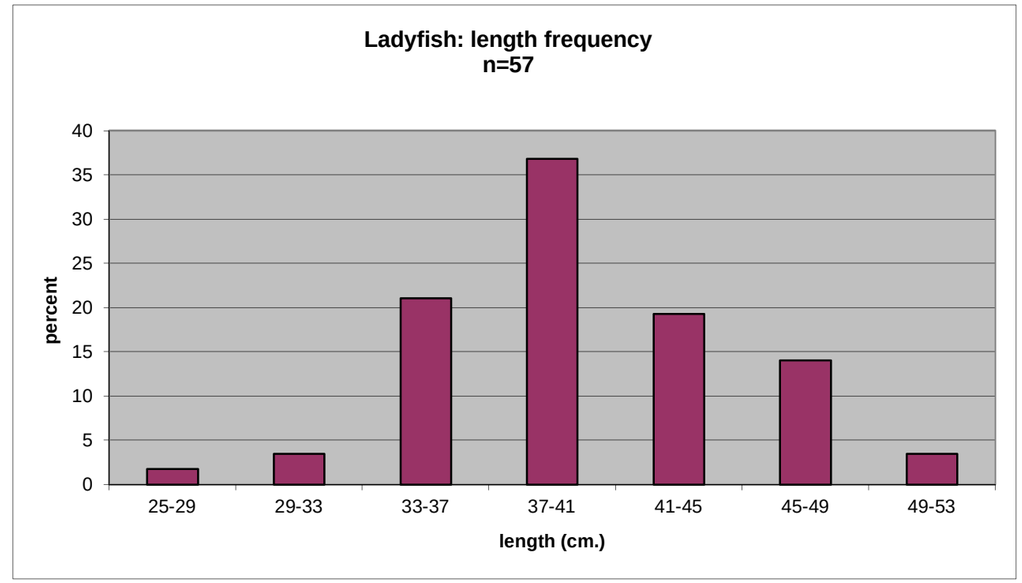
Mojarra		
length	number	percent
10-13	1	0.757576
13-16	1	0.757576
16-19	3	2.272727
19-22	18	13.63636
22-25	43	32.57576
25-28	31	23.48485
28-31	21	15.90909
31-34	9	6.818182
34-37	5	3.787879
	132	

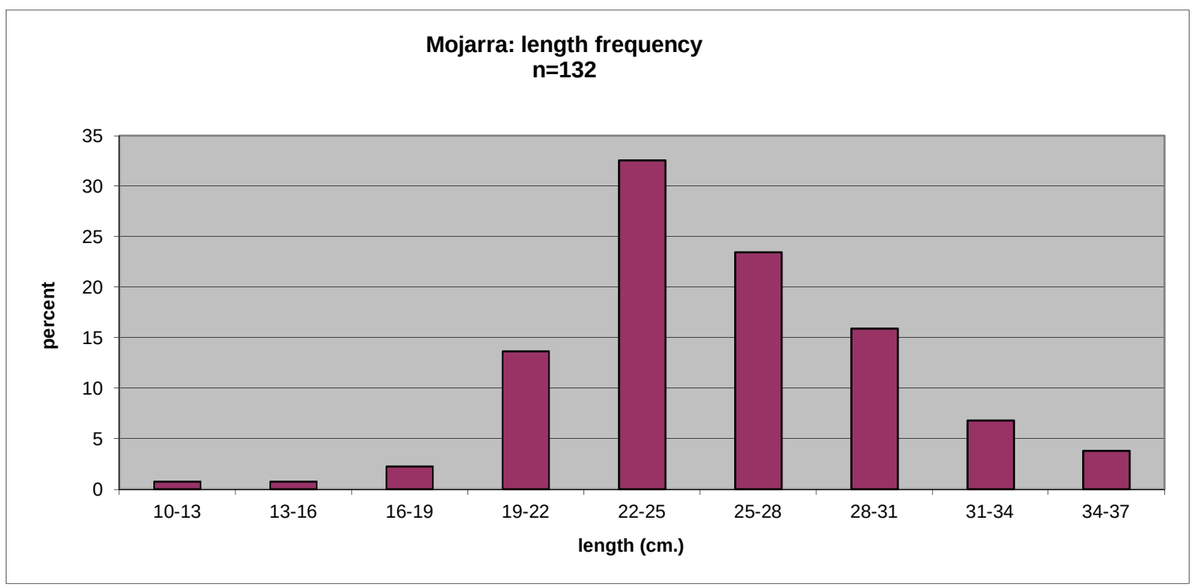
Snook		
length	number	percent
24-28	2	8.695652
28-32	1	4.347826
32-38	4	17.3913
38-42	5	21.73913
42-46	5	21.73913
46-50	3	13.04348
50-54	1	4.347826
54-58	0	0
58-62	0	0
62-66	2	8.695652
	23	






Swordspine Snook: length frequency
n=35
percent
40
35
30
25
20
15
10
5
0
<20
20-22
22-24
24-26
26-28
28-30
30-32
32-34
length (cm.)


Ladyfish: length frequency
n=57
percent
40
35
30
25
20
15
10
5
0
25-29
29-33
33-37
37-41
41-45
45-49
49-53
length (cm.)


Mojarra: length frequency
n=132
percent
35
30
25
20
15
10
5
0
10-13
13-16
16-19
19-22
22-25
25-28
28-31
31-34
34-37
length (cm.)

M-1

Striped mojarra	49	
Ladyfish	10	
Mullets	6	
Swordspine snook	4	
Atlantic thread herring	3	
Rhomboid mojarra	3	
Other	9	Sierra, Pámpano, Flounder, Flagfin mojarra, Snook, Jacks
Total	84	

M-2

Striped mojarra	42	
Swordspine snook	17	
Mullets	14	
Rhomboid mojarra	7	
Agujón	4	
Snook	3	
Jacks	3	
Other	8	Pámpano, Flagfin mojarra, Corvino, Ladyfish, Tarpon
Total	98	

M-3

Striped mojarra	13	
Ladyfish	6	
Tilapia	3	
Rhomboid mojarra	3	
Other	2	Snook, Jack
Total	27	

ST-1

Striped mojarra	22
Ladyfish	18
Tilapia	12
Swordspine snook	8
Anchovy	4
Mullet	3
Rhomboid mojarra	3
Total	70

ST-2

Tilapia	33
Ladyfish	23
Mojarra	11
Tarpon	11
Pleco	7
Swordspine snook	6
Snook	6
Total	97

Species	Qty.
Striped mojarra	137
Ladyfish	58
Tilapias	48
Swordspine snook	35
Mullets	23
Rhomboid mojarra	16
Tarpon	13
Snook	11
Other (9 ssp.)	35
	376

Mojarra	137
Ladyfish	58
Tilapias	48
Swordspine Sr	35
Mullets	23
Rhomboid Moj	16
Tarpon	13
Snook	11
Other	35
	376

FECHA	Estación	Especie	largo (mm)	Observaciones
7-Aug	T-2	5	290	
		1	304	
		5	290	
		5	249	
		2	403	
		10	206	
		2	381	
		2	363	
	M-1	5	253	
		5	247	
		11	189	sardina de hebra
		7	151	
		11	188	sardina de hebra
	M-2	5	296	
		5	226	
		10	340	
		5	191	
		5	213	
		11	150	mojarreta
		10	126	
14-Aug	M-3	1	339	
	T-1	0		
	T-2	11	441	pleco
21-Aug	M-1	5	230	
		2	451	
		11	283	pámpano
		2	425	
		2	439	
		2	431	
		5	216	
		2	416	
		2	424	
		11	136	lenguado
		2	364	
		11	116	muniama
		11	212	muniama
		2	436	
	M-2	11	254	pámpano
		5		
		5	216	
		5	229	
		6	334	
		11	185	muniama
		10	234	
		11	642	agujón
		11	104	pámpano
		6	268	
	M-3	0		
27-Aug	T-1	5	264	
		6	551	
		5	232	
		2	368	
		5	306	
	T-2	1	336	
		1	354	
		1	314	
		1	281	
		2	403	
		1	310	
		1	316	
		2		
		2	375	
		1	389	
		2	372	
		2	365	
	M-1	5	334	
		5	361	
		5	299	
		5	227	
		5	284	
		5	281	
		5	235	
4-Sep	M-2	5	308	

OTHER	
agujón	4
corvino	1
lenguado	1
mojarreta	16
muniama	4
pámpano	4
pleco	7
sardina de hebra	3
sierra	1
	41

I

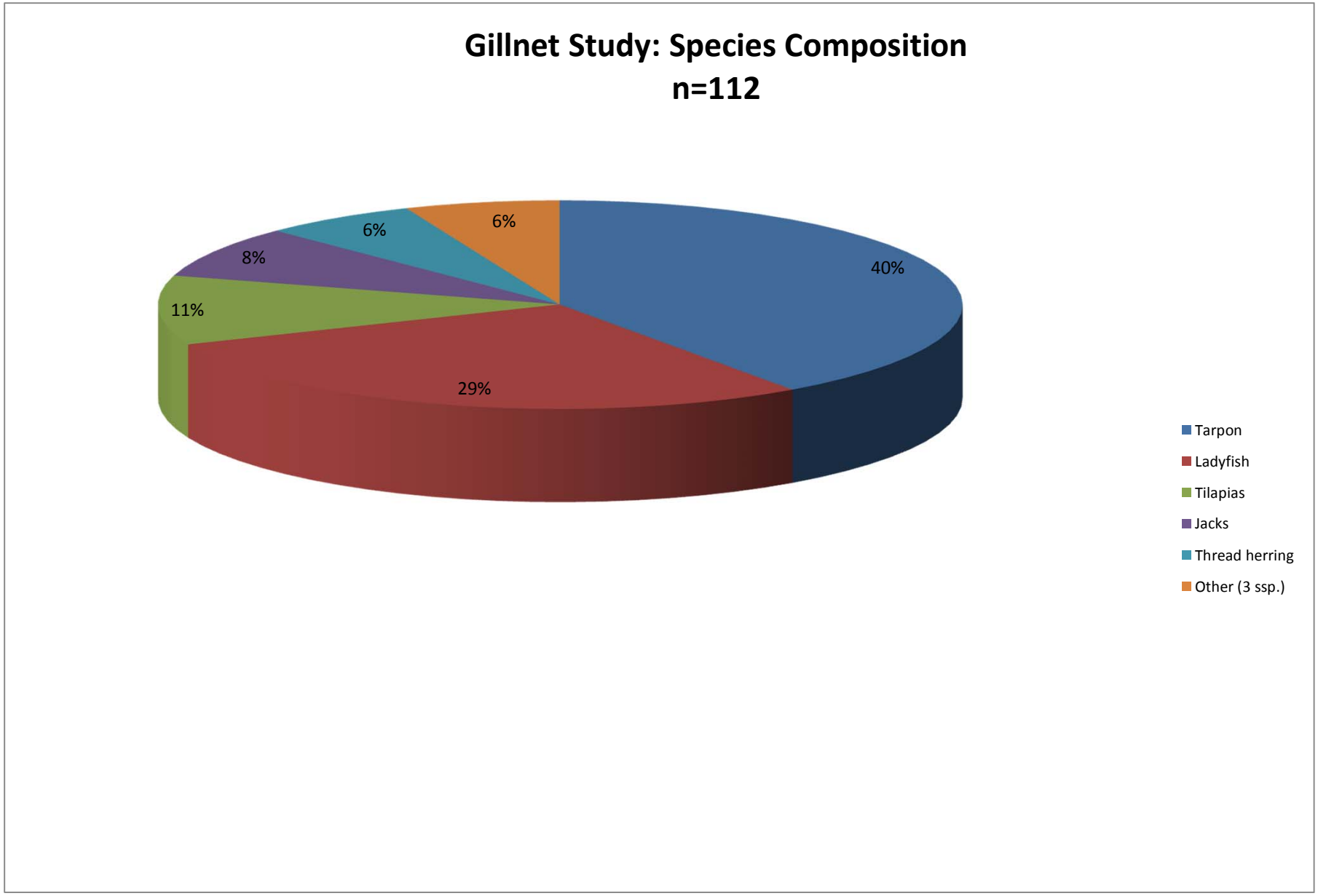
		6	619
		6	236
		11	566 agujón
		11	598 agujón
		11	592 agujón
		6	237
	M-3	1	288
		5	244
		5	217
	T-1	2	402
8-Sep	T-2	1	324
		1	335
		2	380
		1	352
		5	281
		5	269
		5	226
		5	242
		2	426
		2	380
		2	396
		2	399
	M-1	0	
	M-2	5	241
		5	216
		2	348
		6	265
		7	159
		6	
18-Sep	M-3	0	
	T-1	1	308
		1	329
		1	296
		2	381
		2	395
		2	280
		2	374
		2	347
	T-2	4	598
		2	351
		2	415
		1	336
		2	457
		9	607
		9	612
		9	666
		4	407
		9	641
		2	460
		2	432
1-Oct	M-1	5	260
		5	306
		5	322
		10	206
	M-2	10	232
		10	209
		5	229
		5	304
		5	243
		5	273
		5	213
		5	257
	M-3	1	305
		5	264
		5	226
		5	238
		5	254
		5	223
		5	228
		5	233
		5	251
		5	238
2-Oct	T-1	5	226
		5	248

		5	267	
		5	276	
		5	264	
		5	257	
		5	234	
		5	233	
		2	421	
	T-2	9	653	
		5	301	
	M-1	5	356	
		5	352	
		5	332	
		5	291	
		5	270	
		5	269	
		5	267	
		5	344	
		5	265	
		5	248	
		5	287	
		5		
		5	271	
		5	213	
		10	225	
		10	242	
		5	328	
9-Oct	M-2	5	256	
		5	288	
		10	234	
	M-3	0		
	T-1	1	332	
		5	266	
		2	375	
		2	354	
		5	171	
		2	410	
		2	354	
16-Oct	T-2	9	636	
		1	303	
		1	330	
		1	394	
		4	381	
		4	391	
		4	347	
		10	338	
		9	599	
		10	322	
		4	277	
	M-1	5	288	
		5	267	
		5	216	
		5	226	
	M-2	5	256	
		10	242	
23-Oct	M-3	0		
	T-1	0		
	T-2	9	621	
		11	301	pleco
30-Oct	M-1	5	303	
		4	312	
		6	380	
		11	196	sardina de hebra
	M-2	5	252	
		5	244	
		5	226	
		5	209	
		5	200	
		5	197	
		6	371	
		5	192	
		6	389	
		11	162	muniama
		11	126	mojarreta
		11	137	mojarreta

	M-3	0		
	T-1	1	287	
		1	300	
		10	219	
5-Feb	T-2	1	328	
		1	392	
		1	323	
		11	426	pleco
		11	395	pleco
		11	376	pleco
	M-1	7	269	
		6	241	
		11	260	sierra
		6	226	
	M-2	5	217	
		5	281	
		5	186	
		6	335	
		7	217	
		6	304	
11-Feb	M-3	4	426	
	T-1	0		
	T-2	2	462	
		5	311	
		1	361	
		1	322	
		1	382	
		11	346	pleco
		2	452	
		2	450	
		2	469	
		2	471	
		10	246	
		10	293	
19-Feb	M-1	5	234	
		6	255	
		11	129	mojarreta
		11	148	mojarreta
		6	243	
	M-2	5	277	
		5	232	
		5	234	
		5	232	
		11	211	corvino
		7	145	
		6	274	
		10	214	
	M-3	5	278	
		5	235	
		2	401	
		2	410	
26-Feb	T-1	5	315	
		1	354	
		5	246	
	T-2	1	328	
		1	336	
		1	347	
		5	320	
		1	340	
		1	326	
		1	343	
		1	321	
		5	260	
		1	344	
		10	251	
	M-1	5	246	
		5	272	
		5	275	
		5	182	
5-Mar	M-2	5	297	
		5	309	
		5	327	
		5	245	
		6	246	

		4	311	
		11	144	mojarreta
		11	142	mojarreta
		5	206	
	M-3	0		
	T-1	2	391	
		3	203	
		2	404	
		3	206	
12-Mar	T-2	9	481	
		11	345	pleco
		1	355	
		1	315	
		1	351	
		1	365	
	M-1	6	252	
	M-2	10	265	
		5	318	
		5	305	
18-Mar	M-3	0		
	T-1	10	210	
		10	214	
		3	208	
		5		
	T-2	0		
26-Mar	M-1	11	250	pámpano
		5	153	
		11	130	mojarreta
		10	226	
		5		
	M-2	11	162	mojarreta
		5		
		11	122	mojarreta
		5	256	
		6	406	
	M-3	11	115	mojarreta
8-Apr	T-1	5	232	
		5	232	
		2	373	
		2	354	
		2	343	
		2	324	
		1	355	
	T-2	0		
	M-1	5	245	
		5	221	
		5	245	
9-Apr	M-2	10	286	
		10	223	
		10	252	
		4	261	
		10	256	
		4	275	
	M-3	2	405	
	T-1	6	541	
15-Apr	T-2	9		
	M-1	2	317	
		5	253	
		5	201	
		5	206	
		5	193	
		2	359	
		5	127	
	M-2	9	504	
		9	505	
		10	264	
23-Apr	M-3	0		
	T-1	1	341	
		5	353	
		5	236	
		5	262	
		5	224	
		10	304	
		11	117	mojarreta

		11	137	mojarreta
		11	127	mojarreta
		3	205	
	T-2	9	632	
30-Apr	M-1	0		
	M-2	10	228	
		10	202	
		10	224	
	M-3	2	509	
		2	495	
		2	461	
		7		
		11	135	mojarreta
		11	147	mojarreta
	T-1	1	321	
		6	382	
		10	297	
		10	215	
		10	250	
		10	233	
		1	303	
		1	226	


Gillnet Study: Species Composition
n=112
40%
29%
11%
8%
6%
6%
Tarpon
Ladyfish
Tilapias
Jacks
Thread herring
Other (3 ssp.)

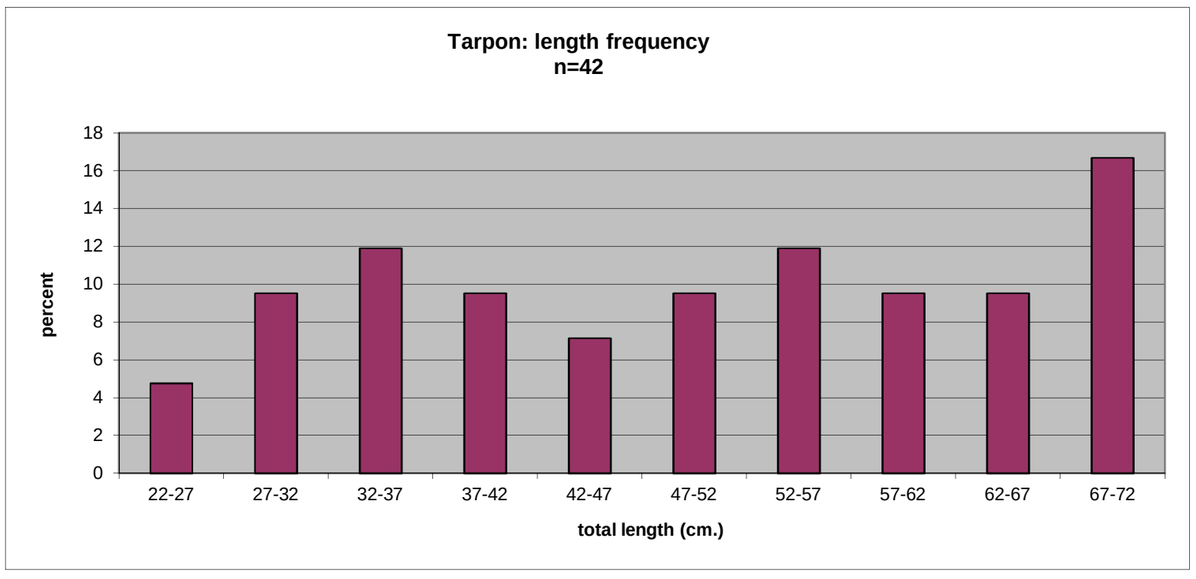
Species	Quantity
Striped mojarra	137
Ladyfish	58
Tilapias	48
Swordspine snook	35
Mullets	23
Rhomboid mojarra	16
Tarpon	13
Snook	11
Other (9 ssp.)	35
Total	**376**

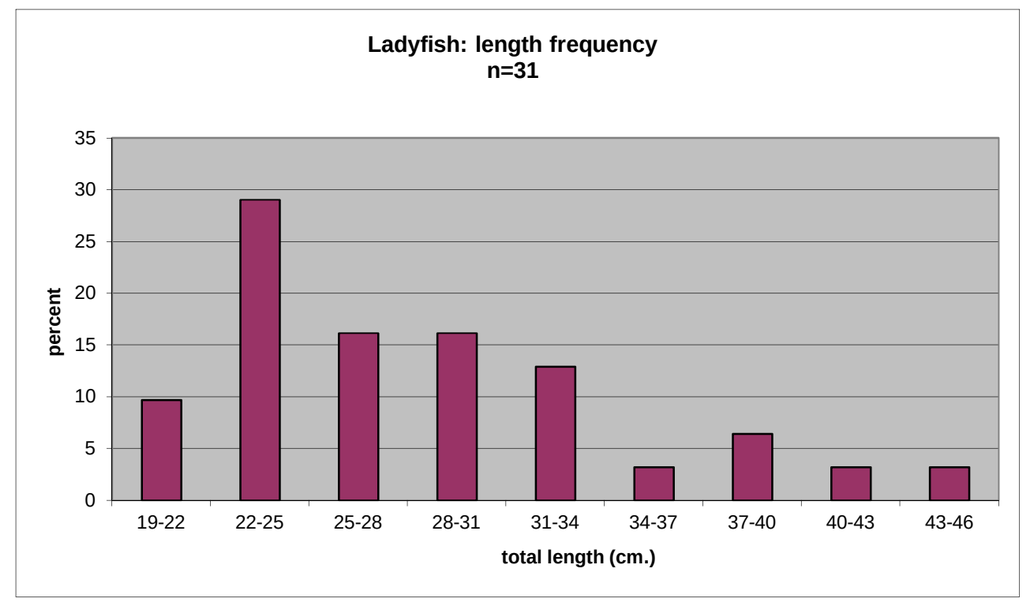
Tarpon

length	number	percent
22-27	2	4.761905
27-32	4	9.52381
32-37	5	11.90476
37-42	4	9.52381
42-47	3	7.142857
47-52	4	9.52381
52-57	5	11.90476
57-62	4	9.52381
62-67	4	9.52381
67-72	7	16.66667
	42	

Ladyfish

length	number	percent
19-22	3	9.677419
22-25	9	29.03226
25-28	5	16.12903
28-31	5	16.12903
31-34	4	12.90323
34-37	1	3.225806
37-40	2	6.451613
40-43	1	3.225806
43-46	1	3.225806
	31	





M-1

Tilapia	1
Ladyfish	2
Jureles	2
Atlantic thread herring	5
Rhomboid mojarra	2
Total	12

M-2

Striped mojarra	2
Ladyfish	5
Atlantic thread herring	2
Pámpano	2
Tarpon	4
Jacks	5
Tilapia	1
Total	21

M-3

Striped mojarra	1
Ladyfish	18
Tilapia	1
Jacks	2
Tarpon	2
Total	24

ST-1

Ladyfish	7
Tilapia	1
Tarpon	14
Total	22

ST-2

Tilapia	8
Tarpon	25
Total	33

Species	Qty.
Tarpon	45
Ladyfish	32
Tilapias	12
Jacks	9
Thread herring	7
Other (3 ssp.)	7
	112

Mojarra	3
Ladyfish	32
Tilapias	12
Thread herring	7
Tarpon	45
Other	13
	112

NUEVO

FECHA	Estación	Especie	largo (mm)	Observaciones	Semana	captura
2-Sep	T-2	9	617		2-Sep	8
	T-2	9	506		3-Sep	11
	T-2	9	642		9-Sep	1
	T-2	9			10-Sep	8
	M-1	0			18-Sep	0
	M-2	9	550		25-Sep	0
	M-2	9	542		1-Oct	1
	M-2	9	521		8-Oct	3
	M-2	9	532		16-Oct	0
3-Sep	M-3	9	482		22-Oct	0
	M-3	9	492		29-Oct	0
	T-1	9	450		5-Nov	1
	T-1	9	434		13-Nov	0
	T-2	9	691		4-Feb	8
	T-2	9	629		12-Feb	4
	T-2	9	672		18-Feb	1
	T-2	9	611		25-Feb	3
	T-2	9	674		3-Mar	1
	T-2	9			10-Mar	3
	T-2	9	609		16-Mar	3
9-Sep	M-1	0			31-Mar	1
	M-2	1	289		7-Apr	7
	M-3	0			14-Apr	3
10-Sep	T-1	9	417		21-Apr	11
	T-1	9	505		26-Apr	4
	T-2	9	720		5-May	31
	T-2	9	691			
	T-2	9	699			
	T-2	9	640			
	T-2	9	537			
	T-2	9	650			
	M-1	0				
18-Sep	M-2	0				
	M-3	0				
	T-1	0				
25-Sep	T-2	0				
	M-1	0				
	M-2	0				
1-Oct	M-3	0				
	T-1	0				
	T-2	9	696			
8-Oct	M-1	11	144	tripletail		
	M-2	11	112	pámpano		
	M-2	11	120	pámpano		
	M-3	0				
16-Oct	T-1	0				
	T-2	0				
	M-1	0				
22-Oct	M-2	0				
	M-3	0				

	T-1	0		
29-Oct	T-2	0		
	M-1	0		
	M-2	0		
5-Nov	M-3	0		
	T-1	0		
	T-2	1	345	
13-Nov	M-1	0		
	M-2	0		
	M-3	0		
	T-1	0		
4-Feb	T-2	1	351	
	T-2	1	359	
	T-2	1	358	
	T-2	1	350	
	T-2	1	371	
	T-2	1	361	
	T-2	9	221	
	M-1	11	182	sardina de hebra
	M-2	0		
12-Feb	M-3	2		se cayó
	T-1	1	364	
	T-2	1	343	
	T-2	9	571	
18-Feb	M-1	0		
	M-2	5	218	
	M-3	0		
25-Feb	T-1	9	250	
	T-2	9		mutilado
	T-2	9	410	
	M-1	0		
3-Mar	M-2	11	186	sardina de hebra
	M-3	0		
	T-1	0		
10-Mar	T-2	9	401	
	M-1	0		
	M-2	11	171	sardina de hebra
	M-2	5	245	
16-Mar	M-3	2	249	
	T-1	9	334	
	T-2	9	291	
31-Mar	M-1	0		
	M-2	0		
	M-3	5	288	
7-Apr	T-1	2	266	
	T-1	2	316	
	T-1	9	283	
	T-1	9	323	
	T-1	2	345	
	T-1	9	364	
	T-1	9	305	

	T-2	0		
	M-1	0		
14-Apr	M-2	8	155	
	M-3	0		
	T-1	2	372	
	T-1	2	293	
21-Apr	T-2	0		
	M-1	11		mojarreta
	M-1	11	200	sardina de hebra
	M-1	11	181	sardina de hebra
	M-1	11	210	sardina de hebra
	M-1	11	127	mojarreta
	M-1	2	436	
	M-1	2	253	
	M-2	8	176	
	M-2	8	188	
	M-2	8	178	
	M-2	8		se cayó
26-Apr	M-3	8	165	
	M-3	8	136	
	T-1	9	343	
	T-2	9	396	
5-May	M-1	8	221	
	M-1	1	212	
	M-1	8	147	
	M-1	11	196	sardina de hebra
	M-2	2	302	
	M-2	2	200	
	M-2	2	330	
	M-2	2	311	
	M-2	2	261	
	M-3	1	358	
	M-3	2	395	
	M-3	2	303	
	M-3	2	250	
	M-3	2	227	
	M-3	2	235	
	M-3	2	191	
	M-3	2	334	
	M-3	2	272	
	M-3	2	250	
	M-3	2	208	
	M-3	2	241	
	M-3	2	307	
	M-3	2	238	
	M-3	2	236	
	M-3	2	310	
	M-3	2	270	
	T-1	9	454	
	T-1	9	312	
	T-1	2	246	

T-1	9	355
T-1	2	410

APPENDIX F

Sponsor Coordination

Rio Anton Ruiz 1135 Continuing Authorities Program (CAP) Project
in Humacao, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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ESTADO LIBRE ASOCIADO DE PUERTO RICO
DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES

26 de mayo de 2004

Ing. Edil Rosas, P.E.
Director Interino
Oficina de Planificación Cuerpo de Ingenieros
400 avenida Fernández Juncos
San Juan, PR 00901

Estimado ingeniero Rosas:

PROYECTO DE CANALIZACION DEL RIO ANTON RUIZ, CARR. PR-3, BO. PUNTA SANTIAGO EN HUMACAO, PR

Hacemos referencia y sometemos copia de la comunicación fechada el 26 de abril de 2004 del Sr. Manuel A. Corbet Nieves, Oficial de Manejo de la Reserva Natural de Humacao, en relación al aumento significativo a la alta salinidad del sistema de lagunas y al Bosque de Pterocarpus de Humacao, aledaños al proyecto de referencia.

Por este medio solicitamos una reunión entre el Cuerpo de Ingenieros y el Departamento de Recursos Naturales y Ambientales, para buscar posibles alternativas que puedan disminuir este efecto en la reserva. Consideramos que este asunto debe tratarse en forma urgente antes de que el daño a la reserva sea permanente.

De tener alguna duda, favor de comunicarse con Gisela M. Molinaris Gelpí coordinadora del proyecto al (787) 724-5833 o (787)725-4025.

Cordialmente,

José M. Lebrón Lastra
Administrador Auxiliar
Área de Recursos de Agua y Minerales

JMLL/JCA/GMMG/

Anejo

P.O. BOX 9066600 PTA. DE TIERRA STATION, SAN JUAN, P.R. 00906-6600
TEL. 724-8774 FAX 723-4255

COMMONWEALTH OF
PUERTO RICO
Department of Natural and
Environmental Resources

February 5, 2015

Colonel Alan M. Dodd
District Engineer
U.S. Army Corps of Engineers
Jacksonville District
Attn: CESAJ-PM-WF
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Colonel Dodd:

SALTWATER INTRUSION NATURAL RESERVE
ANTON RUIZ RIVER FLOOD CONTROL PROJECT

The construction of the Rio Anton Ruiz, CAP Section 205, flood control project resulted in a situation of saltwater intrusion into the freshwater wetlands and lagoons in the Humacao Natural Reserve. Sand bags were installed in two areas as a temporary mitigation measure to stop the saltwater intrusion. In one of the areas, the sand bags were broken and in the other area, these subsided, as indicated by the Manager of the Natural Reserve, Manuel Corbet. He has been closely monitoring the effect of the saltwater intrusion in the Pterocarpus swamp and lagoon areas. Changes in fish species composition have been documented. Locally endangered native duck species have been displaced from some areas. Pterocarpus trees along the Boca Prieta channel died or show distress signals. He has been sending monitoring reports and data to the Jacksonville District, Planning Division, Environmental Branch.

These measures haven't resolved the situation; a permanent alternative is needed to reverse the salinity to its previous levels, therefore, I request that the U.S. Army Corps of Engineers, Jacksonville District, undertake an investigation of the aforementioned problems under the authority of Section1135 of the Water Resources Development Act of 1990, as amended. Puerto Rico Department of Natural and Environmental Resources hereby express our willingness to serve as the study sponsor.

I understand that the first $100,000 of the initial investigations would be Federally financed. The remaining estimated cost of the study would be cost shared 50%-50% with the Federal government, taking into consideration the exemption provided for the Commonwealth of Puerto Rico under Section 1032, WRRDA 2014. If studies indicate a viable solution, our objective will be to proceed with construction. We are capable of fulfilling our financial obligations for further study, design, construction, operation, and maintenance: in general, providing a minimum of 35 percent of the total project costs, including furnishing lands, easements, right-of-way, relocations, and disposal areas. We are also aware that the Corps' and our responsibilities will be delineated in the Project Partnership Agreement, which both parties will execute before construction commences.

If you need additional information, please contact me at (787) 999-2200 extension 2493 or via email jalayon@drna.gobierno.pr

Sincerely,

Department of Natural and Environmental Resources

Javier O. Alayon Del Valle, P.E.
Assistant Administrator
Water and Minerals Resources Area

joav/gmmg

P.O. Box 366147 San Juan Puerto Rico 00936
Tel: 787.999.2200 Fax: 787.999.2303
www.drna.gobierno.pr

DNER

COMMONWEALTH OF
PUERTO RICO
Department of Natural and
Environmental Resources

December 23, 2016

Eng. Jason A. Kirk
Colonel, U.S. Army
District Commander
DEPARTMENT OF THE ARMY
Jacksonville District Corps of Engineers
701 San Marco Boulevard
Jacksonville, Florida 32207

Dear Colonel Kirk:

This is to reaffirm the support of the Puerto Rico Department of Natural and Environmental Resources (DNER) for the Río Anton Ruiz Restoration, Section 1135 of the Continuing Authorities Program (CAP) in Humacao, Puerto Rico. Puerto Rico DNER has the financial capability to execute a Project Partnership Agreement (PPA) for the Project should the Project Report be approved.

Puerto Rico DNER understands that under the PPA it will be responsible for sharing in the costs of the projects, acquiring necessary real estate interests, and performing necessary operation, maintenance, repair, rehabilitation, and replacement of the Project.

Sincerely,

Nelson J. Santiago-Marrero
Secretary

NJSM/joadv/ero

C: Eng. Javier O. Alayón - Assistant Administrator
Water and Minerals Resources Area

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