US Army Corps of Engineers®

Prepared by:

South Atlantic Division
Savannah District

TURPENTINE RUN, ST. THOMAS, U.S. VIRGIN ISLANDS

Implementation Review Plan

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V1.5

SECTION 1
Introduction

1.1 Purpose

This Review Plan (RP) for TURPENTINE RUN (P2 475651), will help ensure a quality-engineering project is developed by the Corps of Engineers in accordance with Engineer Regulation (ER) 1165-2-217, “Civil Works Review Policy”. As part of the Project Management Plan this RP establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products and lays out a value-added process and describes the scope of review for the current phase of work. This RP will be provided to the Project Delivery Team (PDT), District Quality Control (DQC) Team, Agency Technical Review (ATR) Team, Safety Assurance Review (SAR) Team, Policy and Legal Compliance Review Team, and Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES) Team. The District Chief of Engineering has assessed that the life safety risk of this project is significant; therefore, a SAR will be required, see Paragraph 9.1.

1.2 Key References

- EC 1165-2-218, USACE Levee Safety Program, 22 April 2021
- Engineer Manual (EM) 1110-2-1913 Design, Construction, and Evaluation of Levees, 30 April 2000
- ECB 2022-7, Interim Approach for Risk-Informed Designs for Dam and Levee Projects, 20 October 2022
- ER 5-1-11, USACE Business Process, 21 Jul 2019
- ER 1165-2-217, Civil Works Review Policy, 01 May 2021
- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January 2013
- ER 1110-2-1156, Safety of Dams – Policy and Procedure, 31 Mar 2014
- ER 1110-1-8159, Engineering and Design, DrChecks^{sm}, 10 May 2011
- ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 August 1999
- Risk Management Center (RMC)-AD-2022-03 Standard Operating Procedure for Safety Assurance Reviews, 22 January 2022
- RMC-AD-2022-01 Standard Operating Procedures for Agency Technical Reviews, 02 November 2021
- Final Turpentine Run, United States Virgin Islands, Continuing Authorities Program (CAP) Conversion Feasibility Report, dated March 2020
- Report of the Chief of Engineers (Chief’s Report), Turpentine, St. Thomas, United States Virgin Islands, Flood Risk Management, dated 17 August 2020
- Project Management Plan (PMP), date 31 Jan 2023

1.3 Review Management Organization

The USACE RMC is the Review Management Organization (RMO) for this project. This RP is specific to the Pre-Construction Engineering and Design (PED) phase and will be updated for additional project phases (e.g., construction phase).

SECTION 2
Project Description

2.1 Project Description

The Turpentine Run/Nadir area is located on the southeastern end of the island of St. Thomas, U.S. Virgin Islands (USVI), about four miles southeast of the city of Charlotte Amalie. The project area begins at the north end of the Nadir development, with improvements planned for the channel as it flows past the Nadir residential area to Mangrove Lagoon.

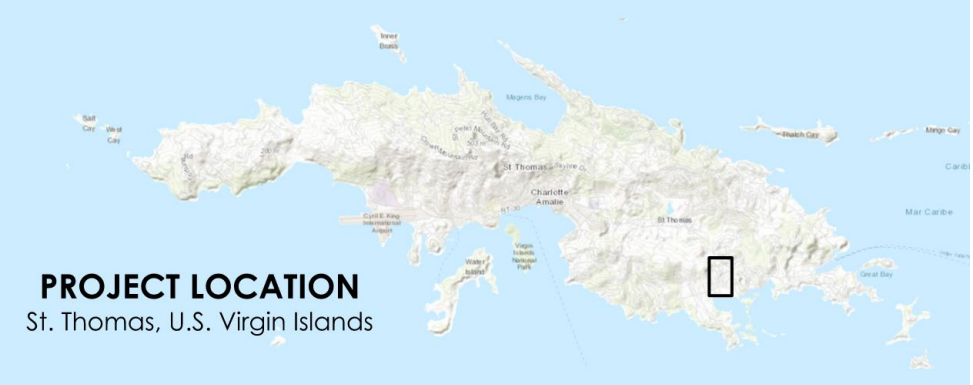

Figure 1: Project Location

The capacity of the existing concrete channel is insufficient to carry flood flows thereby causing flooding in the development. In addition to monetary damage, the nature of the flooding creates a substantial and significant threat to the safety of area residents, where two casualties have already been reported. The Turpentine Run project area is within the 100-year flood plain.

The project design reduces the risk of flooding for events up to the 4% annual exceedance probability. In previous years, during flood events there has been loss of life in this project location. The project area is a densely populated residential area surrounding the project flood control features.

The overall status of the project is 2%, the plan has a signed Chief's Report and is federally funded to completion but is awaiting matching non-federal funding. The estimated cost for the project is approximately $43 Million at the FY2020 price level. The estimated population at risk is 13,000, this is the population residing within the Turpentine Run basin. This estimate will be updated as refinements are made during future risk assessment efforts.

Project risks were evaluated as part of the Conversion Feasibility Report but were limited to a cost risk analysis and general project risk and uncertainty required for all feasibility studies. More information on the project features is provided below.

2.1.1 Project Authorization

The Turpentine Run Section 205 Project was initially authorized under the CAP, Section 205 of the Flood Control Act of 1948 (Public Law 80-858), as amended (33 U.S.C. § 701s), which culminated in the Turpentine Run Detailed Project Report and Environmental Assessment prepared in 1990, amended in 1992 and approved in 1994. The project was not constructed due to contractor bids in excess of the awardable threshold.

The project was then planned under Section 209 of the Flood Control Act of 1966 (Public Law 80-858) as amended (33 U.S.C. § 701s), with the CAP conversion feasibility study completed under the Bipartisan Budget Act (BBA) of 2018 (Public Law 115-123).

Turpentine Run is now authorized for construction by Section 401(2)(13) of the Water Resources Development Act of 2020, Public Law 116-260. The Disaster Relief Supplemental Appropriations Act (DRSSA) of 2022 allocated funding to the project for the PED phase and the construction phase.

2.1.2 Current Project Details

As described in the 1994 Detailed Project Report (DPR), the recommended plan involves replacement of the existing concrete channel with a new channel having greater capacity. Improvements would begin at the north end of the Nadir development and include an area to be excavated to transition flow into the new channel. A small levee (260 feet in length) would be constructed along the northern edge of the development. A sheetpile wall (170 feet in length) would run along the development side of the channel and connect the levee to the drop structure, which would be located near the entrance to the existing concrete channel. The drop structure has an overall length of 60 feet.

From the drop structure, the proposed channel would be concrete and U-shaped for approximately 460 feet. It will then transition to a trapezoidal, earthen channel lined with rip rap for approximately 1,385 feet. Where possible, the existing concrete channel wall along the Nadir development will be left intact.

Just south of the new Bovoni Road Bridge, a levee is proposed for the west side of the channel. This levee runs for approximately 1,300 feet, ending at the Nadir racetrack at the south end of the channel. Rip rap will be placed on the left side of the existing channel as it flows around the corner of the racetrack.

Based on a site visit in November 2018 and September 2019, the conditions on the ground do not require any changes to the previously developed plan.

As part of the Conversion Feasibility Report the original hydraulic model was updated from HEC-2 to a 2D HEC-RAS model. The hydrologic analysis was reviewed for accuracy in 2020 but a new model was not built for the project. Activities during PED would include an update of both models as one of the first tasks.

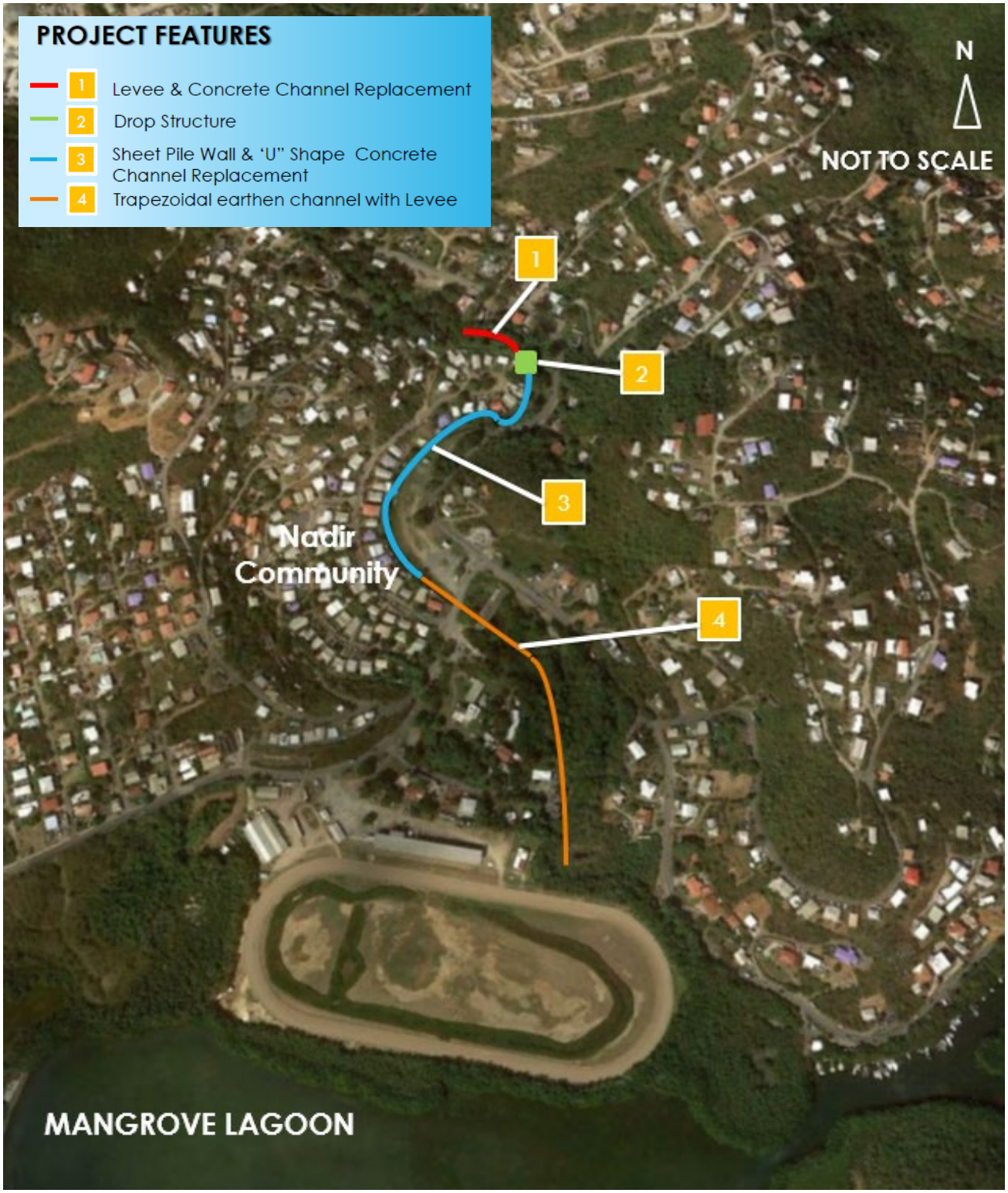

Figure 2: Project Feature Detail

2.2 Project Sponsor

The Non-Federal sponsor for this project is the United States Virgin Island (USVI) Department of Public Works.
There will not be in-kind contributions for this effort. Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, SAR, Policy, and Legal Compliance (if applicable), BCOES, and SAR reviews.

SECTION 3
Risk Assessment During Design

Due to construction of a new levee as part of this project, a Potential Failure Mode Analysis (PFMA) will be conducted following the initial update of the hydrology and hydraulics (H&H) modeling effort early in the design process prior to 35% design completion). If the PFMA produces credible failure modes and a risk to life safety, a full Semi-quantitative Risk Assessment (SQRA) will be initiated. The risk assessment (PFMA and SQRA) will undergo ATR at the 35% design level. Comment structure, if applicable, will mirror ATR documentation requirements. The review activities associated with the risk assessment are to be defined in this RP. Once the risk assessment during design is completed, this RP will be re-visited by the District, Major Subordinate Command (MSC), and RMC to determine if the review requirements in this RP need to be revised.

The design risk assessment will be reviewed by subject matter experts as deemed appropriate for the project. The design risk assessment review will determine if there is a major risk concern, if there is a controversial process being used or if there will likely be a design deviation request.

SECTION 4
Project Delivery Team Reviews

An Architecture/Engineering (A/E) firm will be designing the construction plans, specifications, and Design Documentation Report (DDR). The A/E firm is responsible for Quality Control of their product.

PDT Reviews are in addition to the independent DQC Reviews described in Section 5. The PDT Reviews are to ensure consistency and effective coordination across all project disciplines for the work product. For example, the PDT will perform a complete reading of any reports and accompanying appendices prepared by the PDT to assure the overall coherence and integrity of the report, technical appendices, and the recommendations before approval. The PDT will normally include a variety of stakeholders, each with his/her own important project requirements and a different, but interlocking, review responsibility. The PDT Review may also include a plans-in-hand review at the end of development. PDT Reviews will be conducted as directed.

SECTION 5
District Quality Control/Quality Assurance

5.1 Requirements

All implementation documents (including supporting data, analyses, environmental compliance documents, etc.) shall

undergo a DQC. A DQC is an internal review process of basic science and engineering work products focused on fulfilling the project quality requirements defined in the PMP. DQC will be performed on Plans & Specifications (P&S) and DDR in accordance with CESAS Engineering Division Quality Management Plan (QMP). DQC occurs during the design development process and is carried out as a routine management practice by each discipline. Certification for each discipline is signed by the reviewer.

The DQC review shall ensure consistency and effective coordination across all disciplines and to assure the overall coherence and integrity of the products. Review comments and responses for this review will be documented in DrChecks. See Attachment 1, Table 18 for the DQC Lead, reviewers, and reviewer's disciplines.

A robust District Quality Assurance (QA) Program establishes the foundation of quality through exhaustive reviews ensuring its own work is thorough, rigorous, and scientifically correct. Reviewers outside of the District place inherent trust in the QA process, believing that every calculation has been verified just like each report page has been spell-checked.

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) and risk assessment reports shall undergo DQC in accordance with ER 1165-2-217. DQC will be performed on all early release decision information (i.e., hydraulic conditions, geotechnical parameters, loading conditions, etc.) and certified complete down to the component or sub-component level prior to incorporation into the design. The District shall perform these minimum required reviews (see Appendix F, 2. Sample DQC Certification Form in ER 1165-2-217) in accordance with District's Quality Management Plan.

The documentation of DQC will be conducted and documented in DrChecks. Final review documents will be included with the project files and as an appendix to the DDR.

5.2 Products to Undergo DQC/QA

An A/E firm will develop the Construction P&S, the DDR, H&H Analysis, and complete Geotechnical Investigations. The DQC will be completed by the A/E firm. The USACE PDT team will complete the Quality Assurance Review of the A/E firms Product and Quality Control.

The A/E firm will submit the Documents listed in each of the DQA Submittal Reviews. The A/E firm will be responsible for Quality Control of each of the products that they submit. USACE will complete a DQA review of each of those products (as listed in the following tables) for the 35%, 65% and 95% design submittals. The PDT will be responsible for putting together the risk assessment. Therefore, in the following tables the DQC of the Risk Assessment will be completed by a USACE DQC team.

The following products will undergo DQA review by USACE staff:

- H&H Model
- Risk Assessment (SQRA / PFMA)
- DDR
- Geotechnical Report
- Construction Plans and Specifications
- Environmental Permitting

DQC/QA will take place at the 35%, 65% and 95% design level. Below are the disciplines that will be involved with each of the review submittals, along with the products that will be reviewed by each discipline.

35% Project Design Submittal Review										
DQA Reviewer Discipline:	**Project Manager**	**EN Lead**	**Hydraulic Engineer**	**Geotechnical Engineer**	**Structural Engineer**	**Civil Engineer**	**Cost Engineer**	**NEPA Lead**	**Consequences**	**Counsel**
Updated Hydrologic and Hydraulic Model		x	x							
Draft Risk Assessment Report (DQC)	x	x	x	x	x				x	x
35% DDR	x	x	x	x	x	x	x	x		
Draft Geotechnical Report		x		x						
35% Construction Plans	x	x	x	x	x	x	x	x		
List of Specifications	x	x	x	x	x	x	x	x		
List of Permitting Needs and Timeline								x		

Table 1 35% DQA Reviewers, Review Products and Schedule

65% Project Design Submittal Review									
DQA Reviewer Discipline:	**Project Manager**	**EN Lead**	**Hydraulic Engineer**	**Geotechnical Engineer**	**Structural Engineer**	**Civil Engineer**	**Cost Engineer**	**NEPA Lead**	**Counsel**
65% DDR	x	x	x	x	x	x	x	x	
Final Geotechnical Report		x		x	x				
65% Construction Plans	x	x	x	x	x	x	x	x	
Draft of Specifications	x	x	x	x	x	x	x	x	
Environmental Permitting Submittals	x	x	x			x		x	x

Table 2 65% DQA Reviewers, Review Products and Schedule

95% Project Design Submittal Review										
DQA Reviewer Discipline:	**Project Manager**	**EN Lead**	**Hydraulic Engineer**	**Geotechnical Engineer**	**Structural Engineer**	**Civil Engineer**	**Cost Engineer**	**NEPA Lead**	**Consequences**	**Counsel**
Final Risk Assessment Report (DQC)	x	x	x	x	x				x	x
95% DDR	x	x	x	x	x	x	x	x		
Final Geotechnical Report (If changes have been made from 65% Report)		x		x	x					
95% Construction Plans	x	x	x	x	x	x	x	x		
Final Draft of Specifications	x	x	x	x	x	x	x	x		
Environmental Approvals (If Available)	x	x	x			x		x		x

Table 3 95% DQA Reviewers, Review Products and Schedule

5.3 Schedule and Estimated Cost of DQC/QA

Although DQC is a seamless process, the following milestone reviews are scheduled in 4. The cost for the DQC/QA will be approximately $20,000 to $30,000 per review.

Project Phase/Submittal	Review Start Date	Review End Date
DQC 35% Review	TBD	TBD
Design Risk Assessment Report	TBD	TBD
DQC 65% Review	TBD	TBD
DQC 95% Review	TBD	TBD
Final Risk Assessment Report	TBD	TBD

Table 4 DQC Schedule

SECTION 6
Agency Technical Review

6.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) and risk assessment reports shall undergo ATR in accordance with ER 1165-2-217 and RMC-AD-2022-01, SOP for ATR. ATR reviews will occur seamlessly, including early involvement of the ATR team for validation of key design decisions, and at the scheduled milestones as shown in Section 6.5. A site visit will be scheduled for the ATR Team. Documentation of ATR will occur using DrChecks^{SM}, the four-part comment structure, responses from the PDT using the three-part structure, and back checking as outlined in ER 1165-2-217.

6.2 Products to Undergo ATR

The following products will undergo ATR team review:

- Hydrologic and Hydraulic Model
- Risk Assessment (SQRA / PFMA)
- DDR
- Geotechnical Report
- Construction Plans and Specifications
- Environmental Permitting

The primary ATR review will take place at the 65% design level. Since most of the design is based on the Hydrologic and Hydraulic Model an H&H Engineer will review the H&H model at the 35% design level.

35% Project Design Submittal Review							
ATR Reviewer Discipline:	**ATR Lead**	**Geotechnical Engineer**	**Hydrology and Hydraulics**	**Structural Engineer**	**Cost Engineer**	**Construction**	**Consequences**
Updated H&H Model			x				

Table 5 35% ATR Reviewers and Review Products

At the 65% design level most of the ATR disciplines will be involved in the review process.

65% Project Design Submittal Review							
ATR Reviewer Discipline:	**Geotechnical Engineer**	**H&H Engineer**	**Structural Engineer**	**Cost Engineer**	**Construction**	**Environmental**	**Consequences**
Draft Risk Assessment Report	x	x					x
65% DDR	x	x	x	x	x	x	x
Final Geotechnical Report	x						
65% Construction Plans	x	x	x	x	x	x	
Draft of Specifications	x	x	x	x	x	x	
Environmental Permitting Submittals						x	

Table 6 65% ATR Reviewers and Review Products

At the 95% design level the ATR will be confirming that all comments have been addressed and supplying in additional comments that may have come up from minor changes in the design.

95% Project Design Submittal Review							
ATR Reviewer Discipline:	**Geotechnical Engineer**	**H&H Engineer**	**Structural Engineer**	**Cost Engineer**	**Construction**	**Environmental**	**Consequences**
Final Risk Assessment Report	x	x	x				x
95% DDR	x	x	x	x	x	x	
Final Geotechnical Report (If changes have been made from 65% Report)	x						
95% Construction Plans	x	x	x	x	x	x	
Final Draft of Specifications	x	x	x	x	x	x	
Environmental Approvals (If Available)						x	

Table 7 95% ATR Reviewers and Review Products

6.3 Required Team Expertise and Requirements

The ATR team disciplines and required expertise may vary for larger projects with multiple reviews, not all disciplines may be required for all reviews. Although the same ATR team members will be used to the maximum extent possible throughout the life of the project, it may be necessary to replace ATR team members based on availability or required expertise in the future. The ATR Lead and PDT will confirm ATR team member availability prior to each review. Changes in ATR team members will be coordinated through the ATR Lead with the RMO and tracked in Table 23 RP Revisions. The following disciplines will be required for ATR of this project:

ATR Lead - The ATR Team Leader will be senior professional outside the home MSC with experience in flood risk management projects and conducting ATR. The Lead should have extensive experience in preparing Civil Works documents. The lead should have a minimum of 10 years of experience with related project design/construction experience and have performed ATR Team Leader duties in the past. ATR Team Leader may also serve as a co-duty to one of the review disciplines.

Geotechnical Engineer - The team reviewer should have experience in the field of geotechnical engineering analysis, design and construction of earth and concrete channels, levees, box culverts, sheet pile retaining structures, cofferdams, and revetments to support the development of the Plans and Specifications. The geotechnical engineer shall have experience in subsurface investigations, rock and soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design and earthwork construction. The geotechnical engineer shall have knowledge and experience in the forensic investigation of seepage, settlement stability and deformation problems associated with drop structures and appetences constructed on rock and soil foundations. A minimum of 10 years of related project design/construction experience is desired.

Hydraulic Engineer - The team reviewer should be a registered professional with experience in the design and analysis of earth and concrete channels, weirs, and concrete box culvert design to support the development of the Plans and Specifications. The hydraulic engineer shall have a minimum of 10 years of related project design/construction experience is desired.

Structural Engineer - The team reviewer should be a registered professional with experience in concrete U-framed channels, concrete box culverts, concrete walls, steel sheet pile retaining walls and cofferdams. The structural engineer shall have experience and be proficient in performing stability analysis, finite element analysis, seismic time history studies, and external stability analysis. A minimum of 10 years of related project design/construction experience is desired.

Cost Engineer - The team reviewer should be experienced in estimating construction costs and contingencies to support the development of Plans and Specification. A minimum of 10 years of related project design/construction experience is desired.

Construction Engineer - Reviewer should be a senior level, professionally registered engineer with extensive experience in the engineering construction field with particular emphasis on dam safety projects. The Construction reviewer should have a minimum of 10 years of experience.

Environmental - The team reviewer will have a solid background in the habitat types to be found in the US Virgin Islands, understand the factors that influence the reestablishment of native species of plants and animals, and understand requirements for National Environmental Priority Act (NEPA).

Consequences - The team reviewer will be an economist experienced with estimating consequences, project risk, and life loss developed as part of the PFMA and SQRA analysis.

Milestone Reviews	Geotech	Geologist	H&H	Structural	Cost	Construction	Environmental	Consequences
ATR 35% Review			X					
ATR 65% Review	X	X	X	X	X	X	X	X
ATR 95% Review	X	X	X	X	X	X	X	X

Table 8. ATR Teams for Milestone Reviews

6.4 Statement of Technical Review Report/Certification

At the conclusion of each ATR milestone, the ATR team will document the review. Interim milestone reviews will use the RMC "Interim ATR Memorandum" template. The final ATR milestone will be documented using the RMC ATR report template, will include all interim milestone memorandums with supporting attachments, and will be submitted to the RMO for review and signature of the Statement of Completion of ATR. The district will then complete and sign a Certification of ATR.

6.5 Schedule and Estimated Cost of ATR

Although ATR is a seamless process, the preliminary ATR milestone schedule is listed in Table 9. The preliminary cost for the ATR is estimated to be between $50,000 and $70,000. At the 65% and 95% level, ATR reviews will follow the DQC/QA. reviews.

Project Phase/Submittal	Review Start Date	Review End Date
ATR 35% H&H Review	TBD	TBD
ATR 65% Review	TBD	TBD
ATR 65% Review	TBD	TBD

Table 9 ATR Schedule

SECTION 7
BCOES Requirements

7.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo BCOES review in accordance with ER 415-1-11 and ER 1110-1-12. BCOES reviews

are done during design for a project using the design-bid-build (D-B-B) method or during development of the request for proposal (RFP) for a design-build (D-B) project. The BCOES review results are to be incorporated into the procurement documents for all construction projects. The BCOES review will be documented as described. The BCOES reviewers are encouraged to include local sponsors' facility operators and maintenance staff. The BCOES roster is provided in Attachment 1, Table 20.

The value of a BCOES review is based on minimizing problems during the construction phase through effective checks performed by knowledgeable, experienced personnel prior to advertising for a contract. Biddability, constructability, operability, environmental, and sustainability requirements must be emphasized throughout the design process for all programs and projects, including during planning and design. This will help to ensure that the government's contract requirements are clear, executable, and readily understandable by private sector bidders or proposers. It will also help ensure that the construction may be done efficiently and in an environmentally sound manner, and that the construction activities and projects are sufficiently sustainable. Effective BCOES reviews of design and contract documents will reduce risks of cost and time growth, unnecessary changes and claims, as well as support safe, efficient, sustainable operations and maintenance by the facility users and maintenance organization after construction is complete. Savannah District will provide the engineering review and certification.

7.2 Products to Undergo BCOES

- DDR
- Construction Plans and Specifications
- Environmental Permitting
- Contract Documents (Bid Schedule and Clauses)

7.3 Schedule and Estimated Cost of BCOES

Although BCOES is a seamless process, the 95% submittal documents will undergo a BCOES review with representatives from each division (to include Engineering, Construction, Contracting, Planning, Operations, and Real Estate). The cost for the BCOES will be approximately $20,000 to $30,000.

SECTION 8
Safety Assurance Review

8.1 Decision on SAR

The District Chief of Engineering has made a risk-informed-decision that this project poses a significant threat to human life (public safety) and therefore a SAR will be performed. Upon completion of the design risk assessment, the District Chief of Engineering will reassess the determination of SAR requirement.

The project design is to reduce flooding for events up to the 4% annual exceedance probability. In previous years, during flood events there has been loss of life in this project location. Therefore, a SAR was determined appropriate for the levee features of this project. The project area is a densely populated residential area surrounding the project flood control features.

8.2 Products to Undergo SAR

External panels will conduct reviews of the design and construction activities prior to the initiation of physical construction and, until construction activities are completed, periodically thereafter on a regular schedule, and before substantial completion of construction activities. The reviews shall consider the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health, safety, and welfare. This review plan is a "living document" and will be updated to discuss SAR in more detail once design of the remediation is in process. Specific products that the panel will be required to review are shown as follows:

- H&H Model
- Risk Assessment Report
- DDR
- Geotechnical Report
- Construction Plans and Specifications

SAR will take place at the 65% and 95% design level, with a 35% SAR limited to just the H&H Engineer of the H&H Model. Below are the disciplines that will be involved with each of the review submittals, along with the products that will be reviewed by each discipline.

65% Project Design Submittal Review				
SAR Reviewer Discipline:	**Geotechnical Engineer**	**H&H Engineer**	**Structural Engineer**	**Construction**
Draft Risk Assessment Report[1]	x	x	x	x
65% DDR	x	x	x	x
Final Geotechnical Report	x			
65% Construction Plans	x	x	x	x
Draft of Specifications	x	x	x	x
Updated H&H Model		x		

Table 10 65% SAR Reviewers and Review Products

[1] Draft Risk Assessment report will be provided as additional documentation, but SAR members will not submit comments on the report.

95% Project Design Submittal Review			
SAR Reviewer Discipline:	**Geotechnical Engineer**	**Structural Engineer**	**Construction**
Final Risk Assessment Report[2]	x	x	x
95% DDR	x	x	x
95% Construction Plans	x	x	x
Final Draft of Specifications	x	x	x

Table 11 95% SAR Reviewers and Review Products

8.3 Required SAR Panel Expertise

The following disciplines will be required for SAR of this project:

Geotechnical Engineer - The member should be a registered professional engineer as a Civil or Geotechnical Engineer with a minimum MS degree or higher in engineering science. Minimum 20 years' experience in geotechnical seismic design, and levee design and evaluation. The Geotech panel member shall also have relevant construction experience in levee construction.

Hydraulic Engineer - The member should be a registered professional engineer with a minimum MS degree or higher in engineering science. Member(s) should have 10-15 years' experience in the analysis and design levees and 5-10 years' experience in physical and numerical modeling. The panel member(s) should be familiar with USACE application of risk and uncertainty analyses in flood risk management studies and a familiarity with standard USACE hydrologic and hydraulic computer models.

Structural Engineer - The member should be a registered professional engineer as a Civil or Structural Engineer with a minimum MS degree or higher in engineering science. The member should have a minimum of 15 years' experience in static and seismic design per industry code standards and USACE design regulations for Civil Works projects, dynamic site-specific response spectra analysis and evaluation, and soil-structure interaction evaluation and design. This team member will also have relevant construction experience in the structures being designed and constructed.

Construction Engineer - Reviewer should be a senior level, professionally registered engineer with extensive experience in the engineering construction field with particular emphasis on dam safety projects. The Construction reviewer should have a minimum of 15 years of experience.

Documentation of SAR will be prepared in accordance with ER 1165-2-217. Each SAR milestone report will be provided to the RMC; the final SAR report will be accompanied by the SAR Milestone Completion Form which documents completion of the SAR and is signed by the District Engineering Division Chief, RMO, and MSC Chief of Engineering Division. See RMC SAR Report template.

8.4 Scope, Schedule, and Estimated Cost of SAR's

The SAR's will be performed in accordance with ER 1165-2-217. Documentation of SAR will use the RMC SAR Report template. SAR reviews will occur at the milestones shown in Table 12. The estimated costs for the SAR's of this project

[2] Final Risk Assessment report will be provided as additional documentation, but SAR members will not submit comments on the report.

are in the range of $100,000 to $150,000. This estimate will be refined when the Scope of Work for the SAR task order is completed.

A SAR site visit may be completed at the 65% level by key SAR team members; however, in the event the SAR is still required during the Construction phase, a SAR site visit will be considered.

Milestone Reviews	Geotech	H&H	Structural	Construction	Site Visit or Conference Call Duration (days)	Review Start Date	Review End Date
35% Design		O			0.5	TBD	TBD
65% Design (Post-ATR certification)	X	X	X	X	3	TBD	TBD
95% Design (Post-ATR certification)	O		O	O	0.5	TBD	TBD
Construction	O		O	X	0.5	TBD	TBD

Table 12 Scheduled Milestone Reviews with Required Reviewers and Site Visit Duration (X - Indicates attendance at the site visit. O - Indicates participation via conference call.)

In addition, SAR Milestones will be required during Construction.

SECTION 9
Review Plan Approval and Updates

The MSC Commander, or delegated official, is responsible for approving this RP. The Commander's approval reflects vertical team input (involving the District, MSC, and RMC) as to the appropriate scope, level of review, and endorsement by the RMC. The RP is a living document and will be updated in accordance with ER 1165-2-217. All changes made to the approved RP will be documented in Attachment 3, Table 23 RP Revisions and shared with the RMC and MSC. The latest version of the RP, along with the Commanders' approval memorandum, will be provided to the RMO.

SECTION 10
Engineering Models

The use of certified, validated, or agency approved engineering models is required for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, SAR (if required), BCOES, and Policy and Legal Compliance review. Where such approvals have not been

completed, appropriate independent checks of critical calculations will be performed and documented. The following engineering models, software, and tools are anticipated to be used. Additional models to evaluate hydrology, consequence estimates, structural and geotechnical analysis may be required and, if necessary, will be included in a future revision.

Model Name	Version
2D HEC-RAS	6.3.1 or newer
GeoStudio	
CWALSHT	

Table 13 Engineering Models and Status

SECTION 11
Review Plan Points of Contact

Title	Name	Organization	Phone
Project Manager	Patrick McHugh	SAS-PMC	912-652-5754
Lead Engineer	Laura (Beth) Williams	SAS-ENH	912-652-5268
Senior Reviewer	Ross Wright	CEIWR-RMC	502-257-1584

Table 14 RP POC's

Attachment 1
Team Rosters (CUI)
(To be Removed Prior to Posting on District Website)

Name	Discipline/Role	District / Agency	Email	Phone
Patrick McHugh	SAS Project Manager	CESAS-PM-C	patrick.j.mchugh@usace.army.mil	912-652-5754
Laura (Beth) Williams	EN Lead	CESAS-EN-H	laura.e.williams@usace.army.mil	912-652-5268
Emily Wortman	Hydraulic Engineer	CESAS-EN-H	emily.t.wortman@usace.army.mil	912-324-0133
Laura Dudley	Geotechnical Engineer	CESAS-EN-GS	laura.r.dudley@usace.army.mil	912-652-5040
Michael Zaitz	Structural Engineer	CESAS-EN-DS	michael.d.zaitz@usace.army.mil	912-652-5386
Trevor Martin	Civil Engineer	CESAS-EN-DG	trevor.b.martin@usace.army.mil	912-652-5013
Paul (Bart) Smith	Cost Engineer	CESAS-EN-ET	paul.b.smith@usace.army.mil	912-652-5521
Suzanne Hill	NEPA Lead	CESAS-PM-P	suzanne.hill@usace.army.mil	912-423-2324
John Moore	Counsel	CESAS-OC	john.c.moore@usace.army.mil	912-652-5140

Table 15 Key Project Delivery Team (PDT) Members

Name	Discipline/Role	District / Agency	Email	Phone
Laura (Beth) Williams	EN Lead	CESAS-EN-H	laura.e.williams@usace.army.mil	912-652-5268
Emily Wortman	Hydraulic Engineer	CESAS-EN-H	emily.t.wortman@usace.army.mil	912-324-0133
Laura Dudley	Geotechnical Engineer	CESAS-EN-GS	laura.r.dudley@usace.army.mil	912-652-5040
Michael Zaitz	Structural Engineer	CESAS-EN-DS	michael.d.zaitz@usace.army.mil	912-652-5386
Trevor Martin	Civil Engineer	CESAS-EN-DG	trevor.b.martin@usace.army.mil	912-652-5013

Table 16 Risk Assessment Team

Name	Discipline/Role	District / Agency	Email	Phone
Patrick McHugh	SAS Project Manager	CESAS-PM-C	patrick.j.mchugh@usace.army.mil	912-652-5754
Laura (Beth) Williams	EN Lead	CESAS-EN-H	laura.e.williams@usace.army.mil	912-652-5268
Emily Wortman	Hydraulic Engineer	CESAS-EN-H	emily.t.wortman@usace.army.mil	912-324-0133
Leland Schuman	Geotechnical Engineer	CESAS-EN-GS	leland.h.schuman@usace.army.mil	912-652-5071
Michael Zaitz	Structural Engineer	CESAS-EN-DS	michael.d.zaitz@usace.army.mil	912-652-5386
Trevor Martin	Civil Engineer	CESAS-EN-DG	trevor.b.martin@usace.army.mil	912-652-5013

Name	Discipline/Role	District / Agency	Email	Phone
Paul (Bart) Smith	Cost Engineer	CESAS-EN-ET	paul.b.smith@usace.army.mil	912-652-5521
Suzanne Hill	NEPA Lead	CESAS-PM-P	suzanne.hill@usace.army.mil	912-423-2324
Colin Rawls	Consequences (Economist)	CESAJ-PD-D	colin.d.rawls@usace.army.mil	904-232-1652
John Moore	Counsel	CESAS-OC	john.c.moore@usace.army.mil	912-652-5140

Table 17 DQA Reviewers

Name	Discipline/Role	District / Agency	Email	Phone
Patrick McHugh	SAS Project Manager	CESAS-PM-C	patrick.j.mchugh@usace.army.mil	912-652-5754
Bryan Robinson	Hydraulic Engineer	CESAS-EN-H	Bryan.j.robinson@usace.army.mil	912-652-5026
Leland Schuman	Geotechnical Engineer	CESAS-EN-GS	leland.h.schuman@usace.army.mil	912-652-5071
Jason Whittaker	Structural Engineer	CESAS-EN-DS	Jason.a.whittaker@usace.army.mil	912-652-5606
Rachel Radtke	Civil Engineer	CESAS-EN-DG	Rachel.l.radtke@usace.army.mil	912-652-5507

Table 18 DQC Reviewers (for Risk Assessment Report Only)

Discipline	Name	Credentials
ATR Lead	Greg Braun	Greg Braun has ten years' experience as a geotechnical engineer. This time has been split between working for USACE and A/E firms. His background covers the design and construction of various geotechnical applications and features. These include: shallow and deep foundations for roadway and building structures, earth retaining structures, global stability analyses of gravity structures, limit equilibrium slope stability analyses, landslide investigations and mitigations, seepage calibration of existing dams and seepage analyses for design of new dams, instrumentation installation and monitoring, and developing and leading subsurface explorations. Greg holds Master and Bachelor of Science degrees in civil engineering from Penn State University and is a Registered Professional Engineer in the Commonwealth of Pennsylvania.
Geotechnical Engineering	Greg Braun	See above.
Hydrology and Hydraulics	Sara Woida	Ms. Woida (P.E., CFM) has over 18 years of federal flood risk management and engineering consulting experience, having worked as a Water Resources Engineer for the USDA Natural Resources Conservation Service, Golder Associates, USACE Pittsburgh District, Bergmann, and now the USACE Risk Management Center. She is

Discipline	Name	Credentials
		skilled in H&H modeling using HEC software, GIS analysis, frequency analysis, climate impact assessments, dam safety risk assessments, stormwater design, and H&H analysis for infrastructure design and planning studies. Sara served as a LRP Hydraulic Engineer, H&H Unit Lead, and Section 408 and Hydropower Coordinator, before joining the RMC as a Hydrologic Engineer. Ms. Woida received her Bachelor's degree in Environmental Systems Engineering from the Pennsylvania State University, Master's degree in Water Resources Engineering from the University of Wisconsin-Madison, and is a registered Professional Engineer in Pennsylvania and Washington states, as well as a Certified Floodplain Manager.
Structural Engineering	Richard Allwes	Mr. Allwes is a Registered Professional Engineer with over 32 years of experience in civil engineering with the Risk Management Center and the Pittsburgh District, the U.S. Bureau of Mines, Mine Safety and Health Administration, and the U.S. Department of Veterans Affairs. He has Bachelor of Science degrees in Mathematics and Mining Engineering and a Master of Science degree in Civil Engineering. Mr. Allwes' expertise includes structural design of civil works projects (Johnstown LFPP, Braddock Dam, Charleroi L&D, Panama Canal (Atlantic Third Lane), Emsworth Dams Rehab, 30% Lock Design for Montgomery L&D), risk analysis, mining/tunneling, and construction. He serves as a Senior Advisor to the LRL Risk Cadre and has had oversight of many risk assessments, including Periodic Assessments, Phase 1 and 2 Issue Evaluation Studies, Dam Safety Modifications Studies, and a Post Implementation Study. Mr. Allwes also has participated in and served as the lead of numerous Agency Technical Reviews of civil works projects and risk assessments for flood reduction management projects and navigation projects.
Cost Engineering	William (Bill) Bolte	TBD.
Construction	William (Bill) DeBruyn	Bill DeBruyn, PE, Civil Engineer/Construction Liaison (CELRH-DSPC-TS). Bill is a Civil Engineer serving as a Construction Liaison at the DSMMCX/LRD-DSPC in Huntington, WV since May 2020. Prior to that, he was stationed at the Nashville District where he

Discipline	Name	Credentials
		was the Resident Engineer/Administrative Contracting Officer at the Middle Tennessee Resident Office. He received his B.S. in Civil Engineering in Tennessee Technological University in 1990. He maintains a Professional Engineer license in the State of Tennessee. Bill started his career in the Nashville District in 1991. He has worked most of his career in Construction, initially as a Project Engineer until January 2006 when he was selected for the RE/ACO position at Kentucky Lock. He later served as the RE/ACO at Chickamauga Lock, Wolf Creek Dam Rehab, and Center Hill Dam Rehab. During his career, he has been assigned to a wide range of construction projects to include hydropower rehab, navigation structures, river bank stabilization, and flood control structures. He also worked on multiple disaster recovery efforts involving several major hurricanes and one earthquake. Bill served as the Resident Engineer at the Mosul Dam project in northern Iraq between February and August 2017.
Environmental	Charles (Chip) Hall	Charles (Chip) W. Hall, Regional Technical Specialist for Environmental Analysis and Compliance for the Great Lakes and Ohio River Division (LRD), is an Account Manager to the North Atlantic Division for the Ecosystem Planning Center of Expertise. Mr. Hall has worked for the Corps for 20 years. He has a Bachelor of Science degree from the University of Tennessee, Knoxville in Wildlife and Fisheries Science. As a biologist, he has worked on many different types of projects including section 14, 205, 202, 206 authorities, General Investigations, Operations, Dam Safety Modifications (Wolf Creek Dam Seepage Rehab and Center Hill Dam Seepage Rehab), and Hydropower Rehab Projects. He served 120 day assignments in both the Great Lakes and Ohio River Division Office and Corps HQ on the LRD Regional Integration Team coordinating reviews and other tasks. He has performed Agency Technical Reviews (ATR) spanning all Division regions, including serving as ATR Team Lead for numerous projects including section 14, 1135, 729, and 531 authorities, as well as, General Investigations, Dam Safety and Hydropower Rhabilitations, and many other unique authorities. He currently serves as a board

Discipline	Name	Credentials
		representative for ERDCs Environmental Restoration Research Area Review Group. Mr. Hall is certified for ATR in Environmental Compliance and Ecosystem Restoration.
Consequences	TBD	TBD.

Table 2 ATR Team

Review	Name	Division/Branch Chief
Biddability, Constructability, Operability, Environmental, Sustainability	Paige Blechinger	Contracting
	Tracy Hendren	Engineering
	Troy Funk	Construction
	Michael Montone	Operations
	Kim Garvey	Planning
	Ralph Werthmann	Real Estate

Table 20 BCOES Team

Discipline	Name
Hydrology and Hydraulics	TBD
Geotechnical	TBD
Structural	TBD
Construction	TBD

Table 21 SAR Panel

Role	Name	Email
RP POC	Emily Wortman	emily.t.wortman@usace.army.mil
Project Manager	Patrick McHugh	patrick.j.mchugh@usace.army.mil
Lead Engineer	Laura (Beth) Williams	laura.e.williams@usace.army.mil
RMC Review Inbox	N/A	RMC.Review@usace.army.mil
RMC	Nate Snorteland Dave Carlson Ross Wright	Nathan.J.Snorteland@usace.army.mil David.E.Carlson@usace.army.mil Ross.N.Wright@usace.army.mil
Dam & Levee Safety QM	Mike Robinette Emily Calla	Michael.D.Robinette@usace.army.mil Emily.K.Calla@usace.army.mil
FRM-PCX	Eric Thaut	Eric.W.Thaut@usace.army.mil
LSC Director	Noah Vroman	Noah.D.Vroman@usace.army.mil
ATR Lead	Greg Braun	Gregory.D.Braun@usace.army.mil
MSC RBT-Chief	Chris Smith	Christopher.T.Smith@usace.army.mil
MSC LSO	Chris Smith	Christopher.T.Smith@usace.army.mil
MSC LSPM	Trent Ferguson	Trent.L.Ferguson@usace.army.mil
SAJ District Engineering Chief	Laureen Borochaner	Laureen.A.Borochaner@usace.army.mil
SAS District Engineering Chief	Tracy Hendren	Tracy.L.Hendren@udace.army.mil

Role	Name	Email
District Construction Chief	Jim Jeffords	Jim.W.Jeffords@usace.army.mil
District LSO	Laureen Borochaner	Laureen.A.Borochaner@usace.army.mil
District LSPM	Randy Rabb	Randy.L.Rabb@usace.army.mil
RP Awareness (MSC)	Michael Wolz	michael.w.wolz@usace.army.mil

Table 22 Review Plan Distribution

Attachment 2
Project Risk Information (CUI)
(To be Removed Prior to Posting on District Website)

PROJECT BACKGROUND

Background: The Turpentine Run Detailed Project Report and Environmental Assessment prepared in 1990, amended in 1992 and approved in 1994. The recommended plan in the Detailed Project Report was developed to address flooding problems in the Turpentine Run/Nadir area. The plan was approved by U.S. Army Corps of Engineers Headquarters in 1994, however, the project was not constructed because contractor bids exceeded the awardable threshold. The non-Federal sponsor for this project is the Department of Public Works for the United States Virgin Islands (USVI).

Project Area: The Turpentine Run/Nadir area is located on the southeastern end of the island of St. Thomas, U.S. Virgin Islands, about two miles southeast of the city of Charlotte Amalie. The project area begins at the north end of the Nadir development, with improvements planned for the channel as it flows past the Nadir residential area to Mangrove Lagoon. The capacity of the existing concrete channel is insufficient to carry flood flows thereby causing flooding in the development. In addition to monetary damage, the nature of the flooding creates a substantial and significant threat to the safety of area residents.

Project Description: As described in the 1994 Detailed Project Report (DPR), the recommended plan involves replacement of the existing concrete channel with a new channel having greater capacity. Improvements would begin at the north end of the Nadir development and include an area to be excavated to transition flow into the new channel. A small levee (260 feet in length) would be constructed along the northern edge of the development. A sheetpile wall (170 feet in length) would run along the development side of the channel and connect the levee to the drop structure, which would be located near the entrance to the existing concrete channel. The drop structure has an overall length of 60 feet.

From the drop structure, the proposed channel would be concrete and U-shaped for approximately 460 feet. It will then transition to a trapezoidal, earthen channel lined with rip rap for approximately 1,385 feet. Where possible, the existing concrete channel wall along the Nadir development will be left intact.

Just south of the new Bovoni Road Bridge, a levee is proposed for the west side of the channel. This levee runs for approximately 1,300 feet, ending at the Nadir racetrack at the south end of the channel. Rip rap will be placed on the left side of the existing channel as it flows around the corner of the racetrack.

Project Costs and Benefits: The updated Certified Project First Cost for Turpentine Run is $43,662,000 in FY20 dollars, or $48,142,000 fully funded. Comparing these first costs adjusted to November 1990 (FY 91) price levels to the previously estimated benefits from the approved 1994 DPR, the updated BCR is 1.15, with approximately $114,000 in average annual net benefits.

Environmental: Pursuant to the National Environmental Policy Act of 1969, as amended, the Corps assessed the effects of the proposed action in the Turpentine Run/Nadir Area, St. Thomas, U.S. Virgin Islands, Detailed Project Report and Environmental Assessment (EA), dated November 1994. The Corps updated the 1994 EA analysis in the 2019 EA and adopts the 1994 EA, by reference, where the information is valid and applicable.

Compliance with USACE Quality Control Standards: The Turpentine Run project is fully compliant with current USACE Quality Control Standards. The CAP Conversion Feasibility Report is prepared in accordance with the Turpentine Run Project Management Plan and ER 1105-2-100, Planning Guidance Notebook, and was reviewed in accordance with EC 1165-2-217, Review Policy for Civil Works. These reviews included District Quality Control, Agency Technical Review, and Mission Subordinate Command review of the project report and design. Since there were no proposed changes to the project design for this previously developed project, a request for exclusion from completing a Type I Independent External Peer Review was approved by South Atlantic Division (SAD) on March 5, 2019.

Project Risk and Uncertainty

Infrastructure vulnerabilities, population at risk, estimated economic damage potential, PFMA, or SQRA was not conducted for this project during the Feasibility Phase. However, project cost and schedule risks and uncertainties were developed for the purposes of determining an appropriate cost contingency and outlining uncertainties and risk for further evaluation during the PED phase.

A risk assessment will be conducted during design potentially by members of the SAS RMC cadre team pending their availability. This risk assessment will be conducted early in the design process. Documents prepared at the 35% submittal will be utilized for the risk assessment to include design drawings, H&H analysis, and consequence estimates. Upon completion of the risk assessment, the cadre will present the information to the design team as well as the district LSO. It is expected that the comments from the risk assessment will be incorporated in the 65% design documents.

Cost Risk Analysis: The cost risk analysis is the process of identifying and measuring the cost impact of project uncertainties on the estimated total project cost. This risk analysis was accomplished as a joint analysis between the cost engineer and the appropriate project delivery team (PDT) members. This section provides a summary of significant risk analysis results that were identified in the Abbreviated Risk Analysis (ARA). Risk analysis results are intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes. Results also provide tools to support decision making and risk management as projects progress through planning and implementation.

To establish a contingency for the project cost estimate, the contingencies were removed from the estimate prior to running the analysis. The total estimated Construction cost of the remaining project excluding contingency was established at approximately $21,536,000. Land Cost remaining for the project is approximately $2,300,000. Planning, Engineering & Design plus Supervision & Administration cost is $7,839,000. This yields a total ARA base cost of approximately $42,531,000. The total contingency was quantified as approximately $10,856,000, or about 35% total contingency for the project. The cost risk elements that were evaluated through the risk analysis consist of the following: project growth; acquisition strategy; construction elements; quantities for current scope; cost estimate assumptions; and external project risks. Each of these elements were given a risk level based on each feature of work for the project. The key cost risk elements identified through the risk analysis were “construction elements” and “quantities for current scope” since the drawings were produced in 1994, there could be a risk of the landscape not being the exact same which could cause a redesign. Also, a major risk is the construction due to the method of construction being very complex.

This project is identified as a Class 3 estimate as defined in ER 1110-2-1302, Civil Works Cost Engineering, with technical information approaching 10-60% of project design. A contingency of 35% generated from the ARA is reasonable for this stage of the project development per ER 1110-2-1302.

Uncertainty in the Engineering and Economic Analyses: There are sources of uncertainties associated with the engineering and economic analyses noted within the CAP Conversion Feasibility Report, including potentially changed conditions. These uncertainties will be addressed during PED, using (as necessary) new survey data, updated models in accordance with applicable guidance (including new guidance since project approval in 1994).

At this time, moderate risk and uncertainty remains for the Bovoni Bridge replacement and the assumption that no design modifications are required to meet current USACE standards. The current fully funded cost of the project does not include costs associated with retrofitting or replacement of the Bovoni Bridge. If design deficiencies are found, the cost of the project will likely increase, potentially impacting the economic justification of the project.

Site conditions and other characteristics detailed in the original planning report may have changed over the ensuing years. This expedited review of the project suggests that changes in the physical conditions, watershed hydraulics, and design standards and practices that have changed over time are potential risks that can be addressed if this project is moved into the design phase for eventual authorization and construction.

Implementation Risks: Some of the key implementation risks potentially affecting project schedule are:

• Real Estate Acquisition: To complete the project, additional Lands, Easements, Rights of Way, Relocations, and Disposal Areas (LERRD) -must be acquired. Difficulty in acquiring the relevant LERRD could disrupt the project schedules and increase the cost.

• Weather: Unpredictable weather, particularly hurricanes, can present challenges to project implementation.

• Underground Utilities: Incomplete surveys of underground utilities have been one of the reasons that the project cost has increased so significantly since authorization. Potentially, this issue could arise again in future contracts.

• Funding Availability: The current cost estimate is based on a relatively aggressive construction schedule, which assumes large and consistent funding packages in coming years. Disruptions in the funding stream have caused issues in the past.

• Contracting: One risk noted in other Puerto Rico and USVI studies is the limited availability of qualified contractors in the post Hurricane Maria environment. This could be particularly true if many projects in Puerto Rico and the USVI are being constructed simultaneously due to the BBA funding.

• Cost: There is a potential risk during PED, if costs increase it could impact the BCR.

Turpentine Run BCR and Net Benefits at FY20 discount rate (2.75%)

	BCR Update (with Recreation)	Without Recreation	Recreation Components
Project First Cost (FY 20 Price Levels)	$43,662,000	$43,237,000	$425,000
IDC (FY 20 Price Levels)	$1, 630,000	$1,624,000	$6,000
Total Economic Cost (FY 20 Price Levels)	$45,292,000	$44,860,000	$430,000
Total Economic Cost (FY 91 Price Levels)	$20,210,000	$20,020,000	$190,000
Interest and Amortization	$750,000	$740,000	$10,000
OMRR&R (FY 91 Price Level)	$15,000	$15,000	$5,000
Average Annual Cost (FY 91 Price Levels)	$765,000	$755,000	$15,000
Primary Benefits (damage reduction)	$710,660	$710,660	
Incidental Recreation Benefits	$168,800		$168,740
Total Annual Benefits from 1994 Approved Report (FY 91 Price Levels)	$879,460	$710,660	$168,740
Benefit to Cost Ratio	**1.15**	**0.94**	**11.25**
Net Benefits (FY 91 Price Levels)	$114,000	($44,340)	$153,750

1.) Total Project First cost based on certified cost, dated 11/8/19
2.) Annual Benefits based on 1994 revised Turpentine Run Detailed Project Report and Environmental Assessment.
3.) Annual Costs deflated to price level of the benefits for purposes of BCR updates
4.) Incidental Benefits include Recreation benefits

This RP will be updated with additional project risk information once the risk assessment during design is completed; these updates will be tracked in table in Attachment 3 and coordinated with the RMC and MSC.

The decision to present the design risk assessment to the LSOG will be based on factors such as higher risk systems, design deviations, projects with existing risk assessments for which the baseline risk appears to change, and controversial or politically sensitive decisions. The determination to present a design risk assessment to the LSOG will be coordinated through the Risk Management Center.

Attachment 3
Review Plan Revisions

Revision Date	Description of Change	Page/Paragraph Number

Table 23 RP Revisions