



**US Army Corps  
of Engineers®**

**Norfolk District**

# **MIAMI-DADE COASTAL STORM RISK MANAGEMENT (CSRM) STUDY**

**Norfolk, Virginia**

**COST ENGINEERING SUB-APPENDIX**

**MAY 2020**

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# **CHAPTER 1 INTRODUCTION**

## **1.1 COST NARRATIVE**

Corps of Engineers cost estimates for planning purposes are prepared in accordance with the following guidance:

- Engineer Technical Letter (ETL) 1110-2-573, Construction Cost Estimating Guide for CivilWorks, 30 September 2008
- Engineer Regulation (ER) 1110-1-1300, Cost Engineering Policy and General Requirements, 26 March 1993
- ER 1110-2-1302, Civil Works Cost Engineering, 15 September 2008
- ER 1110-2-1150, Engineering and Design For Civil Works Projects, 31 August 1999
- ER 1105-2-100, Planning Guidance Notebook, 22 April 2000, as amended
- Engineer Manual (EM) 1110-2-1304 (Tables revised 30 March 2007), Civil Works Construction Cost Index System, 31 March 2013
- CECW-CP Memorandum For Distribution, Subject: Initiatives To Improve The Accuracy Of Total Project Costs In Civil Works Feasibility Studies Requiring Congressional Authorization, 19 Sep 2007
- CECW-CE Memorandum For Distribution, Subject: Application of Cost Risk Analysis Methods To Develop Contingencies For Civil Works Total Project Costs, 3 Jul 2007
- Cost and Schedule Risk Analysis Guidance, 17 May 2009

The goals of the cost engineering for the Miami-Dade Coastal Storm Risk Management Feasibility Study are to present a Total Project Cost (construction and non-construction costs) for the Tentatively Selected Plan (TSP) at the current price level to be used for project justification/authorization and to project costs forward in time for budgeting purposes. In addition, the costing efforts are intended to produce a final product, or cost estimate, that is reliable and accurate and that supports the definition of the Government's and the non-Federal sponsor's obligations.

## **1.2 PROJECT DESCRIPTION**

The feasibility study formulates, evaluates, and compares reasonable solutions to reduce the risk of coastal storm damages to property and infrastructure and minimize risk to public safety in the study area. The study area is located entirely in Monroe County, Florida.

A number of alternatives were considered by the PDT in order to accomplish the goals of reducing the risk of coastal storm damages and minimize risk to public safety. These alternatives

consist of shoreline stabilization via revetments along segments of Route 1, floodproofing/elevating/acquisition of both critical and noncritical structures found throughout the study areas.

## **CHAPTER 2   ALTERNATIVES**

### **2.1   Alternative 1 – No Action**

Alternative 1 includes taking no action.

### **2.2   Alternative 2 – Critical Infrastructure Only (Non-Structural)**

Alternative 2 includes the protection of critical infrastructure throughout the study areas. This includes fire stations, medical facilities, police stations, potable water facilities, wastewater facilities, EOC facilities and airport facilities. This alternative makes use of Floodproofing, Elevation and acquisition to protect these structures.

### **2.3   Alternative 3 – Miami River Basin + Alternative 2**

Alternative 3 includes the construction of a surge barrier at Miami River, a Floodwall at Edgewater along with Nonstructural measures outside of the surge barrier plus Alternative 2.

### **2.4   Alternative 4 – Nonstructural + Alternative 2**

Alternative 4 includes acquiring, elevating, and wet and dry floodproofing of structures in seven socially vulnerable, economic damage centers defined by Hazus and the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index which include Miami River, Little River, Arch Creek River, Aventura, North Beach, South Beach, and Cutler Bay areas plus Alternative 2.

## **2.5 Alternative 5 – Inland Storm Surge Reduction (Structural) + Alternative 2**

Alternative 5 includes Surge barriers at the most socially vulnerable, economic damage centers which include Miami River, Little River, and Biscayne Canal plus Alternative 2.

## **2.6 Alternative 6 – Alternatives 3 + 4**

Alternative 6 includes Alternatives 3 plus 4.

## **2.7 Alternative 7 – Alternatives 4 + 5**

Alternative 7 includes Alternatives 4 + 5.

## **2.8 Alternative 8 – Alternatives 4 + 5 – Edgewater Floodwall**

Alternative 7 includes Alternatives 4 + 5 but does not include the Edgewater Floodwall.

## **2.9 Tentatively Selected Plan – Alternative 8**

Alternative 8 has been chosen as the tentatively selected plan. It is a combination of Alternatives 2, 4 and 5, and includes Analyzing critical infrastructure throughout all of Miami-Dade County on priority asset categories. This includes wet and dry floodproofing, elevating, acquiring, and relocating structures or utilities, as well as ringwalls, Acquiring, elevating, and wet and dry floodproofing of structures in seven socially vulnerable, economic damage centers defined by Hazus and the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index which include Miami River, Little River, Arch Creek River, Aventura, North Beach, South Beach, and Cutler Bay areas and Surge barriers at the most socially vulnerable, economic damage centers which include Miami River, Little River, and Biscayne Canal.

# **CHAPTER 3   COST ESTIMATE**

## **3.1 BASIS OF ESTIMATE**

The structural construction cost estimate was developed using Micro-Computer Aided Cost Estimating System (MCACES), Second Generation (MII) using the appropriate Work

Breakdown Structure (WBS). These cost estimates were developed utilizing cost resources such as RSMMeans, MII Cost Libraries, and vendor quotations and are supported by the preferred labor, equipment, materials, and crew/production breakdown to align with current construction methods. Quantities were provided by the PDT and checked by the cost engineer.

The nonstructural cost estimate was developed based on data obtained by the PDT from the USACE NATIONAL NONSTRUCTURAL COMMITTEE BEST PRACTICE GUIDE 2020-01 and New Orleans District (2012 Donaldson to the Gulf Study). This data consists of square foot costs for each structure based on type, size and elevation desired.

The MII report is provided at Attachment 1 to this cost engineering appendix.

### **3.2 CONTINGENCY**

The goal in contingency development is to identify the uncertainties associated with an item of work or task, forecast the cost/risk relationship, and assign a value to this task that would limit the cost risk to an acceptable degree of confidence. Consideration must be given to the details available at each stage of planning, design, or construction for which a cost estimate is being prepared.

An Abbreviated Risk Analysis (ARA) was conducted in accordance with the procedures outlined in the manual entitled “Cost and Schedule Risk Analysis Guidance”, dated 17 May 2009. Members of the Norfolk District Project Delivery Team (PDT) participated in a cost risk analysis brainstorming session to identify risks associated with the project. The Risk Analysis utilized the “LOW RISK” category as the project involves typical construction with possible life safety issues. Assumptions were made to the likelihood and impact of each risk item, as well as the probability of occurrence and magnitude of the impact if it were to occur. Adjustments were made to the analysis upon review by the PDT and the final contingencies were established. The ARA Report is provided as Attachment 2 to this Cost Engineering Appendix.

### **3.3 PLANNING, ENGINEERING, AND DESIGN (PED)**

Costs for Planning, Engineering and Design (PED) have been included based on the standard percentage included in the Total Project Cost Summary (TPCS). The percentage breakout can be found in the TPCS.

### **3.4 CONSTRUCTION MANAGEMENT (S&A)**

Costs for Construction Management (S&A) have been included based on the standard percentage included in the Total Project Cost Summary (TPCS). The percentage breakout can be found in the TPCS.

### 3.5 TOTAL PROJECT COST SUMMARY (TPCS)

The Total Project Cost Summary (TPCS) addresses the inflation through project completion; accomplished by escalation to the mid-point of construction. The TPCS includes Federal and non-Federal costs for all construction features of the project, PED and S&A, along with the appropriate contingencies and escalation associated with each of these activities. The TPCS is formatted according to the CWWBS. The TPCS was prepared using the MCACES/MII cost estimate, contingencies developed by the ARA, the project design and construction schedule, and estimates of PED and S&A prepared by others. The TPCS for both the Structural and Non-Structural TSPs are provided as Attachments 3 and 4 to this Cost Engineering Appendix.

## CHAPTER 4 O&M COSTS

### 4.1 O&M COSTS

Table 4.1, found below, shows a summary of total O&M costs over 50 years for each alignment. These O&M costs have been omitted from the construction cost estimates because they are not actual construction costs.

	<b>Total O&amp;M over 50 years</b>	<b>Total Present Value over 50 years</b>	<b>Annualized O&amp;M</b>
<b>Biscayne Canal</b>	\$118,735,659	\$88,558,061	\$3,280,272
<b>Edgewater</b>	\$136,278,837	\$104,920,707	\$3,886,359
<b>Little River</b>	\$122,713,659	\$90,536,858	\$3,353,568
<b>Miami River Option 1</b>	\$196,210,535	\$160,628,093	\$5,949,812
<b>Miami River Option 2</b>	\$56,355,000	\$30,428,510	\$1,127,100

Table 4.1

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**ATTACHMENT 1**  
**MII Report**

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**ATTACHMENT 2**  
**Abbreviated Risk Analysis**

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**Abbreviated Risk Analysis**

Project (less than \$40M): **Miami-Dade County CSRM Feasibility Study**  
 Project Development Stage/Alternative: **Feasibility (Recommended Plan)**  
 Risk Category: **Moderate Risk: Typical Project Construction Type**

**Alternative: Recommended Plan**

**Meeting Date: 1/7/2020**

Total Estimated Construction Contract Cost = **\$ 925,775,000**

	<u>CWWBS</u>	<u>Feature of Work</u>	<u>Contract Cost</u>		<u>% Contingency</u>	<u>\$ Contingency</u>	<u>Total</u>	
1	11 01 LEVEES	Miami River Wall & Closures	\$ 260,140,449		33.32%	\$ 86,681,744	\$ 346,822,193	
2	11 01 LEVEES	Edgewater Wall & Closures	\$ 200,233,503		33.32%	\$ 66,720,071	\$ 266,953,574	
3	11 01 LEVEES	Little River Wall & Closures	\$ 344,853		33.32%	\$ 114,909	\$ 459,762	
4	11 LEVEES AND FLOODWALLS	Biscayne Canal & Closures	\$ 120,545,276		33.32%	\$ 40,167,051	\$ 160,712,327	
5	01 LANDS AND DAMAGES	Nonstructural	\$ 2,864,297		29.14%	\$ 834,567	\$ 3,698,864	
6			\$ -		0.00%	\$ -	\$ -	
7			\$ -		0.00%	\$ -	\$ -	
17	All Other	<b>Remaining Construction Items</b>	\$ 341,646,614	58.5%	270.97%	\$ 925,775,000	\$ 1,267,421,614	
18	30 PLANNING, ENGINEERING, AND DESIGN	<b>Planning, Engineering, &amp; Design</b>	\$ 222,926,620		0.00%	\$ -	\$ 222,926,620	
19	31 CONSTRUCTION MANAGEMENT	<b>Construction Management</b>	\$ 68,137,040		0.00%	\$ 0	\$ 68,137,040	
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)						\$ -	

<b>Totals</b>							
	Real Estate	\$	-		0.00%	\$	-
	Total Construction Estimate	\$	925,775,000		144.06%	\$	1,333,716,421
	Total Planning, Engineering & Design	\$	222,926,620		0.00%	\$	222,926,620
	Total Construction Management	\$	68,137,040		0.00%	\$	68,137,040
<b>Total</b>		<b>\$</b>	<b>1,216,838,660</b>		<b>110%</b>	<b>\$</b>	<b>1,333,716,421</b>

	<b>Base</b>	<b>50%</b>	<b>80%</b>
<b>Range Estimate (\$000's)</b>	\$1,216,839k	\$2,017,069k	\$2,550,555k

\* 50% based on base is at 5% CL.

**Fixed Dollar Risk Add:** (Allows for additional risk to be added to the risk analysis. Must include justification. Does not allocate to Real Estate.)

**Miami-Dade County CSRM Feasibility Study** | 8-Jan-20

Feasibility (Recommended Plan)

Abbreviated Risk Analysis

Meeting Date: 7-Jan-20

Risk Level					
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Moderate	Significant	Critical

**Risk Register**

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	
<b>Project Scope Growth</b>							<b>Maximum Project Growth</b>	<b>75%</b>
PS-1	Miami River Wall & Closures	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities? • Design confidence? • Project accomplish intent?	Project scope could potentially change due to dynamic requirements, and potential changing site conditions.	Moderate	Possible	2	
PS-2	Edgewater Wall & Closures	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities? • Design confidence?	Project scope could potentially change due to dynamic requirements, and potential changing site conditions.	Moderate	Possible	2	
PS-3	Little River Wall & Closures	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities? • Design confidence?	Project scope could potentially change due to dynamic requirements, and potential changing site conditions.	Moderate	Possible	2	
PS-4	Biscayne Canal & Closures	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities? • Design confidence?	Project scope could potentially change due to dynamic requirements, and potential changing site conditions.	Moderate	Possible	2	
PS-5	Nonstructural	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities? • Design confidence?	Project scope could potentially change due to dynamic requirements, and potential changing site conditions.	Moderate	Possible	2	
PS-18	Planning, Engineering, & Design	• Design confidence?	• Defer soil borings/geotech exploration to pre-construction PED for beach projects only • Usage of G2CRM • Inclusion of inland bay areas in study scope	1.) New borrow sites may be required which would increase costs for developing those sand sources (M). 2.) Discovery of subsurface conditions from the ones assumed could negatively impact C&S (L). 3.) Coastal/H&H engineers unfamiliar with software, could increase cost and schedule (M). 4.) Structural issues due to karst geology may induce piping failures (M). 5.)	Moderate	Possible	2	
PS-19	Construction Management	• Potential for scope growth, added features and quantities?	• Potential for scope growth, added features and quantities? • Project accomplish intent?	Potential Scope Growth would result in greater duration for construction management personnel.	Marginal	Possible	1	
<b>Acquisition Strategy</b>							<b>Maximum Project Growth</b>	<b>30%</b>
AS-1	Miami River Wall & Closures	• Contracting plan firmly established?	•(Real Estate) Obtaining Perpetuity Easements • Contracting plan firmly established? • Limited bid competition anticipated? • Accelerated schedule or harsh weather schedule? • 8a or small business likely? • High-risk acquisition limits competition, design/build?	Acquisition Strategy is unknown at this time. There is a potential limit of interested bidders, decreasing overall competitiveness.	Moderate	Possible	2	
AS-2	Edgewater Wall & Closures	• Contracting plan firmly established?	•(Real Estate) Obtaining Perpetuity Easements • Contracting plan firmly established? • Limited bid competition anticipated? • Accelerated schedule or harsh weather schedule?	Acquisition Strategy is unknown at this time. There is a potential limit of interested bidders, decreasing overall competitiveness.	Moderate	Possible	2	
AS-3	Little River Wall & Closures	• Contracting plan firmly established?	•(Real Estate) Obtaining Perpetuity Easements • Contracting plan firmly established? • Limited bid competition anticipated? • Accelerated schedule or harsh weather schedule?	Acquisition Strategy is unknown at this time. There is a potential limit of interested bidders, decreasing overall competitiveness.	Moderate	Possible	2	
AS-4	Biscayne Canal & Closures	• Contracting plan firmly established?	•(Real Estate) Obtaining Perpetuity Easements • Contracting plan firmly established? • Limited bid competition anticipated? • Accelerated schedule or harsh weather schedule?	Acquisition Strategy is unknown at this time. There is a potential limit of interested bidders, decreasing overall competitiveness.	Moderate	Possible	2	
AS-5	Nonstructural	• Contracting plan firmly established?	•(Real Estate) Obtaining Perpetuity Easements • Contracting plan firmly established? • Limited bid competition anticipated? • Accelerated schedule or harsh weather schedule?	Acquisition Strategy is unknown at this time. There is a potential limit of interested bidders, decreasing overall competitiveness.	Moderate	Possible	2	
AS-19	Construction Management	• Bid schedule developed to reduce quantity risks?	• Contracting plan firmly established? • 8a or small business likely? • Requirement for subcontracting?	Contract Acquisition strategy can affect the overall requirements for construction management. Expedited Schedule, or multiple contract awards can increase the requirement of onsite	Marginal	Possible	1	
<b>Construction Elements</b>							<b>Maximum Project Growth</b>	<b>25%</b>
CE-1	Miami River Wall & Closures	• High risk or complex construction elements, site access, in-water?	• Accelerated schedule or harsh weather schedule? • High risk or complex construction elements, site access, in-water? • Special mobilization? • Potential for construction modification and claims?	Overall Construction is both simple and straightforward, however the location of construction will cause problems for site access and disposal. Construction Elements include Road Closure, Excavation, possible rerouting of underground any/all underground utilities, formwork, concrete placement	Moderate	Possible	2	

CE-2	Edgewater Wall & Closures	• High risk or complex construction elements, site access, in-water?	<ul style="list-style-type: none"> <li>• Accelerated schedule or harsh weather schedule?</li> <li>• High risk or complex construction elements, site access, in-water?</li> <li>• Special mobilization?</li> <li>• Potential for construction modification and claims?</li> </ul>	Overall Construction is both simple and straightforward, however the location of construction will cause problems for site access and disposal. Construction Elements include Road Closure, Excavation, possible rerouting of underground any/all underground utilities, formwork, concrete placement.	Moderate	Possible	2	
CE-3	Little River Wall & Closures	• High risk or complex construction elements, site access, in-water?	<ul style="list-style-type: none"> <li>• Accelerated schedule or harsh weather schedule?</li> <li>• High risk or complex construction elements, site access, in-water?</li> <li>• Special mobilization?</li> <li>• Potential for construction modification and claims?</li> </ul>	Overall Construction is both simple and straightforward, however the location of construction will cause problems for site access and disposal. Construction Elements include Road Closure, Excavation, possible rerouting of underground any/all underground utilities, formwork, concrete placement.	Moderate	Possible	2	
CE-4	Biscayne Canal & Closures	• High risk or complex construction elements, site access, in-water?	<ul style="list-style-type: none"> <li>• Accelerated schedule or harsh weather schedule?</li> <li>• High risk or complex construction elements, site access, in-water?</li> <li>• Special mobilization?</li> <li>• Potential for construction modification and claims?</li> </ul>	Overall Construction is both simple and straightforward, however the location of construction will cause problems for site access and disposal. Construction Elements include Road Closure, Excavation, possible rerouting of underground any/all underground utilities, formwork, concrete placement.	Moderate	Possible	2	
CE-5	Nonstructural	• High risk or complex construction elements, site access, in-water?	<ul style="list-style-type: none"> <li>• Accelerated schedule or harsh weather schedule?</li> <li>• High risk or complex construction elements, site access, in-water?</li> <li>• Special mobilization?</li> <li>• Potential for construction modification and claims?</li> </ul>	Overall Construction is both simple and straightforward, however the location of construction will cause problems for site access and disposal. Construction Elements include Road Closure, Excavation, possible rerouting of underground any/all underground utilities, formwork, concrete placement.	Marginal	Possible	1	
CE-19	Construction Management	• High risk or complex construction elements, site access, in-water?	<ul style="list-style-type: none"> <li>• Accelerated schedule or harsh weather schedule?</li> <li>• High risk or complex construction elements, site access, in-water?</li> <li>• Water care and diversion plan?</li> </ul>	Overall Construction is both simple and straightforward, however the location of construction will cause problems for site access and disposal. Construction Elements include Road	Negligible	Unlikely	0	
<b>Quantities for Current Scope</b>							<b>Maximum Project Growth</b>	<b>20%</b>
Q-1	Miami River Wall & Closures	• Possibility for increased quantities due to loss, waste, or subsidence?	<ul style="list-style-type: none"> <li>• Level of confidence based on design and assumptions?</li> <li>• Possibility for increased quantities due to loss, waste, or subsidence?</li> <li>• Appropriate methods applied to calculate quantities?</li> <li>• Sufficient investigations to develop quantities?</li> <li>• Quality control check applied?</li> </ul>	Depending on multiple site studies and investigations yet to be done, given quantities are likely to change.	Moderate	Possible	2	
Q-2	Edgewater Wall & Closures	• Possibility for increased quantities due to loss, waste, or subsidence?	<ul style="list-style-type: none"> <li>• Level of confidence based on design and assumptions?</li> <li>• Possibility for increased quantities due to loss, waste, or subsidence?</li> <li>• Appropriate methods applied to calculate quantities?</li> <li>• Sufficient investigations to develop quantities?</li> <li>• Quality control check applied?</li> </ul>	Depending on multiple site studies and investigations yet to be done, given quantities are likely to change.	Moderate	Possible	2	
Q-3	Little River Wall & Closures	• Possibility for increased quantities due to loss, waste, or subsidence?	<ul style="list-style-type: none"> <li>• Level of confidence based on design and assumptions?</li> <li>• Possibility for increased quantities due to loss, waste, or subsidence?</li> <li>• Appropriate methods applied to calculate quantities?</li> <li>• Sufficient investigations to develop quantities?</li> <li>• Quality control check applied?</li> </ul>	Depending on multiple site studies and investigations yet to be done, given quantities are likely to change.	Moderate	Possible	2	
Q-4	Biscayne Canal & Closures	• Possibility for increased quantities due to loss, waste, or subsidence?	<ul style="list-style-type: none"> <li>• Level of confidence based on design and assumptions?</li> <li>• Possibility for increased quantities due to loss, waste, or subsidence?</li> <li>• Appropriate methods applied to calculate quantities?</li> <li>• Sufficient investigations to develop quantities?</li> <li>• Quality control check applied?</li> </ul>	Depending on multiple site studies and investigations yet to be done, given quantities are likely to change.	Moderate	Possible	2	
Q-5	Nonstructural	• Possibility for increased quantities due to loss, waste, or subsidence?	<ul style="list-style-type: none"> <li>• Level of confidence based on design and assumptions?</li> <li>• Possibility for increased quantities due to loss, waste, or subsidence?</li> <li>• Appropriate methods applied to calculate quantities?</li> <li>• Sufficient investigations to develop quantities?</li> <li>• Quality control check applied?</li> </ul>	Depending on multiple site studies and investigations yet to be done, given quantities are likely to change.	Marginal	Possible	1	
<b>Specialty Fabrication or Equipment</b>							<b>Maximum Project Growth</b>	<b>75%</b>
FE-1	Miami River Wall & Closures	• Level of confidence based on design and assumptions?	• Level of confidence based on design and assumptions?	Closure Design is in early stages. Exact quantities and dimensions of each are yet to be determined.	Moderate	Possible	2	
FE-2	Edgewater Wall & Closures	• Level of confidence based on design and assumptions?	• Level of confidence based on design and assumptions?	Closure Design is in early stages. Exact quantities and dimensions of each are yet to be determined.	Moderate	Possible	2	
FE-3	Little River Wall & Closures	• Level of confidence based on design and assumptions?	• Level of confidence based on design and assumptions?	Closure Design is in early stages. Exact quantities and dimensions of each are yet to be determined.	Moderate	Possible	2	
FE-4	Biscayne Canal & Closures	• Level of confidence based on design and assumptions?	• Level of confidence based on design and assumptions?	Closure Design is in early stages. Exact quantities and dimensions of each are yet to be determined.	Moderate	Possible	2	
FE-5	Nonstructural	• Level of confidence based on design and assumptions?	• Level of confidence based on design and assumptions?	No specialty fabrication is expected to be used or needed. Project scope/construction means do not require any specialty equipment.	Marginal	Possible	1	
<b>Cost Estimate Assumptions</b>							<b>Maximum Project Growth</b>	<b>35%</b>
CT-1	Miami River Wall & Closures	• Lack confidence on critical cost items?	<ul style="list-style-type: none"> <li>• Reliability and number of key quotes?</li> <li>• Assumptions related to prime and subcontractor markups/assignments?</li> <li>• Assumptions regarding crew, productivity, overtime?</li> <li>• Lack confidence on critical cost items?</li> </ul>	Current Working Estimate is based on historical contract awards as well as historical designs. Assumptions related to prime/sub contractors have been made, but could be different in execution. At this phase of the project, the cost estimate seems to be sound based on the current scope of work, with few critical assumptions being made.	Moderate	Possible	2	

CT-2	Edgewater Wall & Closures	• Lack confidence on critical cost items?	<ul style="list-style-type: none"> <li>• Reliability and number of key quotes?</li> <li>• Assumptions related to prime and subcontractor markups/assignments?</li> <li>• Assumptions regarding crew, productivity, overtime?</li> <li>• Lack confidence on critical cost items?</li> </ul>	Current working Estimate is based on historical contract awards as well as historical designs. Assumptions related to prime/sub contractors have been made, but could be different in execution. At this phase of the project, the cost estimate seems to be sound based on the current scope of work, with few critical assumptions being made.	Moderate	Possible	2	
CT-3	Little River Wall & Closures	• Lack confidence on critical cost items?	<ul style="list-style-type: none"> <li>• Reliability and number of key quotes?</li> <li>• Assumptions related to prime and subcontractor markups/assignments?</li> <li>• Assumptions regarding crew, productivity, overtime?</li> <li>• Lack confidence on critical cost items?</li> </ul>	Current working Estimate is based on historical contract awards as well as historical designs. Assumptions related to prime/sub contractors have been made, but could be different in execution. At this phase of the project, the cost estimate seems to be sound based on the current scope of work, with few critical assumptions being made.	Moderate	Possible	2	
CT-4	Biscayne Canal & Closures	• Lack confidence on critical cost items?	<ul style="list-style-type: none"> <li>• Reliability and number of key quotes?</li> <li>• Assumptions related to prime and subcontractor markups/assignments?</li> <li>• Assumptions regarding crew, productivity, overtime?</li> <li>• Lack confidence on critical cost items?</li> </ul>	Current working Estimate is based on historical contract awards as well as historical designs. Assumptions related to prime/sub contractors have been made, but could be different in execution. At this phase of the project, the cost estimate seems to be sound based on the current scope of work, with few critical assumptions being made.	Moderate	Possible	2	
CT-5	Nonstructural	• Lack confidence on critical cost items?	<ul style="list-style-type: none"> <li>• Reliability and number of key quotes?</li> <li>• Assumptions related to prime and subcontractor markups/assignments?</li> <li>• Assumptions regarding crew, productivity, overtime?</li> <li>• Lack confidence on critical cost items?</li> </ul>	Current working Estimate is based on historical contract awards as well as historical designs. Assumptions related to prime/sub contractors have been made, but could be different in execution. At this phase of the project, the cost estimate seems to be sound based on the current scope of work, with few critical assumptions being made.	Moderate	Possible	2	
<b>External Project Risks</b>							<b>Maximum Project Growth</b>	<b>40%</b>
EX-1	Miami River Wall & Closures	• Potential for severe adverse weather?	<ul style="list-style-type: none"> <li>• Potential for severe adverse weather?</li> <li>• Political influences, lack of support, obstacles?</li> <li>• Unanticipated inflations in fuel, key materials?</li> <li>• Potential for market volatility impacting competition, pricing?</li> </ul>	Potential risk related to unforeseen severe or adverse weather due to the location of the construction features. At this phase of the project, there is also a concern for funding and/or support obstacles. Each site will have access issues and road closure difficulties due to their location, so any sudden increase in fuel, route closings, or availability of material could impact day to day routines during construction.	Moderate	Unlikely	1	
EX-2	Edgewater Wall & Closures	• Potential for severe adverse weather?	<ul style="list-style-type: none"> <li>• Potential for severe adverse weather?</li> <li>• Political influences, lack of support, obstacles?</li> <li>• Unanticipated inflations in fuel, key materials?</li> <li>• Potential for market volatility impacting competition, pricing?</li> </ul>	Potential risk related to unforeseen severe or adverse weather due to the location of the construction features. At this phase of the project, there is also a concern for funding and/or support obstacles. Each site will have access issues and road closure difficulties due to their location, so any sudden increase in fuel, route closings, or availability of material could impact day to day routines during construction.	Moderate	Unlikely	1	
EX-3	Little River Wall & Closures	• Potential for severe adverse weather?	<ul style="list-style-type: none"> <li>• Potential for severe adverse weather?</li> <li>• Political influences, lack of support, obstacles?</li> <li>• Unanticipated inflations in fuel, key materials?</li> <li>• Potential for market volatility impacting competition, pricing?</li> </ul>	Potential risk related to unforeseen severe or adverse weather due to the location of the construction features. At this phase of the project, there is also a concern for funding and/or support obstacles. Each site will have access issues and road closure difficulties due to their location, so any sudden increase in fuel, route closings, or availability of material could impact day to day routines during construction.	Moderate	Unlikely	1	
EX-4	Biscayne Canal & Closures	• Potential for severe adverse weather?	<ul style="list-style-type: none"> <li>• Potential for severe adverse weather?</li> <li>• Political influences, lack of support, obstacles?</li> <li>• Unanticipated inflations in fuel, key materials?</li> <li>• Potential for market volatility impacting competition, pricing?</li> </ul>	Potential risk related to unforeseen severe or adverse weather due to the location of the construction features. At this phase of the project, there is also a concern for funding and/or support obstacles. Each site will have access issues and road closure difficulties due to their location, so any sudden increase in fuel, route closings, or availability of material could impact day to day routines during construction.	Moderate	Unlikely	1	
EX-5	Nonstructural	• Potential for severe adverse weather?	<ul style="list-style-type: none"> <li>• Potential for severe adverse weather?</li> <li>• Political influences, lack of support, obstacles?</li> <li>• Unanticipated inflations in fuel, key materials?</li> <li>• Potential for market volatility impacting competition, pricing?</li> </ul>	Potential risk related to unforeseen severe or adverse weather due to the location of the construction features. At this phase of the project, there is also a concern for funding and/or support obstacles. Each site will have access issues and road closure difficulties due to their location, so any sudden increase in fuel, route closings, or availability of material could impact day to day routines during construction.	Moderate	Possible	2	
EX-19	Construction Management	• Potential for severe adverse weather?	<ul style="list-style-type: none"> <li>• Potential for severe adverse weather?</li> <li>• Political influences, lack of support, obstacles?</li> <li>• Unanticipated inflations in fuel, key materials?</li> </ul>	Multiple items can affect the overall duration of construction, resulting in the duration of construction management increasing or decreasing.	Negligible	Unlikely	0	

**ATTACHMENT 3**  
**Structural TPCS**

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**\*\*\*\* TOTAL PROJECT COST SUMMARY \*\*\*\***

PROJECT: Miami-Dade CSRM Feasibility Study  
PROJECT NO: 476677  
LOCATION: Dade County - Miami, Florida

DISTRICT: NAO Norfolk District  
POC: CHIEF, COST ENGINEERING  
PREPARED: 5/14/2020

This Estimate reflects the scope and schedule in report; TSP

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)					TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER <i>A</i>	Civil Works Feature & Sub-Feature Description <i>B</i>	COST (\$K) <i>C</i>	CNTG (\$K) <i>D</i>	CNTG (%) <i>E</i>	TOTAL (\$K) <i>F</i>	Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19				Spent Thru: 12/1/2018 (\$K)	TOTAL FIRST COST (\$K)	ESC (%)	COST (\$K) <i>M</i>	CNTG (\$K) <i>N</i>	FULL (\$K) <i>O</i>
						ESC (%) <i>G</i>	COST (\$K) <i>H</i>	CNTG (\$K) <i>I</i>	TOTAL (\$K) <i>J</i>						
<b>11</b>	LEVEES & FLOODWALLS	\$997,121	\$339,021	34%	\$1,336,142	2.5%	\$1,022,449	\$347,633	\$1,370,081	\$0	\$1,370,081	35.4%	\$1,383,984	\$470,554	\$1,854,538
<b>18</b>	CULTURAL RESOURCE PRESERVATION	\$7,786	\$2,647	34%	\$10,433	2.5%	\$7,984	\$2,714	\$10,698	\$0	\$10,698	35.4%	\$10,807	\$3,674	\$14,481
		\$0	\$0 -		\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
		\$0	\$0 -		\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
	<b>CONSTRUCTION ESTIMATE TOTALS:</b>	\$1,004,907	\$341,668		\$1,346,575	2.5%	\$1,030,432	\$350,347	\$1,380,780	\$0	\$1,380,780	35.4%	\$1,394,790	\$474,229	\$1,869,019
<b>01</b>	LANDS AND DAMAGES	\$355,432	\$120,847	34%	\$476,279	2.5%	\$364,460	\$123,916	\$488,377	\$0	\$488,377	23.9%	\$451,469	\$153,499	\$604,968
<b>30</b>	PLANNING, ENGINEERING & DESIGN	\$135,662	\$46,125	34%	\$181,788	3.9%	\$140,916	\$47,912	\$188,828	\$0	\$188,828	33.5%	\$188,161	\$63,975	\$252,135
<b>31</b>	CONSTRUCTION MANAGEMENT (S&A)	\$145,712	\$49,542	34%	\$195,253	3.9%	\$151,355	\$51,461	\$202,815	\$0	\$202,815	46.5%	\$221,800	\$75,412	\$297,212
	<b>PROJECT COST TOTALS:</b>	\$1,641,713	\$558,182	34%	\$2,199,895		\$1,687,164	\$573,636	\$2,260,799	\$0	\$2,260,799	33.7%	\$2,256,220	\$767,115	\$3,023,334

- \_\_\_\_\_ CHIEF, COST ENGINEERING
- \_\_\_\_\_ PROJECT MANAGER
- \_\_\_\_\_ CHIEF, REAL ESTATE
- \_\_\_\_\_ CHIEF, PLANNING
- \_\_\_\_\_ CHIEF, ENGINEERING
- \_\_\_\_\_ CHIEF, OPERATIONS
- \_\_\_\_\_ CHIEF, CONSTRUCTION
- \_\_\_\_\_ CHIEF, CONTRACTING
- \_\_\_\_\_ CHIEF, PM-PB
- \_\_\_\_\_ CHIEF, DPM

ESTIMATED FEDERAL COST: **100% \$3,023,334**  
ESTIMATED NON-FEDERAL COST: **0% \$0**  
**ESTIMATED TOTAL PROJECT COST: \$3,023,334**

**\*\*\*\* CONTRACT COST SUMMARY \*\*\*\***

**ATTACHMENT 4**  
**Non-Structural TPCS**

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\*\*\*\* TOTAL PROJECT COST SUMMARY \*\*\*\*

PROJECT: Miami-Dade CSRM Feasibility Study - NonStructural  
PROJECT NO: 476677  
LOCATION: Dade County - Miami, Florida

DISTRICT: NAO Norfolk District  
POC: CHIEF, COST ENGINEERING  
PREPARED: 5/27/2020

This Estimate reflects the scope and schedule in report; TSP

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)					TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST (\$K) C	CNTG (\$K) D	CNTG (%) E	TOTAL (\$K) F	Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19				Spent Thru: 12/1/2018 (\$K)	TOTAL FIRST COST (\$K)	ESC (%)	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O
						ESC (%) G	COST (\$K) H	CNTG (\$K) I	TOTAL (\$K) J						
02	RELOCATIONS	\$1,303,596	\$443,223	34%	\$1,746,819	2.5%	\$1,336,708	\$454,481	\$1,791,189	\$0	\$1,791,189	35.4%	\$1,809,365	\$615,184	\$2,424,549
18	CULTURAL RESOURCE PRESERVATION	\$13,035	\$4,432	34%	\$17,467	2.5%	\$13,366	\$4,544	\$17,911	\$0	\$17,911	35.4%	\$18,092	\$6,151	\$24,244
		\$0	\$0 -		\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
		\$0	\$0 -		\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
<b>CONSTRUCTION ESTIMATE TOTALS:</b>		\$1,316,631	\$447,655		\$1,764,286	2.5%	\$1,350,075	\$459,025	\$1,809,100	\$0	\$1,809,100	35.4%	\$1,827,457	\$621,335	\$2,448,792
01	LANDS AND DAMAGES	\$0	\$0 -		\$0	-	\$0	\$0	\$0	\$0	\$0	-	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN	\$177,745	\$60,433	34%	\$238,179	3.9%	\$184,629	\$62,774	\$247,403	\$0	\$247,403	24.9%	\$230,532	\$78,381	\$308,913
31	CONSTRUCTION MANAGEMENT (S&A)	\$190,911	\$64,910	34%	\$255,821	3.9%	\$198,305	\$67,424	\$265,729	\$0	\$265,729	33.5%	\$264,747	\$90,014	\$354,761
<b>PROJECT COST TOTALS:</b>		\$1,685,288	\$572,998	34%	\$2,258,285		\$1,733,008	\$589,223	\$2,322,231	\$0	\$2,322,231	34.0%	\$2,322,737	\$789,730	\$3,112,467

CHIEF, COST ENGINEERING

PROJECT MANAGER

CHIEF, REAL ESTATE

CHIEF, PLANNING

CHIEF, ENGINEERING

CHIEF, OPERATIONS

CHIEF, CONSTRUCTION

CHIEF, CONTRACTING

CHIEF, PM-PB

CHIEF, DPM

ESTIMATED FEDERAL COST: 100% \$3,112,467  
ESTIMATED NON-FEDERAL COST: 0% \$0

**ESTIMATED TOTAL PROJECT COST: \$3,112,467**

\*\*\*\* CONTRACT COST SUMMARY \*\*\*\*

\*\*\*\* TOTAL PROJECT COST SUMMARY \*\*\*\*

LOCATION: Dade County - Miami, Florida  
This Estimate reflects the scope and schedule in report;

TSP

POC: CHIEF, COST ENGINEERING

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:		12/18/2018		Program Year (Budget EC):		2020						
		Effective Price Level:		10/1/2018		Effective Price Level Date:		1 OCT 19						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST (\$K)	CNTG (\$K)	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
	<b>Critical Infrastructure Floodproofing</b>													
02	RELOCATIONS	\$34,638	\$11,777	34%	\$46,415	2.5%	\$35,518	\$12,076	\$47,594	2030Q2	35.4%	\$48,077	\$16,346	\$64,423
18	CULTURAL RESOURCE PRESERVATION	\$346	\$118	34%	\$464	2.5%	\$355	\$121	\$475	2030Q2	35.4%	\$480	\$163	\$644
		\$0	\$0	0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
		\$0	\$0	0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
<b>CONSTRUCTION ESTIMATE TOTALS:</b>		\$34,984	\$11,895	34%	\$46,879		\$35,873	\$12,197	\$48,069			\$48,557	\$16,509	\$65,066
01	LANDS AND DAMAGES	\$0	\$0	0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN	\$4,723	\$1,606	34%	\$6,329		\$4,906	\$1,668	\$6,574			\$6,408	\$2,179	
2.5%	Project Management	\$874.60	\$297	34%	\$1,172	3.9%	\$908	\$309	\$1,217	2025Q2	21.3%	\$1,102	\$375	\$1,476
1.0%	Planning & Environmental Compliance	\$349.84	\$119	34%	\$469	3.9%	\$363	\$124	\$487	2025Q2	21.3%	\$441	\$150	\$590
1.0%	Engineering & Design	\$349.84	\$119	34%	\$469	3.9%	\$363	\$124	\$487	2025Q2	21.3%	\$441	\$150	\$590
1.0%	Reviews, ATRs, IEPRs, VE	\$349.84	\$119	34%	\$469	3.9%	\$363	\$124	\$487	2025Q2	21.3%	\$441	\$150	\$590
1.0%	Life Cycle Updates (cost, schedule, risks)	\$349.84	\$119	34%	\$469	3.9%	\$363	\$124	\$487	2025Q2	21.3%	\$441	\$150	\$590
1.0%	Contracting & Reprographics	\$349.84	\$119	34%	\$469	3.9%	\$363	\$124	\$487	2025Q2	21.3%	\$441	\$150	\$590
3.0%	Engineering During Construction	\$1,049.52	\$357	34%	\$1,406	3.9%	\$1,090	\$371	\$1,461	2030Q2	46.5%	\$1,598	\$543	\$2,141
2.0%	Planning During Construction	\$699.68	\$238	34%	\$938	3.9%	\$727	\$247	\$974	2030Q2	46.5%	\$1,065	\$362	\$1,427
1.0%	Project Operations	\$349.84	\$119	34%	\$469	3.9%	\$363	\$124	\$487	2025Q2	21.3%	\$441	\$150	\$590
31	CONSTRUCTION MANAGEMENT	\$5,073	\$1,725	34%	\$6,797		\$5,269	\$1,792	\$7,061			\$7,722	\$2,625	
10.0%	Construction Management	\$3,498	\$1,189	34%	\$4,688	3.9%	\$3,634	\$1,236	\$4,869	2030Q2	46.5%	\$5,325	\$1,811	\$7,136
2.0%	Project Operation:	\$700	\$238	34%	\$938	3.9%	\$727	\$247	\$974	2030Q2	46.5%	\$1,065	\$362	\$1,427
2.5%	Project Management	\$875	\$297	34%	\$1,172	3.9%	\$908	\$309	\$1,217	2030Q2	46.5%	\$1,331	\$453	\$1,784
<b>CONTRACT COST TOTALS:</b>		\$44,780	\$15,225		\$60,005		\$46,047	\$15,656	\$61,704			\$62,687	\$21,314	\$84,000

\*\*\*\* CONTRACT COST SUMMARY \*\*\*\*

PROJECT: Miami-Dade CSRM Feasibility Study - NonStructural  
LOCATION: Dade County - Miami, Florida  
This Estimate reflects the scope and schedule in report;

TSP

DISTRICT: NAO Norfolk District  
POC: CHIEF, COST ENGINEERING

PREPARED: 5/27/2020

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
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**\*\*\*\* TOTAL PROJECT COST SUMMARY \*\*\*\***

A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	<b>Floodproofing</b>													
<b>02</b>	RELOCATIONS	\$673,147	\$228,870	34%	\$902,017	2.5%	\$690,245	\$234,683	\$924,929	2030Q2	35.4%	\$934,314	\$317,667	\$1,251,981
<b>18</b>	CULTURAL RESOURCE PRESERVATION	\$6,731	\$2,289	34%	\$9,020	2.5%	\$6,902	\$2,347	\$9,249	2030Q2	35.4%	\$9,342	\$3,176	\$12,519
							\$0							
	<b>CONSTRUCTION ESTIMATE TOTALS:</b>	\$679,878	\$231,159	34%	\$911,037		\$697,147	\$237,030	\$934,178			\$943,657	\$320,843	\$1,264,500
<b>01</b>	LANDS AND DAMAGES	\$0	\$0	0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
<b>30</b>	PLANNING, ENGINEERING & DESIGN	\$91,784	\$31,206	34%	\$122,990		\$95,338	\$32,415	\$127,753			\$124,536	\$42,342	
2.5%	Project Management	\$16,997	\$5,779	34%	\$22,776	3.9%	\$17,655	\$6,003	\$23,658	2025Q2	21.3%	\$21,409	\$7,279	\$28,688
1.0%	Planning & Environmental Compliance	\$6,799	\$2,312	34%	\$9,110	3.9%	\$7,062	\$2,401	\$9,463	2025Q2	21.3%	\$8,564	\$2,912	\$11,475
1.0%	Engineering & Design	\$6,799	\$2,312	34%	\$9,110	3.9%	\$7,062	\$2,401	\$9,463	2025Q2	21.3%	\$8,564	\$2,912	\$11,475
1.0%	Reviews, ATRs, IEPs, VE	\$6,799	\$2,312	34%	\$9,110	3.9%	\$7,062	\$2,401	\$9,463	2025Q2	21.3%	\$8,564	\$2,912	\$11,475
1.0%	Life Cycle Updates (cost, schedule, risks)	\$6,799	\$2,312	34%	\$9,110	3.9%	\$7,062	\$2,401	\$9,463	2025Q2	21.3%	\$8,564	\$2,912	\$11,475
1.0%	Contracting & Reprographics	\$6,799	\$2,312	34%	\$9,110	3.9%	\$7,062	\$2,401	\$9,463	2025Q2	21.3%	\$8,564	\$2,912	\$11,475
3.0%	Engineering During Construction	\$20,396	\$6,935	34%	\$27,331	3.9%	\$21,186	\$7,203	\$28,390	2030Q2	46.5%	\$31,047	\$10,556	\$41,603
2.0%	Planning During Construction	\$13,598	\$4,623	34%	\$18,221	3.9%	\$14,124	\$4,802	\$18,926	2030Q2	46.5%	\$20,698	\$7,037	\$27,735
1.0%	Project Operations	\$6,799	\$2,312	34%	\$9,110	3.9%	\$7,062	\$2,401	\$9,463	2025Q2	21.3%	\$8,564	\$2,912	\$11,475
<b>31</b>	CONSTRUCTION MANAGEMENT	\$98,582	\$33,518	34%	\$132,100		\$102,400	\$34,816	\$137,216			\$150,060	\$51,021	
10.0%	Construction Management	\$67,988	\$23,116	34%	\$91,104	3.9%	\$70,621	\$24,011	\$94,632	2030Q2	46.5%	\$103,490	\$35,187	\$138,676
2.0%	Project Operation:	\$13,598	\$4,623	34%	\$18,221	3.9%	\$14,124	\$4,802	\$18,926	2030Q2	46.5%	\$20,698	\$7,037	\$27,735
2.5%	Project Management	\$16,997	\$5,779	34%	\$22,776	3.9%	\$17,655	\$6,003	\$23,658	2030Q2	46.5%	\$25,872	\$8,797	\$34,669
	<b>CONTRACT COST TOTALS:</b>	\$870,244	\$295,883		\$1,166,127		\$894,886	\$304,261	\$1,199,147			\$1,218,253	\$414,206	\$1,632,459

**\*\*\*\* CONTRACT COST SUMMARY \*\*\*\***

PROJECT: Miami-Dade CSRM Feasibility Study - NonStructural  
 LOCATION: Dade County - Miami, Florida  
 This Estimate reflects the scope and schedule in report; TSP

DISTRICT: NAO Norfolk District  
 POC: CHIEF, COST ENGINEERING

PREPARED: 5/27/2020