ORDER FOR SUPPLIES OR SERVICES

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

1. DATE OF ORDER: 09/21/2017

2. CONTRACT NO. (If any): EP-C-17-031

3. ORDER NO.: 0001

4. REQUISITION/REFERENCE NO.: PR-ORD-17-01605

5. ISSUING OFFICE (Address correspondence to):
CPOD
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: NWD
Cincinnati OH 45268

6. SHIP TO:
a. NAME OF CONSIGNEE: CPOD
b. STREET ADDRESS: US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: NWD
c. CITY: Cincinnati
d. STATE: OH
e. ZIP CODE: 45268

7. TO: George Townsend
a. NAME OF CONTRACTOR: TETRA TECH, INC.
b. COMPANY NAME:
c. STREET ADDRESS: 10306 EATON PL STE 340
d. CITY: FAIRFAX
e. STATE: VA
f. ZIP CODE: 220302201

f. SHIP VIA:

8. TYPE OF ORDER
[ ] a. PURCHASE
REFERENCE YOUR:
Please furnish the following on the terms and conditions specified on both sides of this order and on the attached sheet, if any, including delivery as indicated.
[X] b. DELIVERY
Except for billing instructions on the reverse, this delivery order is subject to instructions contained on this side only of this form and is issued subject to the terms and conditions of the above-numbered contract.

9. ACCOUNTING AND APPROPRIATION DATA: See Schedule

10. REQUISITIONING OFFICE: ORD/OARS/EMD/CIN

11. BUSINESS CLASSIFICATION (Check appropriate box(es))
[ ] a. SMALL [X] b. OTHER THAN SMALL [ ] c. DISADVANTAGED [ ] d. WOMEN-OWNED [ ] e. HUBZone
[ ] f. SERVICE-DISABLED VETERAN-OWNED [ ] g. WOMEN-OWNED SMALL BUSINESS (WOSB) ELIGIBLE UNDER THE WOSB PROGRAM [ ] h. EDWOSB

12. F.O.B. POINT: Destination

13. PLACE OF
a. INSPECTION: Destination
b. ACCEPTANCE: Destination

14. GOVERNMENT B/L NO.:

15. DELIVER TO F.O.B. POINT ON OR BEFORE (Date): 09/28/2018

16. DISCOUNT TERMS:

17. SCHEDULE (See reverse for Rejections)

ITEM NO. (a)	SUPPLIES OR SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	DUNS Number: 198549560 Firm Fixed Price TO Regional Monitoring Networks TOCOR: Jordan West Continued ...					

18. SHIPPING POINT:
19. GROSS SHIPPING WEIGHT:
20. INVOICE NO.:

17(h) TOTAL (Cont. pages): $79,990.00

21. MAIL INVOICE TO:
a. NAME: RTP Finance Center
b. STREET ADDRESS (or P.O. Box): US Environmental Protection Agency
RTP-Finance Center (AA216-01)
109 TW Alexander Drive
www2.epa.gov/financial/contracts
c. CITY: Durham
d. STATE: NC
e. ZIP CODE: 27711

SEE BILLING INSTRUCTIONS ON REVERSE

17(i) GRAND TOTAL: $79,990.00

22. UNITED STATES OF AMERICA BY (Signature): 09/21/2017 Candice Charlton ELECTRONIC SIGNATURE

23. NAME (Typed): Candice Charlton
TITLE: CONTRACTING/ORDERING OFFICER

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

DATE OF ORDER	CONTRACT NO.	ORDER NO.
09/21/2017	EP-C-17-031	0001

ITEM NO. (a)	SUPPLIES/SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	Admin Office: CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268 Accounting Info: 17-18-C-262W000-101FK6XR1-2532-26A5C-17262WC735-001 BFY: 17 EFY: 18 Fund: C Budget Org: 262W000 Program (PRC): 101FK6XR1 Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 17262WC735-001 Period of Performance: 10/01/2017 to 09/30/2018					
0002	Task Order Issuance Line Item: Technical Support for EPA/ORD/NCEA's Ecological Assessment Programs Delivery-Payment Schedule The table below presents the payment amount associated with each deliverable. TBD deliverables will be invoiced with other deliverable invoices when possible. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, the performance based payment invoicing amounts below will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. Deliverables(Estimated Invoice Date-on or after)Amount 1.1/1.2a/3.1a/2.1a(6-Dec-1)$14,943.19 3.2a/3.1b/2.1b(31-Jan-18)$13,185.16 2.2a/2.3a(24-Feb-18)$17,228.62 3.2b/2.1c/2.2b(7-Apr-18)$14,943.19 2.1d/2.3b/2.2c(2-Jun-18)$10,899.74 2.1e(TBD)$2,461.23 2.2d(TBD)$2,197.53 3.1c(TBD)$4,131.35 FIRM FIXED PRICE TOTAL: $79,990.00 Continued ...				79,990.00	

TOTAL CARRIED FORWARD TO 1ST PAGE (ITEM 17(H)) $79,990.00

ORDER FOR SUPPLIES OR SERVICES
SCHEDULE - CONTINUATION

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

DATE OF ORDER	CONTRACT NO.	ORDER NO.
09/21/2017	EP-C-17-031	0001

ITEM NO. (a)	SUPPLIES/SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)

TOTAL CARRIED FORWARD TO 1ST PAGE (ITEM 17(H)) $0.00

PERFORMANCE WORK STATEMENT

Contract: EP-C-17-031
PR-ORD-17-01605
TO # TBD

TITLE: Adaptation Planning for Resilient Natural Resources
EAS Short Title: Adaptation for Natural Resources

PERIOD OF PERFORMANCE: TO Award date through one year following award

TASK ORDER COR: Jordan West
Global Change Research Program
US Environmental Protection Agency
1200 Pennsylvania Ave., NW (8601P)
Washington, DC 20460
west.jordan@epa.gov
703-347-8584 (voice)
703-347-8694 (fax)

ALTERNATE TOCOR: Susan Julius
Global Change Research Program
US Environmental Protection Agency
1200 Pennsylvania Ave., NW (8601P)
Washington, DC 20460
julius.susan@epa.gov
703-347-8619 (voice)
703-347-8694 (fax)

INTRODUCTION

Work in EPA's Exposure Analysis and Risk Characterization Group (EARCG) includes assessments of the potential vulnerability to climate change (and other global change stressors such as land-use change) of ecosystem health, water quality, human health and air quality with a focus on developing adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science and to provide adaptation support for decision makers and managers. Vulnerability and adaptation assessment activities in the EARCG's aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA) and are designed to build the capacity of EPA programs, regional offices, aquatic ecosystem managers (including wetland and coral reef managers), and other decision-makers to assess and respond to global change impacts on ecosystem processes and services. The purpose of this task order is to provide technical support to the EARCG and partners to advance frameworks and methods for vulnerability assessments and adaptation planning processes for resilient wetland, coral reef, and other natural resource systems.

This task order (TO) focuses on two parallel, but related, areas of work: (1) vulnerability and adaptation assessment methods for wetlands and (2) adaptation planning frameworks, as demonstrated for coral

reefs and other aquatic systems. Each of these two major areas of work is represented by a Task.

Work Area 1, **National Wetlands Vulnerability Assessment Methods**, supports EPA Office of Water's (OW) priority #4 (Watersheds at risk) and priority #5 (Coastal wetlands at risk). Earlier work in this area focused on: the development of a methodological framework and inventory of wetland vulnerabilities for a mid-Atlantic pilot region based on vulnerability assessment methods, resilience theory, and wetlands classifications; an analysis and summary of best approaches for applying inventory results to inform adaptation of EPA OW Programs; and initiation of follow-on work in the form of a Coastal Track (extending the framework and approach to coastal wetlands) and a Programmatic Track (applying the framework and results to decision-making with partners in State programs).

Work Area 2, **Adaptation Planning Framework & Coral Reef Demonstration**, supports EPA OW'S priority #8 (Indicators of climate change), as well as needs of EPA Regions with coral reefs and other applicable aquatic systems (such as those supported by the Chesapeake Bay Program). Earlier work in this area focused on: collaboration with a Climate-Smart Work Group convened by the National Wildlife Federation to develop a unified adaptation framework for natural resources; demonstration of a more detailed and tailored use of the framework for coral reef ecosystems; and development of an "Adaptation Design Tool" to help managers brainstorm and design effective adaptation actions in response to identified vulnerabilities to the resilience of their natural resources due to environmental change.

OBJECTIVES

For work Area 1, the Contractor shall continue—following on WA 4-06 contract EP-C-12-060--technical advancement of frameworks and methods for characterizing wetland relative vulnerabilities for multiple wetland types at multiple scales, in order to support development of information and processes for integrating climate change considerations into wetlands programs and activities of OW as well as Regional and State partners. Objectives are to:

(1) Prepare a journal article on the technical approach for application of framework concepts to coastal wetlands, including development and validation of versions for both data-rich and data-scarce situations and the framework's applicability at the national scale, and results of SLAMM (Sea Level Affecting Marsh Migration) modeling;

For Work Area 2, the Contractor shall provide technical support-- following on WA 4-06 contract EP-C-12-060 --for continued elaboration of the climate-smart adaptation planning cycle, with development of associated adaptation design and evaluation tools. Objectives are to:

(1) Finalize a journal article presenting conceptual approach, methods, results and expert testing of the Adaptation Design Tool[1];
(2) Develop a conceptual model and methodological approach for demonstrating how information generated with the Adaptation Design Tool can effectively feed into evaluation and selection processes for prioritizing adaptation actions during management planning.

REQUIRED CONTRACTOR QUALIFICATIONS

[1] Parker et al. (2017); https://www.coris.noaa.gov/activities/CCAP_design/

1) Multidisciplinary professional expertise in assessing the impacts of climate change and other interacting stressors (such as land use change) on climate-sensitive ecosystems, including expertise in resilience and threshold theory and management adaptation.

2) Thorough knowledge and application of wetlands classification systems including the hydro-geomorphic method (HGM) and Cowardin/National Wetlands Inventory (NWI) system; thorough knowledge of the CWA Section 404 compensatory mitigation program; and familiarity with State voluntary restoration activities in EPA Region 3.

3) Thorough knowledge of conceptual approaches, methods, trainings and on-the-ground work on climate change vulnerability assessment and adaptation planning applications for coral reef and wetland conservation and management.

4) Experience developing and evaluating practical frameworks and trainings for integrating climate change considerations into management planning and building resilience into conservation.

5) Expertise in directed literature searches and synthetic analyses of available literature (including grey literature). Expertise in conducting literature reviews and compiling, interpreting and using pertinent models, data sets and reports for wetlands associated with Coastal Track and Programmatic Track case study locations.

6) Experience organizing and facilitating stakeholder processes, partnerships, and expert scientific meetings.

7) Experience developing, managing, and ensuring quality control of large-scale datasets and assessments.

8) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

SPECIFIC TASKS:

TASK 1 Prepare Quality Assurance Project Plan and Establish/Maintain Communication

SubTask 1.1: Develop a Quality Assurance Project Plan

For previous work under this project under WA 4-06 of contract EP-C-12-060, the Contractor had been working under Quality Assurance Project Plans (QAPPs) #360 and #445, which document the quality processes and procedures for the types of tasks associated with this project. The TOCOR will provide the QAPPs #360 and #445. The Contractor shall create a QAPP for this Task Order, combining and updating information from the previous QAPPs as necessary to reflect the Tasks below, and submit the QAPP for TOCOR and QA Manager's approval. The Contractor shall not perform any work on the new tasks under this task order until the QAPP is reviewed and approved by the TOCOR and QA Manager. The QAPP shall

include documentation on quality assurance checks to verify accuracy, completeness, and adherence to established format and must address data collection, analysis, and the use of existing (secondary) data that will be used in this project. Guidance for developing QAPPs that meet EPA specifications prepared for activities conducted by or funded by EPA, are available online at http://www.epa.gov/quality/qa_docs.html, see "EPA Requirements for Quality Assurance Project Plans (QA/R-5)". EPA ORD has a new requirement and new tracking system. The contractor shall include the following EPA ORD QA Tracking number on the QAPP cover page: X-XX-XXXXXXX-XX-X-X.

Deliverable 1.1a: QAPP **Due:** within 7 days of task order award

The Contractor shall not proceed with Tasks 2 - 3 until the QAPP is approved.

SubTask 1.2: Establish and Maintain Communication

Within seven days after task order award, the Contractor shall schedule a kickoff call, not to exceed 2 hours, with the TOCOR and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall establish a schedule for regular progress reports, check in calls, and other communications throughout the period of performance. The Contractor shall initiate additional communication with the TOCOR should developments arise that may affect the conduct or schedule of any task. The Contractor shall prepare very brief minutes of meetings with the EPA staff and monthly status reports. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed.

Deliverable 1.2a: Kickoff call **Due:** within 7 days of task order award

Deliverable 1.2b: Regular status reports **Due:** monthly

TASK 2 National Wetlands Vulnerability Assessment Methods

SubTask 2.1: Coastal Track Case Study Journal Article

Under a separate contract, EPA has been collaborating with the Partnership for the Delaware Estuary (PDE) on a case study that uses a modified coastal wetlands vulnerability framework to assess the relative vulnerabilities of salt marshes of the Delaware Estuary in order to inform adaptation of PDE programs. The TOCOR will provide the Contractor with the vulnerability assessment and adaptation analysis for the specific case study application. This analysis considers the sensitivity of coastal wetland systems and their exposure to climatic changes as determinants of vulnerability, and links these findings to implications for management adaptations at the appropriate locations and scales to inform place-based decision support needs (i.e., increase adaptive capacity).

In this Subtask, the Contractor shall work with the TOCOR to produce a journal article on "Extension of the wetlands relative vulnerabilities framework approach to coastal wetlands". The article will present the technical approach for application of framework concepts to coastal wetlands in the Delaware Estuary, including development and validation of versions for both data-rich and data-scarce situations and the framework's applicability at the national scale, and results of SLAMM (Sea Level Affecting Marsh

Migration) modeling. The Contractor shall be provided with an annotated outline for the article, along with all of the analyses and write-ups from the case study completed under the previous contract. Based on this material, the Contractor shall produce a rough draft, followed by an "internal review draft" (IRD) manuscript, and then address internal reviewers' comments to produce a revised draft. The Contractor shall then format and submit the revised draft to a peer-reviewed journal for publication. Upon receipt of external reviews, the Contractor shall make revisions to the manuscript and resubmit it for publication. All manuscript versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.1a: 1st draft article **Due:** 5 weeks after task order award

The Contractor shall use the annotated outline and other materials provided by the TOCOR to prepare a first draft manuscript, formatted for the journal selected in consultation with the TOCOR. The draft article will then be submitted to the TOCOR and full project team for a two-week team review.

Deliverable 2.1b: Internal Review Draft (IRD) article **Due:** 4 weeks after team review

Working with feedback received from the full project team and through written technical direction from the TOCOR, the Contractor shall revise the manuscript to produce an IRD article for submission to EPA's internal review process.

**********EPA Internal Review Period, Approximately 4 weeks**********

Deliverable 2.1c: 3rd draft (revised) article **Due:** 4 weeks after receipt of IR comments

The Contractor shall use the comments received from EPA's internal review process as the basis for a revision of the manuscript. In addition to the revised manuscript, the Contractor shall produce a summary of responses to comments and a record of the changes made to the manuscript. During the revision process, the Contractor shall consult with and obtain feedback from the TOCOR and full project team as needed, soliciting their feedback on a rolling basis as sections of revisions are completed, to form the basis for completing Deliverable 2.1d.

Deliverable 2.1d: External Review Draft (ERD) article and journal submission **Due:** 3 weeks after approval of 2.1c

The Contractor shall make further revisions based on TOCOR and project team feedback and submit the ERD manuscript to the selected peer-reviewed journal for external review.

Deliverable 2.1e: Finalized article and journal re-submission **Due:** 4 weeks after receipt of ER comments

The Contractor shall make final revisions based on the comments from the journal's external reviewers, in conjunction with TOCOR and project team feedback, and re-submit the finalized manuscript to the selected peer-reviewed journal for publication.

SubTask 2.2: Coastal Track SLAMM Modeling Report

Under a separate contract, EPA has been collaborating with the Partnership for the Delaware Estuary

(PDE) to update SLAMM (Sea Level Affecting Marsh Migration) model results for the Delaware Estuary, to inform the Coastal Track case study. In this Subtask, the Contractor shall work with project team members under the supervision of the TOCOR to produce a SLAMM report detailing the comprehensive results of the SLAMM runs and their interpretation. Since the results of these analyses form part of the technical basis for the journal article in Subtask 2.1, the goal will be to produce this report in a timely manner to allow its citation in the journal article by the time it is accepted for publication. The Contractor shall be provided with an annotated outline for the article, along with all of the SLAMM runs, analyses and write-ups completed under the previous contract. Based on this material, the Contractor shall support the production of a rough draft, followed by an "internal review draft" (IRD) manuscript, and help address internal reviewers' comments to produce a revised draft. The Contractor shall then format and submit the revised draft to a peer-reviewed journal for publication. Upon receipt of external reviews, the Contractor shall make revisions to the manuscript and resubmit it for publication. All manuscript versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.2a: 1st draft SLAMM report **Due:** 14 weeks after task order approval

The Contractor shall work with the TOCOR and project team members, using the annotated outline and other materials provided, to prepare a first draft report, formatted as instructed through written technical direction by the TOCOR. The draft article will then be submitted to the TOCOR and full project team for a two-week team review.

Deliverable 2.2b: Internal Review Draft (IRD) report **Due:** 4 weeks after team review

Working with feedback received from the full project team and through technical direction by the TOCOR, the Contractor shall assist with revising the report to produce an IRD report for submission to EPA's internal review process.

**********EPA Internal Review Period, Approximately 4 weeks**********

Deliverable 2.2c: 3rd draft (revised) report **Due:** 4 weeks after receipt of IR comments

The Contractor shall assist project team members as needed with revisions to the report based on the IR comments.

Deliverable 2.2d: External Review Draft (ERD) article and journal submission **Due:** 3 weeks after approval of 2.1c

The Contractor shall assist project team members to make further revisions based on TOCOR and project team feedback through written technical direction by the TOCOR, and assist with formatting and submission of the ERD report to the selected peer-reviewed journal for external review.

SubTask 2.3 Programmatic Track Case Study Development

Under a previous contract, a Programmatic Track collaboration was initiated with EPA Region 3, Association of State Wetland Managers (ASWM), and Pennsylvania State partners to test the applicability of the vulnerability framework and approach for informing voluntary restoration programs at the Regional/State level. Based on feedback received from the partners, a strawman proposal was

drawn up for a case study that will demonstrate application of the framework for State restoration decisions. In this SubTask, the Contractor shall continue development of a case study design for this work. The TOCOR will provide all background information, discussion notes, and write ups produced to date.

Deliverable 2.3a: Draft case study design and partner feedback **Due:** 16 weeks after task order award

Using the straw man proposal as a starting point, the draft case study will include: (1) the proposed geographic scope (area and location of focus); (2) a plan for testing the framework under either a "data-rich" or "data-poor" scenario (depending on the availability of data); (3) a preliminary assessment of the decision context in which decisions about voluntary restoration activities are being made; and (4) an explanation of how case study results on relative vulnerability can be translated into adaptation options for adapting restoration activities. The draft case study design will be presented to the TOCOR and project partners via webinar for feedback.

Deliverable 2.3b: Revised case study design **Due:** 12 weeks after approval of 2.3a

The Contractor shall revise the case study design based on project team partners' feedback and through written technical direction by the TOCOR.

TASK 3 Adaptation Planning Framework & Coral Reef Demonstration

SubTask 3.1: Adaptation Design Tool Journal Article

Under a separate contract, a coral reef demonstration of principles of Climate-Smart Conservation was developed and published (West et al. 2017) [2]. This in turn led to creation of an Adaptation Design Tool and user guide (Parker et al. 2017)[3] for coral reef managers. A draft manuscript presenting the Design Tool and results of its "testing" through expert consultations in the Pacific and Caribbean was developed and put through EPA's internal review process. In this Subtask, the Contractor shall work with the TOCOR and project team to revise the paper, "Corals & Climate Adaptation Planning: Adaptation Design Tool" into an "external review draft" (ERD) manuscript and submit the manuscript to a peer-reviewed journal for publication. Upon receipt of external reviews, the Contractor shall work with the TOCOR and project team to make revisions to the manuscript and resubmit it for publication. All manuscript versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 3.1a: Revised article **Due:** 4 weeks after task order award

The Contractor shall use the comments received from EPA's internal review process as the basis for a revision of the manuscript. In addition to the revised manuscript, the Contractor shall produce a summary of responses to comments and a record of the changes made to the manuscript. During the

[2] West et al. (2017): https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5219003/
[3] Parker et al. (2017): https://www.coris.noaa.gov/activities/CCAP_design/

revision process, the Contractor shall consult with and obtain feedback through written technical direction from the TOCOR and full project team as needed, soliciting their feedback on a rolling basis as sections of revisions are completed, to form the basis for completing Deliverable 3.1b.

Deliverable 3.1b: External Review Draft (ERD) article and journal submission **Due:** 4 weeks after approval of 3.1a

The Contractor shall make further revisions based on project team feedback and through written technical direction by the TOCOR and submit the ERD manuscript to the selected peer-reviewed journal for external review.

Deliverable 3.1c: Finalized article and journal re-submission **Due:** 4 weeks after receipt of ER comments

The Contractor shall make final revisions based on the comments from the journal's external reviewers, in conjunction with project team feedback and through written technical direction from the TOCOR, and re-submit the finalized manuscript to the selected peer-reviewed journal for publication.

SubTask 3.2: Using Adaptation Design to Inform Evaluation & Selection

In this SubTask, the Contractor shall work with the TOCOR and project team on a conceptual approach and methods for using adaptation design information in Step 5 of the Climate-Smart Cycle, "Evaluation & Selection" (See West et al. 2017 and Parker et al. 2017). This shall involve a review of recent literature on evaluation and selection methods, followed by development of a conceptual approach showing how to link the Adaptation Design Tool outputs to these methods.

Deliverable 3.2a: Literature review of evaluation & selection methods **Due:** 6 weeks after task order award

The Contactor shall perform a limited review of the literature (focusing on the last 5 years) to identify existing decision support methods and tools currently in use for the evaluation and selection of actions during management planning processes for coral reef ecosystems and/or other natural resource systems. References may be drawn from the peer-reviewed literature, as well as the grey literature, planning documents, manuals, case studies, and reports. The Contractor shall compile an annotated list of most-relevant resources, with brief summaries of the methods described.

Deliverable 3.2b: Conceptual approach for moving from tool output into evaluation & selection **Due:** 8 weeks after approval of 3.2a

Using Deliverable 3.2a, along with the results of project team input, the Contractor shall develop a conceptual approach and proposed methods for how the Adaptation Design Tool results can feed into methods and tools being used by natural resource managers to evaluate and select final, priority management actions for their management plans. This shall include analysis of the opportunities and challenges associated with using Design Tool outputs for this purpose.

MILESTONES AND DELIVERABLES:

Task/ SubTask	Milestone/Deliverable	Due Date
1	**Prepare Quality Assurance Project Plan and Establish/Maintain Communication**	
1.1	**1.1a:** Quality Assurance Project Plan	7 days after TO award
	--------	--------
1.2	**1.2a:** Kickoff call and regular communications	7 days after TO award
	1.3b: Progress reports	Monthly
2	**National Wetlands Vulnerability Assessment Methods**	
2.1	**2.1a**: 1st Draft article	4 weeks after TO award
	2.1b: Internal Review Draft (IRD) article	4 weeks after approval of 2.1a
	2.1c: 3rd draft (revised) article	4 weeks after receipt of IR comments
	2.1d: External Review Draft (ERD) article and submission	3 weeks after approval of 2.1c
	2.1e: Finalized article and journal re-submission	4 weeks after receipt of ER comments
	--------	--------
2.2	**2.2a:** 1st draft SLAMM report	14 weeks after TO award
	2.2b: Internal Review Draft (IRD) SLAMM report	4 weeks after approval of 2.2a
	2.2c: 3rd draft SLAMM report	4 weeks after receipt of IR comments
	2.2d: External Review Draft (ERD) SLAMM report and submission	4 weeks after approval of 2.2c
	--------	--------
2.3	**2.3a:** Draft case study design and partner feedback	16 weeks after TO award
	2.3b: Revised case study design	12 weeks after approval of 2.3a
3	**Adaptation Planning Framework & Coral Reef Demonstration**	
3.1	**3.1a:** Revised article	4 weeks after TO award
	3.1b: External Review Draft (ERD) article and submission	4 weeks after approval of 3.1a
	3.1c: Finalized article and journal re-submission	4 weeks after receipt of ER comments
	--------	--------
3.2	**3.2a:** Literature review of E & S methods	6 weeks after TO award
	3.2b: Conceptual approach for moving into E & S	8 weeks after approval of 3.2a

ACCEPTANCE CRITERIA:

The Contractor shall prepare high quality deliverables in accordance with academic standards. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE	OF PAGES
	1	2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
P00001	See Block 16C		

6. ISSUED BY CODE CPOD

CPOD
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: NWD
Cincinnati OH 45268

7. ADMINISTERED BY *(If other than Item 6)* CODE

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

TETRA TECH, INC.
Attn: George Townsend
10306 EATON PL STE 340
FAIRFAX VA 220302201

CODE 198549560 FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-17-031 0001

10B. DATED *(SEE ITEM 13)* 09/21/2017

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended. ☐ is not extended.
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended , by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted ; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted , such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*
See Schedule

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER *(Specify type of modification and authority)* Mutual Agreement to No Cost Modification

E. IMPORTANT: Contractor ☐ is not. ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

DUNS Number: 198549560
Firm Fixed Price TO Regional Monitoring Networks
TOCOR: Jordan West
This is a no cost modification, with the purpose to amend the PWS task(s) deliverables.
Please see update to Attachment 1.

LIST OF CHANGES:
Reason for Modification : Other Administrative Action
Total Amount for this Modification: $0.00
New Total Amount for this Version: $0.00
New Total Amount for this Award: $79,990.00
Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
		Matthew Growney	
15B. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA ELECTRONIC SIGNATURE *(Signature of Contracting Officer)*	16C. DATE SIGNED 11/17/2017

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center (AA216-01) 109 TW Alexander Drive www2.epa.gov/financial/contracts Durham NC 27711 Period of Performance: 10/01/2017 to 09/30/2018 Delivery-Payment Schedule The table below presents the payment amount associated with each deliverable. TBD deliverables will be invoiced with other deliverable invoices when possible. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, the performance based payment invoicing amounts below will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. Deliverables(Estimated Invoice Date-on or after)Amount 1.1/1.2a/3.1a/2.1a(6-Dec-1)$14,943.19 3.2a/3.1b/2.1b(31-Jan-18)$13,185.16 2.2a/2.3a(24-Feb-18)$17,228.62 3.2b/2.1c/2.2b(7-Apr-18)$14,943.19 2.1d/2.3b/2.2c(2-Jun-18)$10,899.74 2.1e(TBD)$2,461.23 2.2d(TBD)$2,197.53 3.1c(TBD)$4,131.35 FIRM FIXED PRICE TOTAL: $79,990.00				

PERFORMANCE WORK STATEMENT

Contract: EP-C-17-031
PR-ORD-17-01605
TO 0001

TITLE: Adaptation Planning for Resilient Natural Resources
EAS Short Title: Adaptation for Natural Resources

PERIOD OF PERFORMANCE: TO Award date through one year following award

TASK ORDER COR: Jordan West
Global Change Research Program
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INTRODUCTION

Work in EPA's Exposure Analysis and Risk Characterization Group (EARCG) includes assessments of the potential vulnerability to climate change (and other global change stressors such as land-use change) of ecosystem health, water quality, human health and air quality with a focus on developing adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science and to provide adaptation support for decision makers and managers. Vulnerability and adaptation assessment activities in the EARCG's aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA) and are designed to build the capacity of EPA programs, regional offices, aquatic ecosystem managers (including wetland and coral reef managers), and other decision-makers to assess and respond to global change impacts on ecosystem processes and services. The purpose of this task order is to provide technical support to the EARCG and partners to advance frameworks and methods for vulnerability assessments and adaptation planning processes for resilient wetland, coral reef, and other natural resource systems.

This task order (TO) focuses on two parallel, but related, areas of work: (1) vulnerability and adaptation assessment methods for wetlands and (2) adaptation planning frameworks, as demonstrated for coral

reefs and other aquatic systems. Each of these two major areas of work is represented by a Task.

Work Area 1, **National Wetlands Vulnerability Assessment Methods**, supports EPA Office of Water's (OW) priority #4 (Watersheds at risk) and priority #5 (Coastal wetlands at risk). Earlier work in this area focused on: the development of a methodological framework and inventory of wetland vulnerabilities for a mid-Atlantic pilot region based on vulnerability assessment methods, resilience theory, and wetlands classifications; an analysis and summary of best approaches for applying inventory results to inform adaptation of EPA OW Programs; and initiation of follow-on work in the form of a Coastal Track (extending the framework and approach to coastal wetlands) and a Programmatic Track (applying the framework and results to decision-making with partners in State programs).

Work Area 2, **Adaptation Planning Framework & Coral Reef Demonstration**, supports EPA OW'S priority #8 (Indicators of climate change), as well as needs of EPA Regions with coral reefs and other applicable aquatic systems (such as those supported by the Chesapeake Bay Program). Earlier work in this area focused on: collaboration with a Climate-Smart Work Group convened by the National Wildlife Federation to develop a unified adaptation framework for natural resources; demonstration of a more detailed and tailored use of the framework for coral reef ecosystems; and development of an "Adaptation Design Tool" to help managers brainstorm and design effective adaptation actions in response to identified vulnerabilities to the resilience of their natural resources due to environmental change.

OBJECTIVES

For work Area 1, the Contractor shall continue—following on WA 4-06 contract EP-C-12-060--technical advancement of frameworks and methods for characterizing wetland relative vulnerabilities for multiple wetland types at multiple scales, in order to support development of information and processes for integrating climate change considerations into wetlands programs and activities of OW as well as Regional and State partners. Objectives are to:

(1) Prepare a journal article on the technical approach for application of framework concepts to coastal wetlands, including development and validation of versions for both data-rich and data-scarce situations and the framework's applicability at the national scale, and results of SLAMM (Sea Level Affecting Marsh Migration) modeling;

For Work Area 2, the Contractor shall provide technical support-- following on WA 4-06 contract EP-C-12-060 --for continued elaboration of the climate-smart adaptation planning cycle, with development of associated adaptation design and evaluation tools. Objectives are to:

(1) Finalize a journal article presenting conceptual approach, methods, results and expert testing of the Adaptation Design Tool[1];
(2) Develop a conceptual model and methodological approach for demonstrating how information generated with the Adaptation Design Tool can effectively feed into evaluation and selection processes for prioritizing adaptation actions during management planning.

REQUIRED CONTRACTOR QUALIFICATIONS

[1] Parker et al. (2017); https://www.coris.noaa.gov/activities/CCAP_design/

1) Multidisciplinary professional expertise in assessing the impacts of climate change and other interacting stressors (such as land use change) on climate-sensitive ecosystems, including expertise in resilience and threshold theory and management adaptation.

2) Thorough knowledge and application of wetlands classification systems including the hydro-geomorphic method (HGM) and Cowardin/National Wetlands Inventory (NWI) system; thorough knowledge of the CWA Section 404 compensatory mitigation program; and familiarity with State voluntary restoration activities in EPA Region 3.

3) Thorough knowledge of conceptual approaches, methods, trainings and on-the-ground work on climate change vulnerability assessment and adaptation planning applications for coral reef and wetland conservation and management.

4) Experience developing and evaluating practical frameworks and trainings for integrating climate change considerations into management planning and building resilience into conservation.

5) Expertise in directed literature searches and synthetic analyses of available literature (including grey literature). Expertise in conducting literature reviews and compiling, interpreting and using pertinent models, data sets and reports for wetlands associated with Coastal Track and Programmatic Track case study locations.

6) Experience organizing and facilitating stakeholder processes, partnerships, and expert scientific meetings.

7) Experience developing, managing, and ensuring quality control of large-scale datasets and assessments.

8) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

SPECIFIC TASKS:

TASK 1 Prepare Quality Assurance Project Plan and Establish/Maintain Communication

SubTask 1.1: Develop a Quality Assurance Project Plan

For previous work under this project under WA 4-06 of contract EP-C-12-060, the Contractor had been working under Quality Assurance Project Plans (QAPPs) #360 and #445, which document the quality processes and procedures for the types of tasks associated with this project. The TOCOR will provide the QAPPs #360 and #445. The Contractor shall create a QAPP for this Task Order, combining and updating information from the previous QAPPs as necessary to reflect the Tasks below, and submit the QAPP for TOCOR and QA Manager's approval. The Contractor shall not perform any work on the new tasks under this task order until the QAPP is reviewed and approved by the TOCOR and QA Manager. The QAPP shall

include documentation on quality assurance checks to verify accuracy, completeness, and adherence to established format and must address data collection, analysis, and the use of existing (secondary) data that will be used in this project. Guidance for developing QAPPs that meet EPA specifications prepared for activities conducted by or funded by EPA, are available online at http://www.epa.gov/quality/qa_docs.html, see "EPA Requirements for Quality Assurance Project Plans (QA/R-5)". EPA ORD has a new requirement and new tracking system. The contractor shall include the following EPA ORD QA Tracking number on the QAPP cover page: X-XX-XXXXXXX-XX-X-X.

Deliverable 1.1a: QAPP **Due:** within 7 days of task order award

The Contractor shall not proceed with Tasks 2 - 3 until the QAPP is approved.

SubTask 1.2: Establish and Maintain Communication

Within seven days after task order award, the Contractor shall schedule a kickoff call, not to exceed 2 hours, with the TOCOR and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall establish a schedule for regular progress reports, check in calls, and other communications throughout the period of performance. The Contractor shall initiate additional communication with the TOCOR should developments arise that may affect the conduct or schedule of any task. The Contractor shall prepare very brief minutes of meetings with the EPA staff and monthly status reports. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed.

Deliverable 1.2a: Kickoff call **Due:** within 7 days of task order award

Deliverable 1.2b: Regular status reports **Due:** monthly

TASK 2 National Wetlands Vulnerability Assessment Methods

SubTask 2.1: Coastal Track Case Study Journal Article

Under a separate contract, EPA has been collaborating with the Partnership for the Delaware Estuary (PDE) on a case study that uses a modified coastal wetlands vulnerability framework to assess the relative vulnerabilities of salt marshes of the Delaware Estuary in order to inform adaptation of PDE programs. The TOCOR will provide the Contractor with the vulnerability assessment and adaptation analysis for the specific case study application. This analysis considers the sensitivity of coastal wetland systems and their exposure to climatic changes as determinants of vulnerability, and links these findings to implications for management adaptations at the appropriate locations and scales to inform place-based decision support needs (i.e., increase adaptive capacity).

In this Subtask, the Contractor shall work with the TOCOR to produce a rough draft report and draft journal article on "Extension of the wetlands relative vulnerabilities framework approach to coastal wetlands". The ~~article~~ report will present the technical approach for application of framework concepts to coastal wetlands in the Delaware Estuary, including development and validation of versions for both data-rich and data-scarce situations and the framework's applicability at the national scale, and

applicable summary results of SLAMM (Sea Level Affecting Marsh Migration) modeling. The draft journal article will examine a subset of this information as it relates to selected management targets and development of recommendations for management adaptations within PDE wetlands conservation and restoration programs. The Contractor shall be provided with ~~an annotated outline for the article, along with~~ all of the analyses and write-ups from the case study completed under the previous contract. Based on this material, the Contractor shall produce a rough draft report, followed by an "internal review draft" (IRD) ~~manuscript~~journal article on "Extension of the wetlands relative vulnerabilities framework approach to coastal wetlands". ~~, and then address internal reviewers' comments to produce a revised draft~~. ~~The Contractor shall then format and submit the revised draft to a peer-reviewed journal for publication. Upon receipt of external reviews, the Contractor shall make revisions to the manuscript and resubmit it for publication.~~ All ~~manuscript~~ product versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.1a: 1st draft ~~article~~report **Due:** 14~~5~~ weeks after QAPP approval

The Contractor shall use the ~~annotated outline and other~~ materials provided by the TOCOR to prepare a first draft ~~manuscript~~report, formatted ~~for the journal selected~~ in consultation with the TOCOR. The draft ~~article~~ report will then be submitted to the TOCOR and full project team for a two-week team review.

Deliverable 2.1b: ~~Internal Review Draft (IRD) article~~2nd draft report **Due:** 5~~4~~ weeks after ~~team review~~approval of 2.1a

Working with feedback received from the full project team and through written technical direction from the TOCOR, the Contractor shall revise the ~~manuscript~~ report to produce ~~an IRD article for submission to EPA's internal review process~~a second draft report for submission to the TOCOR.

~~**********EPA Internal Review Period, Approximately 4 weeks**********~~

Deliverable 2.1c: Annotated outline for journal article~~3rd draft (revised) article~~ **Due:** 34 weeks after ~~receipt of IR comments~~approval of 2.1b

The Contractor shall use the ~~comments received from EPA's internal review process~~draft report as the ~~basis~~ starting point for ~~a revision of the manuscript~~an annotated outline for a journal article on "Extension of the wetlands relative vulnerabilities framework approach to coastal wetlands". This should include focused scoping of a subset of report findings to address selected management targets and make links to recommendations for management adaptations for these targets within PDE wetlands conservation and restoration programs. ~~In addition to the revised manuscript, the Contractor shall produce a summary of responses to comments and a record of the changes made to the manuscript. During the revision process, the Contractor shall consult with and obtain feedback from the TOCOR and full project team as needed, soliciting their feedback on a rolling basis as sections of revisions are completed, to form the basis for completing Deliverable 2.1d.~~

Deliverable 2.1d: 1st draft journal article **Due:** 6 weeks after approval of 2.1c

The Contractor shall use the annotated outline, materials from the draft report, and written technical direction from the TOCOR to prepare a first draft manuscript, formatted for a journal selected in consultation with the TOCOR. The draft article will then be submitted to the TOCOR and full project

team for a two-week team review.

~~External Review Draft (ERD) article~~ ~~**Due:** 3 weeks after approval of 2.1c and journal submission~~

~~The Contractor shall make further revisions based on TOCOR and project team feedback and submit the ERD manuscript to the selected peer-reviewed journal for external review.~~

Deliverable 2.1e: Internal Review Draft (IRD) article **Due:** 6 weeks after approval of 2.1d

Working with feedback received from the full project team and written technical direction from the TOCOR, the Contractor shall revise the manuscript to produce an IRD article for submission to EPA's internal review process.

~~Finalized article and journal re-submission~~ ~~**Due:** 4 weeks after receipt of ER comments~~

~~The Contractor shall make final revisions based on the comments from the journal's external reviewers, in conjunction with TOCOR and project team feedback, and re-submit the finalized manuscript to the selected peer-reviewed journal for publication.~~

SubTask 2.2: Coastal Track SLAMM Modeling Report

Under a separate contract, EPA has been collaborating with the Partnership for the Delaware Estuary (PDE) to update SLAMM (Sea Level Affecting Marsh Migration) model results for the Delaware Estuary, to inform the Coastal Track case study. In this Subtask, the Contractor shall work with project team members under the supervision of the TOCOR to produce a SLAMM report detailing the comprehensive results of the SLAMM runs and their interpretation. Since the results of these analyses form part of the technical basis for the journal article in Subtask 2.1, the goal will be to produce this report in a timely manner to allow its citation in the journal article by the time it is accepted for publication. The Contractor shall be provided with an annotated outline for the article, along with all of the SLAMM runs, analyses and write-ups completed under the previous contract. Based on this material, the Contractor shall ~~support the production of~~produce a ~~rough~~ 1st draft report, followed by an "internal review draft" (IRD) ~~manuscript~~report, and help address internal reviewers' comments to produce a 3rd draft revised ~~draft~~report. While the internal review and/or production of the 3rd draft are in-process, the Contractor shall hold a webinar on the coastal case study, to present and receive feedback on the SLAMM modeling and to discuss scoping of the journal article for Task 2.1. Finally, after feedback on the 3rd draft report from selected stakeholders and the TOCOR, t~~T~~he Contractor shall ~~then format and submit the revised draft to a peer-reviewed journal for publication. Upon receipt of external reviews, the Contractor shall make revisions to the manuscript and resubmit it for publication.~~ produce a final report for submission to EPA. All ~~manuscript~~ report versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.2a: 1st draft SLAMM report **Due:** 7~~14~~ weeks after ~~task order~~QAPP approval

The Contractor shall work with the TOCOR and project team members, using the annotated outline and other materials provided, to prepare a first draft report, formatted as instructed through written technical direction by the TOCOR. The draft article will then be submitted to the TOCOR and full project team for a two-week team review.

Deliverable 2.2b: Internal Review Draft (IRD) report **Due:** 54 weeks after ~~team review~~approval of 2.2a

Working with feedback received from the full project team and through technical direction by the TOCOR, the Contractor shall assist with revising the report to produce an IRD report for submission to EPA's internal review process.

**********EPA Internal Review Period, Approximately 4 weeks**********

Deliverable 2.2c: Stakeholder webinar **Due:** TBD, February 2018

Working with the TOCOR, the Contractor shall present a webinar to selected stakeholders on the SLAMM modeling results and thought process for the coastal case study journal article of SubTask 2.1. Feedback from this group will be used to inform both final revisions of the SLAMM report, and scoping of the most useful focus for the coastal case study journal article (Deliverables 2.1:c-e).

Deliverable 2.2d: 3rd draft (revised) report **Due:** 54 weeks after receipt of IR comments

The Contractor shall assist project team members as needed with revisions to the report based on the IR comments.

Deliverable 2.2e~~d~~: ~~External Review Draft (ERD) article~~ ~~**Due:** 3 weeks after approval of 2.1c and journal submission~~Final SLAMM report **Due:** 4 weeks after approval for 2.2d

The Contractor shall assist project team members to make further revisions based on TOCOR and project team feedback through written technical direction by the TOCOR, and assist with formatting and submission of the ERD report to the selected peer-reviewed journal for external review.

SubTask 2.3 Programmatic Track Case Study Development

Under a previous contract, a Programmatic Track collaboration was initiated with EPA Region 3, Association of State Wetland Managers (ASWM), and Pennsylvania State partners to test the applicability of the vulnerability framework and approach for informing voluntary restoration programs at the Regional/State level. Based on feedback received from the partners, a strawman proposal was drawn up for a case study that will demonstrate application of the framework for State restoration decisions. In this SubTask, the Contractor shall continue development of a case study design for this work. The TOCOR will provide all background information, discussion notes, and write ups produced to date.

Deliverable 2.3a: Draft case study design and partner feedback **Due:** ~~16~~ 20 weeks after ~~task order award~~QAPP approval

Using the straw man proposal as a starting point, the draft case study will include: (1) the proposed geographic scope (area and location of focus); (2) a plan for testing the framework under either a "data-rich" or "data-poor" scenario (depending on the availability of data); (3) a preliminary assessment of the decision context in which decisions about voluntary restoration activities are being made; and (4) an explanation of how case study results on relative vulnerability can be translated into adaptation options

for adapting restoration activities. The draft case study design will be presented to the TOCOR and project partners via webinar for feedback.

Deliverable 2.3b: Partner webinar for feedback **Due:** TBD, March-April 2018

Working with the TOCOR, the Contractor shall present a webinar to the Programmatic Track partners from Region 3, ASWM and the Pennsylvania on the proposed draft case study design. Feedback from this group and written direction from the TOCOR will be used to inform refinements and additions to the case study for production of a revised case study design.

Deliverable 2.3c: Revised case study design **Due:** ~~1~~20 weeks after approval of 2.3a

The Contractor shall revise the case study design based on ~~project team partners'~~partner feedback and through written technical direction by the TOCOR.

TASK 3 Adaptation Planning Framework & Coral Reef Demonstration

SubTask 3.1: Adaptation Design Tool Journal Article

Under a separate contract, a coral reef demonstration of principles of Climate-Smart Conservation was developed and published (West et al. 2017) [2]. This in turn led to creation of an Adaptation Design Tool and user guide (Parker et al. 2017)[3] for coral reef managers. A draft manuscript presenting the Design Tool and results of its "testing" through expert consultations in the Pacific and Caribbean was developed and put through EPA's internal review process. In this Subtask, the Contractor shall work with the TOCOR and project team to revise the paper, "Corals & Climate Adaptation Planning: Adaptation Design Tool" into an "external review draft" (ERD) manuscript and submit the manuscript to a peer-reviewed journal for publication. Upon receipt of external reviews, the Contractor shall work with the TOCOR and project team to make revisions to the manuscript and resubmit it for publication. All manuscript versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 3.1a: Revised article **Due:** 4 weeks after ~~task order award~~QAPP approval

The Contractor shall use the comments received from EPA's internal review process as the basis for a revision of the manuscript. In addition to the revised manuscript, the Contractor shall produce a summary of responses to comments and a record of the changes made to the manuscript. During the revision process, the Contractor shall consult with and obtain feedback through written technical direction from the TOCOR and full project team as needed, soliciting their feedback on a rolling basis as sections of revisions are completed, to form the basis for completing Deliverable 3.1b.

Deliverable 3.1b: External Review Draft (ERD) article **Due:** 4 weeks after approval of 3.1a

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[2] West et al. (2017): https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5219003/
[3] Parker et al. (2017): https://www.coris.noaa.gov/activities/CCAP_design/

and journal submission

The Contractor shall make further revisions based on project team feedback and through written technical direction by the TOCOR and submit the ERD manuscript to the selected peer-reviewed journal for external review.

Deliverable 3.1c: Finalized article and journal re-submission **Due:** 4 weeks after receipt of ER comments

The Contractor shall make final revisions based on the comments from the journal's external reviewers, in conjunction with project team feedback and through written technical direction from the TOCOR, and re-submit the finalized manuscript to the selected peer-reviewed journal for publication.

SubTask 3.2: Using Adaptation Design to Inform Evaluation & Selection

In this SubTask, the Contractor shall work with the TOCOR and project team on a conceptual approach and methods for using adaptation design information in Step 5 of the Climate-Smart Cycle, "Evaluation & Selection" (See West et al. 2017 and Parker et al. 2017). This shall involve a review of recent literature on evaluation and selection methods, followed by development of a conceptual approach showing how to link the Adaptation Design Tool outputs to these methods.

Deliverable 3.2a: Literature review of evaluation & selection methods **Due:** 24~~6~~ weeks after ~~task order award~~QAPP approval

The Contactor shall perform a limited review of the literature (focusing on the last 5 years) to identify existing decision support methods and tools currently in use for the evaluation and selection of actions during management planning processes for coral reef ecosystems and/or other natural resource systems. References may be drawn from the peer-reviewed literature, as well as the grey literature, planning documents, manuals, case studies, and reports. This process also can be made more efficient through consultation with selected experts in the field, as per written direction from the TOCOR. The Contractor shall compile an annotated list of most-relevant resources, with brief summaries of the methods described.

Deliverable 3.2b: Conceptual approach for moving from tool output into evaluation & selection **Due:** 10~~8~~ weeks after approval of 3.2a

Using Deliverable 3.2a, along with the results of project team input and written direction from the TOCOR, the Contractor shall develop a conceptual approach and proposed methods for how the Adaptation Design Tool results can feed into methods and tools being used by natural resource managers to evaluate and select final, priority management actions for their management plans. This shall include analysis of the opportunities and challenges associated with using Design Tool outputs for this purpose.

MILESTONES AND DELIVERABLES:

Task/ SubTask	Milestone/Deliverable	Due Date
1	**Prepare Quality Assurance Project Plan and Establish/Maintain Communication**	
	1.1a: Quality Assurance Project Plan	7 days after TO award
	--------	--------
1.1	**1.2a:** Kickoff call and regular communications	7 days after TO award
1.2	**1.3b:** Progress reports	Monthly
2	**National Wetlands Vulnerability Assessment Methods**	
2.1	**2.1a**: 1st draft report	14 weeks after QAPP approval
	2.1b: 2nd draft report	~~4~~ 5 weeks after approval of 2.1a
	2.1c: Annotated outline for coastal case study article	~~4~~ 3 weeks after approval of 2.1b
		~~3~~ 6 weeks after approval of 2.1c
	2.1d: 1st draft journal article	6~~4~~ weeks after approval of 2.1d
	2.1e: Internal Review Draft (IRD) article	--------
	--------	7 weeks after QAPP approval
2.2	**2.2a:** 1st draft SLAMM report	7 weeks after QAPP approval
	2.2b: Internal Review Draft (IRD) SLAMM report	~~4~~ 5 weeks after approval of 2.2a
	2.2c: Stakeholder webinar on coastal case study	TBD, February 2018
	2.2d: 3rd draft (revised) SLAMM report	~~4~~ 5 weeks after receipt of IR comments
	2.2e: ~~External Review Draft (ERD)~~Final SLAMM report	4 weeks after approval of 2.2d
2.3	~~and submission~~	--------

	2.3a: Draft case study design and partner feedback	20 weeks after QAPP approval
	2.3b: Partner webinar for feedback	TBD, March-April 2018
	2.3c: Revised case study design	~~12~~ 20 weeks after approval of 2.3a
3	**Adaptation Planning Framework & Coral Reef Demonstration**	
3.1	**3.1a:** Revised article	4 weeks after QAPP approval
	3.1b: External Review Draft (ERD) article and submission	4 weeks after approval of 3.1a
	3.1c: Finalized article and journal re-submission	4 weeks after receipt of ER comments
	--------	--------
3.2		
	3.2a: Literature review of E & S methods	~~6~~ 24 weeks after QAPP approval
	3.2b: Conceptual approach for moving into E & S	~~8~~ 10 weeks after approval of 3.2a

ACCEPTANCE CRITERIA:

The Contractor shall prepare high quality deliverables in accordance with academic standards. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE 1 OF PAGES 2

2. AMENDMENT/MODIFICATION NO. P00002

3. EFFECTIVE DATE See Block 16C

4. REQUISITION/PURCHASE REQ. NO. PR-ORD-19-00013

5. PROJECT NO. *(If applicable)*

6. ISSUED BY CODE CAD

CAD
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: W136
Cincinnati OH 45268-0001

7. ADMINISTERED BY *(If other than Item 6)* CODE

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

TETRA TECH, INC.
Attn: George Townsend
10306 EATON PL STE 340
FAIRFAX VA 22030

CODE 198549560 FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-17-031 0001

10B. DATED *(SEE ITEM 13)* 09/21/2017

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended. ☐ is not extended.
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended , by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted ; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted , such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*
See Schedule

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER *(Specify type of modification and authority)* Mutual Agreement to Close Out Task Order-NO COST MOD

E. IMPORTANT: Contractor ☐ is not. ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

DUNS Number: 198549560
Firm Fixed Price TO Regional Monitoring Networks
TOCOR: Jordan West
LIST OF CHANGES:
Reason for Modification: NO COST MOD to close out task order in full based on mutual agreement of both parties.
Total Amount for this Modification: $0.00
New Total Amount for this Version: $79,990.00
New Total Amount for this Award: $79,990.00

Contracting Officer changed
Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*

16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*
Mark Cranley

15B. CONTRACTOR/OFFEROR
(Signature of person authorized to sign)

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA
ELECTRONIC SIGNATURE
(Signature of Contracting Officer)

16C. DATE SIGNED 11/01/2018

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	from Matthew Growney to Mark Cranley Delivery: 09/28/2018 Delivery Location Code: CPOD CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268 USA Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center (AA216-01) 109 TW Alexander Drive www2.epa.gov/financial/contracts Durham NC 27711 Period of Performance: 10/01/2017 to 09/30/2018				