ORDER FOR SUPPLIES OR SERVICES

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

1. DATE OF ORDER: 06/06/2012

2. CONTRACT NO. (If any): EP-C-11-037

3. ORDER NO.: 0001

4. REQUISITION/REFERENCE NO.: PR-ORD-12-00287

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: NHEERL - GED
b. STREET ADDRESS: US Environmental Protection Agency
National Health and
Environmental Effects Research Lab
1 Sabine Island Drive
c. CITY: Gulf Breeze
d. STATE: FL
e. ZIP CODE: 32561

7. TO: (b)(4)
a. NAME OF CONTRACTOR: TETRA TECH EM, INC.
b. COMPANY NAME:
c. STREET ADDRESS: 1881 CAMPUS COMMONS DRIVE
SUITE 200
(b)(4)
d. CITY: RESTON
e. STATE: VA
f. ZIP CODE: 201911519

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.
☒ 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: CPOD

11. BUSINESS CLASSIFICATION (Check appropriate box(es))
☐ a. SMALL ☒ 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 WOMEN-OWNED SMALL BUSINESS PROGRAM ☐ h. ECONOMICALLY DISADVANTAGED WOMEN-OWNED SMALL BUSINESS (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): 30 Days After Award

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: (b)(4) TOPO: Jim Harvey Continued ...					

18. SHIPPING POINT:
19. GROSS SHIPPING WEIGHT:
20. INVOICE NO.:
17(h) TOTAL (Cont. pages): $0.00

21. MAIL INVOICE TO:
a. NAME: RTP Finance Center
b. STREET ADDRESS (or P.O. Box): US Environmental Protection Agency
RTP-Finance Center
Mail Drop D143-02
109 TW Alexander Drive
c. CITY: Durham
d. STATE: NC
e. ZIP CODE: 27711

SEE BILLING INSTRUCTIONS ON REVERSE

17(i) GRAND TOTAL: $99,333.77

22. UNITED STATES OF AMERICA BY (Signature):

23. NAME (Typed): Camille W. Davis
TITLE: CONTRACTING/ORDERING OFFICER

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.
06/06/2012	EP-C-11-037	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: 11-12-C-261E000-404FB2APW-2532-12261EC007-001 BFY: 11 EFY: 12 Fund: C Budget Org: 261E000 Program (PRC): 404FB2APW Budget (BOC): 2532 DCN - Line ID: 12261EC007-001 Period of Performance: 06/06/2012 to 11/15/2013					
0001	Regional Methods Program Project Number 11RMP-05, Improving TMDL and Waste Load Allocation Permit Limits by Determination and Application of New Sediment Diagenesis Input Parameters in Current Water Quality Models-1st Action The obligated amount of award: $60,000.00. The total for this award is					

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

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE 1 OF PAGES 2

2. AMENDMENT/MODIFICATION NO. 001

3. EFFECTIVE DATE 11/29/2012

4. REQUISITION/PURCHASE REQ. NO. PR-ORD-13-00214

5. PROJECT NO. *(If applicable)*

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 CPOD

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

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

TETRA TECH EM, INC.
Attn: (b)(4)
1881 CAMPUS COMMONS DRIVE
SUITE 200
(b)(4)
RESTON VA 201911519

CODE (b)(4) FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-037 0001

10B. DATED *(SEE ITEM 13)* 06/06/2012

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

Net Increase: $27,190.00

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)* Limitation of Funds Notice

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

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

DUNS Number: (b)(4)
Improving TMDL and Waste Load Allocation Permit Limits by Determination and Application of New Sediment Diagenesis Input Parameters in Current Water Quality Models
TOPO: Jim Harvey
LIST OF CHANGES:

Reason for Modification : Funding Only Action
Obligated Amount for this Modification: $27,190.00
New Total Obligated Amount for this Award: $87,190.00
Incremental Funded Amount changed From $60,000.00 To $87,190.00

Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9A 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)*
Camille W. Davis

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

15C. DATE SIGNED

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

16C. DATE SIGNED 11/29/2012

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH EM, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	CHANGES FOR LINE ITEM NUMBER: 1 Obligated Amount for this modification: $27,190.00 NEW ACCOUNTING CODE ADDED: Account code: 12-13-C-261E000-301FK8XPV-2532-26A6F-13261AC049-00 1 Beginning FiscalYear 12 Ending Fiscal Year 13 Fund (Appropriation) C Budget Organization 261E000 Quantity: 0 Amount: $27,190.00 Funding break-outs for this Incremental Funding is as follows: Cost: $(b)(4) Fee: $ TOTAL: $27,190.00 Delivery: 30 Days After Award Delivery Location Code: NHEERL - GED NHEERL - GED US Environmental Protection Agency National Health and Environmental Effects Research Lab 1 Sabine Island Drive Gulf Breeze FL 32561 USA Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center Mail Drop D143-02 109 TW Alexander Drive Durham NC 27711 FOB: Destination Period of Performance: 06/06/2012 to 11/15/2013				

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)*
002	01/23/2013	PR-ORD-13-00738	

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 CPOD

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

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

TETRA TECH EM, INC.
Attn: (b)(4)
1881 CAMPUS COMMONS DRIVE
SUITE 200
(b)(4)
RESTON VA 201911519

CODE (b)(4) FACILITY CODE

(x) **9A. AMENDMENT OF SOLICITATION NO.**

9B. DATED *(SEE ITEM 11)*

x **10A. MODIFICATION OF CONTRACT/ORDER NO.** EP-C-11-037 0001

10B. DATED *(SEE ITEM 13)* 06/06/2012

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)* Net Increase: $6,600.00
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)* Limitation of Funds Notice

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

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

DUNS Number: (b)(4)
The purpose of this modification is to add incremental funding to the task order.
TOPO: Jim Harvey
LIST OF CHANGES:
Reason for Modification : Funding Only Action
Obligated Amount for this Modification: $6,600.00
New Total Obligated Amount for this Award: $93,790.00
Incremental Funded Amount changed From $87,190.00 To $93,790.00

CHANGES FOR LINE ITEM NUMBER: 1
Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9A 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)*	
		Camille W. Davis	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		*(Signature of Contracting Officer)*	01/23/2013

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH EM, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	Obligated Amount for this modification: $6,600.00 Incremental Funded Amount changed from $87,190.00 to $93,790.00 NEW ACCOUNTING CODE ADDED: Account code: 12-13-C-261E000-301FK8XPW-2532-26A6F-13261EC069-001 Beginning FiscalYear 12 Ending Fiscal Year 13 Fund (Appropriation) C Budget Organization 261E000 Quantity: 0 Amount: $6,600.00 The break-out for this incremental funding is as follows: Cost: $ (b)(4) Fee: $ TOTAL: $6,600.00 Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center Mail Drop D143-02 109 TW Alexander Drive Durham NC 27711 FOB: Destination Period of Performance: 06/06/2012 to 11/15/2013				

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE 1 OF PAGES 2

2. AMENDMENT/MODIFICATION NO. 003

3. EFFECTIVE DATE 01/25/2013

4. REQUISITION/PURCHASE REQ. NO. PR-ORD-13-00761

5. PROJECT NO. *(If applicable)*

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 CPOD

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

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

TETRA TECH EM, INC.
Attn: (b)(4)
1881 CAMPUS COMMONS DRIVE
SUITE 200
(b)(4)
RESTON VA 201911519

CODE (b)(4) FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-037 0001

10B. DATED *(SEE ITEM 13)* 06/06/2012

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

Net Increase: $5,543.77

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)* Limitation of Funds Notice

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

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

DUNS Number: (b)(4)
The purpose of this modification is to add incremental funding to fully fund the task order.
TOPO: Jim Harvey
LIST OF CHANGES:

Reason for Modification : Funding Only Action
Obligated Amount for this Modification: $5,543.77
New Total Obligated Amount for this Award: $99,333.77
Incremental Funded Amount changed from $93,790.00 to $99,333.77

Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9A 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)*
Camille W. Davis

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

15C. DATE SIGNED

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

16C. DATE SIGNED 01/25/2013

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH EM, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	CHANGES FOR LINE ITEM NUMBER: 1 Obligated Amount for this modification: $5,543.77 Incremental Funded Amount changed from $93,790.00 to $99,333.77 NEW ACCOUNTING CODE ADDED: Account code: 12-13-C-261E000-301FK8XPV-2532-26A6F-13261EC068-001 Beginning FiscalYear 12 Ending Fiscal Year 13 Fund (Appropriation) C Budget Organization 261E000 Quantity: 0 Amount: $5,543.77 The incremental funding break-out is as follows: Cost: $(b)(4) Fee: $ TOTAL: $5,543.77 Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center Mail Drop D143-02 109 TW Alexander Drive Durham NC 27711 FOB: Destination Period of Performance: 06/06/2012 to 11/15/2013				

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE 1 OF PAGES 2

2. AMENDMENT/MODIFICATION NO. 004

3. EFFECTIVE DATE 10/29/2013

4. REQUISITION/PURCHASE REQ. NO. PR-ORD-13-00761

5. PROJECT NO. *(If applicable)*

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 EM, INC.
Attn: (b)(4)
1881 CAMPUS COMMONS DRIVE
SUITE 200
(b)(4)
RESTON VA 201911519

CODE (b)(4) FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-037 0001

10B. DATED *(SEE ITEM 13)* 06/06/2012

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 between the Parties and Tetra Tech's e-mail dated 10/24/13

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

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

DUNS Number: (b)(4)
The purpose of this modification is to extend the period of performance until February 28, 2014 due to the government shutdown. This is a No Cost extension.
TOPO: Jim Harvey
LIST OF CHANGES:

Reason for Modification: Extend Period of Performance

Period of Performance End Date changed
From: November 15, 2013
To: February 18, 2014
Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9A 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)* Camille W. Davis	
15B. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA *(Signature of Contracting Officer)*	16C. DATE SIGNED

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH EM, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	This is a No Cost Extension Delivery: 30 Days After Award Delivery Location Code: NHEERL - GED NHEERL - GED US Environmental Protection Agency National Health and Environmental Effects Research Lab 1 Sabine Island Drive Gulf Breeze FL 32561 USA Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center Mail Drop D143-02 109 TW Alexander Drive Durham NC 27711 FOB: Destination Period of Performance: 06/06/2012 to 02/28/2014				

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE 1 OF PAGES 2

2. AMENDMENT/MODIFICATION NO. 005

3. EFFECTIVE DATE See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

5. PROJECT NO. *(If applicable)*

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 EM, INC.
Attn: (b)(4)
1881 CAMPUS COMMONS DRIVE
SUITE 200
(b)(4)
RESTON VA 201911519

CODE (b)(4) FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-037 0001

10B. DATED *(SEE ITEM 13)* 06/06/2012

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

Net Decrease: -$202.13

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)* Limitation of Funds Notice

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

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

DUNS Number: (b)(4)
The purpose of this modification is to de-obligate excess funds in accordance with the Unliquidated Obligations exercise.
TOPO: Jim Harvey
LIST OF CHANGES:

Reason for Modification : Funding Only Action

Obligated Amount for this Modification: -$202.13

Incremental Funded Amount changed
Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9A 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)*
Camille W. Davis

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

15C. DATE SIGNED

16B. Camille W. Davis ELECTRONIC SIGNATURE

16C. DATE SIGNED 07/23/2014

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH EM, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	From: $99,333.77 To: $99,131.64 CHANGES FOR LINE ITEM NUMBER: 1 Obligated Amount for this modification: -$202.13 Incremental Funded Amount changed from $99,333.77 to $99,131.64 CHANGES FOR ACCOUNTING CODE: 12-13-C-261E000-301FK8XPV-2532-26A6F-13261EC068-001 Amount changed from $5,543.77 to $5,341.64 Fundig break-out is hereby changed to read as follows: Cost: (b)(4) Fee: Total: $99,131.64 Delivery: 30 Days After Award Delivery Location Code: NHEERL - GED NHEERL - GED US Environmental Protection Agency National Health and Environmental Effects Research Lab 1 Sabine Island Drive Gulf Breeze FL 32561 USA Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center Mail Drop D143-02 109 TW Alexander Drive Durham NC 27711 FOB: Destination Period of Performance: 06/06/2012 to 02/28/2014				

PERFORMANCE WORK STATEMENT
STREAMS II
Task Order 001, Tetra Tech EP-C-11-037

TITLE: Improving TMDL and Waste Load Allocation Permit Limits by Determination and Application of New Sediment Diagenesis Input Parameters in Current Water Quality Models

Task Order Manager (TOM)	**Alternate Task Order Manager (ATOM)**
Name: Jim Harvey	Name: Linda Harwell
Office: ORD/NHEERL/GED	Office: ORD/NHEERL/GED
1 Sabine Island Drive	1 Sabine Island Drive
Gulf Breeze FL 32561	Gulf Breeze FL 32561
Phone: 850-934-9237	Phone: 850-934-2464
Fax: 850-934-9201	Fax: 850-934-9201
Email: Harvey.Jim@epa.gov	Email: Harwell.Linda@epa.gov

PERIOD OF PERFORMANCE: June 6, 2012 through November 15, 2013

TASKS

TASK 1 RESEARCH WORK PLAN/RESEARCH APPROACH

Contractor shall develop research work plan and approach to determine supporting parameters that may be utilized in the sediment diagenesis module such as light penetration, depth, sediment particle size (for each station) and composition and chemical measurements that have a high probability of reflecting sediment oxygen demand (SOD) in oxic sediments of Tampa Bay and similar environments (see attached Regional Methods proposal for additional details). At a minimum, parameters should include SOD rates, flux rates for ammonia, total nitrogen (organic and inorganic), and total phosphorus in water from chambers and cores to include an initial and final concentration. Bulk sediment analysis should include ammonia, total nitrogen (organic and inorganic) and total phosphorus, aluminum, iron, manganese, and thiomolybdate. Dissolved organic carbon (DOC), total organic carbon (TOC), and sulfur are also possible analytes, but may not be analyzed if not enough funding is available under this Task Order.

TASK 2 QUALITY ASSURANCE PERFORMANCE PLAN (QAPP) DEVELOPMENT AND APPROVAL

Upon approval and acceptance of Task 1 via Task Order Award, contractor shall develop QAPP, including sampling design and analysis and statistical approach for Tampa Bay sediments.

TASK 3 SAMPLING AND SOD CHAMBER DEVELOPMENT

Upon Task Order award, contractor shall collect Tampa Bay sediments as specified in the QAPP and conduct SOD measurements as specified in USEPA 2009. Operating Procedure for Sediment Oxygen Demand, SESDPROC-507-R2, Region 4, SESD, Athens, Georgia. Samples will also be analyzed for

analytes (Fe, S, Mo, etc. and their redox state) as specified in background documentation for the purpose of establishing correlations between sediment components and SOD.

Task 3 Deliverable: Status Report on sampling and SOD chamber development.

TASK 4 ANALYSIS OF SEDIMENT DIAGENESIS INPUT PARAMETERS

Upon written approval to proceed, contractor shall conduct and record SOD measurements and conduct sediment component chemical analyses

Task 4 Deliverable: Report on SOD chamber and sediment component chemistry results. Report shall include raw data in excel format and transformed or calculated data, also in excel format. Draft Report shall be in digital format and e-mailed to TOM.

TASK 5 ANALYSIS OF SOD CHAMBER RESULTS AND CORRELATIONS WITH SEDIMENT DIAGENESIS INPUT PARAMETERS

Upon written approval of Task 4, contractor shall conduct appropriate statistical analyses of results to determine correlations, if any, between sediment component chemistry and redox state, and SOD as determined in experimental chambers for the purpose of determining a rapid chemical assay surrogate measure method for SOD.

Task 5 Deliverable: Draft Report on analysis of sod chamber results and correlations with sediment diagenesis input parameters and feasibility of use of sediment chemical analysis results as a surrogate measure for SOD.

Task 5 Deliverable Schedule:

1) Draft written deliverable(s) for review by the TOM will be prepared in accordance with the timeframe specified in the Task Order Schedule of Benchmarks and Deliverables.
2) Final written deliverable(s) will be furnished in accordance with the timeframe specified in the Task Order Schedule of Benchmarks and Deliverables, after written comments are received from the TOM.

SCHEDULE OF BENCHMARKS & DELIVERABLES:

Task Number	DELIVERABLE	DELIVERY SCHEDULE
1	Research Work Plan/Research Approach	Due on date for Receipt of Proposals (March 23, 2012)
2	Quality Assurance Performance Plan (QAPP)	Within 60 business days after Task Order Award.
3	Status Report on sampling and SOD chamber development	Within 60 business days after receiving written comments in written technical direction from TOM
4	Report on SOD chamber and sediment component chemistry results	Within 90 business days after receiving Task Order Manager's written acceptance of Task 3's deliverable.

5	Draft and Final Reports on analysis of sod chamber results and correlations with sediment diagenesis input parameters	Within 90 business days after receiving Task Order Manager's written acceptance of draft.

REPORTING

All documentation and reporting under this Task Order shall be in compliance with contract requirements.

Additional requirements specific to this Task Order are as follows: all reports shall be transmitted via e-mail to the TOM. MS Word shall be used for descriptive written reports and QAPP, MS excel shall be used for data and reports of analyses. Contractor shall verify with TOM format of report before transmittal.

TRAVEL

All travel under this Task Order shall be in compliance with contract requirements.

CONTRACTOR IDENTIFICATION

Contractor personnel shall always identify themselves as Contractor employees by name and organization and physically display that information through an identification badge. Contractor personnel are prohibited from acting as the Agency's official representative.

The Contractor shall refer any questions relating to the interpretation of EPA policy, guidance, or regulation to the Task Order Manager.

ATTACHMENTS:

This section provides additional detailed project background or other necessary reference materials for contractor performance.

Attachment: Regional Methods Proposal Background

Task Order 1 ATTACHMENT
Regional Methods Proposal for FY2012

TITLE: Improving TMDL and Waste Load Allocation Permit Limits by Determination and Application of New Sediment Diagenesis Input Parameters in Current Water Quality Models

REGIONAL TECHNICAL CONTACT: Mel Parsons, Region 4 SESD, 980 College Station Road, Athens, GA 30605, 706.202.5092, parsons.mel@epa.gov.

MANAGER'S NAME AND SIGNATURE: John Deatrick

ES&T DIRECTOR'S NAME AND SIGNATURE: Michael Peyton

RSL's NAME: Thomas Baugh. Baugh has deferred to Peyton, per 10/05/10 e-mail from Baugh to SESD, with concurrence from Dennis Wesolowski in 10/05/2010 e-mail to SESD.

ORD CONTACT: Jim Harvey

PRINCIPAL INVESTIGATORS/RECIPIENTS: STREAMS 2 Contract

ABSTRACT:
States within EPA R4 utilize water quality models, with required data inputs, to manage nutrient pollution of water bodies on their 303(d) lists through the TMDL and Waste Load Allocation Program. One of the processes long known to impact the quality of surface waters is the oxygen demand by and concomitant nutrient release from bottom sediments. Sediment oxygen demand (SOD), due to the mineralization (diagenesis) of organic materials in bottom sediments, can greatly contribute to oxygen declines in water bodies. Because of their importance, SOD and associated sediment nutrient release rates have been included in essentially all modern numerical water quality models (Martin, 2002). R4 currently collects data for these parameters as model inputs through *in-situ* chamber measurements. Although chamber measurements are a reliable and accurate means of determining these rates, the method is very labor intensive and therefore limiting in the number of locations that can be studied in a given time frame for a given water body. A mechanistic model, incorporating sediment diagenesis, that provided links between influxes of organic materials to sediments; physical, biological and chemical processes occurring within the sediments; and consequent sediment oxygen demand and nutrient release, was developed by De Toro et al. (1990). Unfortunately, there are currently no measureable parameters indentified that can be utilized to calibrate or verify the diagenesis module. The objectives of this proposed research are to determine supporting parameters that may be utilized in the diagenesis module and to explore means of expanding the spatial sampling capacity for these parameters in a given water body. In particular the use of molybdate to thiomolybdate conversion, as an indicator of anoxia and SOD, will be examined.

BACKGROUND:

Eutrophication and associated impacts on ecosystem services are significant issues for many watersheds in Region 4, including the largest estuarine system in the southeast, the Albemarle-Pamlico watershed in North Carolina and Virginia, containing estuaries on the Federal list of impaired waters under Section 303(d) of the Clean Water Act. Others areas such as Tampa Bay have specific goals set for seagrass restoration and have developed a Nitrogen Consortium to evaluate inputs of nitrogen into Tampa Bay to voluntarily limit those inputs. Both these areas are a focus of a large research program in the EPA Office of Research and Development (ORD) called the Ecosystem Services Research Program (ESRP). Within the ESRP, the Tampa Bay and Albemarle-Pamlico watershed, (and its associated estuaries), are two of five place-based studies across the nation, with an important focus in these locations on issues related to nitrogen management.

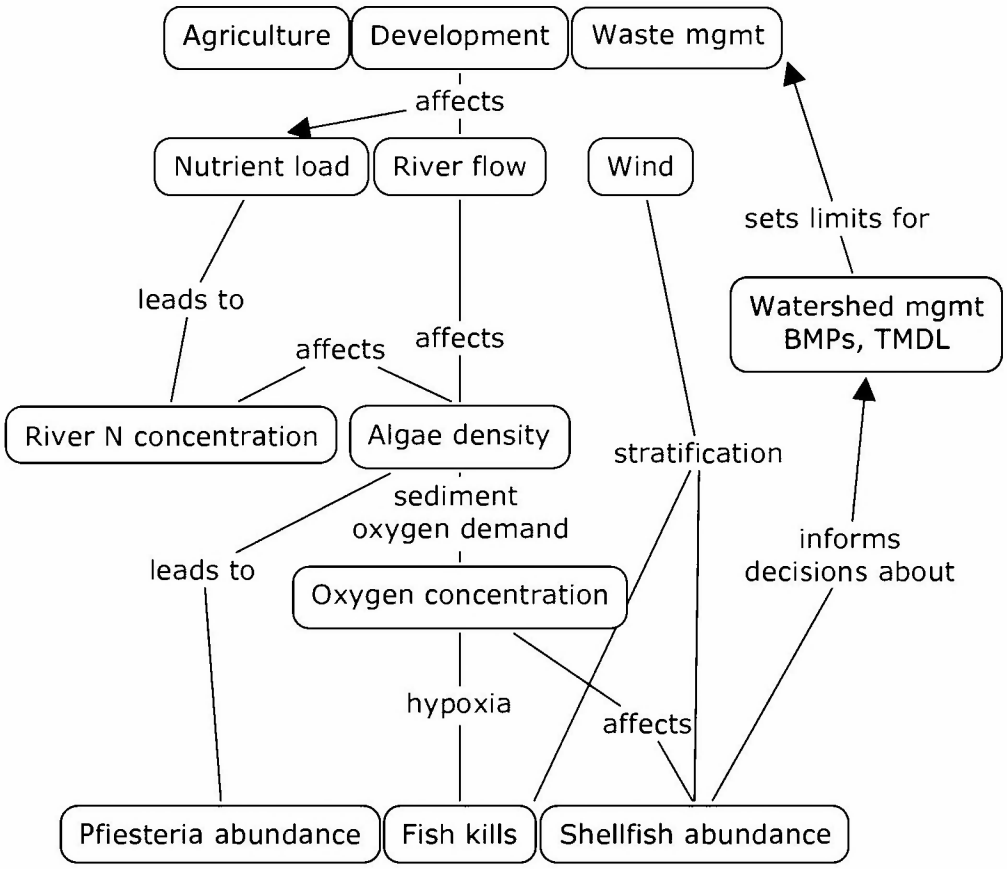

Fig. 1. Conceptual model for nutrient impacts on the Neuse river system (after Shabman, 2005).

A conceptual model for the impacts of human activities in a watershed is shown in Figure 1 for example. Drivers of agriculture, development, and waste management lead to system pressures, including nutrient loading. These pressures affect the state of the system (Figure 1, green boxes), and, in turn, ecological endpoints (shown in blue). Ecosystem services are the endpoints that affect people, and therefore are the aspects of the environment that

people care about. A better understanding and quantification of the state of the system will enable us to better judge the way services provided by this system are impacted by human activity. This improved judgment will in turn inform and improve management decisions in the watershed.

States within EPA R4 utilize water quality models, with required data inputs, to manage nutrient pollution of water bodies on their 303(d) lists through the TMDL and Waste Load Allocation Program. One of the processes long known to impact the quality of surface waters is the oxygen demand by and concomitant nutrient release from the bottom sediments. Sediment oxygen demand (SOD), due to the mineralization (diagenesis) of organic materials in bottom sediments, can greatly contribute to oxygen declines in water bodies. Because of their importance, SOD and associated sediment nutrient release rates have been included in essentially all modern numerical water quality models (Martin, 2002), R4 currently collects data for these parameters as model inputs by *in-situ* chamber measurements (EPA, 2009). Although chamber measurements are a reliable and accurate means of determining these rates, the method is very labor intensive and therefore limiting in the of locations that can be studied in a given time frame for a given water body.

A mechanistic model, incorporating sediment diagenesis which provided links between influxes of organic materials to sediments; physical, biological and chemical processes occurring within sediments; and consequent sediment oxygen demand and nutrient release, was developed by DiToro et al. (1990). This routine is being or has been incorporated into popular water quality models such as QUAL2K (Chapra 2007) and WASP (Wool et al. 2003, Martin 2004), distributed to states by EPA's Watershed and Water Quality Modeling Technical Support Center, and the CE-QUAL-lCM model (Cerco and Cole 1995), distributed by the Corps of Engineers. Unfortunately, there are few measureable parameters identified that can be utilized to calibrate or verify the diagenesis module. Efforts to manage nutrient levels, particularly nitrogen, in Tampa Bay depend on accurate estimates of nutrient inputs, exports, and transformations at the sediment-water interface. This is particularly important in a shallow, well mixed estuary like Tampa Bay, where exchanges between the water column and bottom sediments may contribute significantly to nutrient transformation processes and sediment oxygen demand (Tampa Bay Estuary Program, 2006).

RESEARCH OBJECTIVES:

The objectives of this proposed research are: 1) to determine supporting parameters that may be utilized in the diagenesis module such as light penetration, depth, sediment particle size and composition and chemical measurements that have a high probability of reflecting sediment oxygen demand (SOD) in oxic sediments of Tampa bay and similar environments. These include but are not limited to measurements conducted by DiToro et al. (1990) and the Tampa Bay Estuary Program (2006) such as SOD rates, flux rates for ammonia, total nitrogen (organic and inorganic) and total phosphorus in water from chambers and cores (initial and final concentrations). Bulk sediment analyses should include ammonia, total nitrogen (organic and inorganic) and total phosphorus, aluminum, iron, manganese, and thiomolybdate. DOC, TOC and sulfur may be analyzed if funds are available; and 2) to explore means of calibrating

sediment core SOD measurements to SOD measurements conducted by EPA Region 4 SESD using SOD chambers (USEPA 2009).

The working hypothesis for the project is that measureable concentrations of reduced metals in sediment and pore water are correlated with sediment oxygen demand and nutrient flux rates.

This research would help Region 4 do its work better through a broader understanding or the biogeochemical processes involved with sediment diagenesis. Since the diagenesis module is or will be included in current water quality models, it has the potential to affect the entire regulated community through improved model outputs for loading predictions and therefore more accurate permit limits for dischargers. This research would greatly improve current water quality models, because the sediment diagenesis component is well founded in theory but lacks measureable inputs for verification and calibration. This work also has utility for water quality submodels for ecosystem services in Tampa Bay that are already under development. Funding for this research would address the need to have leading experts in the field focus directly on establishing essential parameterization inputs for popular water quality models. There are currently no alternative opportunities to address this need. Chamber studies have been at the forefront of SOD/nutrient flux measurements for many years, but there is currently inadequate information available on additional measureable parameters for model input.

More accurate permit limits for dischargers would be extremely beneficial to states and communities with water bodies on the 303(d) list. More accurate permit limits and an improved understanding by Federal and State regulatory agencies concerning the biogeochemical processes in sediment that can contribute to eutrophication in our water bodies will lead to healthier ecosystem with fewer violations of water quality standards and failures to meet designated uses.

Improved understanding, methods, and data sets would provide better inputs to frequently used water quality models, thus allowing EPA and the States to better manage 303(d)-listed water bodies in the Region and Nationally. The proposed work would improve understanding of how human activities affect estuarine ecosystems and the services they provide, which in turn will lead to improved management of these valued systems Region-wide. The diagenesis model would also be applicable to fresh water systems in R4 as well as nationally.

RESEARCH APPROACH:

Field testing and evaluation of potential sampling methods began at SESD in FY2010. Additional testing of sampling methods and chemical parameters recommended by the Principle Investigators would be coordinated with SESD and ORD researchers in Tampa Bay and various locations around the Region on a seasonal basis beginning in FY2012. Traditional SOD/nutrient flux projects are already planned for 2012, in conjunction with SESD's workplan. These projects will also provide information to assess potential methods and parameters for diagenesis and examine and perhaps correlate the range of environmental conditions under which measured variables can be used to estimate the SOD.

In addition, the other research partners would conduct field and model verifications of potential parameters, both independently and collaboratively during SESD's field efforts. Through these efforts, physical and chemical characteristics of sediment and pore water would be identified that could be utilized as model inputs to estimate SOD/nutrient flux rates, in addition to traditional chamber measurements. These additional measurements would not only help delineate variability that isn't currently possible to detect, but would also provide enough data points to be statistically defensible. These measurements could include concentrations of ammonia, nitrate, organic N, thiomolybdate (MoS_4), iron (Fe), manganese (Mn) and hydrogen sulfide H_2S) in surface and subsurface sediments as well as depth, light penetration, and chlorophyll a. Nitrate, Fe, Mn, and H_2S concentrations are recognized for their importance relating to SOD/nutrient flux (Di Toro 1998, 2001; Murrell et al. 2009; Tampa Bay Estuary Program 2006)) and are scheduled to be included in the WASP diagenesis module.

Accumulation of Mo has been utilized as a geochemical marker of hypoxic bottom water conditions (Adelson et al., 2001; Boothman and Coiro, 2009; Crusius et al., 1996). Concentration of Mo in sediment may be utilized to assess interactions between sediment diagenesis and water column dynamics and their relationship to nitrogen loading from watersheds (Murrell et al, 2009). ORD's National Health and Environmental Effects Research Laboratory (NHEERL), Gulf Ecology Division (GED) and Atlantic Ecology Division (AED), will share information and participate in data analysis and model verification and calibration, based on parameters measured by contractors and SESD.

Laboratory analysis for additional relevant constituents, including nutrients, organic carbon, and selected metals would be conducted by the R4 SESD Laboratory and contractor. Parameters would include: SOD rates, flux rates for ammonia, total nitrogen (organic and inorganic) and total phosphorus in water from chambers and cores (initial and final concentrations). Bulk sediment analyses should include ammonia, total nitrogen (organic and inorganic) and total phosphorus, aluminum, iron, manganese, and thiomolybdate. DOC, TOC and sulfur may be analyzed if funds are available to determine "What is the effect of altering boundry conditions- effects of light, redox, and how can this relate to SOD and TMDLs?" Statistical analysis will be conducted by ESRP and SESD researchers to determine **what drives SOD most strongly and under what conditions**.

Model estimates of SOD/nutrient flux, based on the parameterized diagenesis module, would be generated by the principal investigators. SESD and ESRP researchers would then statistically compare the model estimates to chamber measurements of SOD/nutrient flux.

RESEARCH PRODUCTS:

Quarterly reports that summarize field activities, data obtained, and initial data analyses shall be submitted. A final report by the collaborators detailing the findings and recommendations of this research would be issued at the culmination of the project. The conclusions of this report could be incorporated into the sediment diagenesis component of various water quality models. The report would also form the basis of one or more peer-reviewed journal article or similar product.

PROJECT MANAGEMENT:
SESD will work with contractor and ESRP researchers in development of the Research workplan, Quality Assurance Project Plan, and will participate as co-author on reports and publications. SESD will meet quarterly (at a minimum) with ORD contact and ESRP researchers to review progress.

COLLABORATORS AND ROLES:
Mel Parsons- Regional Contact, R4 SESD representative, 706-202-5092, parsons.mel@epa.gov Biologist in the Ecological Assessment Branch of the Science and Ecosystem Support Division (SESD) Athens, GA. Lead for SOD and Nutrient flux measurements in R4; Liaison to SESD's in-house chemists.

Jim Harvey- ORD Sponsor and Project Officer (COTR) 850-934-9237, harvey.jim@epa.gov Research Biologist in the Ecosystems Assessment Branch of the Gulf Ecology Division, National Health and Environmental Effects Research Laboratory. ORD ESRP Tampa research task member and ORD Contact, responsible for contract administration.

Marc Russell-Research Ecologist and Lead for the ORD ESRP Tampa Bay Demonstration Project. 850-934-9344, russell.marc@epa.gov Ecosystems Assessment Branch of the Gulf Ecology Division, National Health and Environmental Effects Research Laboratory.

Richard Devereux- Research Microbiologist-microbial transformation of sulfur and related biogeochemistry, 850-934-9346, devereux.richard@epa.gov, Acting Branch Chief, Ecosystem Assessment Branch, Gulf Ecology Division, National Health and Environmental Effects Research Laboratory.

John E. Rogers- Research Microbiologist, 850-934-9326, rogers.johne@epa.gov Developer of Systems Dynamic Model for Tampa Bay seagrass growth. Gulf Ecology Division, National Health and Environmental Effects Research Laboratory.

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