

2. AMENDMENT/MODIFICATION NO. P00002	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. RES-19-0139	5. PROJECT NO. (If applicable)
6. ISSUED BY US NRC - HQ ACQUISITION MANAGEMENT DIVISION MAIL STOP TWFN-07B20M WASHINGTON DC 20555-0001	CODE NRCHQ	7. ADMINISTERED BY (If other than Item 6)	CODE

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) SOUTHWEST RESEARCH INSTITUTE 6220 CULEBRA RD SAN ANTONIO TX 782385166	(x)	9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MODIFICATION OF CONTRACT/ORDER NO. 31310018D0002 31310018F0093
CODE    007936842	FACILITY CODE	10B. DATED (SEE ITEM 13) 09/28/2018

**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:      \$179,457.00  
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).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: FAR 52.243-2 CHANGES-COST REIMBURSEMENT (AUG 1987) - ALTERNATE I (APR 1984)
	D. OTHER (Specify type of modification and authority)

**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.)  
Project Title: "Update Input Parameter Recommendations for MACCS COMIDA2 File"

The purpose of this modification is to make within scope changes to the statement of work to accommodate additional level of effort required to complete the project. As a result, the task order ceiling is increased by \$179,457, from \$87,502 to \$266,959. The task order obligations are increased by \$179,457, from \$87,502 to \$266,959. The period of performance is extended from July 15, 2019 to December 31, 2020. See continuation pages for specific changes to the task order.

Task Order Obligation Amount: \$266,959.00 (Changed)  
Task Order Ceiling: \$266,959.00 (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) CAROLYN A. COOPER
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)	15C. DATE SIGNED  (Signature of Contracting Officer)
	16C. DATE SIGNED 07/09/2019

**CONTINUATION SHEET**

REFERENCE NO. OF DOCUMENT BEING CONTINUED  
31310018D0002/31310018F0093/P00002

PAGE OF  
2 13

NAME OF OFFEROR OR CONTRACTOR  
SOUTHWEST RESEARCH INSTITUTE

ITEM NO. (A)	SUPPL ES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	<p>Period of Performance: 09/28/2018 to 12/31/2020 (Changed)</p> <p>NEW ACCOUNTING CODE ADDED: Account code: 2019-C0200-FEEBASED-60-60D003-60B306-1003-11-6-182-251A-11-6-182-1003 \$100,000.00</p> <p>NEW ACCOUNTING CODE ADDED: Account code: 2019-X0200-FEEBASED-60-60D003-60B306-1003-11-6-182-251A-11-6-182-1003 \$79,457.00</p> <p>Period of Performance: 09/28/2018 to 12/31/2020</p>				

**SECTION SF 30 BLOCK 14 CONTINUATION PAGES**

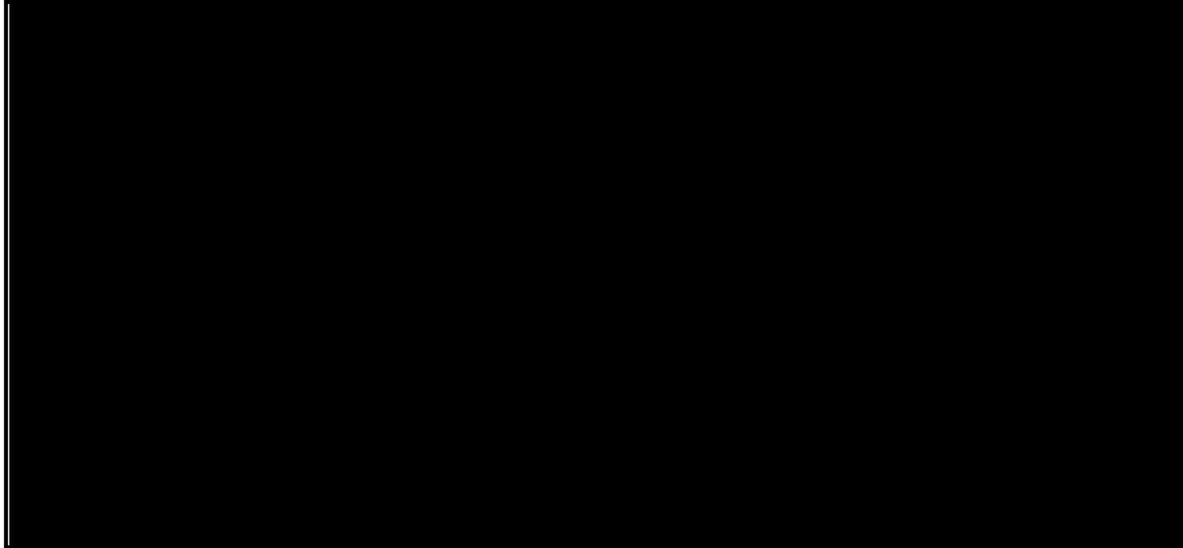
The following changes are hereby made to the task order:

**B.2 CONSIDERATION AND OBLIGATION— TASK ORDERS (AUG 2011)** is hereby deleted in its entirety and replaced as follows:

- (a) The total ceiling of this contract for the products/services under this contract is **\$266,959 (Cost of [REDACTED] and Fixed-Fee of [REDACTED])**.
- (b) This order is subject to the minimum and maximum ordering requirements set forth in the contract.
- (c) The amount presently obligated with respect to this order is **\$266,959** of which [REDACTED] represents costs and [REDACTED] represents fixed-fee. The obligated amount shall, at no time, exceed the order ceiling as specified in paragraph (a) above. When and if the amount(s) paid and payable to the Contractor hereunder shall equal the obligated amount, the Contractor shall not be obligated to continue performance of the work unless and until the Contracting Officer shall increase the amount obligated with respect to this order, in accordance with FAR Part 43 - Modifications. Any work undertaken by the Contractor in excess of the obligated amount specified above is done so at the Contractor's sole risk and may not be reimbursed by the Government.
- (d) The Contractor shall comply with the provisions of FAR 52.232-22 - Limitation of Funds, for incrementally-funded delivery orders or task orders.
- (e) In accordance with FAR 52.216-8 - Fixed Fee, it is the policy of the NRC to withhold payment of fee after payment of 85 percent of the fee has been paid in order to protect the Government's interest. The amount of fixed-fee withheld from the contractor will not exceed 15 percent of the total fee or \$100,000, whichever is less. Accordingly, the maximum amount of fixed-fee that may be held in reserve is [REDACTED]

**B.3 PRICE/COST SCHEDULE** is hereby deleted in its entirety and replaced as follows:

Total Estimated Cost and Fixed-Fee breakdown by CLIN is presented below.



**SECTION C – Descriptions/Specifications/Statement of Work** is hereby deleted in its entirety and replaced as follows:

**Statement of Work (REVISION 1)**

Fee Recoverable: Non Fee Recoverable

CAC Number: KF0090

**1. PROJECT TITLE**

Update Input Parameter Recommendations for MACCS COMIDA2 File.

**2. BACKGROUND**

The Office of Nuclear Regulatory Research, Division of System Analysis, Accident Analysis Branch (RES/DSA/AAB) plans, develops, and manages analytical and experimental research projects on the progression, response, and offsite consequences of postulated severe accidents; and performs safety analyses of nuclear power plant systems. This work includes safety and security analyses; including postulated severe accident analyses of accident progression in reactor vessel, containment, and postulated accidents from spent fuel storage and transportation. State-of-the-art analytical techniques are used to develop realistic best estimates of the potential effects (consequences) to the public of low-likelihood nuclear power plant and spent fuel storage and transportation accidents which could release radioactive material into the environment. AAB models accident progression in order to estimate the magnitude and timing of radioactive release into the environment to estimate site-specific

consequences (e.g. health effects). The experimental research projects support NRC's knowledge and understanding of severe accidents, and they support NRC's models with experimental data. AAB provides consultation to other NRC offices regarding safety or licensing decisions, development of guidance, or other regulatory needs, and partners with USDOE, universities, laboratories, and other national and international research centers. Also manages the Agency long-term research program and research for advanced reactor designs.

To accomplish regulatory research tasks, AAB use various computer codes including MELCOR Consequence Analyses Code System (MACCS). MACCS suite of computer codes is used to evaluate the impacts of atmospheric releases of radioactive aerosols and vapors on human health and the environment. The COMIDA2 code is a preprocessor code to MACCS that is used to estimate dose-to-source ratios from ingestion of contaminated foodstuffs. The output file produced by COMIDA2 is used by the MACCS code to project whether and for how long agricultural products would be interdicted, and to estimate collective radiological doses for areas that are not subject to interdiction.

### **3. OBJECTIVE**

The recommended values for use with the COMIDA code have not been systematically reviewed since the publication of the code manual (NUREG/CR-6613 Volume 2, Chanin and Young 1998). Although many of the recommendations in Volume 2 of NUREG/CR-6613 may still represent the most current information, it is prudent to review current state of practice in radioecological modeling to determine whether updates to recommended parameter values are warranted. The objective of this task order is to obtain technical assistance with identifying appropriate updates, if needed, to COMIDA2 parameters for MACCS as described in NUREG/CR-6613 Volume 2. This work supports cost-benefit work and parameter guidance work since it would primarily relate to SAMA/SAMDA or Regulatory Analysis work.

Revision 1 of this task order statement of work is due to the recognition about extra level of effort and time needed to complete the task order. In the execution of original task order, research was conducted to ascertain the number of parameters required review and update. It was determined that certain information was not readily available in public domain and a higher level of syntheses will be required to formulate parameter values. Also, documentation on how the parameter influence the results was also either missing or not readily available.

### **4. SCOPE OF WORK**

#### **Task 1 – Kick-Off Meeting**

The Contractor shall participate in a kick-off meeting with the Contracting Officer's Representative (COR) and other NRC technical staff to discuss the scope of work, expectations, project management, deliverables, and performance requirements of the task order. The Contractor shall prepare a written summary of the meeting that documents the meeting discussions and action items identified during the meeting.

## **Task 2 –Initial Assessment of Recommended Input Parameter Values for the COMIDA2 Food Chain Model**

The contractor shall perform the following tasks related to updating recommendations for selecting input parameters for use with the MACCS COMIDA2 model.

- **Subtask 2.1:** Review recommended input parameters used to develop MACCS COMIDA2 files as documented in NUREG/CR-6613 Volume 2. Identify any recommended updates to these parameters. The contractor shall prepare a draft technical report that describes any recommended updates and the technical basis for the recommendations.
- **Subtask 2.2:** Identify COMIDA2 input parameters in NUREG/CR-6613 Volume 2 likely to be site- or region-specific and provide recommendations on how a user could develop those parameters. The contractor shall identify sources of information that a user could consult to develop site- or region specific parameter values. The contractor shall prepare a draft technical report that documents the recommendations along with the basis for the recommendations.
- **Subtask 2.3:** Identify important uncertain or site-specific input parameters by performing quantitative sensitivity analyses using the MACCS code to demonstrate the sensitivity of population dose and economic costs to recommended changes in COMIDA2 input parameters per subtask 2.1 above. The contractor shall prepare a draft technical report that identifies the important uncertain or site-specific input parameters and characterizes the sensitivity of MACCS code outputs to changes in these inputs

## **Task 3 –Interim Documentation**

The Contractor shall document the work performed under Task 2 in a single consolidated draft final technical report. A draft of the final technical report shall be provided in advance of the final report to allow for NRC review and comment. The final report prepared under Task 4 shall incorporate NRC comments, **and document the additional work performed as part of this modified task order.**

## **Task 4 - Final Assessment of Recommended Input Parameter Values for the COMIDA2 Food Chain Model**

Following information was collected and categorized about the parameters while conducting research related to subtask 2.1 and 2.2 as described above:

Category	Parameters in Category	# of Values in Category
Category 1	Leach Rate Constant, Plant Growth Rate Constant, Maximum Areal Biomass, ALPHA-Foliar Interception Constant, Resuspension Rate Constant, Initial Areal Biomass, Senescence Rate, Weathering Rate, Rainsplash Rate, Short-Term Integration Time for Milk When Cows Are on Pasture	37
Category 2	Concentration Ratios, Foliar Absorption Rate Constant, Animal Product Transfer Coefficients, Dry-to-Wet Weight Conversion Factors, All Animal Rates (Beef, Dairy, Poultry, Other), Delay Times for Animal Products, Delay from storage to feed	246
Category 3	Adsorption/ Desorption Rate, Plant Growth Rate Constant, Hay Cuttings, Time of Crop Tillage, Crop/Hay Dates, Pasture/Grazing Dates, Percolation Rate, Soil Density, Thickness of Zone Soil	25
Category 4	Plant deposition, Maximum Standing Biomass	22

The adequacy of the information on these categories are explained below:

Category 1: Values readily available (37 values)

Category 2: Literature and values available, but a basic level of synthesis is needed to extract values compatible with COMIDA needs (246 values)

Category 3: Literature and values are available, but a deeper level of synthesis and analysis is needed to extract values (25 values). These are few parameters, but sources of information are varied. Data are reported in different units or different meaning than required in COMIDA.

Category 4: Additional documentation is needed beyond MACCS user guide (22 values). Additional information is required from the software developer to better understand the parameter meaning and use in the COMIDA code.

The contractor shall perform additional analysis including additional MACCS sensitivity runs on Categories 2, 3, and 4, as described below.

#### **Subtask 4.1 Workshop on Research from Task 2**

The contract shall prepare for and conduct a workshop on research conducted for Task 2, and the draft final technical report prepared as part of Task 3 listed above. The purpose of the workshop is to allow technical exchange between key NRC and CNWRA staff, and experts from Sandia National Laboratories. The feedback from this workshop shall be used

to prioritize the remaining work, clarify missing information on COMIDA model implementation in MACCS, resolving any open issues on Category 4 parameters and other input required for the final report. The workshop is expected to be held in the Fall of 2019, either at SNL Albuquerque, NM, or near NRC headquarters in Rockville MD. The location and date of workshop shall be selected by mutual consent between the COR and CNWRA and confirmed in writing by the COR. The workshop is not expected to be more than one day (8 hours).

Documents to Support Workshop: The contractor shall prepare a workshop agenda that includes Introductions and Objectives, Presentation by SNWRA experts, SNL staff if any, discussions, prioritization of remaining work, action Items etc. The contractor shall prepare power point slides for the workshop and provide a copy of the input and output files of MACCS used to generate research results and prepare questions for Sandia National Laboratory on missing MACCS/COMIDA model information, needed to complete the work, as soon as possible and no later than 30 calendar days before the workshop. The contractor shall incorporate NRC comments on the slides and questions.

After completion of the workshop, the contractor shall prepare a workshop meeting summary report that lists all meeting participants, documents all information collected during the workshop discussion and identifies action items.

#### **Subtask 4.2 Post Workshop Plan Review**

The contractor shall develop a project plan e.g. list tasks and schedule for completion, to complete remaining analyses based on information collected and the priority ranking of effort developed during the workshop. The contractor shall conduct a follow up meeting, within two weeks after submission of the project plan, expected to be held via teleconference, with NRC staff to review and discuss the project plan. A revised project plan shall be prepared if applicable to address the outcome of the meeting.

#### **Subtask 4.3 Perform Additional Analysis (High Priority)**

Pursuant to the NRC approved project plan, the contractor shall perform the high priority work for Categories 2, 3, and 4 and, high priority action items from the workshop. The contractor shall compile relevant information, parameter by parameter, references and recommended values/distributions. A more extensive sensitivity analysis shall be performed to evaluate updated information and incorporate parameters.

For Category 2, Average parameters among sources as required and all input values shall be clearly identified in the final technical report. For example, distributions may be “judged” from different sources, therefore the selection of values shall be individually documented, for each parameter and radionuclide/element.

The contractor shall prepare an update to the draft final report prepared in Task 3 that documents the work performed under Task 4. Documented samples of input data files and MACCS runs shall be provided as part of the revised draft report. The contractor shall



incorporate NRC comments on the updated draft final report and prepare a final report as a NUREG-CR.

**Subtask 4.4 Perform Additional Analysis (Low Priority)**

Pursuant to the NRC approved project plan, the contractor shall perform the low priority work for Categories 2, 3, and 4 and, low priority action items from the workshop. The contractor shall compile relevant information, parameter by parameter, references and recommended values/distributions. A more extensive sensitivity analysis shall be performed to evaluate updated information and incorporate parameters. The contractor shall update the final report to document the work performed under this task. The contractor shall incorporate NRC comments on the report and prepare a final updated report as a NREG-CR.

**Subtask 4.5 Participation in Related Meetings**

The contractor shall present the findings from this task order at a research seminar at NRC or at an International MACCS Users Group (IMUG) meeting in summer 2020. The presentation shall require prior COR approval, therefore draft presentation slides shall be provided to COR 30 calendar days in advanced of the presentation date. The dates and location will be selected in consultation with the COR.

**5. APPLICABLE DOCUMENTS AND STANDARDS**

Chanin, D. and M. Young (1998). Code Manual for MACCS2: Volume 2, Preprocessor Codes COMIDA2, FGRDCF, IDCF2 (NUREG/CR-6613). Sandia National Laboratories, Albuquerque, NM (ML17047A444)

Abbott, M. L. and A. Rood (1993). COMIDA: a radionuclide food chain model for acute fallout deposition (EGG-GEO-10367), Idaho National Engineering Laboratory, EG&G Idaho Inc. U.S. Department of Energy Office of Scientific and Technical Information (OSTI), Washington, DC.

6.0 DELIVERABLES AND DELIVERY SCHEDULE

Deliverable Schedule

Task	Deliverable Description	Quantity/Media	Due Date	Submit to
1	Kick-Off Meeting Summary	Email	one week after completion of kickoff meeting	COR
2.1	Subtask 2.1 Draft Technical Report	Electronic document, (Adobe PDF or MS Word), 1 copy on CD-ROM or via email/electronics download	45 days after initiation of contract	COR
2.2	Subtask 2.2 Draft Technical Report	As above	90 days after initiation of contract	COR
2.3	Subtask 2.3 Draft Technical Report	As above	120 days after initiation of contract	COR
3	Draft Final Technical Report for NRC review and comment	As above	135 days after initiation of contract	COR
4.1	Workshop Agenda Workshop Presentation slides Input and Output Files for MACCS Questions for Sandia National Laboratory	Electronic document, (Adobe PDF or MS Word, Power Point), copy on CD-ROM or via email/electronics download	30 calendar days before start of Workshop	COR
4.1	Workshop Summary Report	Electronic document, (Adobe PDF or MS Word),	One week after completion of Workshop (sept 30)	COR
4.2	Project Plan	Electronic document, (Adobe PDF or MS Word),	One week after completion of workshop Sept 30	COR

Task	Deliverable Description	Quantity/Media	Due Date	Submit to
4.2	Revised Project Plan (If required)	Electronic document, (Adobe PDF or MS Word),	One week after completion of meeting	COR
4.3	Updated Draft Final Report incorporating high priority items	Electronic document, (Adobe PDF or MS Word),	Within 90 calendar days of completion of project plan meeting	COR
4.3	Final Report incorporating high priority items in NUREG-CR Format  Input/Output files of MACCS	Electronic document, (Adobe PDF or MS Word), 1 copy on CD- ROM or via email/electronics download	One week after receipt of COR comments	COR
4.4	Updated Draft Report incorporating low priority items	Electronic document, (Adobe PDF or MS Word	Within 60 calendar days after start of task	COR
4.4	Final Updated Report incorporating low priority items in NUREG-CR Report  Input/Output files of MACCS	Electronic document, (Adobe PDF or MS Word), 1 copy on CD- ROM or via email/electronics download	One week after receipt of COR comments	COR
4.5	Seminar or Meeting Presentation Slides	Electronic document (Power Point)	30 calendar days before start of Workshop	COR
	*Monthly Letter Status Report (MLSR) per Section F.2 of the Base Contract	Electronic Adobe PDF	20 <sup>th</sup> day of the following month	CO/COR

Upon request by the COR, the contractor shall make available any scientific notebooks, calculation worksheets, or MACCS or COMIDA input or output files used to support the development of the deliverables listed above.

## 6. REQUIRED LABOR CATEGORIES

It is expected that staff performing technical work or key personnel will have background and experience in the following areas:

Nuclear Engineering  
Radiation Protection and Health Physics  
Dose assessment  
Radioecology  
Radiological Engineering  
Consequence Analysis  
MACCS computer code

This evaluation requires an understanding of MACCS as well as offsite consequence analysis phenomenology. Knowledge in all technical elements of offsite consequence modeling including radionuclide release, atmospheric transport and dispersion, site data, weather data, emergency response and protective actions, exposure pathways, health effects, and offsite costs is required to perform analyses with MACCS code.

The Contractor shall also provide a Program Manager who shall be responsible for the performance of the work. The Program Manager shall have full authority to act for the Contractor on all contract/order matters relating to daily operation of this order. The Program Manager shall have at a minimum, B.S. in science or engineering. The Program Manager shall also have significant experience with program or project management and NRC regulatory requirements. The Program Manager will support all of the Tasks.

## 7. GOVERNMENT-FURNISHED PROPERTY

It is understood that SWRI has access to MACCS computer code. A copy of the code and associated documentation will be provided by the COR if requested.

## 8. PERIOD OF PERFORMANCE

Refer to Section F.1 TASK/DELIVERY ORDER PERIOD OF PERFORMANCE (SEP 2013)

## 9. PLACE OF PERFORMANCE

Work will be performed at the contractor's site except for travel identified below in Section 10.

## 10. SPECIAL CONSIDERATIONS

### TRAVEL

The following travel may occur under this task order:

- FY 19: One, two-person, 1-day trips to NRC headquarters or Sandia National Laboratories Albuquerque, NM for workshop
- FY 2020 One, two-person, 1-day trip to NRC headquarters or IMUG meeting location

The contractor shall request and obtain written approval from the COR before incurring any travel costs. The contractor shall be authorized travel expenses consistent with the Federal Travel Regulations and the limitation of funds for this task order

## **SECURITY**

The work expected under this task order is unclassified and not sensitive.

## **KEY PERSONNEL**

Refer to Section H.2 2052.215-70 KEY PERSONNEL (JAN 1993)

**F.1 TASK/DELIVERY ORDER PERIOD OF PERFORMANCE (SEP 2013)** is hereby deleted in its entirety and replaced as follows:

This task order shall commence on September 28, 2018 and will expire on December 31, 2020.

(End of Clause)

**G.2 2052.215-78 TRAVEL APPROVALS AND REIMBURSEMENT - ALTERNATE 1 (OCT 1999)** is hereby deleted in its entirety and replaced as follows:

(a) Total expenditure for travel may not exceed [REDACTED] without the prior approval of the contracting officer.

(b) All foreign travel must be approved in advance by the NRC on NRC Form 445, Request for Approval of Official Foreign Travel, and must be in compliance with FAR 52.247-63 Preference for U.S. Flag Air Carriers. The contractor shall submit NRC Form 445 to the NRC no later than 30 days prior to the commencement of travel.

(c) The contractor will be reimbursed only for travel costs incurred that are directly related to this contract and are allowable subject to the limitations prescribed in FAR 31.205-46.

(d) It is the responsibility of the contractor to notify the contracting officer in accordance with the FAR Limitations of Cost clause of this contract when, at any time, the contractor learns that travel expenses will cause the contractor to exceed the travel ceiling amount identified in paragraph (a) of this clause.

(e) Reasonable travel costs for research and related activities performed at State and nonprofit institutions, in accordance with Section 12 of Pub. L. 100-679, must be charged in accordance with the contractor's institutional policy to the degree that the limitations of Office of Management and Budget (OMB) guidance are not exceeded. Applicable guidance documents include OMB Circular A-87, Cost Principles for State and Local Governments; OMB Circular A-122, Cost Principles for Nonprofit Organizations; and OMB Circular A-21, Cost Principles for Educational Institutions.