



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

November 30, 2001

Wesley C. Patrick, President  
Center for Nuclear Waste  
Regulatory Analyses  
6220 Culebra Road  
PO Drawer 28510  
San Antonio, TX 78228-0510

Subject: Modification No. 3 to Task Order No. 10 Entitled, "Reuse Soil Scenario Analysis", Under Contract NRC-02-97-001

Dear Dr. Patrick:

In accordance with the task order procedures of the subject contract, this letter definitizes Modification no. 3 to Task Order No. 10. This effort shall be performed in accordance with the enclosed Statement of Work, and the Contractor's technical proposal dated September 20, 2001, as amended on October 25, 2001, and November 26, 2001. The effective date of this task order modification is November 30, 2001.

The period of performance for Task Order No. 10 is changed to February 22, 2001 through December 31, 2002. The cost ceiling is increased by \$99,802, from \$94,038, to \$193,840. The amount of \$174,437 represents the total estimated reimbursable costs, the amount of \$5,447 represents the cost of facility capital, and the amount of \$19,402 represents the fixed fee for this task order.

The obligated amount remains \$94,038.

The issuance of this task order modification does not change any of the terms and conditions of the subject contract.

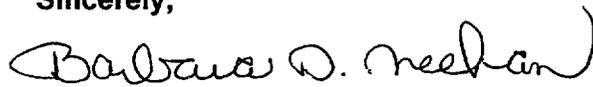
A summary of obligations for this task order from award date through the date of this action is given below:

Total FY01 obligation amount:	\$94,038
Total FY01 deobligation amount:	20,000
Total FY02 obligation amount:	20,000
Cumulative Total:	\$94,038

Please indicate your acceptance of Modification No. 3 to Task Order No. 10 by having an official authorized to bind your organization, execute three (3) copies of this document in the space provided and return two (2) copies to the U.S. Nuclear Regulatory Commission, Attn: Mrs. Barbara Meehan, ADM/DCPM/CMB2, Mail Stop T-712, Washington, DC 20555. You should retain the third copy for your records.

If you have any questions regarding this matter, please call me on (301) 415-6730.

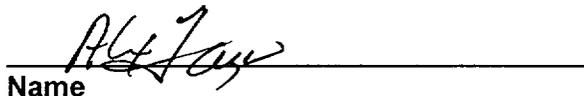
Sincerely,



Barbara D. Meehan, Contracting Officer  
Contract Management Branch No. 2  
Division of Contracts and  
Property Management  
Office of Administration

Enclosure: As stated

Accepted:

  
Name

*for* R.B. Kalmbach, Director, Contracts  
Title

December 7, 2001

Date

**OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
DIVISION OF WASTE MANAGEMENT**

**STATEMENT OF WORK**

**TITLE: REUSE SOIL SCENARIO ANALYSIS    JOB CODE: J5156**  
**CONTRACTOR: CNWRA    SITE:    San Antonio    STATE:    TX**  
**CONTRACT NUMBER: NRC-02-97-001        TASK ORDER: 10**

**NRC PROJECT MANAGER:        James Shepherd (301-415-6712)**

**DWM TASK MONITOR:            Giorgio Gnugnoli (301-415-7432)**

**PRINCIPAL INVESTIGATOR(S): John Russell (301-881-0289)**

**PERIOD OF PERFORMANCE:    Date of Award through December 31, 2002**

**1.0    BACKGROUND**

The U. S. Nuclear Regulatory Commission (NRC) has a set of regulations that control operations at a variety of facilities which use radioactive materials, including hospitals and clinics, universities, power plants, and manufacturing facilities. The intent of these regulations is to ensure that licensed facilities use radioactive materials in a manner that protects public health and safety. These regulations also consider potential economic impacts on consumers and licensees.

There are currently no generally applicable NRC regulations for control of solid materials for the release from NRC-licensed facilities that could have either small amounts of, or no, radioactivity. Solid materials include metals, concrete, soils, equipment, furniture, etc., present at licensed nuclear facilities. Nonetheless, NRC licensees still seek to release materials when they are obsolete or no longer useful, or when the facility is being shut down or decommissioned. In the absence of a national standard, NRC staff has developed guidance, for use on a case-specific basis. Although the guidance is considered safe, the lack of criteria may create inconsistent release levels.

Currently, the NRC staff is engaged in a process of considering how best to control those materials that have very low amounts of, or no, radioactivity. On June 30, 1999, NRC staff published a paper on alternatives for controlling this material and requested public comment. Subsequent to this, the NRC staff conducted public meetings at four locations around the country, during the Fall of 1999 and also in May 2000, to discuss the paper and hear public comments.

A large number of public comments have been received, both in writing and verbally, at the public meetings. Based on those comments, the Commission decided to defer a decision on whether to prepare a regulation on control of solid materials, and has instead requested that the

National Academy of Sciences (NAS) conduct a study on possible alternatives for control of slightly contaminated materials. In the meantime, the NRC staff is developing further technical information and will seek additional public input before making a decision in this area. Although the NRC staff has been developing a technical basis for control of metals (such as copper, iron, aluminum) and concrete, soil has not yet been analyzed. If soil were to be reused, potential scenarios might include, but not be limited to, construction and agricultural uses, and, under certain conditions, non-commercial uses of soil or soil-related products.

As part of the development of this technical basis for soil, an effort has been established with the U.S. Department of Agriculture's National Agricultural Library (NAL) to examine potential soil reuse scenarios, and a draft report NUREG-1725 was issued for public comment on July 19, 2000. This report documents the results of the NAL's literature search. Based on information contained in draft NUREG-1725, the NRC staff have started analysis of a limited number of exposure scenarios. Additional technical information and analyses are needed to develop these and other potential soil reuse scenarios, such as parameter values and associated probability distributions (to reflect uncertainty), and the appropriate computational methods.

Results from this scoping analysis would provide technical bases and criteria for determining whether further development of technical bases is needed and could provide a more reliable basis for answering questions regarding soil reuse activities.

## 2.0 OBJECTIVE

The objective is to provide NRC staff with technical assistance in quantitatively assessing the hypothetical dose impacts from plausible scenarios involving reuse of soils which might be excavated and transported from an NRC-licensed facility for use in commerce or by the general public.

## 3.0 WORK REQUIREMENT

The CNWRA shall perform scoping analyses to delineate the influence of ranges of soil volumes used and specific radionuclides. Moreover, it shall examine the sensitivity of the scoping analyses results across those ranges of soil volumes and radionuclides.

This task order comprises two sequential tasks:

- **Task 1** - The purpose of this task is to perform a scoping analysis of potential doses from exposure to soils released from NRC-licensed facilities. The CNWRA shall analyze a limited number of scenarios and their associated assumptions and parameter values and distributions. The CNWRA shall also rank the scenarios commensurate with the estimated potential radiological impacts.
- **Task 2** - A second task may be conducted to provide detailed dose analyses of selected scenarios and screening of additional scenarios, based on the rankings identified from Task 1.

### Task 1. Scoping Analyses of a Limited Number of Scenarios.

- 3.1 This first task involves the CNWRA performing computational analyses of a limited number of exposure scenarios involving soil reuse, as provided by the NRC TPM. As a part of this effort, the NRC staff will work with the CNWRA to identify the following information:
  - 3.1.1 Spreadsheet software for the calculational methods developed for the publication of NUREG-1640 *Radiological Assessments for Clearance of Equipment and Materials from Nuclear Facilities*. The CNWRA shall need to acquire *Crystal Ball* Version 4.0 or higher marketed by Decisioneering, Inc. which is necessary to operate the spreadsheet software.
  - 3.1.2 Preliminary descriptions of a limited number of scenarios identified in consultation with the NRC TPM. This includes preliminary information on the exposure pathways, volumes of soil, source terms, parameter values and ranges and their corresponding probability distributions, where available.
  - 3.1.3 Information for 2 preliminary scenario evaluations performed by NRC staff for further CNWRA analysis and development.
  - 3.1.4 Appropriate computational methods (e.g., DandD, RESRAD, Microshield, VARSKIN, TSD-Dose, hand calculations) which will be needed in the performance of the analyses. The CNWRA shall use lessons learned from the CNWRA's Vertical Slice Review of draft NUREG-1640 in evaluating other computational methods.
  - 3.1.5 Additional scenarios, as identified by the NRC TPM, in consultation with the CNWRA.
- 3.2 The CNWRA shall use the information, computational methods provided by the NRC staff, as well as others identified, in consultation with the NRC TPM, to perform a scoping analysis of potential doses for the purpose of prioritizing work on the scenarios. The subtasks to be performed include:
  - 3.2.1 An initial conceptual evaluation of each scenario with respect to relevance, credibility, and likelihood. The CNWRA shall report to the NRC TPM on the results of the conceptual evaluation and identify additional scenarios, or modifications of scenarios, as a result of this evaluation.
  - 3.2.2 Dose assessment analyses of scenarios accepted by the NRC TPM. These analyses shall take into account the volume of reused soil that is assigned for each scenario and adjust the analyses as appropriate. The volumes of soil chosen by the NRC staff for this analysis are: 400 m<sup>3</sup>, 300 m<sup>3</sup>, 200 m<sup>3</sup>, 100 m<sup>3</sup>, 10 m<sup>3</sup>, 5 m<sup>3</sup>, and 0.5 m<sup>3</sup>.
  - 3.2.3 A ranking of the scenarios according to the results of the screening dose assessment using the previously identified information and computational methods.
  - 3.2.4 An evaluation of the sensitivity and importance of each parameter (and associated distribution) for each scenario using RESRAD, DandD, and, if applicable, other computational methods identified in consultation with the NRC TPM.<sup>1</sup>

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<sup>1</sup>References 17,18 and 19 in the bibliography are recommended.

3.3 The results of the Task 1 work shall be fully documented in a report. The description shall include the scenarios, the parameter values and ranges, and all other significant assumptions on which the dose analyses are based.

3.3.1 The report shall include a listing of normalized dose conversion factors (mSv/a per Bq/g and mrem/y per pCi/g) tabulated in a format similar to that shown below.

**Example of Tabulation of Normalized Dose Conversion Factors for Soils Reuse Scenarios**

DCFs mrem/y per pCi/g	NRC Staff-identified Scenarios				D&D Default Values 64FR68395 pCi/g	25 mrem/y ÷ D&D Default Values	Sewage Sludge Dose Assessment Values
	Radionuclide	Scenario A	Scenario B	Scenario C			Scenario D
Tc-99							
Co-60							
U-238							
Cs-137							
I-129							
Etc...							

3.3.2 The results of sensitivity and uncertainty analyses shall also be tabulated to characterize the sensitivity of certain parameters that significantly affect the calculated dose conversion factors.

3.3.3 The report shall reflect the relevant consistency of the analyzed soil reuse scenario approach with those used in the Interagency Steering Committee on Radiation Standards (ISCORS) Sewage/Sludge Dose modeling approach, License Termination Rule Standard Review Plan modeling approach, and the international and other domestic modeling approaches.

3.3.4 The CNWRA shall identify modifications to the ranking of scenarios and the critical parameter values to improve the initial task 1 results, as well as the overall development of the technical information base. These recommendations should also identify which of the original scenarios should be excluded or modified and describe additional scenarios that should be incorporated into the technical information base. These recommendations should also address the relevant importance and associated uncertainties of the results.

3.4 At the conclusion of Task 1, the CNWRA shall provide a technical presentation to the NRC staff on the results of Task 1 and a proposal for the conduct of Task 2. This presentation of results shall consist of a walk-through of the work done under section 3.2 and documented in section 3.3 to include:

- 3.4.1 the computational methods and parameter ranges and distributions for soils reuse scenarios.
- 3.4.2 the rationale and process for derivation of the normalized dose conversion factors, including:
  - 3.4.2.1 transparency of the dose assessment analyses and related data base used by the CNWRA in the performance of Task 1.
  - 3.4.2.2 reproducibility of the dose assessment analyses.
  - 3.4.2.3 uncertainty and sensitivity analyses for the scenario- and volume-based parameters (ref. § 3.2.2).
- 3.4.3 revising suggestions for ranking of modified scenarios in terms of dose/risk and in terms of associated uncertainties.
- 3.4.4 recommendations on what to modify and refine for further analyses.
- 3.5 The CNWRA shall provide products as specified in section 4.0 *Reporting Requirements*.

Optional Task 2. Detailed Dose Analyses of Selected Scenarios and Scoping of Additional Soil Reuse Scenarios.

Based on the results of Task 1, it is anticipated that detailed analyses of additional exposure scenarios may be necessary. As indicated in § 3.1.5, additional scenarios may be identified by the NRC TPM which may require further consideration.

- 3.6 The NRC staff will work with the CNWRA to identify the following:
  - 3.6.1 Additional soil reuse scenarios using NAL information search results.
  - 3.6.2 Information and computational methods from several sources, such as the NRC primary Technical Basis Contract, NAL information search, public comments on draft NUREG 1725, and other NRC, Federal, domestic or international information sources.
- 3.7 Based on the information provided in § 3.6 and other information sources identified by the CNWRA the CNWRA shall perform the following tasks:
  - 3.7.1 Perform a detailed analysis of the selected scenarios.
  - 3.7.2 Perform uncertainty analyses on scenario assessment results as they relate to individual dose estimates. These uncertainty analyses shall take into account distributions provided by the NRC TPM and from citable technical literature.
  - 3.7.3 Update the tables and results developed in Task 1 § 3.3 as part of the technical letter report specified in § 3.8.

3.7.4 Develop a users manual for estimating dose from potential soil reuse scenarios. The estimation mechanism should be in the form of a spreadsheet algorithm, as specified in section 4.3-under Reporting Requirements.

#### 4.0 REPORTING REQUIREMENTS

4.1. The CNWRA shall submit an interim letter report to the NRC TPM their preliminary results at the mid-point of the Task performance period. Within 2 weeks the NRC TPM will provide NRC staff comments on the interim report. Thereafter, the NRC TPM and the CNWRA shall meet to discuss: modifications of the soil reuse scenarios, the computational methods for performing the dose assessments, proposed modifications to scenario ranking, additional and auxiliary potential scenarios which may need to be identified and/or characterized, and any recommendations for additional modifications.

4.2 The CNWRA shall submit a final, camera-ready NUREG/CR-formatted report to the NRC TPM that documents the results of the performance assessment of the revised scenarios and the related revised ranking of these scenarios -- both from the perspective of risk and uncertainty.

4.3 For the purpose of future publication of technical letter reports, the following format shall be adhered to:

Analyses for inclusion in published reports shall be explicitly reported in NUREG or NUREG/CR format as appropriate. These reports shall be technically edited and publication-ready, complete with background information.<sup>2</sup> Letter reports and intermediate reports shall be submitted in both hard copy and electronically. Word processing submissions shall be in WordPerfect®, version 7.0 or greater; spreadsheets in EXCEL® or Lotus Notes®, versions 5.0 or greater, or Quattro Pro® version 8 or better with design specifications sufficient to enable implementation in different spreadsheet software or in later versions. Other electronic formats shall be agreed upon with the NRC TPM.

4.4 As part of the performance of this Task Order, the CNWRA shall provide a monthly written progress report by the 15<sup>th</sup> of the following month summarizing the work performed during the previous calendar month. Monthly status reports shall be self-contained and shall include an executive summary that summarizes the results with regard to the project objectives as defined in the statement of work for this Task Order. The executive summary shall be structured to enhance the usefulness of reports to the licensing staff and the agency as a whole. Monthly letter progress reports shall describe the monthly level of effort by various levels of pay, the technical work performed corresponding to the billing, technical and administrative issues, a log of the expenditures, and a projection of the spending plan by subtask. Vouchers billing work performed shall be preceded by or accompanied with a monthly letter status report corresponding to and accounting for the billing. The monthly letter progress report shall break down the number of hours billed and percent of effort by staff level corresponding to the billing. Project spending plans

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<sup>2</sup>The CNWRA shall provide, to the NRC TPM, completed draft sections of major reports, as they become available. This is intended to optimize the production schedule of deliverables by affording the NRC staff the opportunity to furnish early feedback to the CNWRA as these reports are being prepared.

and billings shall be at the subtask level. The monthly letter progress report or billing shall include a tracking of the spending plan, a cumulative accounting of the spending, as well as the current billing. The monthly progress letter report shall include a section that clearly identifies issues, difficulties, needed decisions on the part of the NRC TPM, and financial concerns.

- 4.5 Biweekly teleconferences with the NRC TPM, other NRC staff, and other NRC staff contractors to discuss progress of the Task Order, problems needing resolution, delays or advances in the schedule of activities and products, potential modification of subtasks, and other topics pertinent to the successful completion of the Task Order. In the case of unexpected complications or potential delay to the deliverables schedule, the CNWRA shall notify the NRC TPM within two working days. Should the complication not be resolvable by telephone communication, the CNWRA shall notify the NRC TPM, in writing and within 5 days of telephone notification, of the inability to resolve such problems.
- 4.6 The letter reports shall be submitted to the NRC TPM as specified in § 5.0 *Schedule of Deliverables* of this SOW. Deliverables schedule for Task 2 will be addressed in a modification of this task order.
- 4.7 The CNWRA shall document their analyses according to the Quality Assurance and Quality Control provisions established by the NRC, as specified in § 10.0 *Other Considerations*.
- 4.8 Under subtask 2, the CNWRA will develop a users manual for the software product (e.g., spreadsheet calculational algorithm) for estimating dose from potential soil reuse scenarios.

5.0 SCHEDULE OF DELIVERABLES

Task 1	Date
Preliminary Letter Report on Feasibility	6 weeks after award
Interim Letter Report on Analyses of Soils Scenarios	4.5 months after award
Final Letter Report on Analyses of Soils Scenarios	7.5 months after award
CNWRA technical presentation on the results of Task 1 and proposed Task 2 follow up	7.5 months after award
Submit "camera-ready" copy of Final Draft Report on Analyses of Soils Scenarios in NUREG format, in both hardcopy and CD-ROM electronic version	9 months after award

## Task 2

Draft Letter Report on Analyses of Additional Soils Scenarios 4.5 months after start-up<sup>3</sup>

Draft users manual for estimating dose from potential soil reuse scenarios. 7 months after start-up

Submit "camera-ready" copy of Final Report on Analyses of Soils Scenarios in NUREG format, in both hardcopy and CD-ROM electronic version 9 months after start-up

Final users manual for estimating dose from potential soil reuse scenarios.

6.0 N/A

### 7.0 PERIOD OF PERFORMANCE

The period of performance for this task order is date of award through December 31, 2002.

### 8.0 TRAVEL

Although there will be bi-weekly teleconferences, it is anticipated that the CNWRA staff shall visit the NRC Headquarters during the period of performance. Travel must be approved, in advance, by the NRC Project Manager.

### 9.0 NRC FURNISHED MATERIALS

The NRC Technical Project Manager will provide the CNWRA with all relevant background material at the time of execution of the contract, as identified in the task descriptions. This does not preclude the CNWRA from accessing other relevant sources of data and information not provided by the NRC staff; however, the information and data from such sources must be incorporated in consultation with the NRC TPM.

### 10.0 OTHER CONSIDERATIONS

Quality assurance (QA) and conflict of interest specifications and procedures shall comply with

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<sup>3</sup>Start-up date for optional task 2 refers to the date that task 2 is effective.

the provisions of the CNWRA's program used for the High-Level Radioactive Waste Repository Program and other charter efforts under NRC Contract No. 02-97-009. No special QA requirements are needed to accomplish this task order.

## 11.0 BIBLIOGRAPHY

1. NUREG-1640. Radiological Assessments for Clearance of Equipment and Materials from Nuclear Facilities. NUREG-1640; Draft, March, 1999.
2. Results of RES Contract to CNWRA for Vertical Slice of Draft. NUREG-1640.
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4. NUREG-1496. Generic Environmental Impact Statement on License Termination Rule, July 1997.
5. NUREG/CR-5512. Residual Radiological Contamination from Decommissioning and Decontamination. Volumes 1-3. Multiple Years.
6. NUREG-1549. Decision Making for Dose Assess to Comply with Radiological Criteria for License Termination. Draft. July 1998.
7. NRC Information on Control of Solid Materials at URL: [www.nrc.gov/NMSS/IMNS/controlsolids.html](http://www.nrc.gov/NMSS/IMNS/controlsolids.html)
8. J. Greeves, D. Cool, NMSS. Memorandum of User Need to T. King, RES, April 13, 1999.
9. T. King, RES. Memorandum Responding to the April 13, 1999 NMSS User Need Memorandum. May 21, 1999.
10. T. King, RES. Memorandum to NMSS: Status of the Development of Dose Factors and Technical Basis to Support Modeling for Clearance of Soils. July 12, 2000.
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14. International Atomic Energy Agency; 1996: "Clearance Levels for Radionuclides in Solid Materials, Application of Exemption Principles" IAEA -TECDOC 855.
15. International Atomic Energy Agency; 1988: Principles for the Exemption of Radiation Sources and Practices from Regulatory Control, Safety Series No. 89.
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17. 64 FR 35090 Issues Paper: NRC Examination of its Approach for Control of Solid Materials at Licensed Facilities. June 30, 1999.
18. 64 FR 68395 Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination. December 7, 1999.
19. TSD-Dose: A Radiological Dose Assessment Model for Treatment, Storage and Disposal Facilities. ANL/EAD/LD-4 Rev. 1, September 1998.
20. NUREG/CR-6676. Probabilistic Dose Analysis Using Parameter Distributions for RESRAD and RESRAD-BUILD Codes. July 2000.
21. NUREG/CR-6692. Probabilistic Modules for the RESRAD and RESRAD-BUILD Computer Codes. User Guide. November 2000.
22. NUREG/CR-6697. Parameter Distributions for Use in RESRAD and RESRAD-BUILD Computer Codes. In publication.

23. June 30, 1998. U. S. Nuclear Regulatory Commission: Staff Requirements Memorandum - SECY-98-028. Regulatory Options for Setting Standards on Clearance of Materials and Equipment Having Residual Radioactivity.
24. NUREG/CR-6682. Summary and Characterization of Public Comments on the Control of Solid Materials. September 2000.
25. Radiation Protection 122. Practical Use of the Concepts of Clearance and Exemption. Guidance on General Clearance Levels for Practices. European Commission. 2000.
26. NCRP Report No. 129. Recommended Screening Limits for Soil and Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies. January 29, 1999.

#### 12.0 MINIMUM REQUIRED TECHNICAL AND OTHER SPECIAL QUALIFICATIONS

The CNWRA investigators proposed for this project shall have the following qualifications:

- a. Health physics background with abilities to conduct dose assessment calculations,
- b. Knowledge and experience using NRC's probabilistic RESRAD and DandD codes,
- c. Modeling expertise specifically in running multimedia environmental pathway models and analyzing their results with regard to parameter and conceptual model sensitivity and uncertainty.
- d. Familiarity with international and domestic guidance on recycle, reuse and clearance of materials from regulatory control.