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ASSESSMENT OF IMPACTS OF ADDITIONAL ARAR, 40CFR191 AUGUST 24, 1990

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REPORT

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ASSESSMENT OF IMPACTS OF ADDITIONAL ARAR, 40CFR191

FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

August 24, 1990

U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS OFFICE

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1.0 INTRODUCTION

At a meeting between the U.S. EPA and DOE at the U.S. EPA Regional Office Chicago on August 7, 1990, U.S. EPA notified DOE that 40CFR191 is considered to be an ARAR for the K-65 residues within Operable Unit 4. This regulation is entitled "EPA Radiation Protection Standards for Managing and Disposing of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes". Inclusion of this regulation as an ARAR requires that remedial alternatives for the K-65 residues must be evaluated for compliance with the provisions of 40CFR191.

1.1 40CFR191 Applicability

Both U.S. EPA and DOE agreed that the K-65 residues do not meet the requirements of applicability of 40CFR191, since K-65 residues are not spent nuclear fuel, high-level radioactive waste, or transuranic waste. The U.S. EPA maintained that the radiological nature of the K-65 residues is similar to transuranic radioactive waste (viz. long half-lives, alpha-particle emitting radionuclides, high radiotoxicity, and a concentration exceeding 100 nCi/g). Because of these similarities, U.S. EPA maintained that 40CFR191 is both "Relevant and Appropriate" as a requirement for management and disposal of the K-65 residues.

1.2 40CFR191 Relevancy and Appropriateness

DOE agrees with the similarities of the stated radiological properties between the K-65 residues and transuranic waste, but does not agree with the determination by U.S. EPA that 40CFR191 is both "Relevant and Appropriate". Although the requirement addresses substances which are similar to those found at the site, DOE and its contractors have maintained that adoption of 10CFR61, 40CFR141, 40CFR192, DOE Order 5400.5, and DOE Order 5820.2A present requirements which provide a sufficient level of protectiveness of human health and the environment.

Inclusion of 40CFR191 as a "Relevant and Appropriate" requirement introduces containment requirements and quantitative release limits which are unnecessary in the presence of the requirements of 40CFR141, DOE Order 5400.5, and DOE Order 5820.2A. Furthermore, disposal system performance assessments upon which containment requirements are based require time frames and financial expenditures which are inconsistent with the RI/FS process. Required performance assessments would, in fact, necessitate either offsite disposal in a previously approved disposal facility or interim on-site monitored retrievable storage until such time that an off-site disposal facility is approved.

1.3 FS Progress To Date

It is not possible to anticipate which regulations the U.S. EPA may choose to include as "Relevant and Appropriate" requirements even though they are not "applicable". Obviously, the U.S. EPA has the responsibility to determine correctly those requirements that are "Relevant and Appropriate" in accordance with their own guidelines (e.g. 53CFR51436-37). We maintain that identification of 10CFR61, 40CFR141, 40CFR192, DOE Order 5400.5, and DOE Order 5820.2A as potential ARARs and TBCs by the RI/FS team satisfies the requirements for such identification under CERCLA, SARA, NCP, and the Consent Agreement (April 1990) and that 40CFR191 should not be included as an ARAR. Nevertheless, with the signing of the Consent Agreement, DOE agreed with U.S. EPA that "The determination of final ARARs by U.S. EPA shall be final and not subject to dispute by U.S. DOE". (Section XII, p. 30)

To date, the FS activities for Operable Unit 4 have proceeded with the premise that 40CFR191 is neither "Applicable" nor "Relevant and Appropriate". The unilateral decision by the USEPA to include 40CFR191 as an ARAR requires that all FS activities performed to date for Operable Unit 4 be repeated to include in light of this new requirement.

1.4 Waste-Type Definitions

40CFR Part 191 specifies standards for management and disposal of spent nuclear fuel, high level wastes, and transuranic wastes.

Spent nuclear fuel is fuel that has been irradiated in a nuclear reactor. High level wastes are wastes resulting from the reprocessing of spent nuclear fuel. The K-65 residues do not fall into either one of these categories.

The various federal agencies have differing definitions of transuranic waste. EPA in 40CFR191 defines transuranic radioactive waste as "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, with half-lives greater than twenty years, per gram of waste, . . .". EPA also listed three exceptions, the second being of interest: "except for wastes that the Department (of Energy) has determined, with the concurrence of the Administrator (EPA), do not need the degree of isolation required by this part."

DOE's policy is that transuranic waste is waste contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g. Additionally, DOE can determine other alpha-contaminated wastes peculiar to a particular site, must be managed as transuranic waste.

A transuranic isotope has an atomic number greater than 92. There are no known transuranic isotopes in the K-65 residues. The alpha emitting radionuclides in the K-65 residues are thorium-230 and - 232 (atomic number 90), radium - 226 (atomic number 88), uranium - 234, 235, 236, and 238 (atomic number 92).

Tables 1, 2, and 3 list the concentrations of alpha-emitting radionuclides with half-lives greater than 20 years for Silos 1, 2, and 3. EPA has started 40CFR191 to be an ARAR since the K-65

TABLE 1

ALPHA EMITTING RADIONUCLIDE CONCENTRATION IN SILO 1*

NUCLIDE (nCi/g)	S1NE1A	S1NE1B	S1NE1C	SISE1	S1SE2	S1SW1	S1NW1
Th-230	21.412	39.693	30.751	10.569	20.848	40.818	43.771
Th-232	ND	ND	ND	ND	ND	ND	0.766
Ra-226	108.1	192.6	166.4	116.8	89.28	181.2	163.3
U-234	0.815	0.326	0.622	0.633	0.814	0.594	0.897
U-235	ND	ND	ND	ND	ND	ND	ND
U-238	0.920	0.398	0.610	0.545	0.758	0.532	0.687
TOTAL (nCi/g):	131	233	198	129	112	223	209

Mean Concentration (nCi/g) = 176

NOTES:
ND - Not Detected
*Alpha emitters with half-lives greater than 20 years

TABLE 2

ALPHA-EMITTING RADIONUCLIDE CONCENTRATION IN SILO 2*

NUCLIDE (nCi/g)	S2SW1	S2NW1	S2NE2	S2SW2	S2NE1	S2NW2
Th-230	31.825	32.784	8.365	29.716	40.124	25.391
TH-232	ND	ND	ND	851	ND	ND
Ra-226	145.300	61.780	0.657	104.900	65.520	68.310
U-234	0.859	1.107	0.974	0.121	0.848	1.404
U-235	ND	0.074	0.047	ND	0.036	0.070
U-238	0.661	1.069	0.874	0.046	0.0814	1.240
Total (nCi/g):	179	97	11	136	107	96

Mean Concentration (nCi/g) = 104

NOTES:
ND - Not Detected
* Alpha emitters with half lives greater than 20 years

TABLE 3

ALPHA EMITTING RADIONUCLIDE CONCENTRATION IN SILO 3*

Nuclide (nCi/g)	# 21	# 22	# 23	# 24	# 25	# 26
Ac-227	0.007	0.006	0.003	0.019	.007	0.010
Pa-231	0.521	0.401	0.266	NA	0.556	0.889
Th-230	41.911	33.881	21.010	71.650	40.968	41.555
Th-232	1.451	ND	0.815	0.911	0.411	ND
Ra-226	2.589	2.192	0.467	6.435	3.073	1.862
U-234	1.935	1.618	0.348	1.524	1.467	1.910
U-235/236	0.152	0.117	ND	0.127	0.054	0.076
U-238	2.043	1.649	0.320	1.600	1.392	1.860
TOTAL (nCi/g):	50.6	39.9	23.2	82.3(1)	47.9	48.2

Nuclide (nCi/g)	# 27	# 28	# 29	# 30	# 33
Ac-227	0.006	0.006	0.006	0.011	0.008
Pa-231	0.458	NA	0.564	0.931	0.431
Th-230	53.227	63.649	61.190	68.759	65.488
Th-232	ND	0.755	0.672	0.581	0.672
Ra-226	1.518	3.702	4.169	2.240	4.451
U-234	1.317	1.052	1.843	1.643	1.600
U-235	0.080	0.042	0.158	0.075	0.118
U-238	1.243	0.994	1.951	1.574	1.878
TOTAL (nCi/g):	57.8	70.2(1)	70.5	75.8	74.6

Mean Concentration = 58 nCi/g

NOTES:

Data validation is currently in progress.

*Alpha emitters with half-lives greater than 20 years.

(1) Pa-231 Not Analyzed for this sample

NA - Not Analyzed

ND - Not Detected

residues in Silos 1 & 2 have alpha activity greater than 100 nCi/g. The mean alpha activity in Silo 3 is 58 nci/g, so there is no reason to believe that Silo 3 would have to be treated as transuranic waste.

From DOE's point of view, the ultimate question is whether or not the K-65 residues have to be managed as transuranic waste. If it does, then by the definition in DOE Order 5820,2A, 1988, the waste is transuranic.

2.0 TECHNICAL IMPACTS AND ISSUES

As a result of the recent EPA statement to invoke 40CFR191 as an ARAR for Operable Unit 4 (OU-4), several technical issues require evaluation and resolution to allow completion of the FS. Some of the issues are the following:

- Reconfiguration of OU-4 into sub-operable units (this was also requested as an action by EPA Comments)
- Reevaluation of technologies and process options to develop new remedial alternatives
- Investigation of the availability of disposal sites for the K-65 material
- Redesigns or new designs of remedial alternatives

Each of these technical issues and a plan for resolving each are described below.

2.1 Reconfiguration of OU-4 Into Sub-Operable Units

Originally, OU-4 consisted of the K-65 silos (Silos 1 and 2) and contents, the metal oxide silo (Silo 3) and contents, the unused silo (Silo 4), the berms around Silos 1 and 2, and the soils beneath the silos. The 40CFR191 ARAR requires that the contents K-65 silo be treated differently than the other materials comprising OU-4. In order to effectively evaluate appropriate alternatives for the different materials and structures to be remediated, OU-4

will be separated into four sub-operable units (SOUs). These SOUs will be the following:

- SOU-4C - Metal oxide silo (Silo 3) contents, structure, and subsoils
- SOU-4A - K-65 residues
- SOU-4B - K-65 silo structures, berms, and subsoils
- SOU-4D - Unused metal oxide silo (Silo 4)

The reasoning for and the impact of separating the one operable unit into four sub-operable units is discussed below.

SOU-4A - K-65 Residues

Since the K-65 residues are the only portion of OU-4 affected by the new ARAR, separation of the material from the rest of OU-4 is appropriate to allow its evaluation in relation to meeting the added ARAR. The universe of technologies and process options will be reinvestigated and new technology/process options will be considered in order to meet the ARAR requirements. Some of the technologies and process options to be considered, possible revised and new alternatives, and relevant technical issues are discussed in subsequent sections.

SOU-4B - K-65 Silo Structures, Berms, and Subsoils

The 40CFR191 ARAR is not "relevant and appropriate" to the K-65 silo structures, berms, and subsoils; therefore, separation of these components of the operable unit from the K-65 residues will allow the remedial alternatives for these portions to be similar to those developed in the previous evaluations. Separation of the K-65 residues from the silo structure, berms, and soils will, however, require revision to the existing alternatives to exclude the K-65 residues from them.

SOU-4C - Metal Oxide Silo (Silo 3) Contents, Structure, and Subsoils

The 40CFR191 ARAR only applies to the K-65 residues present in Silos 1 and 2. As previously presented, the Silo 3 contents

contain lower activities of the alpha-emitting radionuclides of concern. Since much evaluation has been performed to date on remediation of the combined Silo 3 contents, structure, and subsoils, this combination will remain intact as SOU-4C to avoid unnecessary re-evaluation of alternatives. Minimal additional evaluation of technologies, process options, or alternatives will be necessary for Silo 3 (SOU-4C).

SOU-4D - Unused Metal Oxide Silo (Silo 4)

SOU-4D covers Silo 4 which was never used.

2.2 New Technologies/Process Options

As a result of treating the K-65 residues as transuranic-like waste, several issues must be addressed concerning waste treatment, waste form, packaging, storage, shipping, and disposal. New technologies/process options will be evaluated. Technologies and process options to be evaluated include the following:

- Investigation of the availability of offsite disposal facilities for the K-65 residues
- Investigation of the availability of offsite facilities for interim retrievable storage of the material
- Evaluation of options for on-site, interim retrievable storage
- Volume reduction, contaminant separation, and contaminant concentration technologies must be identified and evaluated
- Packaging, shipping, and disposal requirements for transuranic-like waste must be investigated and developed

The viable technologies and process options will then be assembled and incorporated into remedial alternatives for the sub-operable units. Tables 4 through 7 list the minimum alternatives for each sub-operable unit, as they have been initially envisioned.

2.3 Disposal Sites Availability

Currently, WIPP appears to be the only facility that meets the requirements for disposal of the K-65 residues. WIPP is intended

TABLE 4

SUB-OPERABLE UNIT 4A MINIMUM REMEDIAL ALTERNATIVES DESCRIPTION AND STATUS

Alternative # (Old #)	*Description*	*Status*
4A-0 (0)	No action	Revision required
4A-1 (1a)	Slurry wall and cap	Not applicable
4A-2 (2a)	Shallow soil mix & cap	Not applicable
4A-3 (6)	Remove, treat (stabilization) on-site disposal	Not applicable
4A-4 (7)	Remove, treat (stabilization), interim storage (if necessary), off-site disposal	Revision required
4A-5 (8)	Remove, volume red./ contaminant separation stabilization, on-site disposal	Not applicable
4A-6 (9)	Remove, volume red./ contaminant separation stabilization, interim storage (if necessary), off-site disposal	Revision required

TABLE 5

SUB-OPERABLE UNIT 4B MINIMUM REMEDIAL ALTERNATIVES DESCRIPTION AND STATUS

Alternative # (Old #)	*Description*	*Status*
4B-0 (0)	No action	Revision required
4B-1	Remove, stabilize, on-site disposal	Revision required
4B-2	Remove, stabilize, off-site disposal	Revision required
4B-3	Remove, package, on-site disposal	Revision required
4B-4	Remove, package, off-site disposal	Revision required
4B-5	Cap	Revision required

TABLE 6

SUB-OPERABLE UNIT 4C MINIMUM REMEDIAL ALTERNATIVES DESCRIPTION AND STATUS

Alternative # (Old #)	*Description*	*Status*
4C-0 (0)	No action	No revision required
4C-1 (1b)	Slurry wall and cap	No revision required
4C-2 (2b)	Shallow soil mix & cap	No revision required
4C-3 (3 modified)	Remove, treat, on-site disposal	Modified to include treatment
4C-4 (4 modified)	Remove, treat, off-site disposal	Modified to include treatment
4C-5 (5 modified)	Rehabilitate silo	No revision required

TABLE 7

SUB-OPERABLE UNIT 4D MINIMUM REMEDIAL ALTERNATIVE DESCRIPTION AND STATUS

Alternative # (Old #)	*Description*	*Status*
4D-0	No action	New

for the disposal of defense-related transuranic waste from ten designated facilities. FMPC presently is not on the intended list.Also, the facility is to undergo an initial five-year testing phase where a limited amount of waste will be accepted. However, WIPP may not be the only option for possible disposal of the K-65 residues.

Per discussions with NTS personnel, NTS has been assessed to accept 40CFR191 material. However, the assessment did not include 40CFR191 material with radium. Therefore, if the K-65 residues are determined to be 40CFR191 material, NTS cannot accept it at this time. However, NTS may be able to accept the K-65 material if the following occurred:

- A policy decision at DOE Headquarters
- A 40CFR191 assessment of the disposal of the K-65 residues at NTS
- EPA concurrence on the 191 assessment methodology

Even if 40CFR191 is not determined to be an ARAR, there is no assurance that NTS would be able to dispose of the waste. Written notification and application to NTS would be required, followed by an NTS evaluation of the K-65 residues. DOE headquarters would also have to approve of the disposal of K-65 residues at NTS.

The availability of other disposal sites will be investigated in detail as part of the required re-evaluation.

2.4 New/Revised Remedial Alternatives

Based upon the reinvestigation of the universe of technologies and process options to find suitable options to handle the K-65 material, and the reconfiguration of Operable Unit 4 into four sub-operable units, new remedial alternatives will be developed and previously developed ones will be revised. The alternatives for SOU-4C will remain unaffected by the new ARAR. All of the previously developed alternatives for SOU-4A and 4B will either be

deleted or will require revision. New alternatives will also be developed for SOU-4A, 4B, and 4D based on the additional screening of technologies to be performed.

SOU-4A is expected to require alternatives to include provisions for interim storage of the K-65 residues unless a disposal facility is identified which will be able to accept the waste when it is prepared for disposal. Interim storage capacity may be considered at an on-site facility or an offsite facility, if available.

Also, remedial alternatives for SOU-4A may include additional process technologies for contaminant separation, volume reduction, or contaminant concentration to reduce the volume of transuranic-like waste from the K-65 residues.

2.5 Redesign and New Design of Process Options

Based on the results of the development of new/revised remedial alternatives, additional design or redesign is expected to be necessary. Design items may include:

- Processes for volume reduction, contaminant separation, and/or contaminant concentration
- Various remediation equipment sizing or resizing to accommodate the new or revised alternatives
- Design of interim storage facilities
- Design of packaging, shipping, and disposal hardware and facilities

All design activities will be performed in sufficient detail to provide a concept for the remedial alternative. Construction schedules and cost estimates will be prepared and used in the risk assessment of the alternative. The risk assessment will be performed after the concept is fully defined and will be used in

3.0 SCHEDULE IMPACT AND ISSUES

To document the changes required if 40CFR191 is relevant and appropriate to the K-65 residues, the Initial Screening of Alternatives (Task 12) document and Detailed Analysis of Alternatives (Task 13) presentation will need to be revised. The Selection of Preferred Alternative (Task 14) presentation prepared, and the Feasibility Study (Task 15), of which the first draft was nearing completion, will need to be revised and completed.

3.1 Initial Screening of Alternatives

Revising the Initial Screening of Alternatives would require, as discussed previously, an updated review of the universe of technologies and process options to determine if any additional technologies can be applied to the K-65 residues.

Concurrently with the review of the universe of technologies, various studies need to be performed. These studies include:

- Proper design life of the on-site interim storage facility, if required, per established design criteria, and if designs developed at other locations are applicable
- Acceptance criteria and cost for off-site disposal
- If stabilization could result in a waste form having less than 100 nCi/g
- If vitrification is a viable option for the transuranic-like waste
- If off-site interim storage is available
- If disposal at a facility similar to NTS, or a commercial facility, is an option
- If separation of the radium from the waste is feasible to allow the option to dispose of most of the waste as non-transuranic-like

After completion of the technologies review, Operable Unit 4 will be broken into the four sub-operable units defined previously.

New alternatives will be defined, as necessary, for each SOU. Existing alternatives will be retained if they are applicable to a SOU. The new alternatives, along with the existing alternatives, will be screened for implementability, overall protection of health and environment, and cost.

Major text changes will be required by the addition of any new technologies and/or process options, and defining the resulting new alternatives and revised alternatives for SOUs -4A, and -4B. A minimum of 13 new or revised alternatives are estimated for SOU-4A and SOU-4B (see Tables 4 & 5). Each alternative, under its respective SOU, will be analyzed with respect to the screening criteria for implementability, overall protection of health and environment, and cost. Any alternative not meeting the screening criteria will not be carried on to the detailed analysis of alternatives. These screenings will create major text changes in the existing Initial Screening of Alternatives document.

By leaving the metal oxide material, structure, and subsoil as a separate SOU only minor text changes concerning the metal oxide material and the Silo 3 structure and subsoil will be required to the existing Initial Screening of Alternatives document. However, screening results would not be revised. Table 6 lists the minimum alternatives for SOU-4C.

Text changes will be required by the addition of SOU-4D. Changes include the addition of the SOU definition, description of any alternatives and a screening analysis of the alternatives. Table 7 lists the minimum alternatives for SOU-4D.

3.2 Detailed Analysis of Alternatives

The Detailed Analysis of Alternatives presentation will be revised to encompass each of the SOUs and its respective alternatives.

The revision of the presentation to reflect SOU-4A and SOU-4B requires major modification to existing alternatives and extensive work to develop new alternatives. A minimum of 13 alternatives

will be evaluated. These evaluations will include detailed conceptual designs, cost estimates, risk assessment analyses, NEPA analyses, and threshold and balancing criteria analyses. These steps cannot be performed concurrently. The cost estimate and NEPA analysis require input from the detailed design results. A portion of the risk analyses depend on the estimated man-power requirements for construction, operation and maintenance which are developed for the cost estimates. Following these analyses, threshold and balancing criteria analyses must be performed.

As was the case in the Initial Screening of Alternatives document, SOU-4C will require only minor changes. Detailed designs, cost estimates, risk assessment analyses, NEPA analyses, and threshold and balancing criteria analyses will require only minor revisions.

The presentation must also be revised to reflect the addition of SOU-4D. However, this is not considered a major effort since there is no waste material to be handled.

3.3 Selection of Preferred Alternatives

The Selection of Preferred Alternatives had not been presented, however, the selection process was near completion. The process to select the preferred alternative consists of a comparative analysis of the strengths and weaknesses of the alternatives relative to one another with respect to each balancing criterion. As a result of this comparative analyses, the alternatives are "ranked" in order of the most preferred alternative with respect to each criterion. Each criterion is "weighted" to indicate its relative importance. These criterion weights and rankings are entered into the computer software program "Expert Choice". Two runs, one including cost and one excluding cost will be run per sub-operable unit. The selection of preferred alternative for SOU-4C will have minor revisions. However, the selection of preferred alternatives for the other sub-operable units will require a total revision of the existing analyses.

3.4 Feasibility Study

The Feasibility Study is a compilation of the previous tasks. The first draft of the Feasibility Study for Operable Unit 4 was nearing completion when it was stated that 40CFR191 is relevant and appropriate to the K-65 residues. Therefore, due to the extensive rework of the initial screening of alternatives, the detailed analysis of the alternatives, and the selection of preferred alternatives, the Feasibility Study will also require extensive rework to accommodate the 40CFR191 ARAR.

4.0 RECOVERY PLAN

Invoking 40CFR191 will impact the schedule and budget for the OU-4 Feasibilty Study. These impacts are described in Sections 4.1 and 4.2.

4.1 Schedule

The schedule to revise the above mentioned deliverables is given in Appendix A. Please note that only one review cycle for DOE is scheduled for the Initial Screening of Alternatives, Detailed Analysis of Alternatives, and the Selection of Preferred Alternatives. The Feasibility Study is scheduled to have the usual two reviews.

4.2 Cost Estimate

The estimated cost required to complete the above scheduled tasks is given in Appendix B. Please not that the NEPA Analyses and Risk Assessments are not costed. These costs will be provided later.

APPENDIX A

RECOVERY PLAN

Schedule Recap

	WEEKS
• Prepare and Issue Draft Initial Screening of Alternatives Document	8
• Prepare Detailed Analysis of Alternatives Presentation	20
• Prepare Selection of Preferred Alternatives Presentation	4
• Draft FS	8
• DOE Review and Responses	14
ACTUAL WEEKS INCLUDING OVERLAPS, ADDED TO EXISTING FFA DATE	40

SCREENING OF TECHNOLOGIES & PROCESS OPTIONS

	WEEKS
• Examine Universe of Technologies	
• Write up New Applicable Technologies	1
• Establish Screening Factors for New Technologies	
• Assemble Process Options	
• Assemble New or Modified Alternatives	1
• Screen for Implementability, Overall Protection of Health & Environment, and Cost	2
• Prepare and Deliver Draft Initial Screening of Alternatives Document	4
TOTAL	8

DETAILED ANALYSIS

	WEEKS
• Develop Detailed Conceptual Designs • Develop Cost Estimates • Evaluate Against 2 Threshold Factors & 5 Balancing Factors	17
• Prepare Detailed Anaylsis of Alternatives Presentation	3
TOTAL	20

SELECTION OF PREFERRED ALTERNATIVES

	WEEKS
Compare Alternatives Using EXPERT CHOICE:	
- 2 EXPERT CHOICE Models will be run per SOU - 1 run including cost, 1 run excluding cost	1
- Prepare Selection of Preferred Alternatives Presentation	3
TOTAL	4

DRAFT FS

	WEEKS
• Prepare Draft for Internal Review	4
• Internal Review	2
• Comment Resolution & Incorporation	2
• Deliver Draft FS	
TOTAL	8

DOE REVIEW AND RESPONSES

	WEEKS
• DOE Review	4
• Resolve & Incorporate Comments	4
• DOE Review (II)	4
• Resolve & Incorporate Comments	2
TOTAL	14

APPENDIX B

IMPACT OF NEW ARAR, FERNALD OU4
ESTIMATED ADDITIONAL COST
(NEPA AND RISK ASSESSMENT NOT INCLUDED)

DIRECT LABOR

Labor Categories	Hours	Average Rate	Cost ($)
Project Manager/Senior Staff (E-11)	1500	32.08	48113.40
Senior Project Engineer (E-9)	1936	25.29	48964.54
Project Engineer (E-7)	3872	20.29	78562.88
Secretary/Word Proc (N-7)	340	8.51	2894.01
DIRECT LABOR SUBTOTAL	7648		178534.83
LABOR OVERHEAD			
Overhead at 130% of direct labor			232095.28
SUBTOTAL -- LABOR INCLUDING OVERHEAD			410630.11
OTHER DIRECT COSTS - UNBURDEDED			
Travel expense			0.00
Sampling Equipment (List Attached)			0.00
OTHER DIRECT COSTS - BURDENED			
Computer Time			300.00
TOTAL OTHER DIRECT COSTS			300.00
SUBTOTAL -- TOTAL DIRECT COSTS AND OVERHEAD			410930.11
G&A BASE (EXCLUDES BURDENED DIRECT COSTS)			410630.11
G&A EXPENSE @ 16.75%			68780.54
SUBTOTAL -- THROUGH G&A			479710.65
FEE BASE (EXCLUDES BURDENED DIRECT COSTS)			479410.65
FEE/PROFIT @ 8%			38352.85
SUBTOTAL -- THROUGH FEE/PROFIT			518063.50
FCCOM			
OH FCCOM = 1.866% OF DIRECT LABOR			3331.46
G&A FCCOM = 0.071% OF G&A BASE			291.55
FCCOM SUBTOTAL			3623.01
TOTAL COST			521686.51