START

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12

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 164715

Proj. ECN

2. ECN Category (mark one)							
Supplemental []	Change ECN []	Supersedure []	Cancel/Void []	Direct Revision [X]	Temporary []	Discovery []	

3. Originator's Name, Organization, MSIN, and Telephone No.
K. J. Koegler, Environmental Engineering Support Section, H4-55, 6-2877 81224

4. Date
9/26/91

5. Project Title/No./Work Order No.
242-A Evaporator/PUREX Plant Condensate Treatment Facility (WYCXA) Project C-018H

6. Bldg./Sys./Fac. No.

7. Impact Level
3

8. Document Number Affected (include rev. and sheet no.)
WHC-SD-EN-AP-041, REV. 1

9. Related ECN No(s).

10. Related PO No.

11a. Modification Work	11b. Work Package Doc. No.	11c. Complete Installation Work	11d. Complete Restoration (Temp. ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

§2.2.5, ¶1; amend to include the following:

"The Golder report included as Appendix C does not address accuracy. However, the work reported directly follows that previously reported in, *Travel Time Estimates for Alternative Tritium Crib Locations, Hanford Site Washington* (Golder 1991). In that report an estimated standard error of plus or minus 20 percent is given."

Page 48, §5.4.3.3; change two occurrences of "0.01 ft (0.1 m)," to read "0.01 ft (0.003 m)."

Added reference: Golder, 1991, *Travel Time Estimates for Alternative Tritium Crib Locations, Hanford Site, Washington*, Golder Associates, Inc., Redmond, Washington.

13a. Justification (mark one)							
Criteria Change []	Environmental []	Facilitate Const. []	Design Error/Omission []	Design Improvement []	As-Found [X]	Const. Error/Omission []	

13b. Justification Details
Incorporation of the U.S. Department of Energy Field Office, Richland, comments.

14. Distribution (include name, MSIN, and no. of copies)

(See attached list.)

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A-7900-013-2 (11/88) (EF) GEF095
Engineering Change Notice

A-7900-013-1 (11/88)

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 164715

15. Design Verification Required	16. Cost Impact N/A		17. Schedule Impact (days)
	ENGINEERING	CONSTRUCTION	N/A
[] Yes	Additional [] $	Additional [] $	Improvement []
[X] No	Savings [] $	Savings [] $	Delay []

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog./Project Engineer K.K. Stanley	20 Sep 91	PE	
Cog./Project Engr. Mgr. J.W. Ledford	9/26/91	QA	
QA L.W. Vance	9/26/91	Safety	
Safety		Design	
Security		Other	
Proj. Prog./Dept. Mgr.			
Def. React. Div.			
Chem. Proc. Div.			
Def. Wst. Mgmt. Div.		DEPARTMENT OF ENERGY	
Adv. React. Dev. Div.			
Proj. Dept.			
Environ. Div.		ADDITIONAL	
IRM Dept.			
Facility Rep. (Ops.)			
Other			

SUPPORTING DOCUMENT

1. Total Pages 296

2. Title	3. Number	4. Rev No.
Characterization Work Plan, C-018H Soil Column Disposal Siting Evaluation	WHC-SD-EN-AP-041	1a

5. Key Words	6. Author
Characterization Work Plan, Soil Column, Disposal Site, 242-A Evaporator, PUREX, Siting Evaluation	Name: K. J. Koegler/S. P. Reidel Signature Organization/Charge Code W81224 EE&G/WYCXA

7. Abstract

The purpose of this work plan is to guide the field activities involved in the characterization of candidate sites for a new soil column disposal site in support of the 242-A Evaporator/PUREX Plant Condensate Treatment Facility, project C-018H. The work plan consists of an initial evaluation of the sites to be characterized, the work plan rationale including data needs and characterization methods, and characterization tasks. Characterization tasks include an evaluation of existing data, vadose and saturated zone soils sampling and analysis, core archival, and ground water investigation. The work plan also discusses hydrologic modeling associated with characterization. Appendices to the work plan include site background and physical setting, a report of completed hydrologic modeling, ground water quality data, biotic survey and cultural resources review of the candidate sites.

9. Impact Level 3

10. Authorized Manager's Name
J. G. Woolard

Authorized Manager's Signature

Specify Distribution Limit External

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RECORD OF REVISION	(1) Document Number WHC-SD-EN-AP-041	Page A

(2) Title: CHARACTERIZATION WORK PLAN, C-018H SOIL COLUMN DISPOSAL SITING EVALUATION

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change – Replace, Add, and Delete Pages	Authorized for Release		
		(5) Cog./Proj. Engr.	(6) Cog./Proj. Mgr.	Date
1 RS	(7) Complete document Revision	x K.J. Kegler	x J.G. Woolard J.G. WOOLARD	6/13/91
1a RS	REPLACE PAGE 27; REPLACE PAGE 48; REPLACE PAGES 52-53.	K. Kegler K.J. Kegler	J.G. Woolard J.G. Woolard	9/26/91

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Table 2-1. Representative Hydraulic Properties of the Unconfined Aquifer.

Stratigraphic Interval	Hydraulic Conductivity (ft per day)
Hanford formation	500 - 20,000
Undifferentiated Hanford and Middle Ringold unit	100 - 7,000
Middle Ringold unit	20 - 600
Low Ringold unit	0.11 - 10
Location	**Transmissivity (ft^2 per day)**
North of Gable Butte and Gable Mountain	4,000 - 25,000
On the flank of Gable Butte and Gable Mountain and along paleochannels	40,000 - 600,000
Other areas on the Hanford Site	2,000 - 40,000

2.2.4 Effective Porosity

A large-scale estimate of effective porosity for the Ringold Formation was derived by Newcomb et al. (1972) for the area near sites 1 and 3. In this assessment, the change in volume of the recharge mound (which developed between 1948 and 1953 from waste-water disposal to U-Pond in the southwestern part of 200 West Area) was compared to estimates of waste-water disposal and evaporation. Results of the analysis indicate an effective porosity of about 0.11 for the Ringold Formation. No other known estimates of effective porosity are available for the Hanford and Ringold formations.

2.2.5 Ground Water Flow Paths and Travel Times

Estimates of the ground water flow paths and travel time to the Columbia River, as well as the rise in water table (mounding) at the disposal site, have been made by Golder Associates, Incorporated (Golder) (Appendix C). A summary of the results of the Golder modeling are presented in Table 2-3. These estimates are first approximations based on limited existing data; with the acquisition of additional data during site characterization, these estimates will be reevaluated.

The Golder report (Appendix C) does not address accuracy. However, the work reported directly follows that previously reported in, *Travel Time Estimates for Alternative Tritium Crib Locations, Hanford Site Washington* (Golder 1991). In that report an estimated standard error of plus or minus 20% is given.

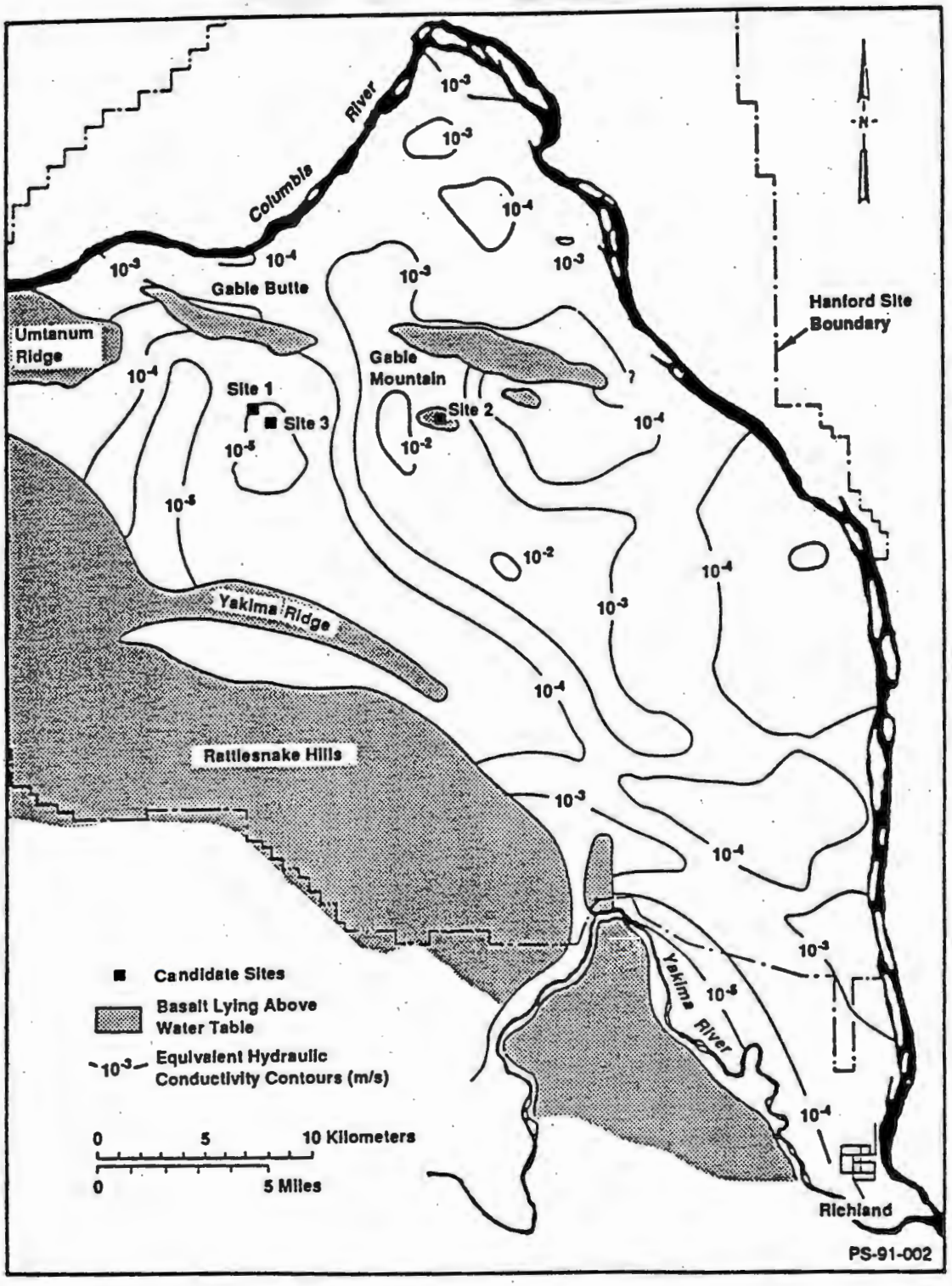

Figure 2-14. Areal Distribution of Equivalent Hydraulic Conductivity for the Unconfined Aquifer Beneath the Hanford Site.

cannot be developed to a turbidity of less than 5 NTU, an explanation will be documented by a qualified hydrogeologist. Other hydrochemical indicators, such as total iron and drilling fluid tracers, may be monitored to assess the adequacy of development pumping for trace constituent sampling. Water will be pumped from the well only after the requirements for purge water (WHC 1989d) have been met.

5.4.3.3 Surveying. After monitoring well installation is completed, all wells will be surveyed for location and elevation by qualified surveyors per WHC-S-014. The elevation of the top of the stainless steel protective casing and of a brass marker in the concrete well head pad will be determined within 0.01 ft (0.003 m). A mark will be placed on the casing to indicate the location that was surveyed. The areal location of the centerline of the well will be determined to the nearest 0.01 ft (0.003 m). All measurements will be referenced to a common datum and reported as Washington State Plane Coordinates (Southzone) of the NAD 83 in meters. The survey results will be reviewed by a licensed surveyor.

5.4.4 Ground Water Sampling

Frequency of sampling and constituents for analysis of ground water sampling will be identified and documented as a result of Task 1.

HydroStar* sampling pumps will be installed in the new wells soon after construction and well development are complete. The depth to water will be measured before the wells are purged. The wells will be purged and samples will be collected after at least three borehole volumes of water have been removed, when specific conductance and pH have stabilized, or in the case of wells completed in very low permeability materials after the well has recharged.

All sampling activities will be performed under contract by PNL and future testing will be carried out by contract laboratories to be determined. The procedures for groundwater sample collection, water-level measurement, and field measurements are contained in *Procedures for Groundwater Investigations* (PNL 1989). Specific applicable procedures include the following:

- GC-1 Ground-Water Sample Collection Procedure
- GC-2 In-Line Sample Filtration Procedure
- GC-3 Disposal of Purge Water from Monitoring Wells
- FA-1 Temperature Measurement Procedure
- FA-2 Calibration of Conductivity Meter and Measurement of Field Conductivity
- FA-3 Calibration of pH Meter and Measurement of Field pH
- WL-1 Water-Level Measurement Procedure
- WL-2 Procedure for Standardizing Steel Tapes
- AD-1 Change Control Procedure
- AD-2 Ground-Water Sample Chain of Custody
- DO-1 Collection and Documentation of Borehole Samples and Well Construction Data
- DO-2 Split-Barrel Auger Sediment Sampling.

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*Hydrostar is a trademark of Instrumentation Northwest, Incorporated.

6.0 HYDROLOGIC MODELING

This section describes the geohydrologic modeling being used in characterization of the candidate sites. Geohydrologic modeling topics include evaluation of the flow of effluent and transport of tritium in the vadose zone and the unconfined aquifer (ground water). Modeling is being performed in two phases, the first of which has been completed. The first phase used existing information to compare alternative disposal sites and provided guidance for the characterization activities. The final phase will address topics not covered in the preliminary phase and will incorporate additional data obtained during site characterization. Also, first phase modeling will be reevaluated, as needed, based upon a comparison between parameters used and site specific information obtained during characterization.

6.1 MODELING PROCESS

This section provides a general discussion of flow and transport modeling in the vadose zone and ground water to provide a basis for subsequent discussions.

The first step is the development of a "picture" (referred to as a conceptual model) of the area under consideration; i.e. its geology, hydrology and physical properties, including conditions at its boundaries and at the beginning of the time of interest. This conceptual model serves as a basis for selecting an appropriate computer encoded numerical model. More importantly, a conceptual model provides the analyst with a framework for evaluating the computer results and assessing the need for additional data. In the modeling process, the conceptual model is periodically updated as more information becomes available and questions are resolved.

The conceptual model forms the basis for the numerical model. A numerical model involves translating the conceptual model into mathematical terms at the nodes of a grid used to describe the geometry of the specific problem, and then employing a numerical scheme to solve the mathematical equations. Models are commonly described by the method employed for numerical analysis, such as finite differences, finite elements, or integrated finite differences. Application of a numerical model requires definition of conditions at the beginning time and at the boundaries of the model, as well as an estimation of the parameters required by the model. Because of these information needs (differing properties and scale factors) it is common to perform vadose zone modeling separately from ground water modeling.

The numerical model may be treated in two parts: a flow model and a transport model. The flow model provides information on the distribution of heads (matric potential or suction head in the vadose zone, and water table elevations in the ground water) and flow velocities. A flow model requires estimates of the hydraulic properties of the geologic materials. The flow model not only provides useful information on hydraulic heads, but it is a preliminary and necessary step for transport modeling. A transport model provides estimates of the rate of migration and configuration of a contaminant plume (size and contaminant concentrations) as it moves through the vadose zone or ground water. Movement of a contaminant plume is controlled by several processes, including advection, hydrodynamic dispersion, dilution,

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and DOE Order 5820.2A, *Radioactive Waste Management*.

DOE-RL, 1989, *Hanford Site Groundwater Protection Management Program*, DOE/RL 89-12, U.S. Department of Energy-Richland Operations Office, Richland, Washington.

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Eddy, P. A. and J. S. Wilbur, 1981, *Radiological Status of the Groundwater Beneath the Hanford Project, January-December, 1980*, PNL-3768, Pacific Northwest Laboratory, Richland, Washington.

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Flyckt, D. L., 1990. *Functional Design Criteria for the 242-A Evaporator and the PUREX Plant Condensate Treatment Facility*, WHC-SD-C018-FDC-001, Westinghouse Hanford Company, Richland, Washington.

Golder, 1991, *Travel Time Estimates for Alternative Tritium Crib Locations, Hanford Site, Washington*, Golder Associates, Inc., Redmond, Washington.

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Koegler, K. J., 1990, *Preliminary Site Evaluation Report for a Soil Column Disposal Site for the 242-A Evaporator and PUREX Plant Condensate Treatment Facility*, WHC-SD-EN-EE-002, Westinghouse Hanford Company, Richland, Washington.

McCain, R. G. and W. L. Johnson, 1990, *A Proposed Data Quality Strategy for Hanford Site Characterization*, WHC-SD-EN-AP-023, Westinghouse Hanford Company, Richland, Washington.

Newcomb, R. C., J. R. Strand, and F. J. Frank, 1972, *Geology and Ground-Water Characteristics of the Hanford Reservation of the U.S. Atomic Energy Commission, Washington*, Professional Paper 717, U.S. Geological Survey, Washington, D.C.

PNL, 1989, *Procedures for Ground-Water Investigations*, PNL-6894, Pacific Northwest Laboratory, Richland, Washington.

PNL, 1990, *Hanford Site Ground-Water Surveillance for 1989*, PNL-7396, Pacific Northwest Laboratory, Richland, Washington.

Strait, S. R., B. A. Moore, 1982. *Geohydrology of the Rattlesnake Ridge Interbed in the Gable Mountain Pond Area*, RHO-ST-38, Rockwell Hanford Operations, Richland, Washington.

WHC, 1989a, *Preliminary Operable Units Designation Project*, WHC-EP-0216, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989b, *Environmental Compliance*, WHC-CM-7-5, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989c, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989d, *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington*, WHC-MR-0039, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Environmental Technology Development and Applications Manual*, WHC-IP-0635, Westinghouse Hanford Company, Richland, Washington.

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 139279
Proj. ECN

2. ECN Category (mark one)
- Supplemental ☐
- Direct Revision ☒
- Change ECN ☐
- Temporary ☐
- Supersedure ☐
- Discovery ☐
- Cancel/Void ☐

3. Originator's Name, Organization, MSIN, and Telephone No.
K.J. Koegler, 81224, H4-55, 6-2877

4. Date
6-13-91

5. Project Title/No./Work Order No.
Characterization Work Plan, C-018H Soil Column Disposal Siting Evaluation

6. Bldg./Sys./Fac. No.

7. Impact Level
3

8. Document Number Affected (include rev. and sheet no.)
WHC-SD-EN-AP-041, Rev. 0

9. Related ECN No(s).

10. Related PO No.

11a. Modification Work
- ☐ Yes (fill out Blk. 11b)
- ☒ No (NA Blks. 11b, 11c, 11d)

11b. Work Package Doc. No.
NA

11c. Complete Installation Work
NA
Cog. Engineer Signature & Date

11d. Complete Restoration (Temp. ECN only)
NA
Cog. Engineer Signature & Date

12. Description of Change
Complete document Revision.

13a. Justification (mark one)
- Criteria Change ☐
- Design Improvement ☐
- Environmental ☒
- As-Found ☐
- Facilitate Const. ☐
- Const. Error/Omission ☐
- Design Error/Omission ☐

13b. Justification Details
Document revised to incorporate regulatory requirements.

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ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) 139279

15. Design Verification Required	16. Cost Impact		17. Schedule Impact (days)
☐ Yes	ENGINEERING N/A	CONSTRUCTION N/A	N/A
☒ No	Additional ☐ $ _____	Additional ☐ $ _____	Improvement ☐ _____
	Savings ☐ $ _____	Savings ☐ $ _____	Delay ☐ _____

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

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Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐	_____	☐
Environmental Report	☐	Inspection Plan	☐	_____	☐
Environmental Permit	☐	Inventory Adjustment Request	☐	_____	☐

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number/Revision
_____	_____	_____
_____	_____	_____
_____	_____	_____

20. Approvals

	Signature	Date
OPERATIONS AND ENGINEERING		
X Cog./Project Engineer	K. Kyle	13 Jun 91
X Cog./Project Engr. Mgr.	J. L. Woods	6/13/91
X QA	LaDell W. Vance	6/20/91
Safety		
Security		
Proj./Prog./Dept. Mgr.		
Def. React. Div.		
Chem. Proc. Div.		
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Adv. React. Dev. Div.		
Proj. Dept.		
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IRM Dept.		
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Other		

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