**Cover Sheet for a Hanford
Historical Document
Released for Public Availability**

Released 1994

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

DISCLAIMER

This is a historical document that is being released for public availability. This was made from the best available copy. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PNL-D-394

Battelle

**Pacific Northwest Laboratory
Richland, Washington 99352**

COPY AND SERIES NO.

DATE

February 4, 1985

TITLE AND AUTHOR

209-E UPGRADES (U)

B. J. Merrill
J. J. DeMyer

CONTRACT

PROJECT NO.

- 1830

- 18

RESERVED FOR TECHNICAL USE

CLASSIFIED BY (GUIDANCE IDENTIFICATION) GEN-12

GEN-12

AUTHORIZED DERIVATIVE CLASSIFIER B. J. Merrill

B. J. Merrill

HANFORD CATEGORY AND/OR OTHER CIRCULATION RESTRICTIONS

RESTRICTED DATA

THIS DOCUMENT CONTAINS RESTRICTED DATA AS
DEFINED IN THE ATOMIC ENERGY ACT OF 1954.
UNAUTHORIZED DISCLOSURE SUBJECT TO ADMINI-
STRATIVE AND CRIMINAL SANCTIONS.

SECURITY INFO

UNAUTHORIZED DISCLOSURE SUBJECT TO
ADMINISTRATIVE AND CRIMINAL SANCTIONS.

THIS DOCUMENT IS NOT BE UNATTENDED OR WHERE AN AUTHORIZED PERSON MAY HAVE ACCESS TO IT WHEN NOT IN USE. IT MUST BE STORED IN A LOCKED RECEPTACLE WITHIN AN SECURED AREA, WHILE IT IS IN YOUR POSSESSION, UNTIL YOU HAVE RETURNED IT TO YOUR CLASSIFIED DOCUMENT RESPONSIBILITY STATION, IT IS YOUR RESPONSIBILITY TO KEEP AND ITS CONTENTS WITHIN THE LIMITS OF THIS OBJECT AND FROM AN AUTHORIZED PERSON. ITS TRANSMITTAL TO, OR STORAGE AT YOUR RESIDENCE IS PROHIBITED. IT WILL BE DISPOSED OF IN ACCORDANCE WITH EXISTING SECURITY REGULATIONS. ALL PERSONS READING THIS DOCUMENT ARE REQUESTED TO SIGN IN THE SPACE

[illegible]

DECLASSIFIED

DECLASSIFIED

Classifier: B. J. Merrill Date: 02-04-85
 Title: Act. Mgr. Safeguards and Security Dept.
 Classification Authority: GEN-12
 Declassify or Downgrade Date or Event

x OADR (Orig. Agency's Determination Req'd.)

THIS DOCUMENT CONSISTS OF
8 PAGES.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Assessment of Critical
 Mass Laboratory Safeguards
 and Security Upgrades (U)

B. J. Merrill
 J. J. DeMyer

January 10, 1985

Classification Cancelled and Changed To

DECLASSIFIED

By Authority of LK Engle

CG-55-3, 9-27-94

By J E Savely 12-16-94

Verified By B. Roberts, 12-20-94

NOT UCNI

UNCLASSIFIED
 SUBJECT TO
 ADMINISTRATIVE AND CRIMINAL

Copy 1 - H. E. Ransom, DOE-RL
 Copy 2 - K. H. Jackson, DOE-RL
 Copy 3 - D. B. Cearlock, PNL
 Copy 4 - B. J. Merrill, PNL
 Copy 5 - H. H. Van Tuyl, PNL
 Copy 6 - D. M. Montgomery, PNL
 Copy 7 - R. M. Fleischman, PNL

MASTER**DECLASSIFIED**

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED D

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

ASSESSMENT OF CRITICAL MASS LABORATORY
SAFEGUARDS AND SECURITY UPGRADES (U)

I. Purpose

Pacific Northwest Laboratory has initiated a review of the Safeguards and Security systems at the Critical Mass Laboratory with regards to determining appropriate upgrading actions that assure that an effective and efficient Safeguards and Security posture consistent with DOE-RL policies, procedures, and priorities is effected.

II. Summary

As a result of this review, PNL has concluded that specific upgrades are required at CML that provide a demonstrated enhancement to the overall security posture of the facility and are based upon prudent expenditures of government funds. It was further concluded that additional recommended upgrades provide minimal improvement to the overall security system at a significant outlay of funds.

III. Analysis

DECLASSIFIED

The initial element in reviewing the security needs of the CML was to assess the attractiveness of the Special Nuclear Material (SNM) contained within, impacts of sabotage, the facility's importance in the Hanford Defense Mission, and its relative importance to other identified Hanford targets. Conclusions resulting from this review are:

- A. SNM used at CML can be categorized as less than attractive due to its physical form (nitrate) or configuration (500 pound fuel assemblies). Difficulties encountered in attempting to steal or divert these materials vary from the need to transport heavy, bulky fuel assemblies, to having to extract 60 liters of plutonium nitrate from shielded tanks and transfer into critically safe containers. Nitrate extraction, in the crudest sense, would require approximately 7 minutes to complete and would significantly increase the probability of a criticality. Adversaries attempting to steal or divert fuel elements would be required to bring power assisted lift equipment or to physically manhandle the assembly; either scenario resulting in a probable diminishment of adversary capabilities.
- B. The recently concluded radiological risk assessment for the CML revealed that for the scenarios performed, the offsite impact of sabotage at CML using up to 50 pounds of plastic explosives would be a small fraction of the release limit defined in DOE Order 6430.1.

- C. Present activities at CML are not related to Hanford's Defense Mission. A possibility exists that a limited amount of work performed at the Los Alamos critical facility could be duplicated at CML should that facility be lost. Thus, the overall impact on the nation's defense program, while not zero, is presently viewed as miniscule.
- D. Based upon the assignment of CML as the number seven (7) priority (behind all other Hanford Protected Areas or operating reactors) on the Hanford Patrol priority list, it may be concluded that the facility does not warrant the resources assigned to higher priority targets. This position is further strengthened by the RL-SAS position that PNL study the effect of not manning the area with Hanford Patrol personnel during off-shift hours.

The second element in assessing CML's security needs was to determine, based upon the above information, what the overall objectives of the security system are, and what elements of that system need improvement to meet these objectives. It is PNL's opinion that the CML security system should:

1. Have a greater than 75% probability that attempted thefts or diversions by the defined maximum credible threat are interrupted by Patrol. Based upon our analysis, the most cost-effective method of accomplishing this objective is to enhance the delay factor at CML. Our analysis also revealed that, due to the close proximity of the Protected Area perimeter to the Material Access Area, significant expenditures of funds to upgrade perimeter protection systems would not noticeably improve the probability of thwarting the adversary.
2. Have a minimal probability of protecting the facility from radiological sabotage by outsiders. Analysis indicates that risk is low and cost is high to upgrade.
3. Have a limited probability of thwarting radiological sabotage by insiders. PNL's analysis concludes that enhanced package searches, and improved physical protection for Patrol personnel at CML would accomplish this objective.
4. Have a strong probability of detecting attempts to divert SNM by an insider. A strong two-person program coupled with an effective SNM screening process at the Protected Area portal and statistically sound warning limits in the Safeguards' system should make this objective obtainable.

DECLASSIFIED

The concluding portion of the review process was to identify specific actions to be taken and to quantify, where possible, their impact on the CML security system. The Estimated Adversary Sequence Interruption (EASI) program, developed by Sandia, was used to quantify changes in the probability of interruption (PI) for each physical change. The PI used here does not calculate the probability of the patrol forces winning against the adversaries, but only refers to their probability of interrupting the adversaries before they can depart the CML Area with SNM.

The relative benefit of proposed upgrades against two scenarios are as follows:

DECLASSIFIED

<u>Upgrade</u>	PI *Scenario 1		PI *Scenario 2	
	<u>Present</u>	<u>Upgrade</u>	<u>Present</u>	<u>Upgrade</u>
Vault Door	.064	.754	.123	.846
Badgehouse Upgrade	.064	.123	.123	.123
**Perimeter Lighting	.064	.064	.123	.123
**Steamlines	.064	.064	.123	.123
**Vehicle Gates	.064	.064	.123	.123

	<u>Scenario 1</u>	<u>Scenario 2</u>
Total Improvement for All Items	.846	.846

Additional analysis of the benefit of upgrading the probability of detection (PD) of the perimeter alarm system from .7 to .95, disclosed that negligible benefit would be derived from the probable expenditure of large sums of money to do so. This opinion is borne out below:

* Scenario details included in Attachment 1.

** While these items demonstrate no discernible effect on the PI, they are perceived as providing enhancement to the ability of Patrol to successfully contain the adversaries.

	<u>Scenario 1</u>	<u>Scenario 2</u>
All Upgrades Complete - PD .7	.846	.846
All Upgrades Complete - PD .95	.878	.878

IV. Conclusions

- A. PNL should proceed with the completion of identified upgrades and give priority to the vault door and badgehouse modifications.
- B. Attempts to upgrade the PD of the perimeter alarm system by "fine tuning" or making other adjustments, should be made, but major modifications or dollar expenditures are not warranted.
- C. Of the upgrades identified in this report, none provide a significant enhancement to the PI for theft scenarios in the mix room, (.979 vs .998), nor do they mitigate the potential for sabotage.
- D. PNL should assess the economic tradeoff and security value of remotely operating access controls for the CML.
- E. PNL should proceed with plans to develop and install an in-place NDA system for the CML. This system will improve SNM inventory accuracy and help reduce the insider diversion threat.
- F. PNL should continue to fund and support the RHO analysis of the CML. The RHO analysis will utilize the SAFE, DIATAM, and MAIT models, thus, providing a degree of sophistication not available in EASI. The position stated in this report should be reviewed with respect to the completed RHO report.
- G. This report should be submitted to DOE-RL SAS for review and concurrence.

DECLASSIFIED

EASI BACKUP DATAI. Description of Assigned ValuesA. Response Times

Patrol response times are based upon estimates obtained from Hanford Patrol and reflect the manpower available under the recently revised 200-E Area Contingency Plan.

7-8 Patrolmen - Avg. Time: 6 minutes

7-8 Patrolmen - Standard Deviation: 1 minute

B. Probability of Communication

The probability of communication (PC) refers to the probability that an alarm that is generated will send a signal that is received by the response force.

PC - .90

C. Probability of Detection

Probability of Detection (PD) refers to the probability that an assessment of detection device, i.e., CCTV, motion detector, door alarm, etc., will detect the intruders. The assigned PD for assessment and detection equipment are as follows:

Perimeter CCTV	.1
Perimeter Alarms	.7
Door Alarms	.95
Motion Alarms	.95

DECLASSIFIEDD. Adversary Action Sequence

The Adversary Action Sequence (AAS) may take the routes of force, stealth, or deceit and may change at any time. The two AASs performed for this study include all of these elements.

SECRET

II. Scenario 1

<u>Adversary Action</u>	<u>PD</u>	<u>Time</u>	<u>Standard Dev.</u>
1. Climb 200-E Area Fence	.01	.15	.05
2. Insider Uses Credentials to Drive Into 200-E Area	.0	N/A	N/A
3. Insider Picks Up Other Adversaries - Drive to 209-E Area	.01	1.5	.5
4. Insider Enters 209-E Badgehouse - Neutralizes Patrolmen	.01	.3	.1
5. Enter 209-E Area and 209-E Building (Unalarmed Portion)	.01	.3	.1
6. Penetrate Alarmed Door to Change Room	.95	.3	.1
7. Penetrate Critical Assembly Room (Car) Vault Door (Explosives)	.95	2.2	.46
7a. Penetrate Critical Assembly Room Door (Explosives)	.95	.3	.1
8. Penetrate Second Car Door	.95	.3	.1
9. Gather SNM	.95	3.0	.5
10. Exit Building and Area	.10	.5	.25

DECLASSIFIED

SECRET

III. Scenario 2

<u>Adversary Action</u>	<u>PD</u>	<u>Time</u>	<u>Standard Dev.</u>
1. Climb 200-E Area Fence	.01	.15	.05
2. Insider Uses Credentials to Drive Into 200-E Area	.0	N/A	N/A
3. Insider Picks Up Other Adversaries - Drive to 209-E	.01	1.5	.5
4. Climb Outer 209-E Fence	.01	.15	.02
5. Travel Through and Over Alarmed Area	.7	.15	.02
6. Climb Inner Fence	.01	.15	.02
7. Travel to Building	.01	.1	.01
8. Enter 209-E Building (Unalarmed Area)	.01	.3	.1
9. Penetrate Alarmed Door to Area	.95	.3	.1
10. Penetrate Car Vault Door (Explosives)	.95	2.2	.46
10a. Penetrate Car Door (Explosives)	.95	.3	.1
11. Penetrate Inner Car Door	.95	.3	.1
12. Gather SNM	.95	3.0	.5
13. Exit Building and Area	.10	.5	.25

DECLASSIFIED

Name	Approved	Date
BJ Merrill (Author)	<i>[Signature]</i>	2-1-85
RR King	<i>[Signature]</i>	2-1-85
RM Fleischman	<i>[Signature]</i>	2-1-85
CL Simpson	<i>[Signature]</i>	2-7-85

Project Number _____

Internal Distribution

With Attachment:

DB Cearlock
 RM Fleischman
 BJ Merrill
 DM Montgomery
 HH Van Tuij

Without Attachment:

RR King
 CL Simpson
 WR Wiley

February 4, 1985

Mr. H. E. Ransom, Director
 Energy Programs Division
 Richland Operations Office
 Department of Energy
 Richland, WA 99352

Dear Mr. Ransom:

209-E UPGRADES (U)

Ref 1: Generic Threats to DOE Nuclear Facilities, January, 1983, (C/NSI).

Ref 2: Richland Operations Office Safeguards and Security Cost Effectiveness Task Force Report, November 29, 1982, (C/NSI).

Ref 3: DOE-RL Security Survey of PNL, November, 1984, (S/NSI).

Ref 4: PNL Safeguards and Security Plan, January 15, 1985, (S/NSI).

Ref 5: Letter, R. R. King to T. R. Fitzsimmons dated January 9, 1985, subject, "Radiological Implications of Generic Threat to Hanford Facilities," (U).

Pacific Northwest Laboratory (PNL) has reviewed the above-referenced documents with regard to determining appropriate upgrading actions at the Critical Mass Laboratory (CML) to assure that an effective and efficient safeguards and security posture, consistent with DOE-RL policies, procedures, and priorities, is effected.

As a result of this review, PNL has concluded that specific upgrades are required at CML that provide a demonstrated enhancement to the overall security posture of the facility, and are based upon prudent expenditures of government funds. It was further concluded that additional recommended upgrades provide minimal improvement to the overall security system, but require significant economic expenditure. The basis for these conclusions, and PNL's recommended actions, are contained in the attached study which is being forwarded for your review and comment.

WHEN SEPARATED FROM
 ENCLOSURES, HANDLE THIS
 DOCUMENT AS UNCLASSIFIED.

DOCUMENT TRANSMITTED BY
 CONFIDENTIAL NATIONAL
 INFORMATION

DECLASSIFIED

Mr. H. E. Ransom
February 4, 1985
Page 2

Questions regarding this correspondence should be referred to R. M. Fleischman on 376-4557 or B. J. Merrill on 375-2821.

Very truly yours,

A handwritten signature in dark ink, appearing to read "D. B. Cearlock".

D. B. Cearlock, Director
Research

DBC:BJM:sc

Attachment

cc: With Attachment:
K. H. Jackson, DOE-RL

DECLASSIFIED