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ASSESSMENT OF THE PROPOSED DECONTAMINATION
AND WASTE TREATMENT FACILITY AT LLNL

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Science Applications International Corporation
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for

Lawrence Livermore National Laboratory
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LLNL Technical Representative - Richard M. Alire

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ASSESSMENT OF THE PROPOSED DECONTAMINATION
AND WASTE TREATMENT FACILITY (DWTF) AT LLNL

1. INTRODUCTION

1.1 Background

To provide a centralized decontamination and waste treatment facility (DWTF) at LLNL, the construction of a new installation has been planned. A conceptual design report (CDR) for the DWTF was issued by Holmes & Narver, Inc. in March, 1985. The stated objectives for this new facility were: (1) to replace obsolete, structurally and environmentally sub-marginal liquid and solid waste process facilities and decontamination facility and (2) to bring these facilities into compliance with existing federal, state and local regulations as well as DOE orders. Construction costs for the proposed DWTF have been estimated at various levels (depending upon assumptions used), with some estimates well in excess of \$40 million.

In a previous study [1], SAIC conducted a preliminary review and evaluation of existing facilities at LLNL and cost effectiveness of the proposed DWTF. This study also explored certain possible alternatives for accomplishing the intended objectives.

Some observations derived from the previous study are:

1.1.1 Environmental risks from existing DWTF operations appear to be so low that any cost effectiveness for their further reduction would be highly unlikely, at least from a standpoint of environmental health and safety.

1.1.2 The above notwithstanding, the question of compliance with existing and/or presumed future regulations could provide a major incentive for the proposed DWTF. Unfortunately, the judgment as to what is necessary to achieve compliance is, to a large extent, conjectural, especially when presumably more restrictive future regulations are considered.

1.1.3 The possibility of eliminated or downscaling certain of the proposed DWTF items should be considered, and

1.1.4 The possibility for incineration of combustible wastes at another DOE facility should be considered. The possibilities for processing other forms of radioactive and hazardous wastes at other DOE sites should also be explored.

Pursuant to this previous SAIC study it was determined to conduct a more detailed review into specific aspects of the proposed DWTF. That is the intent of this study.

1.2 Statement of Problem

Because of concerns that the costs for the DWTF may be excessive, it has been determined that the certain aspects of the proposed DWTF should be evaluated to determine the possibility for cost reduction that might result from elimination or downscaling certain items in the DWTF design, and/or the possibility of having these functions performed at another DOE site. Following preliminary investigation and discussion, it was determined that facilities at the Idaho National Engineering Laboratory (INEL) might be well suited for this purpose.

1.3 Study Objectives

The objectives for the current study as specified in the scope of work are:

1.3.1 To assess the capability of INEL facilities to process LLNL radioactive and hazardous wastes and the willingness of appropriate authorities to do so. To analyze the feasibility of shipping the radioactive and/or hazardous wastes to INEL and assess applicable state and federal (DOT) statutes as well as requirements for compliance.

1.3.2 To evaluate various items in the DWTF conceptual design report (CDB) to determine the need and design scale for each and to identify those items that may be altered or deleted to achieve significant cost savings without affecting compliance to applicable regulations.

1.3.3 To provide advice regarding environmental protection plans and programs.

In accordance with these objectives, this report will consider offsite processing of LLNL waste at INEL in Section 2, possible changes in specific DWTF items in Section 3, and will offer general and specific recommendations in Section 4.

2. POSSIBILITIES FOR OFFSITE PROCESSING AT INEL

To assess the capability of INEL facilities to handle LLNL radioactive and/or hazardous wastes, inquiries were made and discussions held with INEL site officials including: EG&G-Idaho personnel responsible for operating waste processing and disposal facilities; DOE-IDO officials at the DOE regional office in Idaho Falls, ID; and DOE-SAN officials concerned with the management of LLNL waste. Discussions were also held with U.S. Ecology Inc. U.S. Ecology is engaged in the commercial processing, management, transport, and disposal of radioactive and hazardous wastes. These discussions were held to assess whether any serious technical or regulatory problems might be anticipated in transporting LLNL waste to INEL. Finally, a site visit was made to INEL to inspect their facilities and discuss the proposed operations with site personnel. A trip report of this visit is presented as Appendix A.

From all preliminary discussions it appears that no serious obstacle of either a technical, procedural, or regulatory nature would be expected. However, since it is impossible in such preliminary discussions to predict all possible conditions, it was determined that the best approach would be to conduct a "trial run" whereby one shipment of LLNL waste is sent to INEL for processing. Any problems that would be encountered in this "trial run" could then be considered in development of any long term plans for processing LLNL waste at INEL. Accordingly, such a procedure was requested via official channels (LLNL to DOE-SAN to DOE-IDO), (see correspondence in Appendix B).

To minimize complications in the trial run procedure, it was determined that a shipment of low-level radioactive waste (LLW), free of transuranic and chemically hazardous materials, and packaged according to the INEL acceptance criteria for LLW be sent for processing and disposal. A copy of the INEL low-level waste acceptance criteria accompanies this report as Attachment 1.

At the present time (3/87), an affirmative reply has been received from DOE-IDO, and all that remains to be done is to conduct the actual trial run procedure. Specific recommendations for the conduct of this procedure are offered in Section 4.1 of this report.

In evaluating the possibility of processing LLNL radioactive and hazardous waste at INEL, we have considered the technical, administrative, and regulatory aspects of the problem. These are discussed in the following sections.

2.1 Technical Considerations

The technical feasibility of shipping LLNL radioactive and/or hazardous wastes to INEL is dependent upon: health and safety factors (what is the relative risk?), and economics (what are the relative costs?).

2.1.1 Health and Safety considerations - The feasibility for offsite shipment of LLNL waste to INEL for processing is dependent upon the relative safety of the alternatives. Although a comprehensive risk assessment is beyond the scope of the present study, some insight can be gained from an evaluation of the relative risks related to combustible low-level radioactive waste. A calculation of these relative risks is presented in Appendix C. This evaluation indicates that although the risk is low in either case, the relative risk of processing the waste at INEL is much lower than at LLNL even considering the transportation risk entailed in shipping the LLNL waste to INEL.

2.1.2 Economic considerations - Cost estimates for waste incineration at LLNL vs. INEL were determined in our earlier report (Appendix C, Reference 1). The unit cost for incineration at LLNL was estimated to be $\$1,628/\text{m}^3$, while the estimated cost for INEL ranged from $\$522$ to $\$718/\text{m}^3$ depending upon the transportation costs assumed. If we assume a cost differential of $\sim\$1,000/\text{m}^3$, and an annual production of 500 m^3 of combustible waste, then an annual cost saving of one-half million dollars might be realized from offsite shipment. These estimates consider both capital and operating costs (with capital costs amortized over an assumed 25 year operating period). They also assume that INEL charges to LLNL for the waste processing per unit waste would be the same as the costs for processing wastes generated at INEL.

Since this assessment was made, a more recent evaluation of incineration costs has been performed in a concurrent study by Contract Estimator (CE). From the CE estimates, it appears that the actual capital cost could be over \$7 million instead of the \$5 million value assumed in the previous assessment. Accordingly, it can be estimated that the annual cost savings from offsite incineration at INEL would be ~\$0.7 million.

This cost savings estimate relates only to the planned incineration operation. Additional and substantial savings might also be realized from offsite processing of other types of radioactive/hazardous waste. It should be noted that this economic assessment considered only engineering (design, construction, and operating) costs. Costs for licensing and permitting were not considered.

2.2 Regulatory/Administrative Considerations

The proliferation of increasingly more stringent and complex environmental regulation in recent years will likely require protracted, complicated, and expensive legal procedure for LLNL to obtain required permits for the proposed DWTF. This is particularly true when there is vigorous public opposition to the proposed facility, as has already been evidenced in the case of the DWTF (see Appendix D). A notable example of this type of problem can be found in the experience of Dow Chemical Company in their proposed hazardous waste incinerator for their Pittsburg, CA facility. Dow has already spent millions of dollars and at least two years in attempting to obtain the necessary permits, and appears to be no closer to this objective than when they started. The CE report on the subject provides greater details on the Dow experience. The point is that, in today's regulatory climate, good design and engineering are simply not enough to obtain the required permissions from local, state, regional (e.g., Bay Area Air Pollution Control District) and Federal agencies. The fact that LLNL is sited in a relatively highly populated area (see discussion in Appendix C) will add further difficulties to the process. It should be emphasized that in all likelihood,

gaining the necessary licences and permits will, at best, be extremely difficult and costly. Embarking upon this process will require the commitment of considerable time and money with no assurance that a successful conclusion can be obtained. The ability to get the required permissions will be dependent upon several factors (e.g., politics, public opinion, etc.) which may be beyond LLNL's control. These problems can be avoided by offsite processing of LLNL's radioactive/hazardous waste at INEL.

Another advantage of offsite processing at INEL is that INEL already has an existing, functioning facility where the regulatory and operational problems have largely been worked out. The inevitable "learning curve" problems would therefore be avoided. It would not be surprising if serious problems in this regard were encountered at the proposed LLNL-DWTF, particularly when several regulatory agencies are watching over the startup of operations.

From discussions with U.S. Ecology, it appears that compliance with regulations for the transport of low specific activity (LSA) radioactive waste from LLNL to INEL would be relatively straightforward. Presently, all such wastes generated in California are shipped out of state for disposal. U.S. Ecology and other licensed shippers could readily handle the administrative and regulatory requirements. No special problems in this regard are foreseen for the trial run procedure. For other forms of radioactive or hazardous wastes, further inquiry into the regulatory aspects will be required. However, no serious difficulty is anticipated.

2.3 Summary and Conclusions

From our assessment it is clear that offsite shipment of LLNL radioactive/hazardous wastes to INEL for processing could offer several advantages. These include:

- Considering the incinerator operation only, a capital cost saving of up to \$7 million, and a total savings of \$700,000 per year over a 25-year operating period, could be realized.

- Due to the fact that the area around INEL has a far lower population density than at LLNL, the risk of processing LLNL waste at INEL would be lower even considering any additional transportation risk.
- Serious regulatory and administrative problems in licensing the DWTF could be avoided or at least minimized.
- Initial discussions with INEL officials indicate that they would be capable and willing to process LLNL wastes.
- Processing LLNL waste at INEL would be consistent with DOE's proposed concept for regional waste processing as advocated in their Strategic Alternatives Plan 2.

3. ASSESSMENT OF PROPOSED DDTF OPERATIONS

In the present study, we have reviewed individual DDTF operations beyond what was discussed in our earlier report [1] and have identified four areas deserving further assessment. These are: decontamination, liquid waste processing, burn pan, and incinerator. These are discussed in the following sections.

3.1 Decontamination Operation

We have inspected the current decontamination operation, discussed the operations with operating personnel, and interviewed several of the requestors for decontamination services at LLNL. While we are not in complete agreement with Mel Coops' [3] suggestion that the decontamination operation at LLNL is totally unnecessary, we do believe that a major portion of this operation is unwarranted and not cost-effective. Decontamination can be complex and expensive. In certain instances, the decontamination costs can exceed the value of the material being cleaned. In other instances, materials have been committed to waste following decontamination. There seems to be a lack of standards and guidelines at LLNL for utilizing decontamination services.

Since decontamination costs are handled as general overhead expense, there is little, if any, incentive for programmatic personnel at LLNL to handle contaminated or suspect items in the most economic manner. Possibly sending some items to decontamination is simply the most expedient means of getting rid of them. It is very likely that implementation of reasonable standards and controls for decontamination, along with a system for charging expenses back to the requesting programs, would have the effect of significantly reducing the required scale of operations. These suggested procedural changes, if successfully implemented, might, in turn, allow for a reduction in the planned design scale for the DDTF.

3.2 Liquid Waste Processing

Estimates of generation rates for various wastestreams at LLNL vary widely. For example, Tables 1 and 2 provide estimates for radioactive and non-radioactive waste streams at LLNL. These estimates are taken from the GDR. In a latter study by Radian Corp., similar estimates presented in Tables 3 and 4 show significantly different, generally lower estimates for the same wastestreams. The design scale for the liquid waste stream operations at the DWTF is dependent upon these estimated generation rates.

As is the case with decontamination services, costs for treatment of liquid wastes are handled as a general overhead expense. The recommended practice of hazardous waste management is minimization of waste volumes. Application of this practice can result in lower risk as well as lower cost. Recognizing this, LLNL has implemented a study on waste minimization as described by R. Heckman [4]. Although the study to date is largely of an academic nature, the application of a practical waste minimization program at LLNL might likely result in significant reduction in the volumes of hazardous waste generated. To provide a reasonable incentive for volumetric reduction of wastestreams, a system of charging expenses to programmatic generators at LLNL might be implemented. Successful implementation of such a waste minimization program could conceivably allow for a significant reduction in design scale for the required treatment facilities in the DWTF.

3.3 Burn Pan

The burn pan operation is intended to oxidize potentially pyrophoric uranium chips. For relatively small quantities, the operation could be performed in a chemistry hood with filtered exhaust. Table 5 presents the annual production of uranium chips for LLNL.

Table 1

TOTAL RADIOACTIVE WASTE GENERATION RATES
BY CLASS AT THE LLNL SITE

<u>Waste Class</u>	<u>Current* Generation L/yr</u>	<u>Projected* Generation L/yr</u>
1. Organic Sludges/Still Bottoms	0	0
2. Solvents and Organic Solutions	4,336	5,269
3. Oils and Greases	77	90
4. Oil and Water Mixtures	59,176	105,268
5. Organic and Oily Wastes	0	0
6. Metal Solutions and Residuals		
a. Solutions	246,830	478,017
b. Sludges and Residuals	0	0
7. Miscellaneous Chemicals and Products	0	0
8. Paint and Organic Residuals	0	0
9. Aqueous Solutions with Organics	1,632	1,958
10. Anion Complexes	0	0
11. Inorganic Sludges and Residuals	0	0
12. Pesticides and Herbicide Wastes	0	0
13. Halogenated Organic Wastes	0	0
14. Clean-up Residuals	**	**
15. Acids	0	0
16. Alkali	0	0
17. Wastewaters not elsewhere classified	16,625	21,304

* These generation rates are consistent with the methodology used in UCID-20209, however, these should be considered approximations only.

** Not Available

Table 2

TOTAL NON-RADIOACTIVE WASTE GENERATION RATES
BY CLASS AT THE LLNL SITE

<u>Waste Class</u>	<u>Current* Generation L/yr</u>	<u>Projected* Generation L/yr</u>
1. Organic Sludges/Still Bottoms	6,592	9,888
2. Solvents and Organic Solutions	42,728	104,323
3. Oils and Greases	57,737	80,813
4. Oil and Water Mixtures	1,263	2,273
5. Organic and Oily Wastes	2,540	4,018
6. Metal Solutions and Residuals		
a. Solutions	7,632,557	12,406,657
b. Sludges and Residuals	2,648	4,766
7. Miscellaneous Chemicals and Products	19,932	34,186
8. Paint and Organic Residuals	0	0
9. Aqueous Solutions with Organics	59,010	110,004
10. Anion Complexes	1,824	3,305
11. Inorganic Sludges and Residuals	60	60
12. Pesticides and Herbicide Wastes	0	0
13. Halogenated Organic Wastes	15,183	21,586
14. Clean-up Residuals	50,620 ¹	100,745 ¹
15. Acids	376	450
16. Alkali	326	439
17. Wastewaters not elsewhere classified	24,368	28,912

¹Rate in Kg yr.

*These generation rates are consistent with the methodology used in UCID-20209, however, these should be considered approximations only.

Table 3

RADIOACTIVE HAZARDOUS WASTE GENERATION ESTIMATES

Waste Class	Total Estimated Annual Quantity (Liters)	Estimated Annual Quantity to Be Treated (Liters/KG)	Estimated Annual Quantity for Solidification (Liters/KG)	Estimated Annual Quantity to Sewer (Liters/KG)	Estimated Annual Quantity with Unknown Disposition (Liters/KG)
Unknown	2,072	200	0	0	1,872
1	7	0	7	0	0
2	1,048	0	648	0	200
3	5,591	0	4,842	0	749
4	12,880	8,272	1,342/242	0	3,272
5	4,755	200	2,872	0	1,683
6a	42,285	34,870	808	5,586	1,032/18
7	1,822	1,500	114	0	208
8	0	0	0	0	0
9	18	0	18	0	0
10	0	0	0	0	0
11	18,840	1,832/2,028	15,008/8,878	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	842	208	588	0	46
16	2,409	2,389	20	0	0
17	176,888	90,082/4,078	1,025/748	86,055	18,387/178
TOTAL	287,155	138,583/6,101	27,481/10,890	71,640	28,481/184

Table 4

NON-RADIOACTIVE HAZARDOUS WASTE GENERATION ESTIMATES

Waste Class	Total Estimated Annual Quantity (Liters)	Estimated Annual Quantity to Be Treated (Liters)	Estimated Annual Quantity for Solidification (Liters)	Estimated Annual Quantity to Sewer (Liters)	Estimated Annual Quantity to 8812 (Liters)	Estimated Annual Quantity with Unknown Disposition (Liters)
1	0	0	0	0	0	0
2	7,182	3,786	0	0	0	3,407
3	0	0	0	0	0	0
4	885	0	18	768	0	208
5	0	0	0	0	0	0
6a	178,821	158,836	0	4,301	0	14,885
7	120,428	0	0	71,528	0	48,900
8	0	0	0	0	0	0
9	800	0	0	800	0	0
10	208	0	0	0	0	208
11	200	0	200	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	9,461	57	84	0	285	8,035
16	0	0	0	0	0	0
17	118,748	8,637	4	71,182	0	38,923
TOTAL	437,861	172,314	307	148,379	285	118,388

Table 5
ANNUAL PRODUCTION OF WASTE URANIUM CHIPS AT LLNL

Year	Quantity (kg)
1981	1485
1982	980
1983	430
1984	106
1985	161
1986	134

The estimated capital cost for the burn pan facility is \$175K. The total amortized capital plus operating cost can be estimated at ~\$50K/yr. Assuming a steady state production of ~150 kg/yr, the unit processing cost would be:

$$\frac{50,000 \text{ $/yr}}{150 \text{ kg/yr}} = \$334/\text{kg}$$

Discussions with knowledgeable personnel of Rocky Flats and the Oak Ridge Y-12 facilities indicate that a burn pan for the scale of operation that LLNL anticipates would not be cost effective. It might be reasonable to explore possible alternatives.

3.4 Incinerator

In addition to the discussion on the incinerator presented in Section 2, there is some question on the design requirements and costs for the proposed rotary-kiln incinerator for the DWTF. These are reviewed in the concurrent CE study.

4. SUMMARY AND RECOMMENDATIONS

Our review and assessment of the proposed DWTf was necessarily limited by the available time and funding. Accordingly, there were some areas that were not investigated (e.g., design basis for liquid treatment facilities, required support facilities, etc.). Some items, such as the volumetric design basis, deserve further in-depth exploration, particularly to assess the affect of a concerted waste minimization program. From our assessment, the following recommendations are offered:

- 4.1 The prospect for offsite shipment of certain LLNL-generated radioactive and hazardous wastes for processing at INEL should be vigorously pursued. As discussed in this report, there are several clear advantages to this procedure, not the least of which is significant cost savings. Initial inquiry as to the required steps for implementing this procedure have already begun. Permission to proceed has been granted by DOE officials at both SAN and IDO. Suggested further steps for implementing the procedure include:
 - 4.1.1 Hold a meeting between LLNL and INEL officials to plan operational details and plan for potential problems that could arise.
 - 4.1.2 Contact a commercial waste transportation company (e.g., U.S. Ecology) to plan for the waste shipment.
 - 4.1.3 Implement a process for waste collection and management of the low level radioactive waste for shipment in the trial run. Attachment 1 provides the INEL waste acceptance criteria that must be met for the shipped waste.
 - 4.1.4 Develop a plan and schedule for the trial run.

- 4.1.5 Initiate a process for assessment of other LLNL waste streams that might be amenable to processing at INEL. Some waste streams worth consideration include: combustible liquid wastes, trans-uranic wastes, and combustible hazardous (organic) wastes.
- 4.2 LLNL is strongly encouraged to establish definitive standards and guidelines for decontamination of contaminated items. At a minimum, this guidance should specify when decontamination can be considered cost effective and when it isn't.
- 4.3 LLNL should implement a system for directly charging decontamination costs to these programs requesting the service. It is likely that such a system could significantly reduce the required scale of decontamination operations.
- 4.4 Methods for volumetric minimization of radioactive and hazardous waste streams should be vigorously pursued. We suggest that a system for charging waste treatment and disposal expenses directly to programs utilizing these services be implemented as an important incentive toward overall waste minimization.
- 4.5 The requirement for the burn pan operation should be reconsidered. The possibility for having the uranium chip oxidation performed at other DOE facilities (e.g., Rocky Flats, Oak Ridge) should be investigated.
- 4.6 Elimination or downscaling of proposed DWTF laundry and laboratory operations (as discussed in our October 6, 1986 report) should be seriously considered.
- 4.7 Implementation of the previous recommendations could result in significantly reduced costs for the DWTF. It may not be too late to reconsider this overall impact and rethink the DWTF design requirements with this goal in mind.

REFERENCES

- [1] Cohen, J.J., "DWTF Assessment," letter report to R. Alire, Lawrence Livermore National Laboratory, October 6, 1986.
- [2] "Strategic Alternatives for Management of Mixed Waste at DOE Facilities," Department of Energy Workshop, Salt Lake City, UT, December 1986.
- [3] Coops, M., Lawrence Livermore National Laboratory private communication, 1986.
- [4] Heckman, R., "Waste Minimization," presentation at Lawrence Livermore National Laboratory, February 27, 1987.

February 6, 1987

Richard M. Alire
Lawrence Livermore National Laboratory
P.O. Box 808
Livermore, CA 94550

Re: Trip Report: Visit to INEL and Discussions with EG&G-Idaho
and DOE-Idaho Operations Office

Dear Dick:

On January 28 and 29, I visited the Idaho National Engineering Laboratory (INEL), EG&G-Idaho offices in Idaho Falls, and the DOE-Idaho Operations Office. During the tour of INEL, I had the opportunity to inspect the Radioactive Waste Management Complex (RWMC) and the incinerator at the Waste Experimental Reduction Facility (WERF). These operations were quite impressive and well run.

The purpose of the trip was to explore the feasibility for utilizing the WERF incinerator and perhaps other RWMC facilities for processing waste generated at LLNL. During the visit, I held discussions with the following EG&G-Idaho personnel: Milo Larson (Manager, Waste Engineering Development), John McFee, John Logan, and Bob Brown of RWMC operations. I also discussed the proposition with James Solecki (Chief, Fuel Processing and Waste Management Division) and Robert Steins (Chief, Waste Management Branch) of the DOE Idaho Operations Office. From these discussions, I received the following information and impressions:

1. The concept of processing LLNL waste at INEL facilities appears to be viewed very positively, if not enthusiastically, by all the people with whom I talked.

2. The concept would fit in well with DOE's ideas on regional facilities for waste processing and disposal.
3. Having received the request for a trial run procedure from DOE-San, Jim Solecki said that before DOE-IDO could give permission, he would need to receive approval from DOE headquarters and from State of Idaho authorities. No problems are anticipated from DOE-HQ. The State of Idaho's response is difficult to predict, but he seemed confident that it would pose no serious obstacle.
4. Everyone there seemed to be more interested in the "big picture" regarding future possibilities (i.e., is the "trial run" a "one-shot deal," or could they expect a continuing program?). I suggested that this might best be determined at a later time, after the results of the trial run are reviewed.
5. The WERF incinerator has not, as yet, received an EPA permit for processing toxic waste. However, they are confident one will be received in the very near future.
6. EG&G-Idaho is confident that ashes produced from combustion of LLNL waste can be disposed of at the RWMC and will not require shipment to NTS. However, they are not certain of this.

At this point, I am convinced that there will be no problem of a technical nature that could preclude the processing of LLNL waste at INEL. Of course, the procedure would require compliance with INEL Low-Level Radioactive Waste Acceptance Criteria (DOE/ID-10112, Rev. 2), but I foresee no difficulties in this regard.

Any problems that might arise would most likely be in the administrative or political areas. For this reason, the "trial run" appears to be a good

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idea. I would advise that as the plans progress, it would be important to keep DOE officials at SAN and IDO informed. I also think it would be helpful if a meeting were held between responsible LLNL and EG&G officials to discuss plans and details. From all my investigations and discussions to date, I firmly believe that implementation of a program for processing LLNL waste at INEL could result in significant cost savings. It could also provide certain advantages in health and safety considering the relatively remote location of the INEL site.

Sincerely,

Jerry J. Cohen

JJC/ps

Lawrence Livermore National Laboratory

January 6, 1987

F. Fong
 U.S. Department of Energy
 San Francisco Operations Office
 1333 Broadway
 Oakland, California 94612

Dear Mr. Fong:

Subject: Possible Process of Certain LLNL
 Radioactive/Hazardous Wastes at LLNL

Over the past few months we have held informal discussions with EG&G waste management personnel at Idaho National Engineering Laboratory (INEL) (Dean Cullen and Milo Larson). These discussions indicate that incineration of some LLNL wastes at INEL would be feasible from an operational standpoint provided that all administrative and regulatory requirements are met. We propose to determine the practicality of this option by making a small trial shipment to INEL. As a first step, a small shipment of combustible low-level radioactive waste would be sent to INEL and burned at the Waste Experimental Reduction Facility (WERF) incinerator. This evaluation exercise would be carried out in conformance with all pertinent regulations, and be authorized by DOE/INEL staff. The stabilized ash obtained from this exercise would be disposed of either at the Nevada Test Site in accordance with existing procedures or, if appropriate, directly at the INEL Radioactive Waste Management Complex (RWMC).

For several years, LLNL has been evaluating methods for improving our ability to manage safely and effectively, radioactive and hazardous wastes generated by our research operations. As part of this effort, our waste management procedures have been subjected to detailed assessment with particular attention toward compliance with existing laws and regulations. As a result, improvements in our waste treatment facilities have been proposed. We are also investigating possible off-site options for the safe and cost-effective management of our wastes.

One option that appears to be currently feasible is incineration of combustible radioactive and hazardous wastes at the INEL. The INEL has adequate staff and extensive facilities currently available for processing radioactive and hazardous wastes. These include the RWMC, WERF, and the Stored Waste Examination Pilot Plant (SWEPP) and Process Experimental Pilot Plant (PREPP) facilities for incineration and certification of transuranic waste. The option of processing LLNL wastes at INEL provides significant advantages for interim processing of those LLNL wastes where a long lead time would be required for implementing suitable on-site treatment facilities at LLNL or where the scale of generation of a particular waste product could not justify installation of on-site waste treatment facilities. The utilization of off-site treatment would also be advantageous in the event of unplanned LLNL facility outages or where local regulatory constraints would preclude on-site treatment.

Completion of the first step will permit assessment of administrative and technical issues involved in shipment off-site for treatment at INEL. If the processing of waste at INEL proves feasible, we would then look at radioactive/hazardous wastes that may be suited for treatment at INEL. Some possible options are:

1. Continued incineration of low-level radioactive combustible wastes until such time as a suitable incinerator is completed at LLNL
2. Incineration of toxic combustible liquid wastes
3. Volume reduction of metallic wastes
4. Processing and certification of LLNL-TRU wastes (at the SWEPP and PREPP facilities) for WIPP disposal.

We request your assistance in obtaining approval of appropriate Department of Energy authorities at the SAN and IDO Operations Offices. Specifically, a request to IDO for permission to conduct phase one is required. We will provide any information that might be needed, and work with appropriate personnel at INEL to insure compliance with all requirements. We have retained Science Applications International Corporation (SAIC) to provide regulatory guidance in this regard. If you have any questions that require additional information, please contact R.M. Alire at 422-8168, Mel Coops at 422-6657, or Jerry J. Cohen of SAIC at 462-5300.

R. M. Alire
Associate Division Leader

RMA:mm:m0567

January 20, 1987

Filbert Fong
Defense Programs Division
Department of Energy
1333 Broadway
Oakland, CA 94612

Re: Proposed processing of LLNL wastes at INEL: Supplementary Information

Dear Fil:

This letter is intended to furnish the supplementary information you requested regarding the proposed "trial run" shipment of LLNL waste to INEL for processing pursuant to Dick Alire's letter of January 6, 1987.

As Dick suggested in his letter, the trial run would consist of a small shipment of combustible low-level radioactive waste (containing no toxics as defined by RCRA). Specifically, we would plan a shipment of about 2000 ft³ (~60 m³) of combustible waste consisting mostly of papers, rags, and non-halogenated plastics. This waste would be carefully screened to assure the absence of metals, glass, or other non-combustible materials. The packaging of this waste could be inspected by EG&G personnel to assure compliance with acceptance criteria for wastes to be processed at the INEL-WERF incinerator.

The packaging and shipment of the waste would be in accordance with DOT regulations and INEL Low-Level Radioactive Waste Acceptance Criteria for WERF (DOE/ID-10112, Rev. 2 - Feb. 1986). Following discussions with EG&G personnel (Dean Hallan, Milo Larsen, and Bob Brown) it appears that the best procedure would be to pack the waste in 2'x2'x2' corrugated cardboard boxes with a polyethylene bag inner container. These boxes would, in turn, be placed in steel containers (~8'x8'x8' "transportainers") for

shipment by truck. The steel containers could then be returned to LLNL for possible reuse. The size of the transportainers is dictated by the ability to conveniently move them with a forklift truck.

At this time, it would be difficult to characterize the radioactive contents of the waste with precision. However, the waste would come within the DOT definition of low specific activity (LSA) material, would contain no transuranic radionuclides, and the major radioactive components would likely be Tritium and Carbon-14. Other radionuclides may also be present, but in concentrations well below LSA limits.

It should be emphasized that the plans as discussed in this letter are of a preliminary nature. It is intended to provide a general idea of what is planned. Subsequent discussions might reveal additional requirements and/or indicate alterations in plans. We would, of course, keep all appropriate parties informed of what's happening and would be responsive to any recommendations that could contribute to the safety and effectiveness of the operation. Your assistance is appreciated.

Sincerely,

Jerry J. Cohen

JJC/ps

cc: R. Alire

United States Government

Department of Energy

memorandum

DATE: January 26, 1987
REPLY TO:
ATTN OF: San Francisco Operations Office (DP)
SUBJECT: LLNL Low Level Radioactive Waste Study

TO: James E. Solecki, Director, Fuel Processing and Waste Operations Division, ID

The Lawrence Livermore National Laboratory (LLNL), a DOE/SAN contractor, requested appropriate approvals to conduct feasible studies on the operational aspects of processing their low level radioactive waste to the Idaho National Engineering Laboratory (INEL) for incineration at your Waste Experimental Reduction Facility (WERF). We request your approval before we will authorize LLNL to proceed with this study.

The radioactive waste form will be low specific activity (LSA) radioactive materials with no transuranics. The radionuclides will probably be H-3 and C-14. The waste material will be combustible, such as rags, papers and non-halogenated plastics. The estimated volume is expected to be 2000 cubic feet. The feasibility studies will involve the following operations:

- package in accordance with INEL Low Level Radioactive WAC for WERE and DOT Rules and Regulations. EGG/ID personnel will be invited to observe the packaging.

- transport the containers to INEL via common truck carrier

- process at WERE the waste to ash

- dispose the stabilized ash at INEL or at the Nevada Test Site

I have attached for your information the January 6, 1987 LLNL letter of request to SAN and the January 20, 1987 information backup letter from the Science Applications International Corporation (SAIC). I understand that Mr. Jerry Cohen, SAIC, will be at Idaho Falls between January 26 and 30, and might call on you in this matter for information exchange. We have no objections to this type of communication, when kept at an informal level.

Please let me know if I can provide anymore input for your evaluation. My phone number is FTS 536-7836.

Filbert T. Fong
Manager, Nuclear Material Programs

attachments

cc(w/o attachments):

R. M. Alire, LLNL

~~James E. Solecki, ID~~

3015 Hopyard Road, Suite K
Pleasanton, CA 94566

B-S

Appendix C

RISK ASSESSMENT FOR PROCESSING LLNL-LLW AT INEL vs. ON-SITE PROCESSING AT LLNL

To evaluate the relative risk of processing LLW at INEL vs. on-site processing at LLNL, a scenario involving the incineration of combustible LLW (as would be the case in the "trial run") is analyzed. To perform the analysis, certain simplifying assumptions are made. In such analysis, there can be wide uncertainties. Nonetheless, for comparative purposes, the analysis can give a reasonable approximation of relative expected risk values.

For purposes of analysis, the expected collective (population) dose (person-rem) is determined. In waste incineration, the effects of tritium release are considered to be of overriding importance since it will be essentially 100% released in the processing. The average concentration of H-3 in waste is assumed to be 20 mCi/m^3 [for a DOE research laboratory (as per DOE/LLW-40T)]. Assuming 500 m^3 of combustible LLW are produced annually at LLNL, a total of $\sim 10 \text{ ci/yr}$ of H-3 will be released to the atmosphere by the waste incineration. This would be the case whether the waste were incinerated at LLNL or at INEL.

To calculate the relative consequences assume:

- o Wind is in the direction of the maximum population density (Figures C-1 and C-2 give population distributions for both LLNL and INEL).
- o Meteorological conditions are relatively stable (as in the LLNL-EIR, SCH-85112611, Table B-5)².

Tables C-1 and C-2 summarize the assumed meteorological and population parameters for LLNL and INEL, respectively.

Figure C-1. Estimated population distribution (in thousands) within 80 km of LLNL and SNL (1975 population data projected to 1980).

C-3

Table C-1
ASSUMED METEOROLOGY AND POPULATION FOR LLNL

Range (km)	X/Q (sec/m ³)	Population (x 10 ³)	P x X/Q (person-sec/m ³)
1-10	1 x 10 ⁻⁵	26	2.6 x 10 ⁻¹
10-20	8 x 10 ⁻⁷	262	2.1 x 10 ⁻¹
20-50	7 x 10 ⁻⁸	437	3.1 x 10 ⁻²
50-80	1 x 10 ⁻⁸	443	<u>4.4 x 10⁻³</u>
		TOTAL	5.1 x 10 ⁻¹

Table C-2
ASSUMED METEOROLOGY AND POPULATION FOR INEL

Range (km)	X/Q (sec/m ³)	Population (x 10 ³)	P x X/Q (person-sec/m ³)
1-10	1 x 10 ⁻³	0.1	1.0 x 10 ⁻⁶
10-20	8 x 10 ⁻⁷	0.3	2.4 x 10 ⁻⁷
20-50	7 x 10 ⁻⁸	1.6	1.1 x 10 ⁻⁸
50-80	1 x 10 ⁻⁸	43	<u>4.4 x 10⁻⁷</u>
		TOTAL	1.7 x 10 ⁻⁶

Using data from ICRP-30 (see reference C-1), the dose conversion factor for exposure to HTO is $3 \times 10^{-2} \frac{\text{rem} \cdot \text{m}^3}{\text{ci} \cdot \text{sec}}$.

The estimated annual collective dose, assuming incineration at the LLNL site, would therefore be:

$$10\text{Ci/yr} \times 5.1 \times 10^{-1} \frac{\text{person} \cdot \text{sec}}{\text{m}^3} \times 3 \times 10^{-2} \frac{\text{rem} \cdot \text{m}^3}{\text{Ci} \cdot \text{sec}} = 0.15 \text{ person} \cdot \text{rem/yr.}$$

Incineration of the same waste at INEL would result in:

$$10\text{Ci/yr} \times 1.7 \times 10^{-6} \frac{\text{person} \cdot \text{sec}}{\text{m}^3} \times 3 \times 10^{-2} \frac{\text{rem} \cdot \text{m}^3}{\text{Ci} \cdot \text{sec}} = 5.1 \times 10^{-7} \frac{\text{person} \cdot \text{rem}}{\text{yr.}}$$

Although the collective dose from incineration at INEL is about five orders of magnitude lower than that at LLNL (reflecting the far lower population density at INEL), even the higher consequences at LLNL should be of little concern in an absolute sense.

However, the lower dose consequences at INEL might be offset by an increased risk from transporting the waste to Idaho for processing. To estimate the transportation consequences, the "unit factor" approach (see reference C-3) is applied. The unit factor for a truck shipment of LLW (general trash from a BWR) is 1.9×10^{-6} person-rem/km for a typical shipment (NUREG/CR-2325). Assuming a distance of 1500 km from LLNL to INEL:

$$\frac{500 \text{ m}^3/\text{yr.}}{60 \text{ m}^3/\text{shipment}} \times 1500 \text{ km/shipment} \times 1.9 \times 10^{-6} \text{ person} \cdot \text{rem/km} \\ = 0.024 \text{ person} \cdot \text{rem/yr.}$$

The calculational results are summarized in Table C-3. From this analysis, it would appear that incineration of combustible LLNL low level radioactive waste at INEL would result in a lower radiological risk than onsite incineration at the LLNL site, even considering the risk of transporting the waste.

Table C-3

RADIOLOGICAL (COLLECTIVE DOSE) CONSEQUENCES
OF PROCESSING LLNL-LLW AT LLNL VS. INEL

Source	Collective Dose (Person-Rem/yr)	
	at LLNL	at INEL
Airborne Effluent from Incineration	0.15	5.1×10^{-7}
Transportation Accidents	0.00	0.024
TOTAL	0.15	0.024

REFERENCES

1. "Draft Environmental Impact Report for -- Lawrence Livermore National Laboratory" SCH-85112611, University of California, Dec. 22, 1986
2. "Environmental and Other Evaluations of Alternatives for Long-Term Management of Stored INEL Radioactive Waste" DOE/ET-0081, Feb. 1979
3. McClure, J.D., "A Methodology for Estimating the Risk of Transporting Low-Level Radioactive Waste in the US," Waste Management '82, University of Arizona, 1982.

Residents: Reject lab waste permit

By Vincent Kiernan
Staff writer

LIVERMORE — A group of Livermore residents wants the state to reject a hazardous waste permit for the Lawrence Livermore National Laboratory, and they cite state reports as evidence the lab can't handle wastes properly.

But a lab spokesman said that the problems in a Nov. 9, 1984, inspection have been corrected and that only paperwork violations have been detected in subsequent inspections.

A report of that inspection by the state Department of Health Services, released by the opponents Thursday, said that a storage area at the lab's southeastern corner then held 1,000 drums of hazardous waste, including 250 drums for which no one knew what was inside.

"Serious leaks were observed in some drums. Swollen drum was observed," according to the report by inspector Andrew Hicks.

Hicks also reported that the hazardous waste area lacked numerous berms, or barriers designed to trap chemical leaks, including berms to block mixing of "incompatibles" — dangerous combinations of chemicals.

Hicks also reported that in the drum storage area there was a trailer in which chemicals were stored. "The door was opened, and I felt a burning in my throat," he wrote.

Lab spokesman Jon Rosell said the report does not reflect the current situation at the lab. "Everything in that report has long since been corrected," he said.

The health department inspected the lab in 1985, and the U.S. Environmental Protection Agency inspected the lab in 1986, Rosell said. No written reports have yet been filed on those inspections, but inspectors told lab officials that only recordkeeping violations were detected, Rosell said.

A health department spokeswoman said she was not immediately familiar with details of the lab inspections.

The Livermore residents also released an undated health department report citing ground water pollution near the lab as evidence that "there is an imminent and substantial endangerment to public health and the environment from contami-

nants from LLNL."

Lab officials believe the contamination stems from chemicals dumped when the property was used as a Naval Air Station.

The documents were released by a group calling itself Tri Valley CAREs, which obtained them from the health department. East Avenue resident Maryliia Kelley said the group is composed of about 10 area residents.

Kelley said she was shocked by the report.

"These are not minor violations," she said. "They don't even know what's in the drums."

"Why were things so bad in 1984? Anyone knows how to label a drum. Anyone knows not to put incompatibles together."

She said the lab has been simply lucky not to have had a major disaster with the toxics. "It's more dumb luck than any great technological thing they've done," she said.

The nuclear weapons laboratory already has temporary state permission to operate its hazardous waste treatment facility.

It has applied for permanent permission, and the health department will hold a public hearing on the application at 7:30 p.m. Wednesday at Rancho Las Positas School, 401 Las Positas Blvd.

An Oct. 26 hearing on the application drew five private citizens. After complaints that the hearing had been poorly publicized with only a small newspaper advertisement six weeks earlier, the health department scheduled a second hearing.

A copy of the lab's 11-volume permit application is available to the public in the reference section of the Livermore Public Library, 1000 S. Livermore Ave.

The hazardous waste treatment facility chemically treats hazardous waste to make them less hazardous.

The permit also would cover a complex of yards and buildings for storage of drums of waste. Lab officials say the drums are stored for as long as two months before being trucked elsewhere for disposal.

D-1

Appendix D

QUESTION: Who said, "There is an imminent and substantial endangerment to public health" from the lab?

ANSWER: Dwight Hoening, Chief N.C.C.S., Toxic Substances Control Division, State of California Department of Health Services (D.H.S.)

Is our water being contaminated by LLNL? For some of us, the answer is already yes. Livermore's groundwater, from which one-third of our water need is met, has been polluted by the lab.

Is our air being contaminated by LLNL? By the lab's own admission, numerous radioactive and toxic accidents have occurred on site. Airborne cancer causing materials have been released into the atmosphere.

Is the ground we live on being contaminated by LLNL? Again, yes. There are many documented cases of soil contamination by the lab. Also, the 1984 state inspection found--among other violations--250 unlabeled drums of hazardous waste (in some cases leaking or bulging) out in the open on asphalt, a substance particularly permeable for toxics.

Have you been concerned about pollution coming from LLNL? There are things we can do to protect our health and the health of our families.

EVENT: A Public Hearing conducted by the state Dept. of Health Services

SUBJECT: The storage and treatment of toxic wastes at LLNL

WHEN: Wed. , January 23th at 7:30 p.m.

WHERE: Rancho Las Positas School, located at 401 Las Positas Blvd. (just off Murrieta) Livermore, Ca..

ATTEND...BRING A FRIEND OR NEIGHBOR...YOUR PRESENCE IS IMPORTANT

Currently, the state does not plan to regulate mixed (radioactive plus toxic) waste. These are extremely hazardous. The state has the court given authority to regulate all toxics, should they choose to accept that responsibility. We believe it is imperative that mixed wastes be included in the permit the state is considering.

Currently, the state is not planning to conduct an Environmental Impact Report. We think an independent and objective E.I.R. is a necessary step in evaluating hazards from the lab, before a permit is issued.

Currently, there is no public documentation by which we, the public, can judge whether the permit, as proposed, will safeguard us and our families from gross mismanagement, accidents, leaks, or malfeasance. It is our responsibility to make sure this permit process improves our safety and does not serve merely to legitimize hazardous operations that put our health and environment at risk on a daily basis.