LA-UR-15-28645, Ver. 2
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Data Analysis for NEPA Supplement Analysis of Chemistry and Metallurgy Research Building Replacement Project at LANL—16017

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ABSTRACT

The Department of Energy/National Nuclear Security Administration (DOE/NNSA) is proposing to provide analytical chemistry (AC) and materials characterization (MC) capabilities at the Los Alamos National Laboratory (LANL) by using a combination of existing space in two existing buildings: The Radiological Laboratory/Utility/Office Building (RLUOB) and the Plutonium Facility, Building 4 (PF-4) in TA-55. This represents a change from decisions made by DOE as informed by previous National Environmental Policy Act (NEPA) analyses.

In accordance with Council on Environmental Quality and DOE requirements, NNSA prepared a Supplement Analysis to evaluate the potential environmental impacts of the proposed action. The focus of this analysis is on determining whether the proposal to provide AC and MC laboratory capabilities in existing space in RLUOB and PF-4 rather than building a new nuclear facility is a substantial change that is relevant to environmental concerns or whether new circumstance or information relevant to environmental concerns and bearing on the proposed action or its impacts are significant. The determination of the analysis is that the existing Chemistry and Metallurgy Research Building Replacement Environmental Impact Statement (CMRR EIS) need not be supplemented, nor is a new EIS required, because “the proposed changes do not represent a substantial change that is relevant to environmental concerns.”[1 p.49] No further NEPA analysis is necessary.

This report describes the analysis used to create data needed for the Supplement Analysis. Los Alamos subject matter experts estimated equipment lists, facility modifications, waste quantities, labor needs and radiological doses. Los Alamos NEPA experts assisted in compiling existing data from the LANL Site-Wide EIS and CMRR EIS for public and other impacts. Bounding conditions were used to determine NEPA estimates.

INTRODUCTION

The Department of Energy/National Nuclear Security Administration (DOE/NNSA) is proposing to provide analytical chemistry (AC) and materials characterization (MC) capabilities at the Los Alamos National Laboratory (LANL) by using a combination of existing space in two existing buildings: The Radiological Laboratory/Utility/Office Building (RLUOB) and the Plutonium Facility, Building 4 (PF-4) in TA-55. This

represents a change from decisions made by DOE as informed by previous National Environmental Policy Act (NEPA) analyses.

In accordance with Council on Environmental Quality (CEQ) and DOE requirements, NNSA is preparing a Supplement Analysis (SA) to evaluate the potential environmental impacts of the proposed action. The focus of this analysis is on determining whether the proposal to provide AC and MC laboratory capabilities in existing space in RLUOB and PF-4 rather than building a new nuclear facility (NF) is a substantial change that is relevant to environmental concerns or whether new circumstance or information relevant to environmental concerns and bearing on the proposed action or its impacts are significant. The end result of the analysis is a determination whether the existing Chemistry and Metallurgy Research Building Replacement Environmental Impact Statement (CMRR EIS) should be supplemented, a new EIS should be prepared, or no further NEPA analysis is necessary.

This report provides data for incorporation into the Supplement Analysis being written by Leidos, Inc. under contract to NNSA. Responding to the data call requires several areas of expertise. Los Alamos subject matter experts estimate equipments lists, facility modifications, waste quantities, labor needs and radiological doses. Los Alamos NEPA experts assist Leidos in compiling existing data from the LANL Site-Wide Environmental Impact Statement (SWEIS) and CMRR EIS for public and other impacts. Bounding conditions are used to determine NEPA estimates.

CONSTRUCTION AND MODIFICATION AT PF-4 AND RLUOB

Description of Modifications to PF-4 and RLUOB

Modifications to PF-4 and RLUOB will occur to add required capabilities to PF-4 and RLUOB for analytical chemistry (AC) and materials characterization (MC). For NEPA bounding purposes, between PF-4 and RLUOB there will be up to 55 enclosures slated for decontamination and disposal (D&D), installation of up to 124 new enclosures, and modification of up to 30 ventilated enclosures. These numbers add D&D of drop boxes to the enclosures listed in the conceptual layout, plus a ten percent factor. For new and ventilated enclosures, a factor of 10 percent is applied to the conceptual numbers. For all waste except enclosures, the methodology used below begins with the conceptual input and adds NEPA bounding to final estimated values. These numbers provide adequate NEPA bounding. Enclosure waste is based on the 55 enclosure number from above.

Site Infrastructure Improvement (SII) consists of three parts: 1) Site Preparation Activities, 2) RLUOB Infrastructure Modification (RIM), and 3) TA-55 and PF-4 Facility Alignment. Site Preparation Activities actions include:

1. Construction support office space for approximately 150 personnel (see Figure 1);
2. Craft support trailers near each work site for logistical support (to minimize workforce transition delays); and

Fig. 1. Location of selected SII subprojects.

3. Construction support warehouse of about 1670 to 1860 m^2 (18,000 to 20,000 square feet) and staging areas (both inside and outside the TA-55 Protected Area).[2 p.1] See Figure 2.

RIM (supports RLUOB Equipment Installation Phase-2, REI2) includes:

1. Reconfigure security boundary on the lab floor to facilitate construction activities.
2. Reconfigure the radiological boundary and isolate the potential contaminated systems to facilitate REI2 construction.
3. Open the existing RLUOB tunnel stub to provide construction access.
4. Provide construction staging and craft work-stations.[2 p.2]
5. Replacement of existing liquid argon tank is yet to be decided.

Figure 1 shows an overview of locations for these sub-projects.

TA-55 and PF-4 Facility Alignment (supports PF-4 Equipment Installation, PEI) includes:

1. Convert existing office space inside PF-3 to provide a small construction crew support area near the PF-4.
2. Increase shower and locker space to reflect increased demand for mandatory onsite showering requirements, following construction worker activity in a radiologically contaminated area (e.g., decontamination and decommissioning).

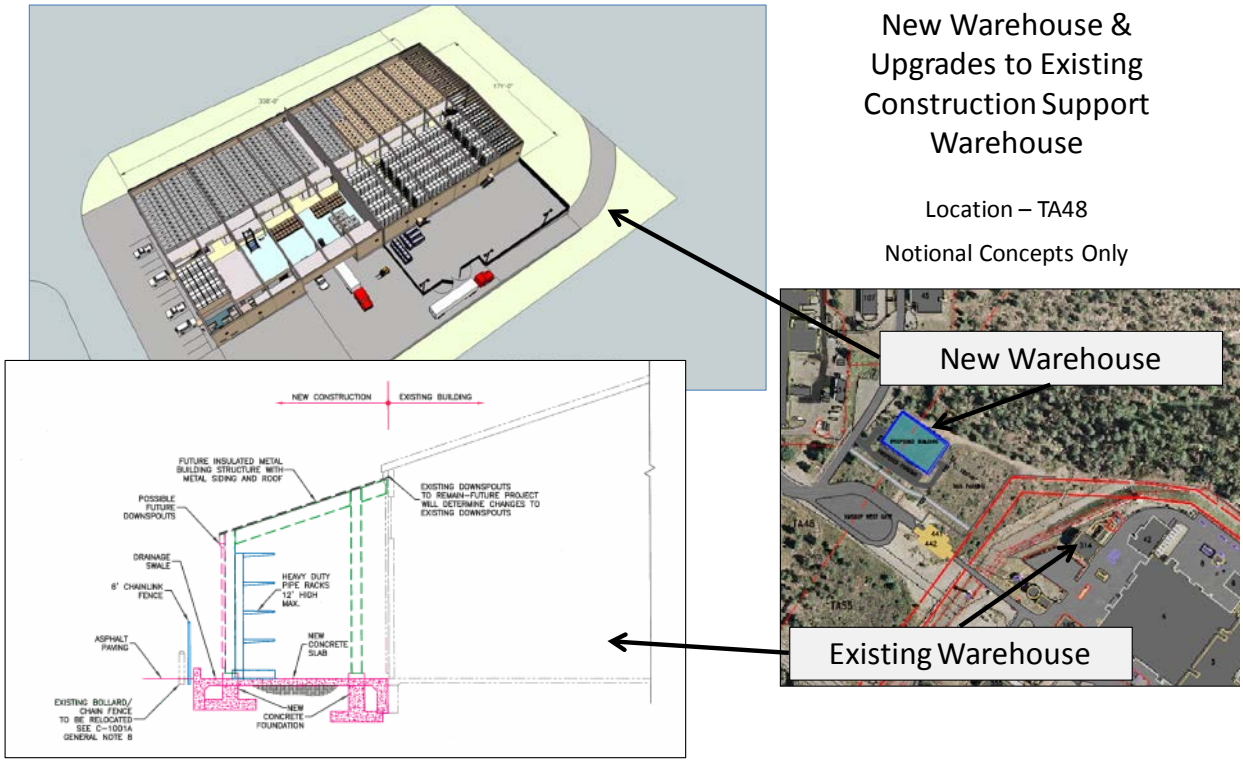

Fig. 2. Locations of selected warehouse subprojects. The new warehouse would be about 1670 to 1960 m^2 (18,000 to 20,000 ft^2).

3. Reconfigure PF-4 security post to improve access/egress from the main laboratory Material Access Area boundary.[2 p.2]

Construction Time Horizon

Baseline project schedules have yet to be defined. To provide NEPA conservatism, construction for PEI and Site Infrastructure Improvement (SII) is assumed in the analysis below to take place over seven years: FY2015 to FY2021, although the actual construction activities could extend to 2024 or beyond depending on federal funding levels. The construction horizon for REI2 is assumed to be four years: FY2016 to FY2019.

Air-Polluting Equipment Required for Construction

Construction materials and new operational equipment will be delivered by trucks that will have nominal air emissions. Once within the HEPA-protected environment inside PF-4 and RLUOB, electric-powered tools and forklifts will be used, and no

criteria air pollutant emissions will occur. SII subprojects use earth-moving equipment for the tunnel driveway, warehouse construction, and office building.

Impacts to Construction Workers

The construction will be done by a combination of resident TA-55 technicians, LANL crafts and subcontract workers, and technical experts for equipment installation. Security escorts will be required to support construction activities. The count of workers is calculated by project, and excludes current PF-4 and RLUOB workers that would provide ancillary support to the project such as radiological control technicians (RCTs). That is, only workers who are assigned directly to the project are counted. The assumption is that all LANS staff are currently fully obligated on other existing projects, meaning that FTEs for these projects must be considered "new" staff resources to the LANL site.[a] Any subcontract employees are also additions to the LANL site.

Combining the PEI and SII allows an estimate of the number of construction workers over time. The PEI workers are added to the subcontract support resources to create Table I. This table includes PEI contingency of 50 percent for crafts and 25 percent for core team to reflect possible added resources. The confined rooms of PF-4 do not allow additional labor resources to be added indiscriminately. If schedule needs to be recovered, double shifts may have to be used to provide adequate space for additional workers to be effective. Constructing an SII

TABLE I. PF-4 Construction FTEs Over Time

	PF-4 Construction FTEs, by Fiscal Year (FY) {1}							
Type of Project	**FY2015**	**FY2016**	**FY2017**	**FY2018**	**FY2019**	**FY2020**	**FY2021**	**Total**
D&D Gloveboxes	5	12	8			20	20	**65**
Reconfigure Gloveboxes		8	8	19	6			**42**
Install New Gloveboxes				48	38	14	14	**113**
Install New Instruments		3	7	7	10	10		**38**
Other D&D				3	3			**6**
Activity Relocation		3	7	14	10			**34**
Core and Mgt Resources	45	45	45	45	45	45	45	**315**
PEI Contingency {2}	14	25	26	57	45	33	28	**227**
SII--Site Prep Activities {3}	90	90	90					**270**
SII-TA-55 & PF-4 Facility Alignment {4}	75	75	75					**225**
Total	**229**	**261**	**267**	**192**	**156**	**122**	**107**	

{1} Assumes 1720 hours per FTE year.

{2} 50 percent applied to crafts and 25 percent to Core/Mgt.

{3} Office (50) plus warehouse (40); Jeff Schroeder.

{4} Up to 50 crafts and 25 managers for internal PF-4 work.

[a] *Some ten percent of assigned staff may not be fully subscribed elsewhere, but this potential is ignored in the NEPA bounding analysis.*

permanent office building to house 150 people would need up to 12 FTEs on the management team plus subcontractor crafts of about 30 FTEs; this is rounded to 50 FTEs. The SII warehouse of about 20,000 sf would have the same management team plus about two-thirds of the subcontractor crafts; this is rounded to 40 FTEs. SII work inside of PF-4 would have up to 50 crafts and 25 managers. The peak year for PEI and SII is FY2017 with about 270 FTEs.

The number of construction worker FTEs is computed for RLUOB in this section using information from Mike Parkes. Combining the REI2 and RIM activities allows an estimate of the number of construction workers over time. The RLUOB construction workers are added to the core team and management support resources to create Table II. The peak FTE level for REI2 and RIM is about 250 in FY2015.

TABLE II. RLUOB Construction FTEs Over Time

	RLUOB Construction FTEs, by Fiscal Year					
Type of Resource	**FY2015**	**FY2016**	**FY2017**	**FY2018**	**FY2019**	**Total**
REI2 Crafts	128	129	121	121	117	**616**
RIM Crafts	59					**59**
Core and Mgt Resources {1}	61	61	81	81	81	**365**
Total	**248**	**190**	**202**	**202**	**198**	

{1} Assumes 75% of these resources arrive in FY2015 and FY2016, rising to 100% by FY2017.

Source: Mike Parkes, October 6, 2014.

Radiological worker exposure depends on the PF-4 equipment installation list and the clean-out schedules. The number of workers exposed to background radiation in PF-4 during construction is estimated from the crews required during the peak construction year—FY2018. Table I shows that 91 craft FTEs are active on PF-4 projects in that year plus a contingency of 50 percent (46) for a total of 137 FTEs. The NEPA bounding value is 150 workers to be exposed in the maximum year. The peak individual dose to all workers will be maintained at less than two rem per year per Los Alamos administrative mandate.

During D&D projects workers will be removing existing gloveboxes and room equipment. Although there will be contamination, no special nuclear material will be present. Consequently, these activities will provide a dose similar to the background dose for all PF-4 workers. The number of PEI craft labor hours is about 500k hours. Adding contingency of 50 percent (250k) gives a total of 750k of PEI radiological worker hours. Total SII craft worker hours from Table I is up to 50 workers×1720 hrs×3 years=260k hours. SII workers will receive very little radiation exposure, so including their hours adds conservatism to the NEPA estimate. The grand total is

1,010k hours. Total background dose at PF-4 is 0.22 mrem/h (0.17 mrem/h neutron plus 0.05 mrem/h photon). Natural dose is 0.03 mrem/h. So total person rem is 1,010k hours times 0.25 mrem/h equals 252,500 mrem, or 253 person rem associated with all PEI and SII construction projects. Dividing by the seven year construction horizon gives 36 rem/y for worker population dose. Average individual dose is calculated by dividing 36 rem/y by the 141 (91+50) craft FTEs used to calculate the total dose, which is then rounded to one significant digit: 300 mrem/y.

RLUOB construction activities for REI2 will not have significant worker exposure. After the systems are installed and tested there will be two final “hot” connections per lab module, where new clean lines are tied-in to existing radiological lines. This will require removing the existing end piece and installing a small piece of duct and a small piece of pipe. The likelihood is these facility utilities will not be “hot” due to the amount of materials present in RLUOB, but for NEPA we consider them as such. Other than this scenario, the workers should not be exposed to any significant external ionizing radiation under existing REI2 scope.

Calendar year 2012 average dose for TA-55 workers who have dosimetry badges (including those with zero doses) was 72 mrem, whereas non-TA-55 workers at LANL had an average dose of 5 mrem. Workers on the glovebox line at TA-54 in the LANL Transuranic Program-Oversized Container Disposition (LTP-OCD) group had the following doses in 2013.

Total individuals monitored: 73; individuals with measurable dose: 29.

Extremity	Shallow	LOE {1}	Deep	Neutron	CED {2}	TED {3}	Total Worker Avg.	Avg. Measurable Dose
16,916	2,438	2,207	1,975	63	1	2,039	28	70

Note: Doses listed are in millirem (mrem)
{1} Lens of Eye
{2} Committed Effective Dose
{3} Total Effective Dose

As a comparison, the annual DOE Occupation Radiation Exposure Report for 2012 shows the collective total of all LANL workers with measurable (i.e., non-zero) radiation dose was 140 person-rem. Dividing by 1,438 workers with measurable dose gives an average measurable dose of 97 millirem.[3 p.3-10]

Construction Waste

The most important factor for waste estimating is the amount and type of D&D that will occur, which is in turn dependent on re-purposing existing areas. Wastes are mainly associated with the D&D of 39 existing boxes. Installing new boxes or modifying old ones does not create significant waste (generally just room trash and small metal pieces), and is ignored here.

Table III shows the total construction waste by type and disposal path. To gain a buffer for NEPA bounding purposes, the totals for all waste except enclosures were

doubled. The number of gloveboxes is based on the NEPA-bounded value of 55, which is computed by adding all drop boxes to the glovebox number, then adding a ten-percent factor. The drop boxes are not lead-lined, and are treated as LLW.

TABLE III. NEPA-Bounding Total Construction Waste for PF-4

Waste Type	Total Waste (ft3)	Total Waste (m3)	Container Type	Container Capacity (ft3)	Number of Containers {1}	External Radiation (mrem/hr	Transport Vehicle & Packaging	Waste Destination {2}
LLW	3,520	100	B-25	96	46	Limit: 200; actual <0.4 {3}	Flat bed Truck	NNSS or commercial TSD
LLW (GBs, DBs)	1,425	40	Custom	1 glovebox or dropbox	19		Flat bed Truck	NNSS or commercial TSD
MLLW (D&D)	32	0.9	55 gal drum	7.4	6	Limit: 200 {3}	Box Truck	NNSS or commercial TSD
MLLW (GBs)	5,400	153	Custom, Type-A	1 glovebox	36	Limit: 200 {3}	Flat bed Truck	NNSS or commercial TSD
TRU	2,800	79	SWB	40	88	Limit: 200 {3}	TRUPACT II	Temporary storage, then WIPP
Haz/Chem	-	-						Commercial TSD, various locations
Non Haz	-	-						
Liquid	-	-						TA-50, RLWTF

{1} Assume 80 percent packaging efficiency for packages (B-25, drum, or SWB). Each glovebox custom-packed individually.

{2} Definitions: Nevada National Security Site (NNSS); Treatment, Storage Disposal site (TSD); Waste Isolation Pilot Plant (WIPP); Radioactive Liquid Waste Treatment Facility (RLWTF).

{3} The regulatory limit is 200 mr/hr at any point on the external surface of the package, per Code of Federal Regulations Title 49, Part 173.441, "Radiation level limitations and exclusive use provisions." Actual value is very low, e.g., about 0.4 mr/hr for LLW.

In general, Nevada National Security Site (NNSS) is the primary location for disposal of LANL LLW and MLLW; WCS (Texas) and Energy Solutions (Clive, Utah) are other options. All LLW is assumed to be packaged into B-25 (2.7 m^3) containers. At LANL, almost never is the container weight-limited. A packaging efficiency of 80 percent is assumed by volume to determine the number of B-25s needed. The LLW destination is assumed to be NNSS, shipped via flat-bed trucks.

All MLLW, except for lead-lined gloveboxes, is packaged in drums. Because the waste from D&D will be bulky and oddly-shaped, Table III includes six drums of MLLW. The destination is a commercial permitted Treatment, Storage, Disposal (TSD) site at a location yet to be determined, shipped via box truck. LANL typically ships MLLW to facilities in Washington, Tennessee, Utah, Florida, Texas, and Nevada.

All TRU waste is assumed to be packaged into standard waste boxes (SWBs), with an allowable volume of 1.1 m^3 (40 ft^3) with maximum payload of 1.8 MT (4,000

lbs). A packaging efficiency of 80 percent is assumed, and the destination is the Waste Isolation Pilot Plant (WIPP), via TRUPACT II and WIPP trucks.

All gloveboxes will be shipped in specially procured Type A shipping containers fabricated to dimensions specific to each glovebox, so size is not an issue. The containers are shipped to NNSS via flat-bed trucks.

Transport vehicle capacities are as follows. WIPP trucks can haul three TRUPACT IIs per load. All LLW and MLLW destined for NNSS will be via flatbed truck with perhaps five of the custom glovebox containers per load. The commercial TSD facility will use a truck operated by an off-site contractor.

All construction waste at RLUOB will be non-radiological with the exception of the final radiological hook-ups ("hot tie-ins") to complete the projects. There will be about eleven tie-ins which will create some material waste plus PPE gear. A total of about 3 m^2 of LLW is expected. Non-radiological construction debris will be typified by wooden crates and boxes, metal pipe pieces, etc. Because RLUOB is a LEED building, all waste will be segregated for recycling and disposal.

Only one RIM activity has significant construction debris: opening the RLUOB tunnel stub. All volumes in the following description are doubled for NEPA bounding. The tunnel connection requires a 40 m long, 7.5 cm thick asphalt driveway to meet the existing RLUOB tunnel about ten feet under current grade. Excavation of material will be up to 2450 m^3. A retaining wall on both sides of the driveway will be built. Demolition to cut out part of the existing tunnel wall will be needed to place a door; this creates up to 27 MT of concrete debris. A grating and sump pit for water collection will be located at the lowest point in the driveway. Lighting and a canopy will be included. Backfill and other aggregate material will be about 3200 m^3. Transport of 900 m^3 of concrete and asphalt waste for recycling along with municipal waste will take up to 65 round trips (doubled for NEPA) to the Los Alamos Waste Facility.

Other Construction Impacts

Site Infrastructure Improvement (SII) activities important to this SA are described here. Site Preparation Activities includes the provision of office space for 150 people, which may involve a permanent building or temporary trailers. The latter will not have significant construction waste because the trailers will be placed on previously disturbed land where trailers existed in the recent past. A permanent office building will have similar impacts to office buildings considered in previous NEPA documents. Placement of craft support trailers will occur on previously disturbed land that in many cases has already been used for this purpose. There is insignificant impact for this. A new warehouse will have impacts similar to other warehouses proposed in the past. It is proposed to be built in an industrial area with disturbed land at TA-48. Adding space to building TA-55-0314 will create some construction waste.

RIM will require six Conex storage containers for LANS equipment, six Conex containers for subcontractor use, three office trailers, one gang bathroom trailer, one storage trailer, and one break room trailer. Parking will be provided for company and government vehicles only; private vehicles will use the TA-55 lot on the south side of Pajarito Road. All of these temporary structures will be places on disturbed land with minimal environmental impact.

The TA-55 and PF-4 Facility Alignment project will not have significant construction impacts because all tasks occur inside existing buildings.

OPERATIONS

Based on the CMRR EIS, the estimated emissions from a new CMRR facility were as follows.

- Actinides (modeled as Pu-239): 7.6E-4 Ci
- Fission Products
  Kr-85: 100 Ci
  Xe-131m: 45 Ci
  Xe-133: 1,500 Ci
- Tritium: 1,000 Ci

For PF-4 there is no impact to current overall emissions due to AC/MC activities. A majority of MC and some AC activities already take place in PF-4. The amount of nuclear materials used by AC activities is minimal compared to the rest of PF-4 activities. Currently most of materials going to the existing CMR facility originate from PF-4. In PF-4, no new tritium capabilities are planned as part of CMRR PEI project, and any tritium associated with MC/AC activities will be well within the existing PF-4 limit. Fission products will have no emissions impacts for PF-4.

In RLUOB only small amounts of tritium-contaminated samples (not pure tritium) will be handled. RLUOB is approved for implementation of SD G 1027 with a limit of 38.6 grams of Pu-239 equivalent, with an annual throughput cap at three kilograms of Pu239-equivalent. The CMRR AC and MC activities will work within this analysis.

REFERENCES

1. Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico, Supplement Analysis, DOE/EIS-0350-SA-2, January 2015. http://energy.gov/sites/prod/files/2015/02/f19/EIS-0350-SA-02-2015.pdf.
2. “CMRR Project: CD-1 Reaffirmation for the REI2 and PEI Subprojects at Los Alamos National Laboratory; Site Infrastructure Improvement Plan,” UCNI, CMRR-PLAN-0105, R0, July 1, 2014.
3. “DOE 2012 Occupational Radiation Exposure Report,” Exhibit 3-14.