EIS

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Subject: Radiochemistry NEPA document

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Kirk, attached is the Radiochemistry Facility NEPA Determination Document updates.

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LA-UR-01-3040

Title: ESH-20 NEPA Determination Document 13
Radiochemistry Facility TA-48

Los Alamos
NATIONAL LABORATORY

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1.0 Introduction

This document describes the *National Environmental Policy Act of 1969* (NEPA) operational envelope for operations, capabilities, and parameters analyzed for The Radiochemistry Facility at TA-48, a key facility in the *Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory* (SWEIS; DOE 1999a). The principal buildings and structures for this key facility are shown in Table 1. The purpose of this document is to determine whether a proposed project for this facility has NEPA coverage in the SWEIS as implemented by the Department of Energy (DOE) in the Record of Decision (ROD) for the SWEIS. As long as The Radiochemistry Facility at TA-48 operates within the bounds of the impacts projected by the SWEIS, the facilities are in compliance with NEPA. If there is potential to exceed projected impacts, further NEPA review would be required.

Table 1. Principal Buildings and Structures of the Radiochemistry Facility at TA-48

Technical Area	Principal Buildings And Structures
TA-48	Radiochemistry Laboratory: 48-1 Machine and Fabrication Shop : 48-8 Diagnostic Instrumentation and Development Building: 48-28 Advanced Radiochemical Diagnostics Building: 48-45 Analytical Chemistry Facility: 48-107

Under the Laboratory Implementation Requirement (LIR) entitled "NEPA, Cultural Resources, and Biological Resources (NCB) Process," (LANL 2000a) proposed projects are screened by the authorized facility NCB reviewer as part of the NCB assessment. The screening requires the facility NCB reviewer to decide

- if the project is new or modified from a previous determination and
- if DOE has already made a determination that covers the proposed project.

The Facility NCB Reviewer uses the Facility NEPA Determination Document (LANL 2000b) for screening. Table 2 summarizes the capabilities, and the operations examples for the capabilities, that were published in the SWEIS to estimate the impacts. If the facility NCB reviewer finds that the proposed activity is one of the capabilities in the SWEIS and is within one of the operations examples for that capability as shown by Table 2, the reviewer could determine that the proposed activity is covered by the SWEIS and does not require further NEPA analysis.

However, a proposal that does not match a capability description in Table 2 or that is not included with one of the operations examples for that capability in Table 2 could still be covered by the SWEIS. The SWEIS analysis is based on information in background documents prepared for each of the key facilities; these background documents provide more detailed descriptions of the ongoing and potential operations for each key facility. In addition, the levels of activity called the "operations examples" for each of the capabilities reflects scenarios that were developed for each capability to provide an estimate for calculating potential impacts. The SWEIS was not intended to set stringent limits on the level of activity for a particular capability. In most facilities the operations examples for every capability would not be reached at one time because of the ebb-and-flow-like nature of the work at LANL. Thus it would be possible to exceed the operations examples for one capability and still be within the parameter limits for the facility or the LANL operations limit. If the proposal reviewer can demonstrate this, the proposal would still have NEPA coverage through the SWEIS. This document presents the procedure for a more detailed review and supporting information from the SWEIS and background documents.

Table 2. The Radiochemistry Facility at TA-48[a]

Capability	Operational Examples
1. Radionuclide Transport Studies	1.1 Actinide transport, sorption, and bacterial interaction studies. 1.2 Development of models for evaluation of groundwater. 1.3 Assessment of performance or risk of release for radionuclide sources at proposed waste disposal sites.
2. Environmental Remediation Support	2.1 Background contamination characterization pilot studies. 2.2 Performance assessments, soil remediation research and development, and field support.
3. Ultra Low-Level Measurements	3.1 Chemical isotope separation and mass spectrometry.
4. Nuclear/Radiochemistry	4.1 Radiochemical operations involving quantities of alpha-, beta-, and gamma-emitting radionuclides for nonweapons and weapons work.
5. Isotope Production	5.1 Target preparation. 5.2 High-level beta/gamma chemistry and target processing to recover isotopes for medical and industrial application.
6. Actinide/Transuranic Chemistry	6.1 Radiochemical operations involving significant quantities of alpha-emitting radionuclides.
7. Data Analysis	7.1 Re-examination of archive data and measurement of nuclear parameters of interest to weapons radiochemists.
8. Inorganic Chemistry	8.1 Synthesis, catalysis, actinide chemistry: • Chemical synthesis of new organo-metallic complexes • Structural and reactivity analysis, organic product analysis, and reactivity and mechanistic studies • Synthesis of new ligands for radiopharmaceuticals 8.2 Environmental technology development: • Ligand design and synthesis for selective extraction of metals • Soil washing • Membrane separator development • Ultrafiltration
9. Structural Analysis	9.1 Synthesis and structural analysis of actinide complexes at current levels. 9.2 X-ray diffraction analysis of powders and single crystals at current levels.
10. Sample Counting	10.1 Measurement of the quantity of radioactivity in samples using alpha-, beta-, and gamma-ray counting systems.

a: Source: Modified from SWEIS 1998 Yearbook (LANL 1999).

2.0 Procedure

A proposed project can be screened by the Facility NCB reviewer or ESH-20 reviewer to determine if it is included in the descriptions in Table 2. Under that procedure, if a proposal does not clearly fit those descriptions of capabilities and operations examples, it will be referred to ESH-20 for review under this procedure, which requires more familiarity with SWEIS supporting documentation and projected additive impacts of other proposed work at LANL. The ESH-20 reviewer will use the data on The Radiochemistry Facility at TA-48 facilities and capabilities from the SWEIS document and the background documentation. The supporting documentation on The Radiochemistry Facility at TA-48 facilities and capabilities is presented in Sections 3 and 4 below.

A flow chart that summarizes the procedure for the ESH-20 reviewer to use in screening a proposal is presented in Attachment 1. Upon receiving a proposal, the reviewer should answer the following:

1. Is this a new capability? Review the detailed descriptions of The Radiochemistry Facility at TA-48 facilities and capabilities from the SWEIS (Section 3 of this document) and from the background documents (Section 4 of this document).
   a. If this is a new capability, go to 4.
   b. If this is not a new capability, go to 2.
2. Does the proposal fit within one of the operations levels for that capability in the SWEIS? Compare description to second column of Table 2.
   a. If the proposal is within the operations levels for that capability, go to 5.
   b. If the proposal is not within the operations examples, go to 3.
3. Is the proposal within the facility operations data envelope? Work with the facility manager and other Environment, Safety, and Health subject matter experts (SMEs) to calculate if the proposal is within the envelope of facility operations data (Table 3).
   a. If the proposal is within the facility operations data envelope, go to 5.
   b. If the proposal is not within the facility operations data envelope, go to 4.
4. ESH-20 will prepare a NERF to complete the NEPA process.
5. Proposal is covered by the SWEIS. Attach explanation/calculations to NCB Screening Checklist (Attachment 2) to complete the NEPA process.

Table 3 Radiochemistry Facility Operations Data

Parameter	Units [a]	SWEIS ROD
Radioactive Air Emissions:		
• Mixed Fission Products	Ci/yr	1.4×10^{-4}
• Plutonium-239	Ci/yr	1.1×10^{-5}
• Uranium-234	Ci/yr	Not Projected [c]
• Uranium-235	Ci/yr	4.4×10^{-7}
• Mixed Activation Products	Ci/yr	3.1×10^{-6}
• Arsenic-72	Ci/yr	1.1×10^{-4}
• Arsenic-73	Ci/yr	1.9×10^{-4}
• Arsenic-74	Ci/yr	4.0×10^{-5}
• Beryllium-7	Ci/yr	1.5×10^{-5}
• Bromine-77	Ci/yr	8.5×10^{-4}
• Germanium-68	Ci/yr	1.7×10^{-5}
• Gallium-68	Ci/yr	1.7×10^{-5}
• Rubidium-86	Ci/yr	2.8×10^{-7}
• Selenium-75	Ci/yr	3.4×10^{-4}
•		

Table 3 cont.

Wastes:		
• Chemical	kg/yr	3300
• Low-level waste	m^3/yr	60
• Mixed low-level waste	m^3/yr	1
	m^3/yr	1

• TRU waste[d] • Mixed transuranic waste[d]	m^3/yr	0

a: Ci/yr = curies per year; MGY = million gallons per year.
b: NPDES is National Pollutant Discharge Elimination System.
c: The SWEIS ROD did not contain projections for this radioisotope.
d: TRU waste was projected to be returned to the generating facility.

3.0 SWEIS Data for the Radiochemistry Facility at TA-48

This section provides information directly from the SWEIS. Section 3.1 is a description of the Radiochemistry Facility from Chapter 2 of the SWEIS. Section 3.2 is a description of the capabilities at the time the SWEIS was written, while Section 3.3 is a description of the capabilities under the preferred alternative as selected under the Record of Decision.

3.1 SWEIS Description of Radiochemistry Facility at TA-48 Facilities

The Radiochemistry Facility at TA-48 was constructed from 1955 through 1957. The entire TA covers 116 acres (47 hectares), but the main buildings are enclosed behind an inactive security fence on 8.6 acres (3.5 hectares) (Figure 1). TA-48 contains five research buildings: Diagnostic Instrumentation and Development Building (48-28), the Clean Chemistry/Mass Spectrometry (48-45), the Weapons Analytical Chemistry Facility (48-107), the Machine and Fabrication Shop (48-8), and the Radiochemistry Laboratory (48-1The Radiochemistry Facility is a research facility that fills three roles. Research supports environmental management projects (e.g., Yucca Mountain Project, plutonium stabilization), catalysis, basic energy, and other scientific endeavors. Chemistry research is performed in the areas of inorganic, actinide, organometallic, environmental, geochemistry and nuclear chemistry. The Radiochemistry Facility is also a production facility, using the hot cell in Building 48-01 to separate and package radioisotopes needed and used by researchers, physicians, hospitals, and pharmaceutical companies all over the world. In a typical year, the LANL isotopes program makes more than 150 shipments of up to 30 different isotopes, some of which are available only from LANL. In addition, the facility provides services to other LANL organizations (e.g., samples are analyzed at TA-48 as part of the environmental surveillance program).

Building 48-01 is a low-hazard Category Radiological nuclear facility, 48-8, 28, 45, and 107 are non-nuclear low hazard chemical research facilities. Forty-one other structures are classified as no hazard, including trailers, transportable buildings, metal storage sheds, office buildings, and storage facilities. The 48-01Radiochemistry Laboratory is a single-story building with a basement and a penthouse. With slightly more than 100,000 square feet (9,300 square meters) of floor space, Building (stet) is divided into several wings for differing types of research:

- Laboratory wings for light chemical analysis and research
- A hot cell for the separation, packaging, and shipment of radioisotopes to medical facilities, research institutions, and pharmaceutical firms
- An alpha wing for research with plutonium and other alpha-emitting radionuclides
- A counting wing, which houses detectors and equipment for the assay of radioactive samples. There is also an office wing and a secure wing for historical weapons data. Most radiochemical research is conducted on the main floor, although a few laboratories are located in the basement. The basement also houses utilities, support systems, and

ventilation exhaust fans and ductwork. Ventilation intake fans and heating and cooling units are located in the penthouse.

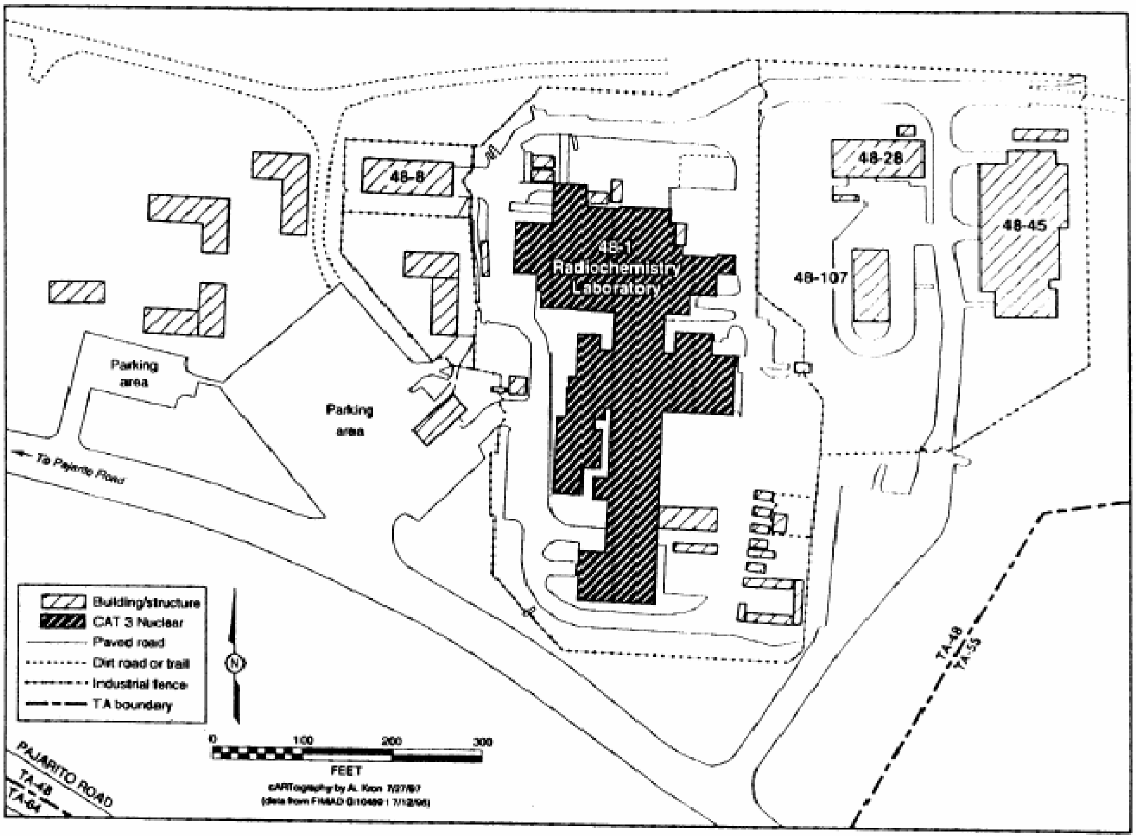


Figure 1. Location of the Radiochemistry Facility at TA-48

Three exhaust stacks at Building 48–01 are continuously sampled for radioactive emissions in accordance with requirements of the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP): FE–7 (hot cell), FE–54 (the alpha wing), and FE–60 (hot cell dilution bench).

The Machine and Fabrication Shop is the former Isotope Separator Facility (48–08), which has been converted into a machine shop that works with non-radioactive materials only. The isotope separators have been dismantled and are in the process of being salvaged. Building 48–28 has two laboratories; one houses five laser systems and two mass spectrometers used for environmental research experiments, and the other is used to analyze radioactive water samples.

The Clean Chemistry/Mass Spectrometry Building (48–45) contains 11 chemistry and 7 instrument laboratories. These laboratories are clean rooms designed to minimize the effect of environmental factors on the accuracy of isotope measurements for experiments in solar physics, geosciences, biology, and atmospheric science.

TheWeapons Analytical Chemistry Facility (48-107) contains four light chemistry laboratories and a laser laboratory and is used to support environmental research, catalysis research, and inorganic chemistry.

3.2 SWEIS Description of Radiographic Facility Capabilities (Baseline)

There are several services and capabilities available at TA-48: radionuclide transport studies, environmental restoration support, ultra-low-level measurements, nuclear and radiochemistry, high-level beta/gamma chemistry, actinide TRU chemistry, data analysis, inorganic chemistry, structural analysis, and sample counting. Each of these is described below. The manner in which these activities would change under the expanded operations alternative, which was selected in the SWEIS ROD, is described in Section 3.3.

3.2.1 Radionuclide Transport

Numerous chemical and geochemical investigations are undertaken that address concerns about hydrologic flow and transport of radionuclides. Areas of study include the sorption (binding) of actinides, fission products, and activation products in minerals and rocks, and the solubility and speciation of actinides in various chemical environments (e.g., environments associated with waste disposal). These studies are paired with the development of models to evaluate, for example, the parameters for performance assessment of mined geologic disposal systems.

3.2.2 Environmental Remediation

Environmental remediation capabilities at TA-48 fall into two categories: characterization and remediation of soils contaminated with radionuclides and toxic metals; and data analysis and integrated site-wide assessment. In characterizing and remediating soils contaminated with radionuclides and toxic metals, a major objective is to minimize the generation of large volumes of metal- and radionuclide-contaminated soils. The objective of data analysis and integrated side-wide assessment is to accelerate remediation through improved sampling schemes, clearer and more efficient evaluation of characterization data, and more effective tools for assigning priority to cleanup targets.

3.2.3 Ultra-Low-Level Measurements

Isotopic tracers and high-sensitivity measurement technologies were developed to support the U.S. nuclear weapons program. These technologies have been adapted to provide analyses for bioassay monitoring, attribution, and non-proliferation activities. For example, these efforts allow determination of whether radiation in an environmental sample results from contamination from a nearby nuclear reactor or from radioactive fallout from global weapons testing. LANL researchers can also trace the migration of radioactive contamination through the environment.

Mass spectrometers detect and analyze samples as small as one-thousandth of one-billionth of a gram (atto-Curie levels). Chemical separation procedures to isolate the element to be measured are conducted in a chemistry laboratory specially designed to keep the sample from being contaminated by natural or man-made sources. This technique can determine both the source and the amount of radioactive contamination.

3.2.4 Nuclear/Radiochemistry

Activities under this capability include developing radiation detectors, conducting radiochemical separations, and performing nuclear chemistry. Development, calibration, and use of radiation detectors include the use of off-the-shelf systems for routine measurement of radioactivity and development of new radiation detection systems for a number of special applications. LANL conducts both routine and special separations of radioactive materials from other radioactive species and stable impurities. These experiments have provided support to Hanford waste tank treatment activities and production of medical isotopes. Separations are based on traditional approaches that use commercially available ion-exchange media, extractants, and other reagents. LANL also develops new separations based on experimental chemical systems, using radioactive tracers to synthesize the chemicals and to characterize their performance.

Nuclear chemistry efforts use exotic laser-based atom traps for probing the interactions of energy and atoms in energy regimes not easily accessed by other techniques. This work requires conducting extensive laser spectroscopy, handling of radioactive materials, and interpreting the resulting data. In other nuclear chemistry efforts, targets are irradiated and isotopes are captured at or at off-site reactors to produce specific radioactive isotopes. These isotopes are then separated from impurities, and their neutron capture cross sections are measured at TA-48.

3.2.5 Isotope Production

This capability produces, chemically separates, and distributes isotopes to the medical and industrial user communities. TA-48 activities include preparing the target packages that will be irradiated to make isotopes, transporting these packages to the LANSCE accelerator, inserting them into the proton beam, retrieving them from the beam, and transporting them back to TA-48. Once the target packages arrive back at TA-48, they are disassembled and the target material is moved to a chemistry hot cell for processing to recover the desired isotopes. Post-irradiation activities associated with these targets must be carried out using remote handling techniques. Separated isotopes are packaged for shipment and are distributed to customers throughout the world.

3.2.6 Actinide/Transuranic Chemistry

The activities in the alpha wing are essentially the same as the radiochemical separations carried out in the rest of the facility. The materials handled are actinides and transuranics (elements with an atomic weight greater than that of uranium [92] that require the special safe-handling environment provided in this wing.

3.2.7 Data Analysis

Data analysis is the process of taking information learned from all of the measurements made on a material and putting it into the context of the experimental design. This process is a paper exercise that turns data into useful information that will help answer experimenters' questions.

3.2.8 Inorganic Chemistry

Inorganic chemistry work at TA-48 includes two main categories of activities: (1) synthesis, catalysis, and actinide chemistry and (2) development of environmental technology. The former category includes chemical synthesis of new organometallic complexes, structural and reactivity analysis, organic product analysis, reactivity and mechanistic studies, and synthesis of new ligands for radiopharmaceuticals. Development of environmental technology includes designing and synthesizing ligands for selective extraction of metals, soil washing, development of membrane separators, photochemical processing, and ultrafiltration. Other work involves oxidation reduction studies on uranium and other metals for both environmental restoration and advanced processing.

3.2.9 Structural Analysis

Structural analysis at TA-48 includes the synthesis, structural analysis, and x-ray diffraction analysis of actinide complexes in both single-crystal and powder form. This capability supports programs in basic energy sciences, materials characterization, stockpile stewardship, and environmental management.

3.2.10 Sample Counting

Sample counting, the measurement of the quantity of radioactivity present in a sample, is accomplished with a variety of radiation detectors, each customized to the type of radiation being counted and the expected levels of radioactivity. All samples counted in the counting facility are sealed items that are placed inside appropriate detectors for a specified period of time. At the end of the count, the data are automatically processed through the computer system and results are presented to the users. Other activities in the counting room include system calibration, quality checks on system performance, and corrective action when problems occur.

3.3 SWEIS Description of The Radiochemistry Facility at TA-48 Capabilities (Preferred Alternative)

The following is the description of activities under the expanded operations (preferred) alternative, which was adopted in the ROD for the SWEIS (DOE1999b). Because much of the work here is research and development, one indicator of activity levels is employment. The No Action Alternative would be expected to utilize about 170 full-time equivalent employees (FTEs). As an indicator of overall activity levels, these expanded operations would be expected to require about 250 FTEs.

3.3.1 Radionuclide Transport

LANL would conduct 80 to 160 of these studies annually.

3.3.2 Environmental Remediation

Environmental remediation activities would approximately double the No Action Alternative level of operations.

3.3.3 Ultra-Low-Level Measurements

These activities would be at approximately double the No Action Alternative level.

3.3.4 Nuclear/Radiochemistry

These operations would be slightly more than the No Action Alternative levels.

3.3.5 Isotope Production

LANL would conduct target preparation, irradiation, and processing to recover medical and industrial application isotopes at a level approximately double that of the No Action Alternative.

3.3.6 Actinide/Transuranic Chemistry

LANL would also perform radiochemical separations at approximately twice the No Action Alternative level of operations.

3.3.7 Data Analysis

LANL would reexamine archive data and measure nuclear process parameters of interest to weapons radiochemists at approximately twice the No Action Alternative level.

3.3.8 Inorganic Chemistry

LANL would conduct synthesis, catalysis, and actinide chemistry activities at a level approximately 50 percent higher than that of the No Action Alternative.

3.3.9 Structural Analysis

LANL would perform these activities at approximately twice the No Action Alternative level of operation.

3.3.10 Sample Counting

LANL's sample counting activity would be the same as the No Action Alternative.

4.0 Background Document Information for The Radiochemistry Facility at TA-48

This section presents information from the "Background Information for The Radiochemistry Facility at TA-48 for the Site-Wide Environmental Impact Statement for Los Alamos National Laboratory" (LANL 1996).

Los Alamos National Laboratory's Radiochemistry Site (TA-48) is a research and development facility, which was established and constructed between 1955 and 1957. It is located 1.1 miles from the TA-3 Administration Building on an unnamed access road (part of the original Pajarito Road) just off Pajarito Road and immediately northeast of TA-55. The entire technical area covers 115.9 acres, and the main buildings are enclosed behind a security fence on 8.59 acres.

TA-48 contains Building RC-1, which is currently classified as a radiological facility four smaller laboratory buildings classified as low-hazard chemicalnon-nuclear; and 26 other structures classified as no hazard, including trailers, transportable buildings, metal sheds, office buildings, and storage facilities.

The C Division Leader is the Responsible Division Leader (RDL) for Building RC-1 and the other low hazard chemical facilities at TA-48. Radiation protection, industrial safety, and environmental management and associated monitoring support are provided by HSR/ENV Division through personnel assigned to C-OPS. Facility Management Division (FMD) provides maintenance services and engineering support to the site.

4.1 Background Document Description of Facilities

4.1.1 Building RC-1

The majority of TA-48's radiochemistry R&D operations, medical radioisotope production, development of waste management technologies, and counting room operations take place in this building. The building is divided into an office wing, light chemistry laboratories for performing low-level radiochemistry, a hot-cell complex to produce medical radioisotopes, an alpha wing used for processing alpha-emitting radioactive and toxic materials, and a counting room complex. There is also a secure data wing with a classified computer and vault containing historical weapons data.

Building RC-1 is currently classified as a radiological facility. Activities at building RC-1 include: small-scale radiochemistry in the laboratories area, chemical research of high alpha activity materials in the alpha facility, final analysis of samples in the counting room, and small-scale production of medical radioisotopes in the hot cells area.

This building is a single-story structure with a basement. The exterior walls are constructed of various materials including masonry, stucco, block, and metal siding. The roof is a flat built-up design. Most radiochemical operations are conducted on the main floor. The basement is used for limited radiochemical activities, chemical storage, and facility utilities and support systems.

Utilities include electricity, water, radioactive liquid waste lines, sanitary sewer lines, and natural gas. A fire suppression system is provided to all areas of the facility, except for the Hot Cells Area and computer rooms. The building fire alarm system is connected to the Laboratory Emergency Operations Center.

Compressor systems supply air for laboratory processes and instrumentation. The main components of the ventilation system date from the original construction of the building. Additional dedicated systems are provided for the hot cells and dissolution areas. Exhaust fans are located in the basement and exhaust through roof stacks. The alpha facility and hot cells areas are ventilated by a HEPA-filter system. A redundant exhaust system is provided for the hot cell area.

The dissolution area houses a high activity chemistry area. These activities involve the largest amounts of beta-gamma radioactivity outside of the hot cell area. A majority of the debris analyzed at TA-48 is transported in Department of Transportation (DOT) type B containers. Since the nuclear testing moratorium, activities in this area primarily consist of high activity chemistry research.

The laboratory area at RC-1 performs small-scale radiochemistry that supports the medical radioisotopes program. A vacuum system is provided in this area for counting equipment, fixed-head air monitors, and drying processes. Other laboratory space is used for research in inorganic chemistry, actinide chemistry, organometalic chemistry, environmental chemistry, and geochemistry.

The Alpha Facility occupies the northeast portion of RC-1. It consists of several rooms designated as controlled areas, housing those activities involving the largest amounts of alpha radioactivity, and other offices and ancillary areas.

The counting rooms are in the east end of the building. This area contains a mix of low-level detectors and counting systems for quantitatively evaluating radioactive samples from the various weapons, medical, and environmental programs. The counting systems measure radioactive emissions of alpha, beta, gamma, and x-rays and also function as fission detectors.

The hot cells area is used for small-scale production of selected radioisotopes for various medical and research purposes. Target materials that have been irradiated to produce desired radionuclides are required to be processed in a series of interconnected and highly shielded hot cells. Hot cell activities can involve both radioactive and toxic materials. Toxic materials are present in such small quantities that they present little or no concern for explosive accidents. Quantities of radioactive materials are substantially larger; however, the hot cells feature substantial shielding and various safety systems and alarms that together mitigate the potential for accidents.

4.1.2 Machine and Fabrication Shop (Building RC-8)

Operations in this facility are limited to machining and fabrication activities for non-radioactive materials. The isotope separators and associated equipment have been dismantled and are in the process of being salvaged. 4.1.3 Diagnostic Instrumentation and Development (Building RC-28)

The Diagnostic Instrumentation and Development Facility contains two laboratories. One lab houses five laser systems and two mass spectrometers used for environmental research experiments. The other lab is used for processing water samples from locations where radioactive contamination is present.

4.1.4 Clean Chemistry and Mass Spectrometry (Building RC-45)

The Clean Chemistry and Mass Spectrometry Facility contains eleven chemistry and seven instrument laboratories. These laboratories are Class 100 clean-room areas designed to minimize the effect of environmental factors on the accuracy of isotope ratio measurements. The wide range of operations at this facility include isotope ratio measurements from experiments in solar physics, geosciences, biology, and atmospheric science.

4.1.5 Weapons Analytical Facility (Building RC-107)

The Analytical Facility contains four light chemistry laboratories and a laser laboratory. Operations in this facility support environmental research programs, catalysis research, and inorganic chemistry.

4.2 Discussion of Missions/Programs Under the No Action and *Expanded Operations* Alternatives & Discussion of Operational Capabilities as They Support Programs

TA-48 supports Los Alamos National Laboratory's mission through capabilities covering a wide range of R&D operations in nuclear and radiochemistry. Specific TA-48 capabilities include radionuclide transport research, environmental remediation research, nuclear/radiochemistry (low to moderate levels), high level beta and gamma chemistry, actinide TRU chemistry, data analysis, inorganic chemistry, structural analysis, ultra low-level measurement, and sample counting (alpha, beta, and gamma).

Operations at TA-48 provide ongoing (including this baseline year) analytical radiochemical research and development support to all five of the Laboratory's major program categories; weapons/defense, energy research, environmental science and waste technology, Laboratory directed research and development, and industrial (non DOE/DoD efforts). Because TA-48 is not the "owner" of these programs, but rather supports many changing programs for the entire Laboratory, detailed program descriptions are not included in this discussion of the site's operational capabilities.

Because TA-48 is a research and development facility, it is difficult to project what an alternative (*expanded operations*) case would look like, except to say that the same activities would continue at an expanded level. Under the expanded case, the level of activity would increase up to the capacity of the space where the activity takes place. These levels are most easily quantified using the number of workers dedicated to a particular capability, or FTE (full time equivalent). The following text described capabilities at the No Action level. Table 4 provides an overview of the research and development capabilities at TA-48 under the Expanded Operations Alternative.

Table 4. Comparison of No-Action and Expanded Operations Capabilities for Radiochemistry Facility at TA-48

Capability	No Action	Expanded Case
Radionuclide Transport	Actinide transport, sorption, and bacterial interaction studies, development of models for evolution of groundwater, assessment of performance or risk of release for radionuclide sources at proposed waste-disposal sites 45-80 studies/year (36 FTEs)	Increased level of operations 80-160 studies/year (28-34 FTEs)
Environmental Remediation	Background contamination characterization pilot studies, performance assessments, soil remediation R&D, field support (10 FTEs)	Increased level of operations (14 FTEs)
Nuclear/Radio Chemistry, low to moderate levels	Radiochemical operations involving quantities of alpha and beta/gamma emitting radionuclides (35	Increased level of operations (44 FTEs)
High Level Beta/Gamma Chemistry (Hot Cell)	Target preparation, irradiation, and processing for recovery of medical and industrial application isotopes (11 FTEs)	Increased level of operations 2 X product (15 FTEs)
Actinide TRU Chemistry (a Wing)	Radiochemical operations involving significant quantities of alpha emitting radionuclides (14 FTEs)	Increased level of operations (20 FTEs)
Data Analysis (weapons)	Re-examination of archive data and measurement of nuclear process parameters of interest to weapons radiochemists (6 FTEs)	Increased level of operations (10 FTEs)

Inorganic Chemistry	Synthesis, catalysis, and actinide chemistry: chemical synthesis of new Organo-metallic complexes, structural and reactivity analysis, organic product analysis, reactivity and mechanistic studies, synthesis of new ligands for radiopharmaceuticals. Environmental technology development: Ligand design and synthesis for selective extraction of metals, soil washing, membrane separator development, ultra-filtration. (35 FTEs)	Increased level of operations (49 FTEs)
Structural Analysis	Synthesis and structural analysis of actinide complexes, x-ray diffraction analysis: single crystal and powder (7 FTEs)	Increased level of operations (22 FTEs)
Ultra Low Level Measurement (Clean Room)	Mass spectrometry, chemical separation 20 FTEs (C-INC,	Increased level of operations 30 FTEs (C_INC)
Sample Counting a, b, g	Measuring the quantity of radioactivity in samples prepared for analysis using alpha, beta, and gamma ray counting systems, 6 FTEs	Increased level of operations 8 FTEs C-INC

4.2.1 Radionuclide Transport

C-INC personnel participate in numerous chemical and geochemical investigations that address concerns about hydrologic flow and transport of radionuclides. One area of study is sorption of actinides, fission products, and activation products in minerals and rocks. These studies are needed to understand fundamental sorption processes, which will reduce uncertainties in assessment of performance (release or risk) for numerous radionuclide sources at the Laboratory and elsewhere.

Studies of the transport of chlorine-36 in geologic media (i.e., tuff) are directed at clarifying models of flow and transport in unsaturated, fractured tuff, with significant applicability to concerns about transient fracture flow.

Other studies are directed at understanding the solubility and speciation of specific actinides in a variety of chemical environments appropriate to waste disposal. These activities are paired with development of models for the evolution of groundwater at sites like Yucca Mountain, to refine estimated ranges of critical parameters for performance assessment of Mined Geologic Disposal Systems.

4.2.2 Environmental Remediation

Environmental remediation capabilities fall into two main categories: characterization and remediation of soils contaminated with radionuclides and toxic metals, and data analysis and integrated site-wide assessment.

In characterizing and remediating soils contaminated with radionuclides and toxic metals, a major objective is to minimize the generation of large volumes of metal- and radionuclide-contaminated soils that strain both waste management capacity and budget. Leaching schemes to remove plutonium, americium, uranium, and other radionuclides are under development. Studies of the effect of varying pH and concentrations of complexants define optimal conditions for simultaneous removal of both americium and plutonium.

The objective data analysis and integrated site-wide assessment is to accelerate remediation through reduced sampling schemes, clearer and more efficient evaluation of characterization data, and more effective tools for assigning priority to cleanup targets. Studies for major waste management projects are developing information critical to evaluation of potential risks form transport of contaminants in the environment.

4.2.3 Ultra-Low Level Measurements

The Clean Chemistry and Mass Spectrometry Team in C Division utilizes isotopic tracers and high-sensitivity measurement technologies that have been developed in support of the United States nuclear weapons program. The isotopic tracers can include both radioactive and nonradioactive isotopes with the emphasis on the nonradioactive. Some are commercially available and some can be produced at Los Alamos on state-of-the-art isotope separators. The Los Alamos team specializes in developing analytical techniques for a variety of problems in nuclear, environmental, and biological sciences.

The Clean Chemistry and Mass Spectrometry Laboratory has wet chemistry laboratories for sample preparation as well as instrument laboratories containing several mass spectrometers for the analysis of specific elements. 4.2.4Nuclear/Radiochemistry

CST-11 nuclear and radiochemistry activities include developing radiation detectors, conducting radiochemical separations, and performing nuclear chemistry.

Development, calibration, and use of radiation detectors include the use of off-the-shelf systems for routine measurement of radioactivity and development of new radiation detection systems for a number of specialty applications. Routine measurement is typically used for measuring the distribution of radioactivity in samples derived from environmental experiments, production of radionuclides, and experiments associated with the Laboratory's weapons test activities. New detector systems under development include a large volume off gas monitor for real time monitoring of possible alpha particle emissions in flowing gas streams and detectors for a portion of the Sudbury Neutrino Observatory solar neutrino experiments.

C-INC conducts both routine and special separations of radioactive materials from other radioactive species and stable impurities. These experiments support the Hanford waste tank pro-treatment problem, production of medical isotopes, and low-level environmental work. Separations are based on traditional radiochemical separation schemes that utilize commercially available ion exchange media, extractants, and other reagents. The group also develops new separations based on novel experimental chemical systems using radioactive tracers to synthesize the chemicals and to characterize their performance.

Nuclear chemistry efforts utilize exotic laser-based atom traps for probing the interactions of energy and atoms in energy regimes not easily accessed by other techniques. This work requires extensive laser spectroscopy, handling radioactive materials, and interpretation of resulting data. In other nuclear chemistry efforts, targets are irradiated and isotopes are captured at LANSCE or at offsite reactors to produce specific radioactive isotopes. These isotopes are then separated from impurities, and their neutron capture cross sections are measured at TA-48.

4.2.5 High Level Beta/Gamma Chemistry

This capability produces, chemically separates, and distributes isotopes to the medical and industrial user communities. TA-48 activities include preparation of the target packages that will be irradiated to make isotopes, transport of these packages to the LANSCE accelerator, inserting them into the proton beam, retrieving them from the beam, and transporting them back to TA-48. Once the target packages arrive back at TA-48, they are disassembled and the target material is moved to a chemistry hot cell for processing to recover the desired isotopes. Post-irradiation activities associated with these targets must be carried out using remote handling techniques. Separated isotopes are packaged for shipment and distributed to customers worldwide.

4.2.6 Actinide TRU Chemistry

The activities in Alpha wing are essentially the same as the radiochemical separations carried out in the rest of the facility. The materials handled are actinides that require the special safe-handling environment provided in this wing.

4.2.7 Data Analysis

Data analysis is the process of taking information learned from all of the measurements made on a material and putting it into the context of the experimental design. This process is a paper exercise that turns data into useful information that will help to answer experimenters' questions.

4.2.8 Inorganic Chemistry

Inorganic chemistry work at TA-48 includes two main categories of activities: synthesis, catalysis, and actinide chemistry, and development of environmental technology. The former category includes, but is not limited to, chemical synthesis of new organo-metallic complexes, structural and reactivity analysis, organic product analysis, reactivity and mechanistic studies, and synthesis of new ligands for radiopharmaceuticals. Development of environmental technology includes, but is not limited to, ligand design and synthesis for selective extraction of metals, soil washing, membrane separator development, photochemical processing, and ultra-filtration. Other work involves oxidation-reduction studies on uranium and other metals for both environmental remediation and advanced processing.

4.2.9 Structural Analysis

Structural analysis at TA-48 includes the synthesis, structural analysis, and x-ray diffraction analysis of actinide complexes in both single crystal and powder form. This capability supports programs in basic energy sciences, materials characterization, stockpile stewardship, and environmental management.

4.2.10 Sample Counting

Sample counting—the measurement of the quantity of radioactivity present in a sample—is accomplished with a variety of radiation detectors, each customized to the type of radiation being counted and the expected levels of radioactivity. All samples counted in the counting facility are sealed sources that are placed inside appropriate detectors for a specified period of time. At the end of the count, the data is automatically processed through the computer system, and results are presented to the users. Other activities in the counting room include system calibration, quality checks on system performance, and corrective action when problems occur.

5.0 References

DOE 1999a: Department of Energy, “Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory,” US Department of Energy, Albuquerque Operations Office DOE/EIS-0238, January 1999.

DOE 1999b: Department of Energy, “Record of Decision: Site Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory in the State of New Mexico,” 64FR50797, Washington, D.C., September 19, 1999.

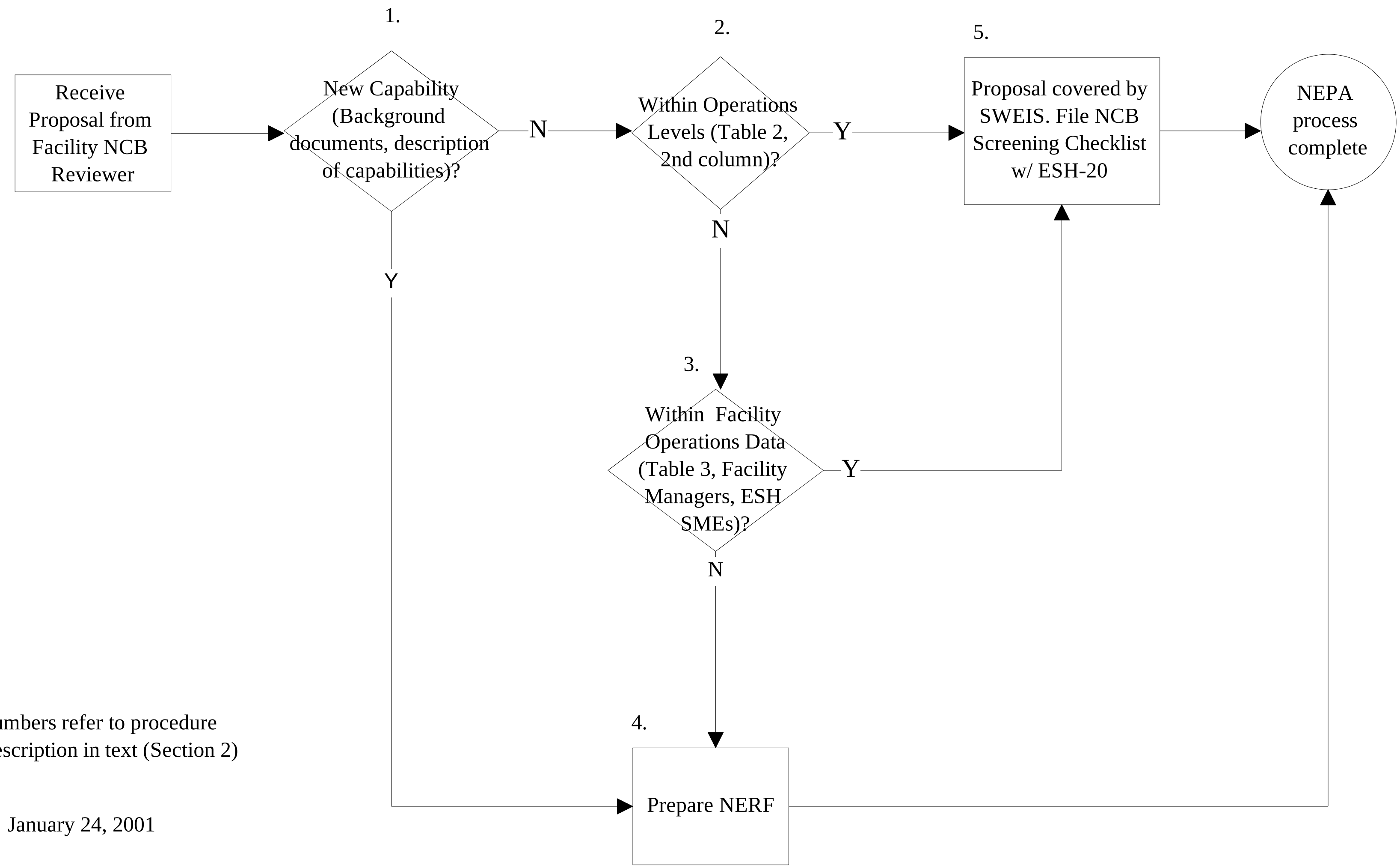
LANL 1996: Los Alamos National Laboratory, “Background Information for the Radiochemistry Site (TA-48) for Site-Wide Environmental Impact Statement, Los Alamos National Laboratory. Transmitted to Mr. Thomas Anderson, GRAM, Inc., by Doris Garvey, Project Leader, on December 2, 1996.

LANL 1999: Los Alamos National Laboratory, “SWEIS 1998 Yearbook: Comparison of 1998 Data to Projections of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory,” Los Alamos National Laboratory LA-UR-99-6391, December 1999.

LANL 2000a: Los Alamos National Laboratory, “NEPA, Cultural Resources, and Biological Resources (NCB) Process Laboratory Implementation Requirement,” Los Alamos National Laboratory LIR 404-30-02.0, January 20, 2000.

LANL 2000b: Los Alamos National Laboratory, “Facility NCB Reviewer Determination Document 13: Radiochemistry Facility TA-48,” LA-UR-01-1273, 2000.

Attachment 1: ESH-20 Screening Flow Chart



Numbers refer to procedure description in text (Section 2)

January 24, 2001

Attachment 2: NCB Screening Checklist

REVIEWER: DATE:

PROJECT TITLE:

PROJECT IDENTIFIER/Reference No:

DESCRIPTION/Comments:

Air or water emissions to environment: Yes ☐ No ☐
Describe issue or resolution:

LOCATION: FMU No: FMU No:

TA:__ Building:_____ TA:__ Building:_____ TA:__ Building:_____
TA:__ Building:_____ TA:__ Building:_____ TA:__ Building:_____
Other: _____

CRITERIA:

2a. 1. Schedule or location modified to avoid T&E concerns?	Yes ☐	No ☐
2. After project modification is there an unresolved T&E issue?:	Yes ☐	No ☐
3. For T&E buffer areas, map of project footprint is attached or has been sent to ESH-20?	Yes ☐	No ☐
2b. Floodplain issue:	Yes ☐	No ☐
2c. Wetland issue:	Yes ☐	No ☐
Wetland BMPs implemented?	Yes ☐	No ☐
2d. Modifications to a historic building:	Yes ☐	No ☐
2e. Archaeological resources affected:	Yes ☐	No ☐
Sites within project area were avoided (notify ESH-20 and provide map):	Yes ☐	No ☐

3a. NEPA Documentation:

CX (specify): LAN-__-_____ LAN-__-_____
Site-wide EIS (specify): Facility NCB Document No.: _____ Operations Level (Use Table 2): _____

3b. Conditions that preclude a cx or SWEIS reference:

Connected action:	Yes ☐	No ☐
Extraordinary circumstances	Yes ☐	No ☐
Siting/expansion - Treatment, Storage, Disposal facility?	Yes ☐	No ☐
Uncontrolled releases of contaminants	Yes ☐	No ☐

Reviewed by ESH-20 NCB staff:

NEPA:	Name	Date	Comment:
Biological Resources:	Name	Date	Comment:
Cultural Resources:	Name	Date	Comment:
Other:	Name	Date	Comment: