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LONG-RANGE INFRASTRUCTURE DEVELOPMENT PLAN

Los Alamos NATIONAL LABORATORY

NNSA National Nuclear Security Administration

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EXECUTIVE SUMMARY

The Los Alamos National Laboratory (LANL) has been delivering cutting edge science since the Manhattan Project in the 1940s. To achieve this diverse set of highly successful Laboratory missions the facilities and infrastructure required had to be built from the ground up, often in remote locations. This portfolio has generally been modified or modernized in an "ad hoc" manner to meet the most immediate mission needs. Strategic planning has been somewhat limited to a few periods when LANL experienced significant new construction and development. The most recent period of new construction and development occurred during a period from 1999 to 2006 with 1.3 million gross square feet (gsf) of new facilities being commissioned at LANL. As a result the Laboratory today has (and still utilizes) facilities and infrastructure that date back to the Manhattan Project. The Laboratory relies heavily on facilities and utility infrastructure that date back to the 1950s – 1980s, and has had the benefit of a relatively recent construction and development period. Planning strategies defined in the Long Range Infrastructure Development Plan (LRIDP) provide analysis of the key strengths and weaknesses of Laboratory infrastructure, aligns these elements with the diverse and unique capabilities of LANL, and enable improved efficiencies based on more strategic approaches that have potential to recast the Laboratory landscape.

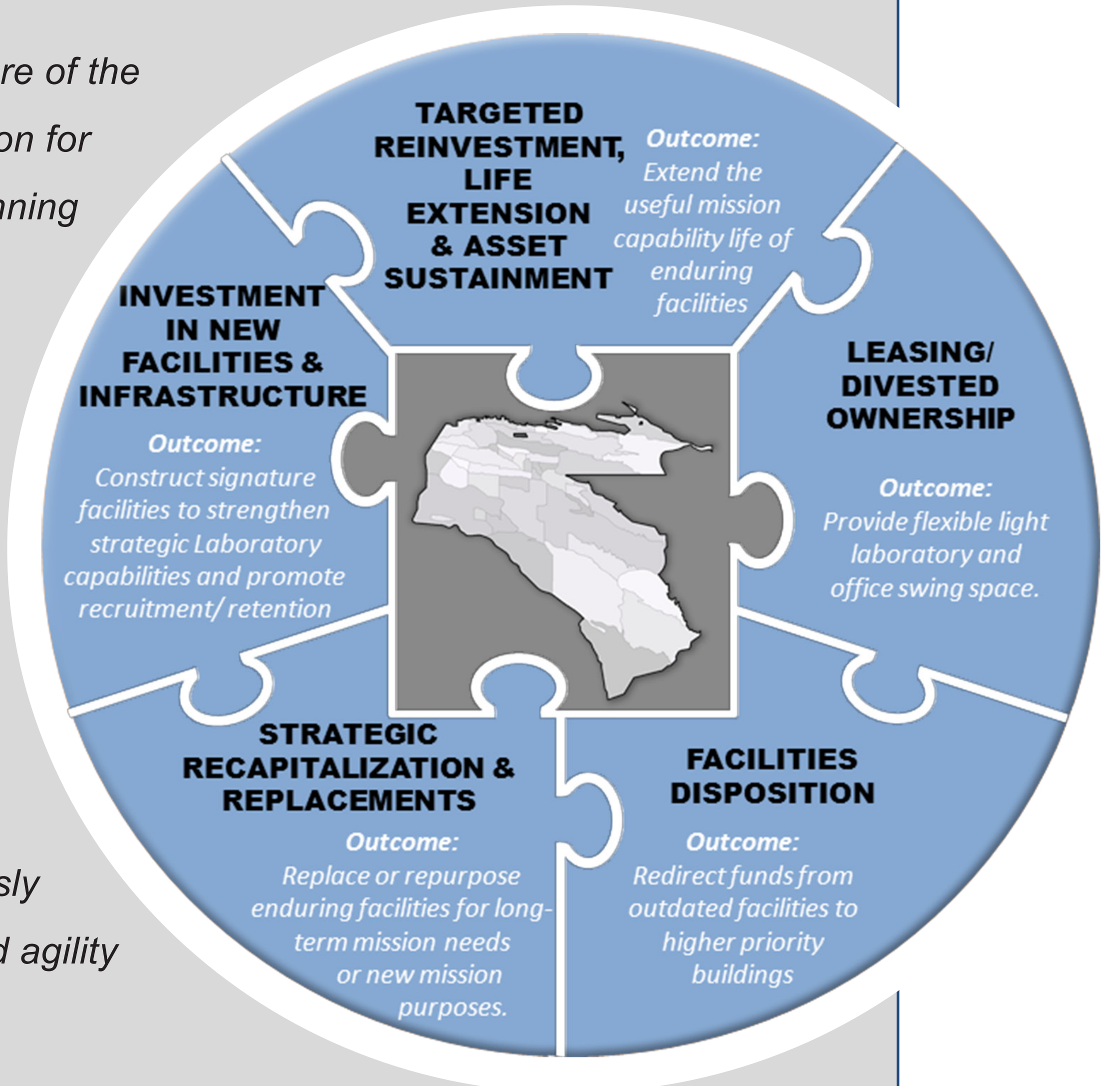
The Long Range Infrastructure Development Plan (LRIDP) has been established to: chart the path forward starting with this infrastructure construct; document the game changing strategies that have been developed and successfully piloted; and define the methodologies to achieve the world leading agile facilities and infrastructure necessary to enable the breakthrough scientific discoveries that lie ahead.

Several strategies have been developed to guide the implementation of the plan. The first step has been asking the hard questions: how will the Laboratory recapitalize the utilities and infrastructure, does the Laboratory need to be smaller and more centralized, what facilities are needed, what is the planned useful life, what can be repurposed for new missions, how can utility systems and enduring facilities be cost-effectively maintained, what is needed to divest and can leasing provide an alternative for agile laboratory and surge-capacity office space? Through this critical assessment an integrated set of implementation strategies have emerged and have now been successfully piloted:

- **Mission Capability Alignment of Infrastructure Assets -** Methodology to right-size Laboratory facility and infrastructure portfolio based on current and future mission need
- **Facility Life - Cycle Management / Facility Utilization Recast -** Define the most optimum utilization of facility and infrastructure assets
- **Program Integration of Interdependent Goals and Objectives -** Leverage complementary planning programs to assure maximum yield for each infrastructure dollar invested
- **Targeted Reinvestment / Life Extension / Asset Sustainment -** Reinvest in and sustain recapitalize enduring facilities to extend their useful mission capability
- **Strategic Recapitalization and Replacement of Assets Beyond Useful Life -** Recapitalize enduring facilities for long term mission need or new mission purpose
- **Investments in New Facilities and Infrastructure / Signature Facilities -** Aggressively pursue the signature facilities that strengthen Laboratory strategic capabilities, encourage recruitment and retention of world-class scientific talent, and keep this Laboratory vital in support of our national security missions for decades to come
- **Facility Disposition -** Actively identify outdated facilities and infrastructure, reduce that footprint and reinvest funds saved on operations and maintenance into higher priority facilities
- **Leasing / Divested Ownership -** Work creative strategies to lease light laboratory and surge-capacity office space

By implementing these infrastructure strategies the Laboratory has already made significant progress towards reducing the footprint of outdated facilities, adding new high-quality Research and Development (R&D) space, revitalizing facilities needed to maintain key capabilities and increasing pride in the overall site work environment. Recent accomplishments can be seen at the Operations Infrastructure Program Website (http://int.lanl.gov/org/padops/operations-infrastructure-program-office/index.shtml).

To embrace a bold vision for the future of the Laboratory we must have a bold vision for the infrastructure that is the underpinning of that future. In order to achieve infrastructure transition to this vision it is essential to gather support and Laboratory resources across organizations and programs, and integrate and align strategic goals and objectives. Utilizing this approach, it becomes possible to leverage available dollars, maximize return on investment, and continuously improve the condition, efficiency, and agility of the infrastructure portfolio.



CHAPTER 1:
SITE OVERVIEW

PURPOSE STATEMENT

Los Alamos National Laboratory (the Laboratory) has a proud 70-year history of accomplishments. These decades of delivering innovative solutions to complex technical problems for the nation bring with them many infrastructure challenges. These challenges include aging facilities and infrastructure; a large site with multiple remote locations that can be expensive to maintain and operate; and a diverse workforce requiring unique knowledge, facilities and equipment. The Laboratory must have a sustainable and world-leading infrastructure in order to maintain a viable future which includes the attraction of future staff and the foundation for new scientific discoveries of the 21st century.

This Long-Range Infrastructure Plan (LRIDP) will define the strategies necessary to revitalize the existing Laboratory infrastructure and identify the signature facilities envisioned. The maturing set of integrated strategies discussed will identify the cost-effective and efficient approaches to provide the infrastructure necessary to sustain the diverse mission and capability needs. The LRIDP discussion, centering around major program areas and supporting organizations, is framed within the context of infrastructure challenges, mission areas, core capabilities, key facilities and technical areas, and accomplishments and future projects. The LRIDP in its entirety results in a series of strategic outcomes that will guide the current state of the Laboratory into a more viable, responsive, and flexible infrastructure for the next generation of science.

THE LONG-RANGE INFRASTRUCTURE PLANNING PROCESS

The long-range infrastructure planning process and the resulting Long-Range Infrastructure Development Plan (LRIDP) offers the planning and implementation strategies to bridge the gap between the current state of the Laboratory's infrastructure and the need for revitalization.

The long-range infrastructure planning process is a multi-year and collaborative endeavor. Collaboration is a key aspect to the planning process in order to gain an understanding of the current and future mission needs. This understanding then translates into the plan of what is required to establish a sustainable Laboratory infrastructure. Planning, although subject to the ever-changing political, financial and technologic climate, does follow a consistent strategy. Planning is the first step in the process of infrastructure revitalization.

Summarized in the table below (and detailed later in this overview) are these integrated strategies that serve as the foundation for the LRIDP.

The LRIDP is structured by major program mission areas and supporting organizations. The data has been aligned to the current Principal Associate Directorate (PAD) organizational structure. For example, all facilities funded by Readiness in Technical Base and Facilities (RTBF) are included under the Weapons Program chapter. Each chapter presents an overview and discussion of major mission areas, core capabilities, and planning and implementation strategies to address infrastructure challenges. Future facility and infrastructure plans have been presented in accordance with the implementation strategies below.

LONG-RANGE INFRASTRUCTURE PLANNING PROCESS

PLANNING STRATEGIES	IMPLEMENTATION STRATEGIES
• Mission Capability Alignment of Infrastructure Assets	• Targeted Reinvestment / Life Extension / Asset Sustainment
• Facility Life-Cycle Management / Facility Utilization Recast	• Strategic Recapitalization and Replacement of Assets Beyond Useful Life
• Program Integration of Interdependent Goals and Objectives	• Investment in New Facilities and Infrastructure / Signature Facilities
	• Facility Disposition
	• Leasing / Divested Ownership

PLANNING STRATEGIES

Mission Capability Alignment of Infrastructure Assets

The Laboratory currently has approximately 850 owned operational facilities (does not include shutdown or leased properties) with ~8M gross square feet (gsf) spread across 40 sq. miles. Most of these facilities support multiple missions, programs, or capabilities. Figure 1.1 shows the types of facilities in the current portfolio. Figure 1.2 shows the diversity of owned operational facility square footage by major mission at the Laboratory. Figures 1.3 and 1.4 demonstrate the age attributes of owned and operational buildings and identify some of the most recognizable facilities at the Laboratory.

This complex arrangement of facility operations has evolved naturally at this Laboratory due (in part) to the immediate benefit it has provided in supporting the Laboratory's diverse but often interdependent capability sets. However, this arrangement (in conjunction with evolving mission capability needs, limitations of individual facility attributes, remote facility locations, etc.) can also create a significant challenge from an efficient utilization perspective. As budgets become more constrained, it is anticipated that the Laboratory will be driven to reduce the number of operating facilities to a smaller better maintained portfolio while sustaining the capability sets necessary for mission success. As a result, the smaller the Laboratory facility footprint becomes, the more significant the understanding of mission capability and facility alignment must become to improve efficient facility utilization.

This strategy includes performing the critical analysis of current Laboratory facilities, and determining how these assets are related to capabilities essential to mission execution. In short, it points toward fundamental decisions about what exists, what needs to be retained and for how long, and when existing facilities need to be refurbished or replaced. It also helps prioritize properties needing to be vacated, identifies mission dependence, and quantifies potential cost savings / avoidance associated with the business case for each proposed action.

As illustrated by Figure 1.4, the institution is managing facilities constructed in virtually every decade and dating to the Manhattan Project and Cold War eras. The age of many mission facilities has exceeded both expected lifetime and original mission use.

Compounding the age of facilities is an ongoing backlog of deferred maintenance on facilities and infrastructure. Extensive deferred maintenance has led to costly repairs to maintain operations. Abandoned and obsolete

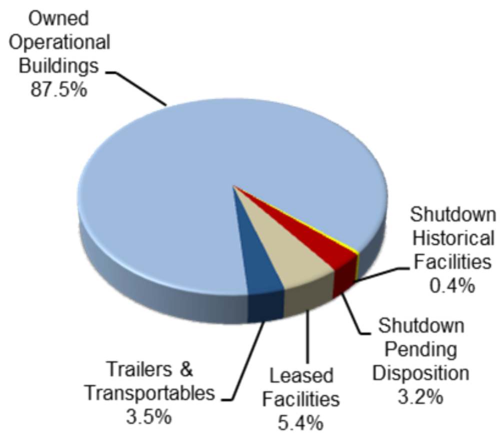


Figure 1.1: The categorization of the operating facility portfolio.

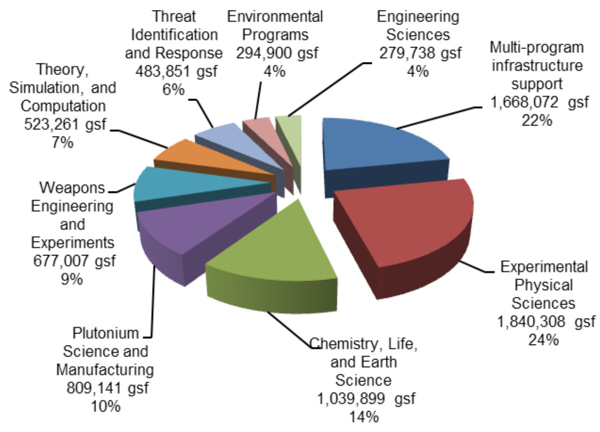


Figure 1.2: The facility portfolio by major missions or capabilities.

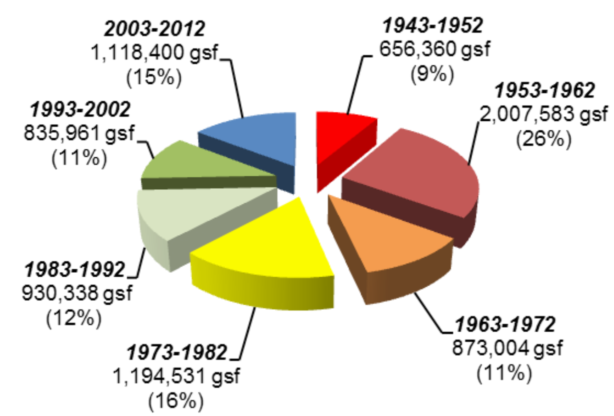


Figure 1.3: The facility portfolio spans all seven decades of Labortory operations.

buildings also have potential to be a drain on Laboratory resources.

Collectively, data evaluated in the facility and infrastructure planning and reporting process validate the implementation of a long-term strategy for managing facilities and infrastructure. The conclusion is that the facility and infrastructure base must be agile enough to respond quickly to new mission requirements and that the ability to repurpose older facilities to execute new missions is required. In response to both mission needs and this changing landscape, a more strategic and integrated approach to facility and infrastructure planning and execution has been developed and implemented.

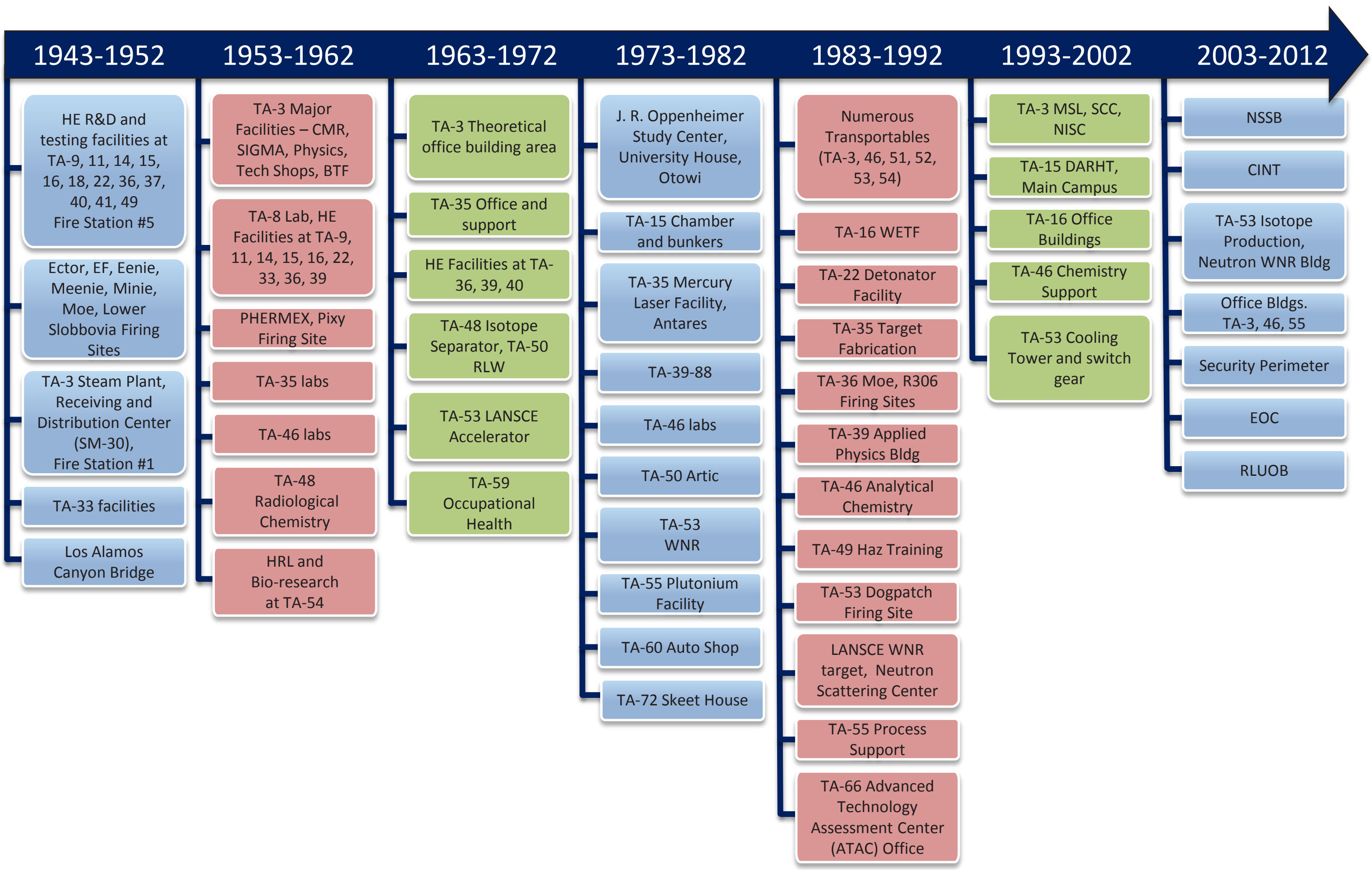


Figure 1.4: The current facility portfolio includes operating facilities from every decade of the Laboratory.

Facility Life-cycle Management / Facility Utilization Recast

To optimally manage the life-cycle of facilities and infrastructure from the determination of need through end-of-life reuse / disposition / recapitalization decisions, it is essential to continually evaluate each asset to an established plan (Figure 1.5). This plan requires that facilities and infrastructure have up-to-date mission dependency, age, condition, location, utility, transferability, sustainability, demand, and scarcity data available. These attributes provide the best basis for informed decisions on assets approaching end-of-life and that have the potential to increase the flexibility and agility of the infrastructure portfolio when recapitalization or repurpose of the asset remains an option.

This strategy:

- enables evaluation of infrastructure assets prior to failure,
- allows maintenance program alignment with where the asset is on its life-cycle,
- sets a timeline for appropriate evaluation of end-of-life options,
- offers alternatives to relocate and/or consolidate similar operations into facilities with matching attributes,
- creates opportunities for the cost effective repurpose of facilities, and
- provides a last verification on decisions to move assets into disposition.

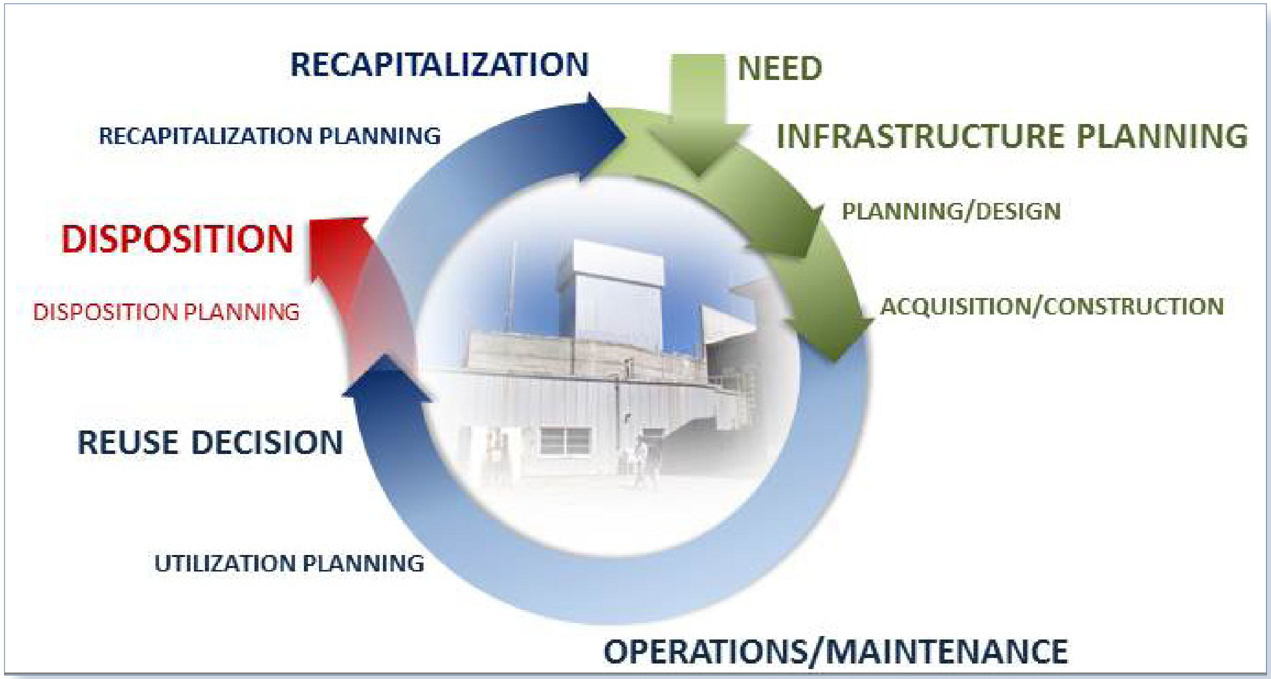


Figure 1.5: Facility life-cycle management.

Program Integration of Interdependent Goals and Objectives

The integration of institutional planning efforts has proven that when individual programs have overlapping or interdependent goals and objectives, significant opportunities also exist to leverage reinvestment dollars to obtain desired outcomes for multiple benefit. Recent examples include Footprint Reduction improvements to facilities that not only allowed consolidation to eliminate poor properties as intended, but also accomplished one or more of the following: recapitalized plant equipment with more efficient sustainable alternatives, extended the life of the facility, solved long-standing serious code or life safety issues, reduced the cost of maintenance, eliminated deferred maintenance, etc. This successful approach to maximizing benefit from each dollar spent has since been repeated with a number of infrastructure revitalization projects. A multi-organizational team was established to identify opportunities like these across institutional programs.

IMPLEMENTATION STRATEGIES

Targeted Reinvestment / Life Extension / Asset Sustainment

These elements grouped together as a single strategy are best described as providing

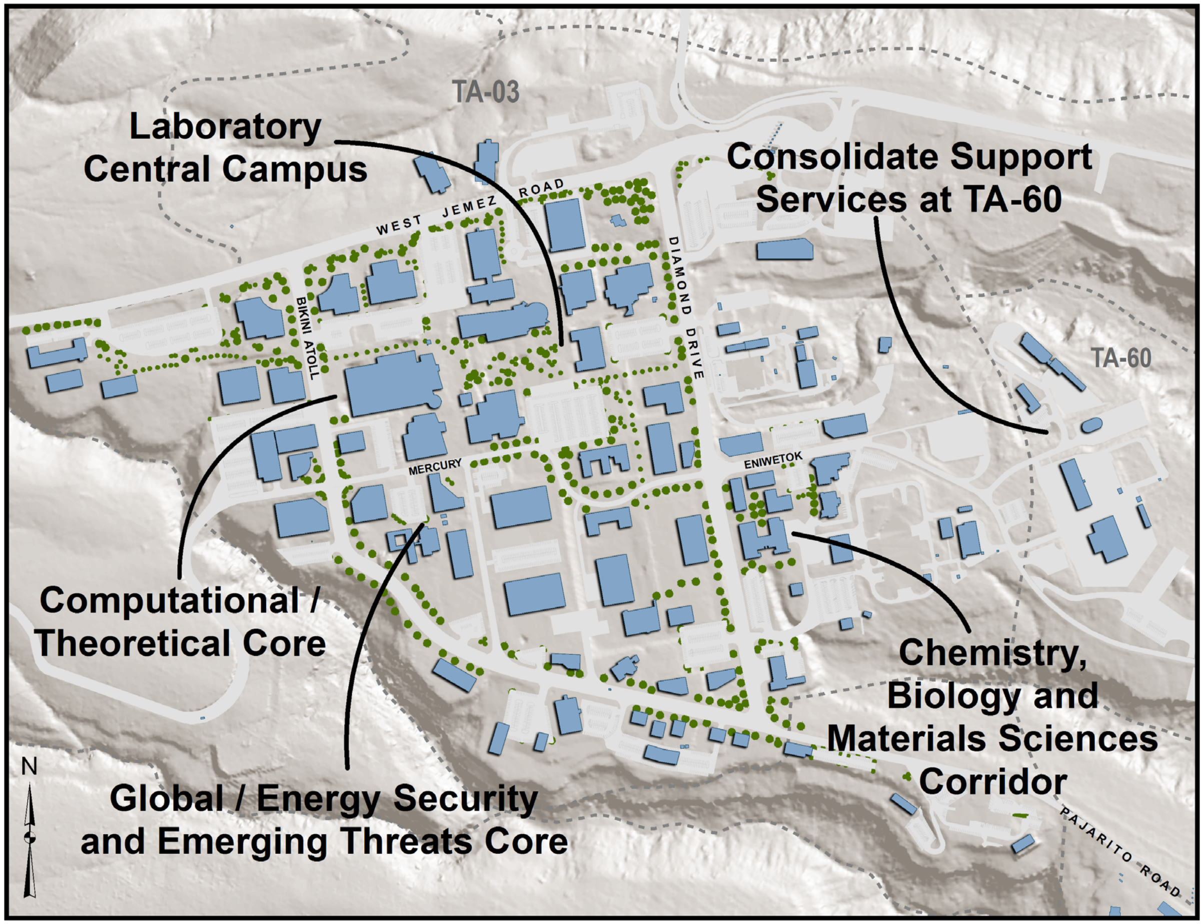


Figure 1.6: An example of the potential recast of TA-03 based on the execution of the facility utilization recast strategy.

The facility utilization recast approach is essential to plans for a future Laboratory that has a reduced footprint, is consolidated and more centralized, and provides improved collaboration by recasting the geographic location of work scope.

stabilization of key facility and infrastructure assets determined to be tied to enduring missions, programs, and capabilities.

Targeted reinvestment is the utilization of existing infrastructure funding to make limited improvements to an infrastructure asset for stabilization. Life extension is the reinvestment specifically intended to extend the life of an existing asset, for a predetermined period of time. Both are methods used when essential capabilities or institutional needs are being supported by near end-of-life facilities / infrastructure systems; and no alternatives exist to relocate the operations.

Asset Sustainment is applied to newer facilities with a good condition rating, are enduring assets, and are sustainable for several years with appropriate maintenance program implementation (sometimes referred to as “maintenance sustainability”). This strategy can be successfully applied to approximately 24% of the Laboratory facility portfolio (Figure 1.7).

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

Strategic Recapitalization is applied when an infrastructure asset is determined to have long-term, enduring mission need but is failing or near end of useful life, and requires replacement or recapitalization to continue supporting essential capabilities or institutional needs.

This strategy has also been successfully utilized to recapitalize major infrastructure utility systems, plant and equipment. In recent years progress has been made to recapitalize facility Heating Ventilation and Air Conditioning (HVAC) systems, electrical equipment and distribution, fire protection systems, plumbing, and structural elements (including roofs). With this strategy we have been able to successfully take a significant burden off the maintenance program, address long-standing code and life safety issues, improve the infrastructure sustainability, reduce or eliminate deferred maintenance, and improve the working conditions for Laboratory staff.

Figure 1.7 summarizes the overall recapitalization and reinvestment strategy.

Investment in New Facilities and Infrastructure / Signature Facilities

Investments in new facilities and infrastructure are generally tied to significant mission / program growth or evolution that requires line-item (>$10 M) government spending to provide for the new or expanding capability. This is critical for continued pursuit of the signature facilities that are essential to Laboratory infrastructure. These facilities strengthen capabilities, enable response to a broad spectrum of national security issues, aid in recruiting and retaining top talent at the Laboratory, and remain vital in support of national security missions for decades.

Within this plan some of these proposed signature facilities will be discussed. The significance of continuing to aggressively plan and pursue signature facilities cannot be overstated. The Matter-Radiation Interactions in Extremes (MaRIE) project, for example, is a flagship experimental facility concept for realizing the future in materials research. However, it is important to note that many new facilities are proposed and are being considered, but fiscal realities will continue to drive most decisions in this area.

Facility Disposition

The Footprint Reduction program has been, and will continue to be a key mechanism in driving more efficient utilization of facilities at the Laboratory. Facilities that are evaluated as being obsolete and are removed from active status provide immediate cost reduction to maintenance and operations. However, these excess facilities still incur costs of approximately $3 dollars per square foot until demolished. Rapid elimination of these obsolete facilities frees funding for the reinvestment in remaining facilities and directly reduces the maintenance backlog. This allows available resources to be channeled into projects that directly maintain productive facilities. Integrated planning has allowed staff to be relocated from obsolete space into newly renovated and repurposed facilities, providing quality laboratory space.

Over the past several years, this program has made significant improvements to targeted

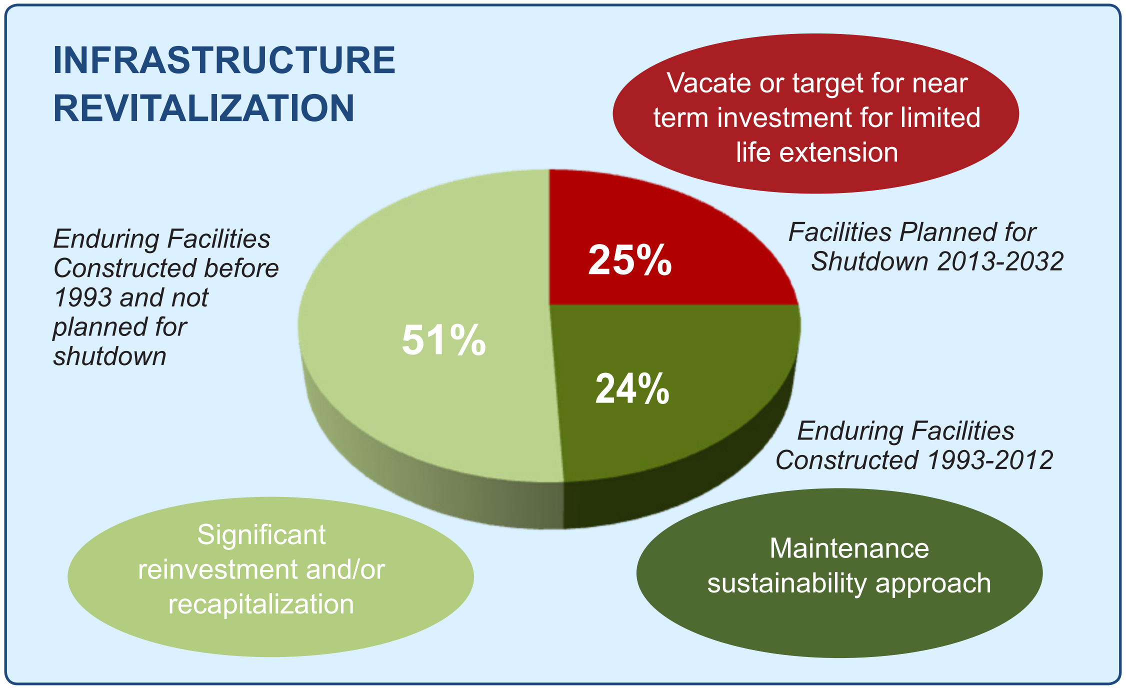


Figure 1.7: The LRIDP Process assigns the appropriate infrastructure revitalization strategy to the facility portfolio.

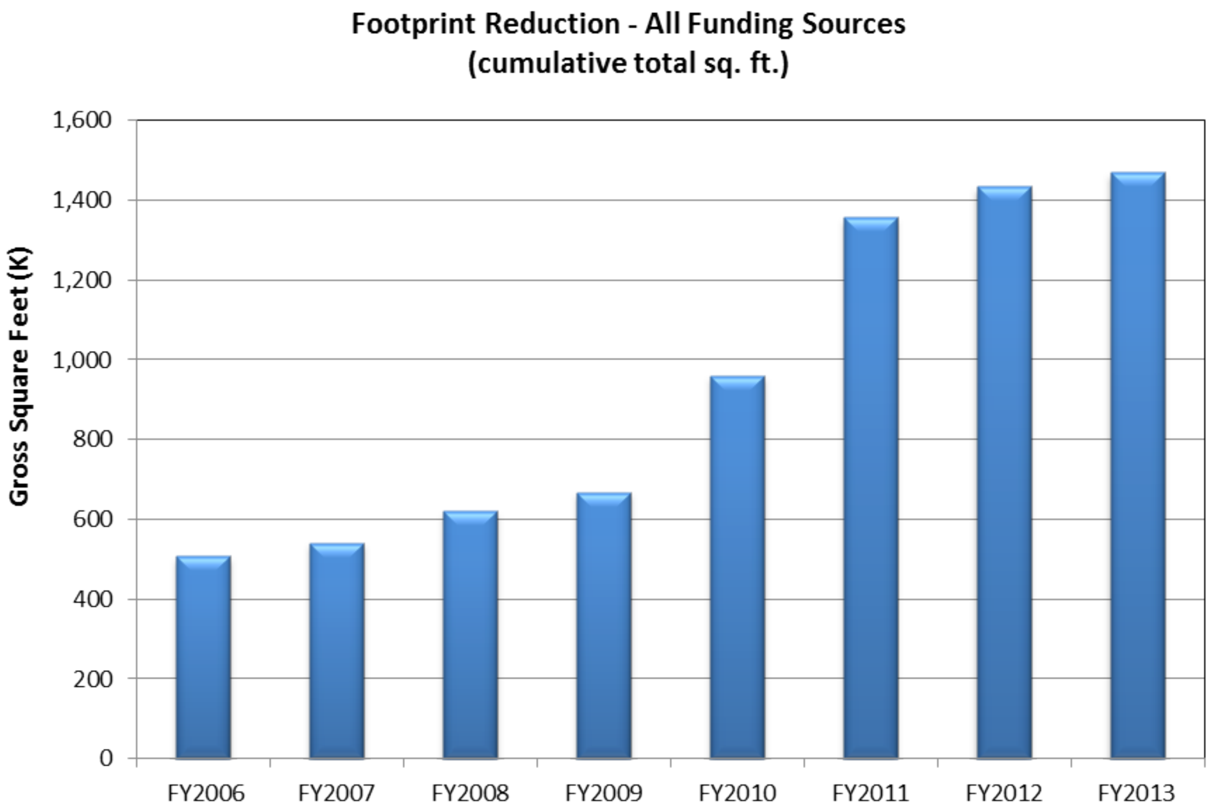


Figure 1.8: Cumulative impact of Footprint Reduction Program in eliminating square footage of obsolete facilities.

facilities, allowed work to be relocated from poor and inefficient facilities, and effectively consolidated work into improved facilities. This has contributed to the creation of better collaboration and work environments for Laboratory staff. This program has successfully eliminated obsolete properties from the active facility portfolio at the Laboratory. The facilities removed through this program are given a defined disposition path. This has resulted in cost avoidance, elimination of significant deferred maintenance, and reduced pressure on operations and maintenance budgets. This plan will define the criteria for determining the remainder of program footprint reduction at the Laboratory.

Figure 1.8 shows the continued level of accomplishments in footprint reduction, utilizing all funding sources.

Leasing / Divested Ownership

Leasing of office space by the Laboratory has been a long-standing approach to house operations support staff off-site to allow on-site facilities to be utilized by scientific staff. In recent years the leasing strategy has been revisited and incorporated into strategic infrastructure planning. As a result the number and square footage of leased office facilities has been steadily decreasing. This tracks with Laboratory staffing trends. In addition, emphasis has been placed on retaining only properties with the attributes most beneficial to long range infrastructure planning. As a result the Laboratory has begun to explore utilization of leased properties for suitable light laboratories and research work. This benefits the laboratory in a number of ways, including providing incubator-type space for collaboration with private industry and outside partners and providing temporary lab space to relocate ongoing work while on site lab facilities are being renovated. These practices continue to evolve and have already realized benefits.

BENEFITS OF A STRATEGIC APPROACH AND RECENT ACCOMPLISHMENTS

Advances in long-range infrastructure planning have enabled integration of common goals and objectives. Leveraging of interdependent planning activities has led to significant operational cost reduction, improved condition and utilization of Laboratory assets, reduction in Deferred Maintenance, and targeted reinvestment and recapitalization plans for infrastructure. The implementation of these

Recent Accomplishments Related to Infrastructure Strategies

- Footprint Reduction at the Laboratory is approaching 1.5M sq. ft. of poor condition, obsolete structures that have been vacated and removed. Of that total >800,000 sq. ft. has been achieved in just the last 4 years. This represents approximately a 17% (7% from 2001 to 2009, and 10% since 2009) reduction in the active facility portfolio.
- Footprint Reduction has also successfully enabled consolidation of operations consistent with long-term planning to relocate Laboratory operations from Technical Areas with close proximity to surrounding communities in favor of more appropriate locations within the Laboratory boundary.
- $10M/yr. direct reduction in operation / maintenance costs resulting from the shutdown of underutilized facilities (savings are improving each year).
- $160M reduction in Deferred Maintenance (DM) in the last 4 yrs. (13 percent reduction) from the removal of excess facilities.
- >45,000 sq. ft. of unfavorable properties have been vacated, and >47,000 sq. ft. of excess properties have been demolished / removed from the Laboratory in FY2013.
- More than 2,000 Laboratory staff (20 percent of Lab population) has had their work environment improved/ renovated over the last 3 years (improved condition and utilization of existing assets).
- The Weapons Infrastructure Program Office has used complementary strategies to reduce nearly $212M in deferred maintenance through FIRP.
- 10 facilities had major plant recapitalization this year. Projects executed in FY13 maximized return on investment by leveraging sustainability benefits, Footprint Reduction plans, deferred maintenance buy-down, support to environmental strategies, and in creating improved laboratory capability space.

integrated strategies has demonstrated a positive impact on operational efficiency and effectiveness and is focused on providing a sustainable and viable future for the Laboratory.

Reinvestment and Recapitalization Planning

Successful long-term planning utilizing a capability-based approach has created a defendable basis for increased budget allocations for infrastructure reinvestment and recapitalization. Figure 1.9 demonstrates the Los Alamos National Security, LLC (LANS) financial commitment to the implementation of this plan.

Consistent with long-term planning, key strategies include the reinvestment and recapitalization of existing assets, consolidation and centralization of functions, and improved utilization of a smaller and more sustainable facility portfolio.

Recapitalization projects this year have included boilers, chillers, other HVAC equipment, control systems, fire alarm systems, building electrical equipment, lighting upgrades, plumbing upgrades, and structural and roofing work.

Deferred Maintenance

Deferred Maintenance (DM) continues to be considered as part of long-term infrastructure planning. The removal of >800,000 gsf (FY10–FY13) of facilities yielding >$160M in DM reduction is a positive trend. Utilization of life-cycle asset management as a contributing strategy to manage deferred maintenance is anticipated to continue for the foreseeable future. In addition to the reduction of deferred maintenance, life-cycle asset management drives cost avoidance and allows more existing maintenance funding for the remaining active facility portfolio. Figure 1.10 illustrates the reduction in DM driven by long-term disposition planning and execution.

Accomplishments of Long-Range Infrastructure Development Plan Projects for FY13

Implementation of the targeted reinvestment and recapitalization projects spans multiple years. Planning for these infrastructure targets is key. By phasing the planning, the design, and eventually the in-the-field execution, several projects can be implemented at the same time. Several projects are currently underway that are specifically designed to improve conditions and better utilize Lab assets.

- TA-59, Building 1 Laboratory and Office Space Utilization – Construction continues on the 53,901-gsf facility with renovations aimed at transforming outdated office and laboratory space into modern and more efficient Laboratory space. Chemistry and Environment Safety

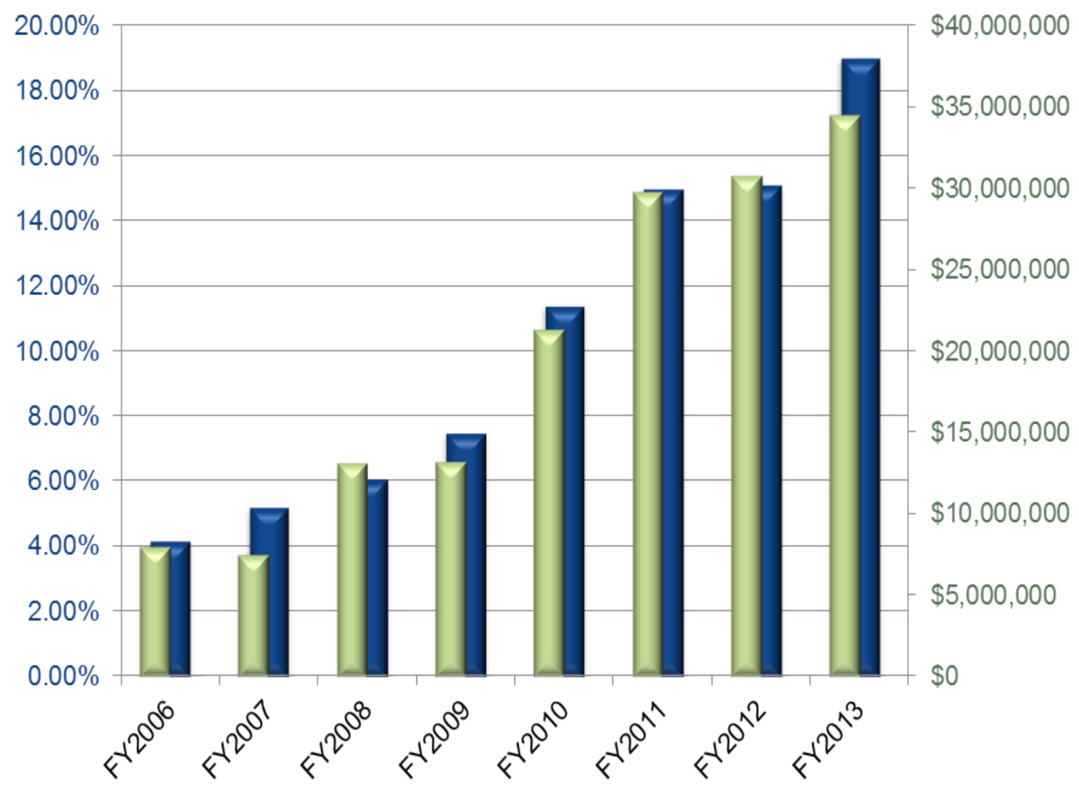


Figure 1.9: Site support reinvestment and recapitalization funding has increased as a percentage of total site support budget and as total dollars per fiscal year.

and Health (ESH) tenants from TA-59, TA-46, and TA-48 will populate the newly renovated building. This will enable the next phase of strategic planning for the TA-46 and TA-48 facilities to commence.

- Also at TA-59, Building 3 recently underwent a series of interior improvements. Interior refurbishments improved the work environment for the ESH staff.

- TA-03, Building 1698 Material Science Laboratory (MSL) Infill Project – Construction also continues here with the creation of 7,978 gsf of new laboratory space. This new and modern laboratory space will house tenants from Chemistry and the Material Science and Technology Divisions and better enable collaborations and multi-disciplinary work. This project also facilitates the next phase of strategic planning at TA-46 and TA-48.

- TA-46, Building 154 HVAC installation – Lab space, especially when housed in aging facilities, will often need infrastructure updating to support staff and delicate programmatic equipment. A new HVAC and controls system was installed, tested, and commissioned in this 11,101-gsf facility. This project is considered a limited life extension strategy for this one TA-46 building because the overall strategy is to vacate this TA.

- TA-66, Building 1 Laboratory and Office Space Utilization – The next facility to be repurposed from under utilized space to newly re-designed space is TA-66, Building 1. With improvements initiated this year, this building will enable Global Security to have a dedicated home for specialized in-house training and hosting needs. These improvements will address the facility infrastructure needs, as well as the Global Security program.

- TA-48, RC-45 Expansion Building – This expansion building will allow for the growth

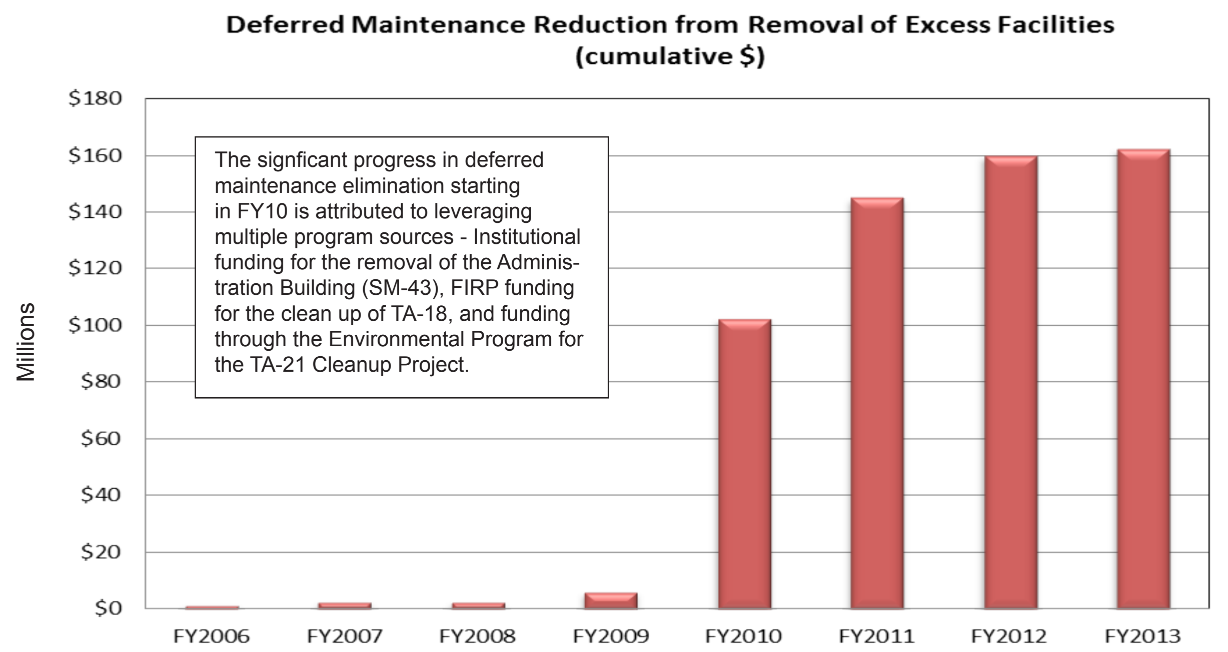


Figure 1.10: Footprint Reduction allows reinvestment in site infrastructure by reducing maintenance of obsolete facilities.

of Chemistry programs beyond their current capabilities within Building 45.

- TA-03, Building 40, Room N161 Lab Space Utilization – TA-03, Building 40 (Physics Buildings) is home to numerous diverse laboratories with tenants from International Space and Response (ISR), Earth and Environmental Science (EES), Materials Physics and Applications (MPA), and Physics (P) Divisions. Consistent with the planning strategy to better utilize lab space, an unused and abandoned lab (room N161) was identified and slated for renovation. This 800-gsf basic lab renovation will be designed as flexible research space and will be able to host researchers from a variety of programmatic areas. This renovation is currently in the design phase.
- TA-48, Building 107 Refurbishment – This project addresses fundamental facility system issues to extend the life of the facility for programmatic use. This project also represents re-purposing a building with sponsor partnership. This project is currently in the design phase.
- TA-16, Buildings 200/204/218 – These facilities house tenants from Decision Applications (D), Nuclear Engineering and Nonproliferation (NEN), and International and Applied Technology (IAT) Divisions and were in need of facility infrastructure improvements. Completed work at TA-16, included exterior improvements, life safety corrective actions, recapitalization of facility HVAC equipment, interior improvements and ADA compliant building access.
- Fire Panel Replacements – Investment continues throughout FY13 as fire panels are design and replaced based upon the approved and prioritized list provided by the Laboratory Fire Marshal.
- Energy Management Projects – Efforts are ongoing in the Utilities and Infrastructure Facility Operations Division (FOD), with energy audits and in-the-field implementation of lighting upgrades, steam trap repairs, identifying/repairing pipe leaks, server room consolidations, etc. This year’s focus has been Building Automation System (BAS) implementation, the High Performance Sustainable Building (HPSB) program, continuation of the metering program, and building re-commissioning. These efforts span multiple technical areas: TAs-03, 60, 69, 43, 48, 59, and 52.
- TA-03, Building 207 - Research Library – One of the best attributes of the Research Library is its availability for collaboration and meeting spaces. However, because the library was built in 1977, the current layout is dated and not conducive to technological advances and flexible

meeting / collaboration spaces. This current project will renovate 8,280 gsf of the first floor and establish multiple collaboration, meeting, seating, and private workspaces.

- TA-03, Building 1663 - Wellness Center – Several initial interior improvements have been completed for the Wellness Center. The total improvements included new flooring in the exercise classroom, new paint and carpet, new shower stalls, new counters and sinks, new lockers in the men's room, new benches, and repair of the building exterior and walkways. Because these improvements were completed in a timely manner and well received by the tenants, staff, and customers, additional improvements (both interior and exterior) are currently being planned.
- TA-35, Building 27 – FY13 investments in this facility included the replacement of facility plant equipment and extensive programmatic facility cleanup and relocation of staff to improved office
- National Fire Protection Agency (NFPA) 70E Low Voltage Test and Maintenance – In FY13 three facilities were targeted for this program – TA-03, Building 261 Otowi, TA-3-38, and TA-03, Building 66 (Sigma). Eight secondary main breakers were successfully installed in Sigma and work continues in Buildings 261 and 38. This work will ultimately lead to the recapitalization of electrical systems across the Laboratory over time.
- TA-03, Building 510 HVAC Replacement – The Building 510 HVAC Replacement Project recapitalized the HVAC plant by replacing two pieces of 20-year-old equipment with a more efficient modern plant. The project provided improved heating and cooling throughout the 9,043-gsf building.

Accomplishments similar to those of FY13 are anticipated in FY14 and beyond. The multi-year approach will yield continued improvements supporting mission activities.

By targeting areas with multiple mission benefits and by efficiently utilizing limited financial resources, this planning has enabled a high return on investment for the Laboratory.

FUNDING THE NEXT GENERATION OF LABORATORY INFRASTRUCTURE

Application of the strategies developed within the LRIDP allows for the realization of the potential funding commitment necessary to accomplish the identified goals. For the purpose of this plan a list of potential infrastructure activities was developed. The activities are proposed within a 10- to 20-year execution horizon that enables maximum flexibility and agility for the Laboratory and will set the infrastructure construct for the long-term future.

Excluding (for this discussion) government investments such as new Signature Facilities (decisions yet to be made) and already planned direct funded line items, General Plant Projects (GPPs), and Expense Projects, focus is on the existing infrastructure assets. These are the assets identified as being enduring to mission, but not currently sustainable for long-term utilization. This plan addresses these gaps in achieving the next-generation infrastructure.

Looking at recapitalization from a top-down perspective, the size and complexity of the challenge becomes apparent. The Replacement Plant Value (RPV) of all assets in this portfolio is currently estimated at ~$14B. This becomes the starting point for the analysis. Appling the strategies previously discussed and excluding the assets that are not anticipated to require recapitalization over this period (maintenance sustainment approach), the RPV/recapitalization estimate is reduced to ~$9.5B. Because of the identified assets that are planned to be divested over this period, their costs can also be excluded. The RPV/ recapitalization estimate drops to ~$5.6B for the remaining portfolio. This would be a starting estimate if only full recapitalization were considered for these assets identified as being enduring to mission but being not currently sustainable for long-term utilization.

Alternately, by examining this same target set of assets from a bottom-up perspective (utilizing life-cycle attribute data), it becomes apparent that most of the utility systems infrastructure in this category do require full recapitalization but that the facilities require varying levels of funding to sustain, not necessarily requiring full recapitalization. By applying an approach best targeted to the individual needs of these facilities, a more reasonable approach emerges. In many cases recapitalization of the major plant and equipment within the facility is what is most practical, and other facilities just need a level of funding to address long-standing maintenance issues. By targeting projects to address these most urgent needs, many of these facilities can also be moved within reach of a maintenance sustainability approach and do not require full recapitalization at this time. This leaves most of the planned new and replacement facility construction in this plan to be associated with strategic planning to recast the Laboratory footprint to a more functionally efficient layout that enhances flexibility and agility of the infrastructure portfolio essential to meeting future mission needs.

By compiling the extensive data and plans within this LRIDP, and benchmarking costs associated with recent execution of similar work scope, the magnitude of the institutional spending becomes apparent (Figure 1.11). The magnitude of this infrastructure revitalization is ~$1.2B over the next 20 years.

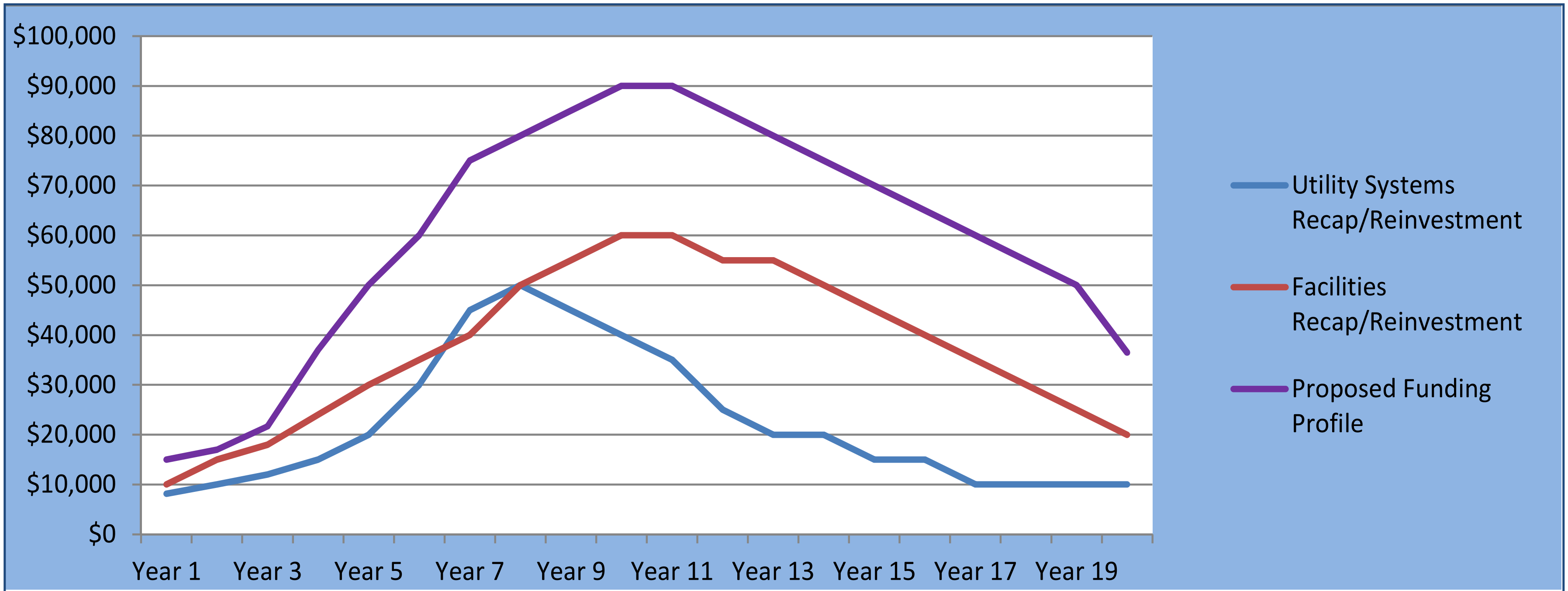
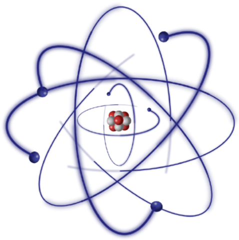


Figure 1.11: Estimated institutional investment in facilities and infrastructure over the next 20 years ($K).



CHAPTER 2: WEAPONS PROGRAM

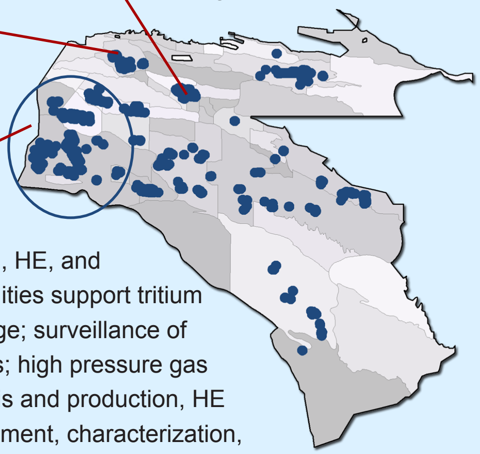
INFRASTRUCTURE CHALLENGES

- Construction schedule delays, such as those associated with the CMRR-NF deferral, TRU Facility and RLWTF projects, result in extending existing facilities beyond their design life, increasing stress on operations and maintenance programs.
- An updated Plutonium Strategy is being developed based on CMRR-NF deferral.
- Competing priorities require funding trade-offs to provide a balance between operational and maintenance considerations.
- Programmatic changes may require unexpected infrastructure and/or operational modifications.

EXISTING FACILITIES

TA-03: Design, Certification, Testing, Surveillance, and ST&E Base; Plutonium; and Non-nuclear Capabilities support weapons modeling and simulation, materials science, SNM analytical chemistry, actinide R&D, hot cells, beryllium processing, specialty parts fabrication, and DU storage.

TA-50/55: Plutonium and SNM Capabilities support manufacturing of plutonium components, recovery and processing of plutonium residues, surveillance and disassembly of weapons components, actinide materials science and processing R&D, fabrication of reactor fuels, Pu^{238} R&D, analytical chemistry, SNM storage, and enduring waste operations.

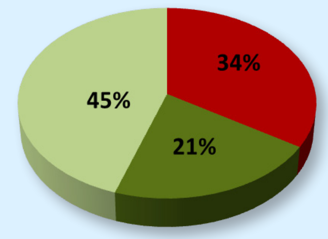


TA-16/08/22: Tritium, HE, and Non-nuclear Capabilities support tritium extraction and storage; surveillance of gas transfer systems; high pressure gas loading; HE synthesis and production, HE and plastics development, characterization, and fabrication; assembly of test devices; radiography; HE firing sites; and detonator development, testing, R&D, and production.

Other Facilities Supporting WP Missions: Design, Certification, Testing, Surveillance, and ST&E Base and Non-nuclear Capabilities support hydrodynamic testing at TA-15 (DARHT), the exploration, development, and application of particle accelerator-based science and technology at TA-53 (LANSCE), and nondestructive and environmental testing facilities at TA-11.

FACILITY STATUS

- Weapons Program funds 40.4% of the Laboratory's owned operating permanent building space, supporting weapons, science, and global security programs.
- About 34% of this building space has a limited life and will be eligible for disposition within the next 20 years.
- The average age of these enduring facilities (>20 years old) is 47 years, ranging from 21-68.



Enduring, ≤ 20 years old: (~658k gsf) 40 structures at TA-16, -22, -39, -50, and -55 including DARHT, RLUOB.

Enduring, >20 years old: (~1,392k gsf) 204 structures including PF-4, WETF, BTF, LANSCE LINAC, detonator facilities, HE radiography, and HE R&D, campaign-funded computing, and testing facilities.

Limited Life: (~1,054k gsf) 57 structures including classified machine shops, CMR, TA-54 domes, RLWTF, TA-16 HE facilities, TA-39 Gun facilities.

IMPLEMENTING STRATEGY

STRATEGY	PRIOR ACCOMPLISHMENTS	FUTURE PLANS
Targeted Reinvestment / Life Extension / Asset Sustainment	• TA-55 Re-Investment Project Phase 1 replaced obsolete cooling tower/chiller systems. • HE radiography support facility underwent several building system upgrades for occupant safety. • Upgraded the BTF Facility Management System and HVAC systems. • Reduced nearly $212M in DM through FIRP. • Fabricated and installed a new 1L target system at the Manuel Lujan Neutron Scattering Center.	• TRP-II and TRP-III will provide seismic upgrades to gloveboxes and refurbish and replace selected critical building systems. • Complete seismic upgrades in PF-4 to conform to the 2007 seismic hazard analysis standard. • Refurbishment of the LANSCE accelerator to restore historical performance levels. • The Metropolis Center will be upgraded with water cooling infrastructure for the Trinity platform arriving in late FY15. • Complete required modifications to RLWTF to meet NMED groundwater discharge permit.
Strategic Recapitalization and Replacement of Assets Beyond Useful Life	• Completed construction of the 375 box line for repackaging TRU waste stored in large boxes. • Replaced HE storage magazines at TA-22 with a modern, secure storage bunker. • Began improvements in PF-4 to relocate analytical chemistry sample preparation from the CMR facility.	• Interim bridge strategies to address the CMRR-NF deferral are being developed to ensure mission obligations will continue to be met. • Environmental Testing facilities will undergo various refurbishments to sustain vibration testing capabilities, including electrical and fire protection upgrades. • WMSEF will replace an antiquated facility with state of the art design, machining, and prototype testing facilities. • Firing Site consolidation will include placing some sites in excess, consolidating open firing to TA-36, and converting into contained firing sites at TA-15 and TA-40. • A new RLWTF capability will replace the obsolete facility at TA-50.
Investment in New Facilities and Infrastructure / Signature Facility	• Constructed the NSSB to replace the antiquated and seismically compromised Administration Building. • Constructed RLUOB, phase I of the CMRR project, to provide modern radiological laboratories for plutonium missions.	• EMCF will replace obsolete lab space in TA-09, building 21 and support both Weapons and Global Security programs. • TRU Waste project will relocate waste management capabilities at TA-54 that are to be closed under the Consent Order. • Dynamic Equation of State facility will consolidate gun capabilities from four separate facilities into a single modern structure.
Facility Disposition	• Terminated programmatic operations and began cleanout in three wings of the CMR facility in preparation for eventual shutdown. • Four TA-21 facilities were decontaminated and demolished. • Demolished over half a million square feet of facilities through FIRP.	• Disposition activities are planned for the CMR, RLWTF, Machine Shops, and PHERMEX.

OVERVIEW

Introduction

The Laboratory is committed to meeting its core mission— developing and applying science, technology, and engineering solutions to ensure the safety, security, and reliability of the United States (US) nuclear stockpile. This commitment encompasses several aspects of the NNSA's Defense Programs mission, as defined in the following mission areas.

Mission Areas

Directed Stockpile Work

The purpose of the Directed Stockpile Work (DSW) program is to maintain and enhance the safety, security, and reliability of the stockpile in the absence of underground testing. Much of the DSW work is accomplished jointly with the Department of Defense (DoD). DSW includes support of the enduring stockpile, life-extension programs (LEP)s, dismantlement and disposition, and activities to support the Nuclear Security Enterprise (referred to as Stockpile Services). Support of the enduring stockpile includes Limited Life Component Exchange, Surveillance and Assessment, Nuclear Explosive Safety Studies, and various associated component production activities. The LEPs include updated designs and enhancements to provide an extended life for an existing stockpile system. The Dismantlement and Disposition Program includes the return of retired units from DoD custody for disassembly and the corresponding disposition of resulting components. Stockpile Services ensure the development and acquisition of necessary process development and equipment at the production agencies, the nation's capability to process plutonium and produce components, and other support activities related to component development and production.

The Laboratory's specific activities under DSW include design, engineering, and surveillance and annual assessment for the B61, W76-0/1, W78, and W88. The Laboratory also is the lead physics laboratory for the W76-1 and B61 LEPs, in addition to supporting the W78-1/88-1 and the W88 Alt 370 LEP efforts. The Laboratory also provides ongoing weapons response and nuclear explosive safety expertise in support of safe operations at the Pantex Plant. Funding for the nation's plutonium strategy and capability also falls under DSW.

Science Campaign

The Science Campaign includes several specific sub-campaigns that focus on scientific capabilities, experiments, testing, and analysis to assess the safety, security, reliability, and performance of the stockpile. The Science Campaign develops certification and assessment tools and the experimental platforms to inform, validate, and provide confidence in essential predictive capabilities. The Science Campaign's deliverables support both the enduring stockpile and LEP efforts (Figure 2.1).

The Laboratory leads and conducts numerous Science Campaign activities, including pit reuse experiments and analysis, advanced diagnostic experiments to assess insensitive HE, physics models development, predictive capability assessments, various weapons-related materials experiments, subcritical experiments at the Nevada National Security Site (NNSS), equations of state for gases, and high-energy-density (HED) physics experiments.

Engineering Campaign

The Engineering Campaign also includes several sub-campaigns that provide modern tools and capabilities to develop and sustain the fundamental engineering basis for stockpile certification and assessments that are needed throughout the entire lifecycle of each weapon. The Engineering Campaign funds activities that assess and improve fielded nuclear and non-nuclear engineering components without further underground testing. Specific sub-campaigns include enhanced surety and surveillance.

Figure 2.1: The Laboratory is responsible for the design, surveillance, and annual assessment of the B61 nuclear weapon under the DSW program.

Laboratory-specific Engineering Campaign activities include membership on the Joint Integrated Lifecycle Surety effort, development and implementation of enhanced physics package surveillance tools, and technology maturation efforts captured in the component maturation framework.

Inertial Confinement Fusion Ignition and High Yield Campaign

The Inertial Confinement Fusion (ICF) Ignition and High-Yield Campaign provides the experimental capabilities and scientific understanding in HED physics necessary to maintain a safe, secure, and reliable nuclear weapons stockpile without underground testing. The ICF Campaign creates and studies matter under extreme conditions that approach the environments found in a nuclear explosion through state-of-the-art laser and pulsed power facilities. The Laboratory ICF activities include various HED experiments to better assess the stockpile.

Advanced Simulation and Computing Campaign

The Advanced Simulation and Computing (ASC) Campaign provides leading edge, high-end simulation capabilities to meet the requirements of weapons assessment and certification, including weapon codes, weapons science, computing platforms, and supporting infrastructure. The ability to model the extraordinary complexity of nuclear weapons systems is essential to establishing confidence in the performance of the aging stockpile. The ASC Campaign underpins the annual assessment of the stockpile and is an integrating element of the predictive capability framework.

The Laboratory-specific activities in the ASC program support the weapons program with models and codes to assess and improve diagnostics. The Laboratory's computing platforms and systems include Cielo and Luna. The Laboratory also plays an extensive role in the ASC relationship with several universities.

Readiness Campaign

The Readiness Campaign focuses on developing and implementing various production capabilities at all national security enterprise (NSE) sites to meet DSW production requirements. The Readiness Campaign mission is dedicated to investing in technologies that will be used in multiple weapons systems applications to conserve development resources and reduce production uncertainty. The Laboratory's Readiness Campaign activities focus on improving the existing pit and detonator production lines with new and upgraded capabilities.

Integration with NNSA and Laboratory Strategic Plans

The weapons program projects identified in this chapter were developed consistent with National Nuclear Security Administration (NNSA) 2008 Complex Transformation Record of Decision (ROD), 2010 Nuclear Posture Review (NPR), the new Strategic Arms Reduction Treaty (START), FY2012 Stockpile Stewardship and Management Plan, FY2011–2041 Corporate Physical Infrastructure Business Plan (CPIBP), 2011 Amended ROD for the Nuclear Facility portion of the CMRR Project, and the December 2012 Construction Working Group–Integrated Construction Alignment Plan. It is assumed that the Laboratory will continue to support warhead surveillance and stockpile assessment science and technology to ensure certification in the absence of underground nuclear testing. The Laboratory will also continue to meet the immediate needs of the stockpile, including production and LEP commitments and milestones. Meanwhile, the Laboratory will continue to strengthen its Science, Technology, and Engineering (ST&E) base by developing and sustaining high quality scientific staff and maintaining the ability to design nuclear warheads.

CORE CAPABILITIES

Design; Certification; Testing; Surveillance; and Science, Technology, and Engineering Base

The Laboratory performs the basic scientific research, design, system engineering, development testing, reliability assessments, and certification of nuclear weapons. In 1995, the President concluded that the continued vitality of all three nuclear weapons laboratories was essential to the nation's ability to fulfill the requirements of stockpile stewardship in the absence of underground nuclear testing. The Laboratory maintains responsibility for the nuclear design and engineering of its nuclear physics packages and uses exceptional ST&E capabilities to preserve the US nuclear deterrent.

Plutonium

The Laboratory is responsible for key nuclear components within the majority of active weapons systems. Most notably, TA-55 provides the only fully functioning plutonium facility used for Research and Development (R&D) and the only pit manufacturing capability within the Nuclear Security Enterprise (NSE) (Figure 2.2). The Laboratory was named a consolidated Center of Excellence for plutonium research, development, and manufacturing activities. The Laboratory's mission is to lead science, engineering, and technology development across a broad range of plutonium-centric programs, with a continuing responsibility to manage and understand the material in all applications. Plutonium R&D activities include the metallurgical characterization of plutonium, measurement of mechanical and physical properties, and development and assessment of technology for manufacturing and component fabrication. Activities include the disassembly and surveillance of plutonium pits and parts and the manufacture of plutonium pits, parts, and samples for nuclear weapons and other non-weapons applications.

Figure 2.2: Molten plutonium in a crucible. Before the Laboratory's cast pits could enter the stockpile, the Laboratory needed to verify that their quality and performance equaled or exceeded the quality and performance of the wrought pits produced at Rocky Flats.

Tritium

Tritium R&D work at the Laboratory is high-pressure gas operations in support of enduring nuclear weapons stockpile activities. Tritium work involves a variety of pressures, temperatures, materials, equipment, and processes, which makes each operation unique. The Laboratory's capabilities include the loading of tritium and deuterium into reservoirs that are used in the gas transfer system of a nuclear weapon and surveillance of gas transfer systems to ensure reliability in the absence of nuclear testing.

High Explosives

The Laboratory's HE capability, which ensures the stability and dependability of HE in nuclear weapons, is essential to maintaining the safety and reliability of the nuclear weapons stockpile. HE R&D supports the improved predictive capability for performance, safety, and aging. The HE mission performed at the Laboratory includes HE synthesis and production, where new explosives are synthesized and manufactured to maintain expertise in explosive materials and processes essential for the long-term maintenance of stockpile weapons and materials. Another activity is HE and plastics development and characterization, which provides characterization data on the initiation and detonation properties of HE and non-HE components for modeling weapons behavior. Additionally, The Laboratory performs HE and plastics fabrication, including pressing and machining. Explosives testing, including the assembly and radiography of test devices and test firing, as well as the design and fabrication of detonators used in the stockpile also occur at the Laboratory.

Non-Nuclear

The Laboratory's non-nuclear component production and testing capability comprises a variety of activities, including some that are unique within the NSE. These activities include work with special material, such as beryllium and uranium, and high-precision machining of classified parts. The Laboratory also performs minor environmental testing of HE components.

Special Nuclear Material Accountability, Storage, Protection, Handling, and Disposition

One key element to performing the Laboratory's mission is the ability to store category (CAT)-I quantities of special nuclear material (SNM). This requirement had been met for the last 30 years, primarily by the CMR facility and the Plutonium Facility (PF)-4 at TA-55. In 2001, the CMR facility was de-inventoried and reduced to a CAT-III facility, leaving PF-4 as an authorized facility to store and process significant amounts of SNM.

MISSION CAPABILITY ALIGNMENT OF INFRASTRUCTURE ASSETS—EXISTING FACILITIES

Design; Certification; Testing; Surveillance; and Science, Technology, and Engineering Base

Dual-Axis Radiographic Hydrodynamic Test Facility: Hydrodynamic tests conducted at DARHT are dynamic integrated systems tests of mockup nuclear packages during which HE is detonated and the resulting motions and reactions of materials and components are observed and measured. Experiments at DARHT support Stockpile Services and Stockpile Systems.

Metropolis Center: The Nicholas C. Metropolis Center for Modeling and Simulation (Figure 2.3) is an integral part of the mission to maintain, monitor, and ensure the nation's nuclear weapons performance through the ASC Program. Computer simulations are conducted on platform systems located within the Metropolis Center and are the primary tools for estimating nuclear yield and evaluating the safety of aging weapons in the nuclear stockpile. Continued certification of aging stockpile safety and reliability depends on the ability to perform these highly complex, three-dimensional computer simulations. All platforms planned for the Laboratory will be installed in the Metropolis Center.

The Los Alamos Neutron Science Center: The LANSCE accelerator and research facilities (Figure 2.4) contribute to the Laboratory's stockpile stewardship mission through the exploration, development, and application of particle accelerator-based science and technology to provide new tools to help ensure the safety and reliability of the nation's nuclear weapons stockpile. Weapons research at LANSCE provides answers to fundamental questions that arise in the stewardship of an aging nuclear stockpile. Researchers use neutron and proton beams as penetrating probes to study weapon components and materials.

Although a significant portion of LANSCE is funded by the Weapons Program, many of the research and user facilities are supported by the Science Program. Infrastructure projects related to the Weapons Program are discussed later in this chapter, and a more in-depth discussion of LANSCE and Science-related projects may be found in Chapter 3, Science, Technology and Engineering.

Materials Science Laboratory: The MSL (Figure 2.5) supports four major types of experimentation: materials processing, mechanical behavior in extreme environments, advanced materials development, and materials characterization. These four areas contain

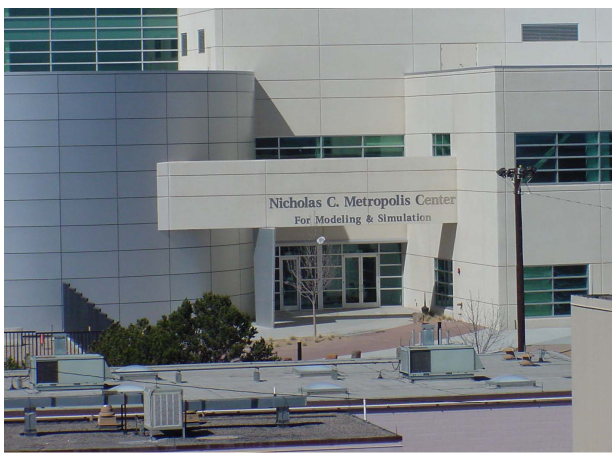


Figure 2.3: Nicholas C. Metropolis Center for Modeling and Simulation.

Figure 2.4: Weapons Neutron Research facility located at LANSCE.

Figure 2.5: Materials Science Laboratory.

operational capabilities that support materials research activities related to nuclear weapons. The MSL is also used for a variety of Science Program applications and is funded by the Institution. Future infrastructure projects pertaining to the MSL are discussed in Chapter 3, Science, Technology and Engineering.

Plutonium

Chemistry and Metallurgy Research Facility: The CMR Building (TA-03, Building 29) was designed as an actinide chemistry and metallurgy research facility. The facility encompasses over 550,000 gsf in eight separate wings, and is more than 50 years old. Current activities within the facility include SNM analytical chemistry, actinide research and development, and remote handling of highly radioactive materials. The analytical chemistry capability housed within CMR provides critical sample analysis for defense programs missions, including pit surveillance, detonator surveillance, and pit manufacturing. Currently, operations have been suspended in three wings to begin the transition of analytical chemistry operations to the CMR Replacement (CMRR) Project facilities, the Radiological Laboratory Utility Office Building (RLUOB) (completed in 2011), and the planned CMRR-NF.

Plutonium Facility: PF-4 is located in TA-55 and is augmented by many support, storage, security, and training structures located throughout the TA. PF-4 is an approximately 151,000-gsf, two-story laboratory and is the major R&D facility in the NSE complex. The facility has the capability to process and perform research on actinide materials, although plutonium is the principal actinide used in the facility. Specific activities conducted within PF-4 include manufacturing of plutonium components, including pits and parts for R&D and testing; recovery and processing of plutonium residues; surveillance and disassembly of weapons components; actinide materials science and processing R&D; fabrication of reactor fuels; and Pu^{238} (plutonium) R&D and applications.

Radiological Laboratory Utility Office Building: From its robust design to its advanced scientific equipment, RLUOB is essential to the Laboratory's national security mission in support of the NNSA's nuclear weapons program. Encompassing more than 200,000 gsf, the radiological facility contains laboratories for analytical chemistry and materials characterization of SNM, along with space for offices, training, and emergency operations.

Legacy and Enduring Waste Operations: The Radioactive Liquid Waste Treatment Facility (RLWTF) is located in TA-50 and consists of four primary structures: the RLWTF, a pump house and influent storage building, the acid and caustic solution tank farm, and a 100,000-gallon influent holding tank (Figure 2.6). The RLWTF treats radioactive liquid waste generated by Weapons Programs activities and is critical for the Laboratory to meet its programmatic deliverables. Without an operational RLW treatment capability, plutonium operations could not be conducted.

Figure 2.6: Radioactive Liquid Waste Treatment Facility.

Solid radioactive and chemical waste produced by Weapons Programs activities are handled at TA-54 and TA-50. Facilities at TA-54 process, temporarily store, and dispose of solid waste. A variety of wastes are managed, including toxic, hazardous, low-level radioactive, transuranic (TRU), and mixtures of these waste types. In addition to the operations at TA-54, TRU waste is processed in the Waste Characterization, Reduction, and Repackaging (WCRR) Facility in TA-50 and is transported to TA-54 for assay and storage. TRU waste is stored onsite until it is transported to the Waste Isolation Pilot Plant (WIPP) for disposal. Chemical and mixed radioactive wastes are transported to other offsite facilities for treatment and disposal.

Tritium

Weapons Engineering Tritium Facility: The Laboratory's tritium work is conducted at WETF, a hazard CAT-II nuclear facility located at TA-16, Building 205. Programmatic work conducted at WETF includes the high-pressure gas loading of tritium into reservoirs used in nuclear weapons and the surveillance of gas transfer systems to ensure reliability in the absence of nuclear testing. The facility also supports the extraction of tritium from irradiated target rods and management of the tritium inventory for the nuclear stockpile.

High Explosives

HE Facilities Operations: The primary capabilities and activities conducted at these facilities include the following:

- HE synthesis and production activities, including explosive manufacturing capabilities, such as synthesizing new explosives and manufacturing pilot-plant quantities of raw explosives and plastic-bonded explosives;
- HE and plastics development and characterization for any explosives used in nuclear weapons technology;
- HE and plastics fabrication, where HE powders are typically compacted into solid pieces and machined to final specified shapes;
- the assembly of test devices, ranging from full-scale nuclear-explosive-like assemblies (where fissile material has been replaced by inert material) to material characterization tests; and
- the Laboratory's HE science and processing capability supports hydrodynamic and other testing needs for LEPs and stockpile services.

HE Radiography: Radiography of test assemblies and other nondestructive testing that support HE operations are conducted at TA-08, Building 23 (Figure 2.7a). This capability supports dynamic experimentation for LEPs and stockpile services.

HE Firing Sites: The facilities that make up the explosives testing operations (Figure 2.7b) are used primarily for research, development, test operations, and detonator development and testing related to NNSA's stockpile stewardship and management programs. The firing sites specialize in experimental studies of the dynamic properties of materials under conditions of high pressure and temperature.

Figure 2.7: The Laboratory's suite of HE facilities and infrastructure include (a) Radiography and (b) Firing Sites.

HE Detonator Facilities: The Laboratory performs R&D for high-power detonators at mission-critical facilities TA-22, Buildings 91 and 115.

Non-Nuclear

HE Detonation Facilities (Production): Mission-critical facilities at TA-22 (Buildings 91, 93, and 115) house the Laboratory's high-power detonator fabrication capability. This capability includes printed circuit manufacture, metal deposition and joining, laser production, and the manufacture of cables and firing systems for tests.

Nondestructive and Environmental Testing Facilities Operations: These facilities provide the capability for component and subsystem environmental testing, including vibration, shock, temperature evaluation, and radiography in both destructive and nondestructive modes. The environmental testing capability, in support of LEP missions, is currently planned to remain at TA-11. A project to refurbish the area is beginning in FY13, with anticipated completion in FY17.

Beryllium Technology Facility: The BTF provides the only classified beryllium materials science processes within the NSE complex. Activities conducted within the BTF include the machining, molding, joining, metallography, and inspection and testing of components.

Machine Shops: The classified machine shops encompass two TA-03 Buildings: a nonhazardous materials machine shop

(Building 39) and a radiological hazardous materials machine shop (Building 102). The shops fabricate specialty components, including unusual and unique parts, fixtures, tools, or other equipment for use (1) in various applications for destructive testing, (2) as replacement parts for the Stockpile Stewardship and Management Program, and (3) in glove-boxes. Building 102 also houses high-precision machining of depleted uranium. Other activities include fabrication using unique or exotic materials and dimensional inspection of finished fabricated components.

Sigma: Sigma Complex (TA-03, Building 66) supports materials synthesis and processing, the characterization of materials, and the fabrication of metallic and ceramic items, including depleted uranium items used in the Stockpile Stewardship Program. Bulk depleted uranium is stored in the Sigma Building as supply and feedstock. Current activities in the Sigma Building focus on test hardware, prototype fabrication, and materials research for the DOE Nuclear Weapons Program, but also include activities related to energy, environment, industrial competitiveness, and strategic research. Designated as a mission critical facility for the Weapons Program, the Sigma Complex supports a large multidisciplinary technology base in materials fabrication science and is funded by the Institution (Figure 2.8). Future infrastructure projects pertaining to Sigma are discussed in Chapter 3, Science Programs.

Figure 2.8: Sigma Facility.

Special Nuclear Material Accountability, Storage, Protection, Handling, and Disposition

Plutonium Facility: PF-4 provides storage of the Laboratory's SNM inventory (primarily plutonium). Other material stored includes sealed sources collected under the DOE's Off-Site Source Recovery Project (OSRP) and mixed-oxide fuel rods. The facility also ships and receives SNM as needed to support the Laboratory activities.

IMPLEMENTING STRATEGIES BY PROGRAMMATIC CAPABILITY—FUTURE PROJECTS

Most projects planned by the Weapons Program consist of line-item construction focusing on strategic recapitalization, replacement of assets, and new facilities in the plutonium and HE capability areas. However, ongoing reinvestments will sustain enduring facilities within all capabilities. Targeted investments will be made to achieve a more consolidated infrastructure that is less costly to maintain while meeting programmatic needs and improving safety and security. Projects are planned that will achieve longer-term cost savings and increased operational efficiencies; result in either consolidation of operations or decommissioning/decontamination of existing facilities; or support unique, specific enhancements or upgrades.

Targeted Reinvestment / Life Extension / Asset Sustainment

Design; Certification; Testing; Surveillance; and Science, Technology, and Engineering Base

LANSCE—Linear Accelerator-Risk Mitigation (LINAC-RM) Projects: Major components of the LINAC have become obsolete, demonstrated failure, and are operating beyond their expected service lives. Due to the unique nature of the equipment used in the LINAC, replacement parts must be fabricated, which could cause up to a one year shutdown in the event of catastrophic failure. To preserve dependable operation of the LINAC, the LINAC-RM projects are a compilation of beamline and equipment subprojects that will focus on renovating and modernizing the existing LINAC and related systems. These projects include refurbishment of the 201-MHz and 805-MHz power systems, replacement of instruments and controls, and replacement of other selected components necessary to sustain reliable operations.

LANSCE Reinvestments: Additionally, other LANSCE facilities are candidates for reinvestment over the next decade, including

- **Main Accelerator/Operations Buildings—**Life-extension projects, including roof repair; HVAC; plumbing; and electrical upgrades to TA-53, Buildings 3 and 4.
- **Machine Shop—**Electrical, HVAC, and plumbing upgrades to TA-53, Building 16.
- **Programmatic Storage—**Electrical and site upgrades to TA-53, Building 364.
- **pRAD Transportable—**TA-53, Building 898 provides the only life and safety accessibility to the north side of the LINAC in the pRAD experimental area. This 26-year-old building will be replaced with the MaRIE project but will need upgrades or replacement in the interim.
- **Weapons Neutron Research (WNR) Life Extension—**A life-extension investment for the WNR-related accelerator buildings (TA-53, Buildings 7, 8, 28, 17, 368, 369, and 679) should be scheduled within the next 5 years. This investment includes roof repair; HVAC, plumbing, and electrical upgrades; drainage and site upgrades; foundation repairs; and emergency ingress and egress upgrades. Building 17, a multiuse, high–bay, heavy-equipment laboratory with a clean room (Class 100 to 1000), will require HVAC upgrades, including refrigerated air and strategic placement of thermostats to ensure constant temperatures. The metal detector shed, an important WNR component, will also need upgrading in the next 5 years.

Metropolis Center Modernization: An ASC-funded project is currently modernizing the Metropolis Center with a water cooling infrastructure that will be needed for the Advanced Technology Systems (ATS)-1—Trinity platform. The ATS-1 machine will arrive in quarter four of FY15. The Trinity platform is expected to quadruple the electrical demand of the present Cielo platform [from 3 megawatts (MW) to 12 MW].

As water becomes the machine cooling media, the electrical demand posed by the current air handling and its associated chilled water system should decrease accordingly with the installation of ATS-1. The Metropolis Center is capable of housing the ATS-1 platform and its successor, the ATS-3, which is anticipated to arrive in FY20. Additional basement electrical switchgear and rotary power conditioning equipment are budgeted and will be installed to meet the ATS-3 machine requirements, which are expected to approach a 20- to 24-MW demand. A sufficient cooling water supply for ATS-3 will need to be addressed because this machine generation is expected to require significantly more cooling water capacity than the ATS-1 machines. The ATS-3 water cooling system is expected to consume all of the treated wastewater that the Sanitary Effluent Reclamation Facility (SERF) can supply. The high-performance computing (HPC) capability is dependent on the SERF reliably providing 88 million gallons per year of treated waste water. Any supply shortfalls will place programmatic deliverables at risk [see Chapter 5, Operations and Business (Utilities)], for a discussion on the SERF system.

A major challenge occurs with the subsequent platform, the ATS-5, which will be delivered in approximately 2025. Providing the infrastructure for this machine will require expanding the electrical and cooling systems to the building's maximum capacity. Subsequently, the Metropolis Center's basement will be full and will not be capable of receiving more electrical or internal water-cooling infrastructure. Additionally, the weight of the processor and server racks for this machine generation might exceed the machine room floor's design load limit. A timeline for future ASC platforms is shown in Figure 2.9.

DARHT Reinvestments: Many small infrastructure projects have recently been completed in the facility, and more will be required to support sustainable, predictable radiography operations. Planning may be initiated on possible significant life extensions / upgrades required within the next 20 years, depending on mission requirements.

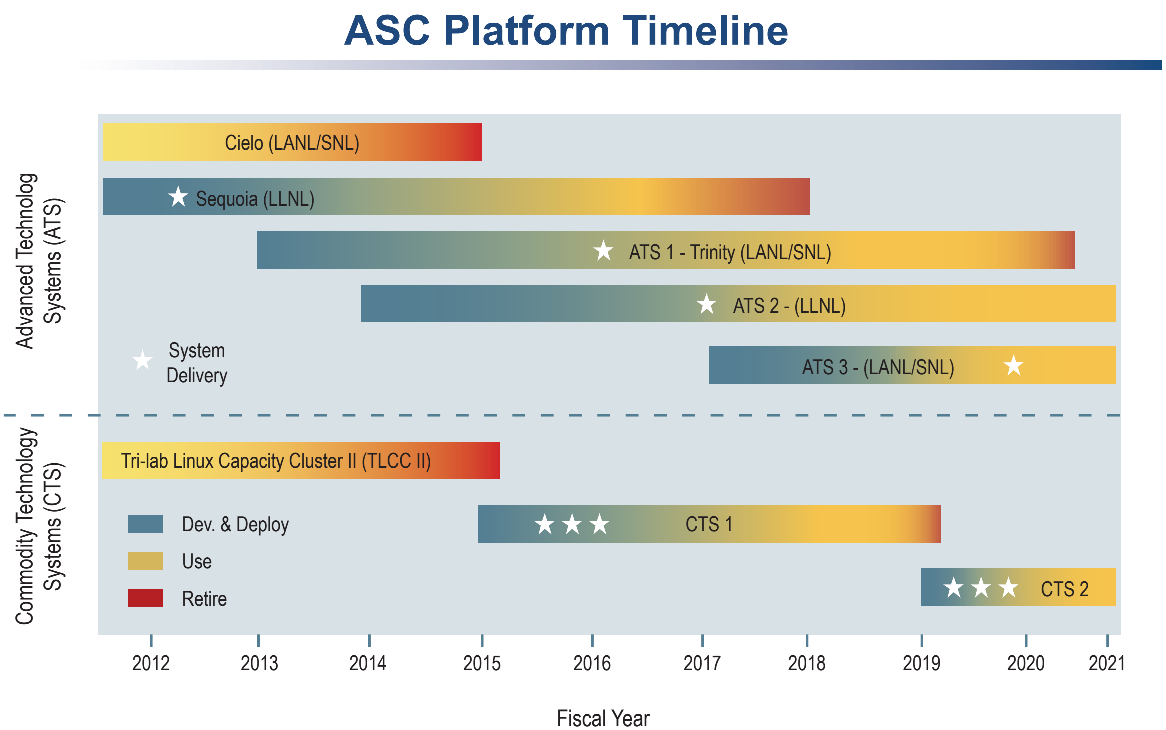


Figure 2.9: Future ASC Platforms Schedule.

Plutonium

TA-55 Reinvestment Project: Originally designated as a single line-item project for capital revitalization of facility and infrastructure systems for the operating nuclear facilities at TA-55, the TRP was subsequently split into three line items (TRP I, TRP II, and TRP III) to achieve accelerated, phased implementation of necessary safety risk reductions.

The focus of TRP I was to replace and upgrade the TA-55 cooling tower/chiller system in PF-6, including three cooling towers, three water-cooled chillers, one air-cooled chiller, and associated pumps, motors, and other components. The project, completed in 2012, was 4 months ahead of schedule and on budget.

The purpose of TRP II is to improve the reliability of the TA-55 Complex by repairing, upgrading, improving, and rehabilitating existing infrastructure capital assets. The project's scope is restricted to facility system content and focuses on facility upgrades and modernization. A near-term investment to upgrade electrical, mechanical, safety, facility controls, and other systems enables reliable operation for the next several decades. With scheduled completion in 2017, TRP II consists of seven related subprojects under three phases:

- **Phase A—**Seismic upgrades to glovebox stands, air dryers refurbishment
- **Phase B—**Seismic upgrades to glovebox stands, confinement door replacement
- **Phase C—**Seismic upgrades to glovebox stands, criticality alarm system replacement, vault water bath cooling upgrade, uninterruptible power supply (UPS) relocation/replacement, exhaust stack monitoring system replacement.

The scope and schedule for TRP III is currently under development. Current proposed project scope includes upgrading the PF-4 active confinement ventilation system to Safety Class C, replacing non-seismically qualified fire alarm panels, wiring, and devices.

Seismic upgrades: the Laboratory adopted an updated sitewide seismic hazard analysis standard in 2007. In response to that effort, the Laboratory's Seismic Analysis of Facilities and Evaluation of Risk (SAFER) project has been conducting a detailed multiyear analysis of the seismic design loads on every existing facility at the site. The Laboratory self-reported to the NNSA a new preliminary analysis of structural load capacities at PF-4. Analysis incorporated new geological data and sophisticated computer modeling and showed that a large earthquake that might occur in north-central New Mexico every 2500 years could cause significant damage to some parts of the facility. Analysis identified areas of the facility that, if strengthened, could increase its seismic response capability and reduce the potential impact on the facility, even under worst-case seismic conditions.

In addition to several subprojects included in TRP II that address seismic concerns, the following Readiness in Technical Base and Facilities (RTBF) expense projects have been completed or are underway in support of seismic upgrades for PF-4 (Figure 2.10):

Figure 2.10: PF-4 facility will undergo life extension and seismic upgrades.

- **Seismic Bracing for Fire Suppression in PF-4 Attic and Basement—**To mitigate post-seismic fires and reduce the off-site dose, the fire suppression system on the laboratory main floor and in the basement requires additional seismic bracing.
- **Above Vault Columns—**Eight columns are built into the reinforced concrete walls of the vault and continue above the vault to the laboratory floor. The captured columns concentrate all of the displacement between the laboratory floor and the basement floor into a short section (54 in.) of the vault columns. The structural modification to reinforce the columns will prevent spalling and loss of axial loads.
- **Anchorage of the Electrical Distribution System Components—**Modification of the electrical distribution system anchorage components that do not meet current documented safety analysis (DSA) seismic requirements will ensure that all system components are capable of meeting Performance Category (PC)-3 target goals.
- **Anchorage of the Safety Significant Bleed-Off Ductwork—**Modification of the safety-significant bleed-off ductwork that does not meet current DSA seismic requirements will ensure that all ductwork is capable of meeting PC-3 target goals.
- **Glovebox Fire Suppression—**DOE standards and National Fire Protection Association (NFPA) 801 require gloveboxes that contain combustible material be equipped with an inert atmosphere or fire suppression system. Installation of fire Foe tubes approved for use in PF-4 will be installed.

RLWTF Groundwater Discharge Permit: The existing RLWTF cannot use the TA-50, Building 250 LLW influent storage facility until an updated Groundwater Discharge Permit is received. The use of this facility will mitigate the risk of the RLW single-walled underground cement tanks releasing radionuclides into the environment.

Tritium

WETF Sustainment: WETF supports many unique capabilities not performed anywhere else (Figure 2.11). Although the Laboratory is continuing an ongoing effort to de-inventory and transfer excess legacy material from WETF, the Laboratory will remain the gas transfer system design agency. As such, the Laboratory will require the capabilities and resources provided by WETF to execute current and future missions.

Figure 2.11: Weapons Engineering Tritium Facility will undergo life extensions/upgrades.

Many small infrastructure projects have recently been completed in the facility, and more will be required to support sustainable, predictable tritium operations. Planning may be initiated on possible significant life extensions/upgrades required within the next 20 years, depending on mission requirements.

High Explosives

Radiography Refurbishment: A multiyear project was completed in FY13 to revitalize TA-08, Building 22, a mission-dependent facility that supports the HE radiography capability. To meet long-term programmatic activities, this facility required extensive upgrades for occupant safety and comfort. The project work scope included repairing and/or replacing flooring, doors, lighting, piping, and interior finishes. The primary electrical power was upgraded, new HVAC units were installed, and data and communication systems were improved.

Additional reinvestments currently planned for the HE radiography facilities include replacing the heating system in TA-08, Building 23, purchasing critical spare parts, and performing corrective maintenance on systems in poor or failing condition.

Non-Nuclear

Beryllium Test Facility (BTF) Reinvestments: In FY13, two projects were completed within the BTF (Figure 2.12) to increase operational efficiency and upgrade outdated equipment. The first project replaced the Facility Management System (building

Figure 2.12: Beryllium Technology Facility (BTF).

control system) to increase the response time for various facility systems. Exhaust variable air volume boxes, duct work, wiring, and conduit were replaced, and new control boards were installed. The second project saw the installation of two new air chillers and associated piping, electrical, and controls to increase reliability and ensure facility availability. Completion of these major reinvestments ensures BTF reliability for current and future mission requirements.

Special Nuclear Material Accountability, Storage, Protection, Handling, and Disposition

As programmatic activities associated with pit manufacturing, surveillance, Pu^{238} heat sources, and nonproliferation programs are being consolidated into the PF-4 facility, the ability to meet the needs for storage and processing of SNM is being challenged. The main storage vault is currently over 95% full. Focused efforts aimed at processing and discarding materials no longer required for programmatic work, in conjunction with vault and laboratory reconfigurations, will help mitigate the escalating space problem for the next decade. The Accelerated Vault Workoff project is increasing efforts to process, package, and ship excess material out of the PF-4 vault. Some material currently held on the floor is being migrated to the vault for safety and security reasons; this migration has the potential to occupy some of the liberated vault space. In conjunction with the containerization of materials on the processing floor and seismic modifications to the facility structure, increased vault storage supports reductions in the facility material at risk.

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

Plutonium

Nuclear Materials Safeguards and Security Upgrades Project, Phase II: The NMSSUP, Phase II project addresses the security system upgrades at TA-55, where the processing of security CAT-I/II quantities of SNM occurs. This project is discussed in greater detail under Chapter 5, Operations and Business (Security).

Chemistry and Metallurgy Research Replacement Project: The CMRR project is planned to provide new facilities at TA-55 to house existing CMR facility capabilities and consolidate CAT-I/II laboratory work into a single area to minimize SNM transfer within the site. The CMRR project consists of the RLUOB and a security CAT-I/II, hazard

CAT-II nuclear laboratory building CMRR-NF. Construction of the RLUOB was completed in 2011, and radiological operations are planned to commence in 2014. Although a substantial final design for the CMRR-NF was completed in FY12, the FY13 President's budget request did not include any funding for the project, deferring construction of the facility by at least 5 years. The Laboratory acknowledges that challenges associated with the CMRR project exist but also recognizes the need for a replacement facility or group of facilities to ensure that mission obligations can be fulfilled. Because of the 5-year deferral, the Laboratory is developing bridge strategies to meet interim and long-term mission needs as described in greater detail under the Integrated Plutonium Science and Research Strategy (LAUR-13-24336).

RLUOB-Enduring Operations: This project moves forward with changes that are needed from an operational standpoint once beneficial occupancy is received. Some changes are based on new code requirements that are now in force that are different from when the building was under construction and when it was completed. These projects are to be completed during the transition phase between the construction scope and the fully operational stage. These projects include modifying the existing material-at-risk tracking system, preparing/updating facility operating procedures and maintenance instructions, completing the final RLW tie-in, relocating safety showers, installing ground-fault circuit interrupter (GFCI) circuits, outfitting a laboratory for waste management operations (Figure 2.13), installing gas bottle racks, networking all continuous air

Figure 2.13: Completed RLUOB laboratory space awaiting waste management modifications.

monitors and alarms to the Operations Center, and installing personal protective equipment (PPE) lockers and clothing bins.

RLWTF Upgrade Project: The Radioactive Liquid Waste Treatment Facility Upgrade Project (RLWTF-UP) is a line-item that will provide the enduring RLW treatment capability. The RLWTF-UP will replace the existing facility built in 1963. Because the low-level / industrial liquid waste represents over 99% of the liquid waste at the Laboratory, the low-level liquid waste (LLW) and TRU liquid waste (TLW) will be treated in separate structures to minimize a costly nuclear facility footprint. The LLW capability's final design is 90% completed, and the TLW is anticipated to start design in FY14. The size-reduction-capability, zero-liquid-discharge (ZLD), portion of the project has been completed but will not be used until the existing RLWTF receives an updated Groundwater Discharge Permit. Construction of the LLW facility is scheduled for completion in June 2016 (Figure 2.14).

High Explosives

Firing Site Consolidation: Currently, 12 outdoor firing sites exist at 5 different TAs. Two of these sites are planned to be consolidated to TA-36, six other sites will be deactivated, and two will be

Figure 2.14: Rendering of proposed RLWTF Upgrade Project.

Figure 2.15: Confined Firing Site at TA-40.

converted to indoor/confined firing sites at TA-15 and TA-40 (Figure 2.15). The outdoor locations at TA-36, Eenie and Minie, consist of above ground concrete bunkers and the firing sites. To support the increased experimental work that will occur at Eenie, numerous upgrades and expansions will be required. Projects include a new diagnostic room in the bunker, sanitary sewer and potable water connections, restrooms, additional HVAC, electrical, fire alarm/suppression systems, and site work. The Minie site is expected to perform the same functions as it does currently, so no renovations or upgrades will be required.

The conversion of outdoor firing sites to indoor/confined will increase the Laboratory's number of sites from one to three. Indoor/confined firing sites present less risk to the environment and reduce the operational impact from adverse weather. The conversion of R306 at TA-15, which comprises 30-year-old reinforced concrete bunkers and a metal building, is planned to be completed in two phases. The first phase will construct a new building to house a walk-in 15-kg vessel, upgrade existing bunkers, and complete site cleanup. Phase 2 will include the purchase and installation of an additional 15-kg vessel. Chamber 5 at TA-40 will also be converted to an indoor/confined firing site. The existing chamber consists of a semi-confined "garage"-type building with a blast wall. Planned modifications include the installation of a new reinforced concrete blast wall to completely enclose the chamber and expansion of the existing building around the chamber.

Non-Nuclear

Weapons Manufacturing and Engineering Support Facility: The WMESF represents a consolidated fabrication and engineering capability required to provide reliable, effective, safe non-nuclear component machining in concert with enhanced engineering design, analysis, and prototype testing for the Stockpile Stewardship Plan and plutonium sustainment efforts. Built in the mid-1950s, the current suite of machining facilities is antiquated, oversized, and expensive to operate. These facilities no longer provide the infrastructure needed to effectively execute NNSA missions at the Laboratory. These facilities are geographically dispersed, which creates logistical problems related to part transport and production control. Consolidation of the weapons manufacturing capability, in conjunction with localized engineering design and testing support, will allow for a more efficient, cost-effective and expedient response to programmatic mission needs of the Laboratory site, as well as support NNSA transformation efforts. When this project is completed, two facilities totaling approximately 183,000 gsf will be vacated and available for reuse or demolition.

TA-11 Facility and Equipment Refurbishments: Reinvestments at TA-11 are required to support increased LEP mission deliverables during the next 5 years. The most pressing risk at this time is the complete loss of the vibration testing capability because of electrical safety concerns. Projects are planned to upgrade the facility electrical system and controls to meet modern safety requirements and procure new equipment. Additional work scope includes correcting fire protection deficiencies. The completion of these projects will enable dual vibration table operation and increased HE load limits, thus allowing the Laboratory to conduct multiple tests simultaneously.

Special Nuclear Material Accountability, Storage, Protection, Handling, and Disposition

CMRR-NF: It will be necessary to expand the capacity available for the storage and processing of CAT-I quantities of SNM beyond 2023, or programmatic work will be impacted. It is anticipated that the CMRR-NF will be coming on line in this timeframe and will provide the required expansion, including additional vault space and laboratory space, for work that is currently performed in the CMR facility. Construction of the CMRR-NF facility will help ensure that the required facilities are available to meet the nation's needs for the next 25 years.

Investments in New Facilities and Infrastructure / Signature Facilities

Design; Certification; Testing; Surveillance; and Science, Technology, and Engineering Base

Matter-Radiation Interactions In Extremes: The proposed science magnet and signature facility, MaRIE, will provide a vital increase in Laboratory capabilities for material and particle science R&D at LANSCE (Figure 2.16). MaRIE will integrate a state-of-the-art materials

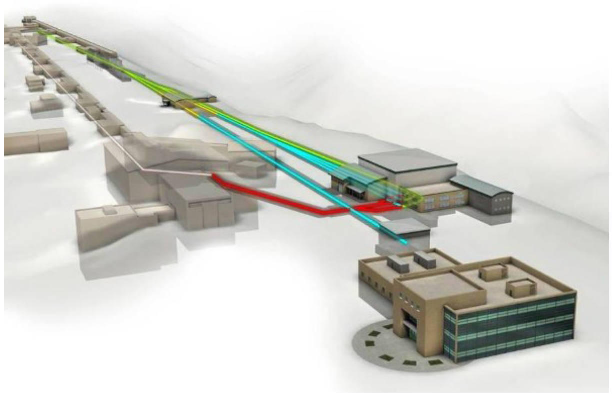


Figure 2.16: Conceptual rendering of proposed MaRIE facilities.

synthesis and characterization capability, a dynamic extremes environment, and a materials irradiation environment with diagnostic tools. The mission needs fulfilled by MaRIE 1.0 are to close key gaps in the ability to understand the condition of the nuclear stockpile and to extend the life of nuclear warheads by observing and ultimately controlling how meso-scale material properties affect weapons performance. Preconceptual planning and project scoping for MaRIE will continue in the near term. MaRIE consists of several key projects that are described in detail in Chapter 3, Science, Technology and Engineering.

Plutonium

TRU Waste Facility: This line-item project will provide the enduring capability to stage, characterize, and certify newly generated TRU, mixed TRU, and low-level and mixed low-level solid waste. The Consent Order currently requires that the Laboratory's existing waste storage, characterization, and disposal capabilities located at TA-54 be closed and remediated by 2015. The enduring capability will be relocated to TA-63. The project is currently completing final design and has an expected construction completion date of 2020. A draft Hazardous Waste Facility Permit (Permit) has been issued by the New Mexico Environment Department (NMED), but construction activities on the enduring capability cannot be initiated until the Permit is finalized.

To mitigate the gap between the establishment of the enduring capability and the consent order commitment date, an interim capability for TRU characterization and certification is being established at TA-55, which is the primary TRU and mixed TRU solid waste generator. The interim capability will establish only the minimum capabilities necessary to maintain mission critical operations until the enduring capability is brought on line. The interim capability will be used to pilot the readiness and start-up activities for the enduring capability.

High Explosives

Energetic Materials Characterization Facility: The aging HE chemistry laboratories at TA-09 will be replaced with a new 20,000-gsf EMCF at TA-22 (Figure 2.17). The new facility will have a smaller footprint than the existing facilities and will perform the same functions more efficiently and reliably. The majority of the existing facilities is more than 50 years old, obsolete, and requires excessive maintenance and repair. The project is necessary to maintain existing and future programs involving design agency energetic materials responsibility and homeland security requirements.

Dynamic Equation-of-State Facility: The proposed DEOS facility will consolidate gun capabilities currently available in four different facilities into a single, modern structure at TA-40. The new facility will be in close proximity to the other active gun facility at TA-40, Building 9 and to existing makeup and experimental assembly buildings and offices. The new building will be approximately 10,000 gsf and have four gun bays. Benefits for this project include increased programmatic efficiency, improved collaboration, and reduced operating costs. The vacated facilities will be deactivated and available for disposition.

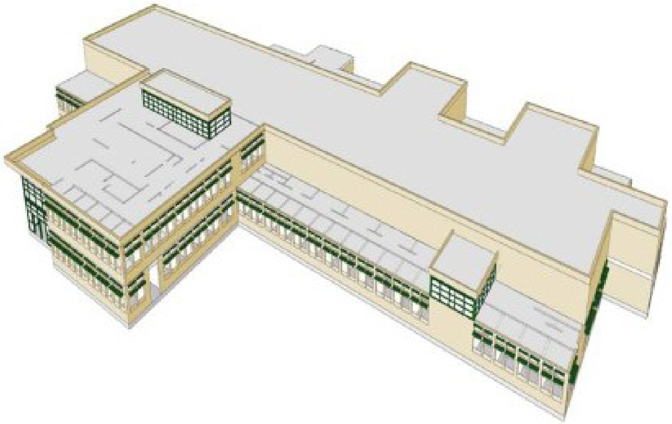


Figure 2.17: Conceptual rendering of proposed Energetic Materials Characterization Facility (EMCF).

Facility Disposition

Design; Certification; Testing; Surveillance; and Science, Technology, and Engineering Base

Beamline "B" Adjustments: The MaRIE project will drive some minor demolition at the north side of Area A (TA-53 Buildings 10, 898, 315, and 575) and modifications to TA-53, Building 3. Removals will allow new MaRIE programmatic facilities to be located in this area. This demolition will occur primarily at Beamline B, in the vicinity of the Neutron Time of Flight (NTOF) structures. This existing extension of the beamline will interfere with new MaRIE construction; however, adjustments to the end of beamline B are intended to facilitate its continued use in that area.

Plutonium

RLWTF Disposition: The Laboratory is planning to disposition the existing RLW facility once the replacement project (RLWTF) is completed and operational, which is currently estimated to be no earlier than FY22.

CMR Disposition: In FY05, disposition of the existing CMR facility received Critical Decision (CD)-0 in conjunction with CMRR CD-1 approval. The receipt of CD-0 demonstrated the NNSA's commitment to meeting the FY02 Energy and Water and Water Development appropriations Bill Conference Report's (107-258) "one-for-one" square footage reduction requirement. Currently, the NNSA cannot initiate CMR disposition activities until completion and operational start-up of the CMRR Nuclear Facility has occurred, currently projected to be no earlier than FY22. Currently, identifying a potential date for CMR disposition or a funding source is premature. However, the Laboratory remains fully committed to the disposition of this facility (571,000 gsf).

High Explosives

Many of the HE structures, which were built in the 1950s, are experiencing end-of-life failures and are unreliable for the long term. Many structures provide a substandard and low-quality working environment and are increasingly expensive to maintain. The geographic separation of the structures also makes effective collaboration problematic. Evolving missions have resulted in orphaned structures and facilities that are no longer suited for today's programmatic needs. For example, NNSA programs require more experimental work to be conducted in confined (i.e., indoor) facilities to reduce environmental impacts, noise, and work restrictions due to adverse weather. The result of these factors is that the current capability set presents increased environmental risk, significant negative programmatic impact, and substantial cost going forward.

The Laboratory has developed a strategic HE infrastructure plan for revitalization and consolidation of various capabilities and facilities required for current and future programmatic deliverables. The plan consists of minor changes to operations and facilities, expense-funded GPPs, and a line-item project.

HE Consolidation: Many unused and obsolete facilities will be deactivated as part of the new HE construction and consolidation plan. Obsolete and unneeded buildings located at TAs -09, -36, and -39, will be permanently deactivated and available for disposition.

- **TA-22 Magazines Disposition—**This project is planned under the proposed Federal Disposition Program (FDP) funding and will disposition excessed buildings and magazines at TA-22.
- **HE Disposition, Phase I—**This project is planned under the proposed FDP funding and will disposition excessed magazines at TA-08, -11, and -37 and the Shop/Assembly Building at TA-11.
- **HE Disposition, Phase II—**This project is planned under the proposed FDP funding, and plans are in place to disposition already excessed facilities and facilities planned to be deactivated at TA-15 and 36. These facilities include obsolete control buildings and storage buildings.
- **TA-09 disposition—**A number of facilities at TA-09 will be dispositioned under the proposed FDP funding once the EMCF is completed and operational, currently estimated to be no earlier than FY21. This disposition includes magazines, laboratories, office buildings, and storage facilities.
- **HE Consolidation Project (Long Term)—**In the long term, additional excessed buildings in TA-15 and TA-09 will be removed because of the consolidation of HE testing areas.

Figure 2.18: The classified machine shops at TA-03 will be dispositioned when replacement facilities are completed.

- **Pulsed High-Energy Radiographic Machine Emitting X-Rays (PHERMEX) Disposition—**About 9,000 gsf of this excessed firing site is currently excessed and planned for demolition.

Non-Nuclear

Shops Disposition: The TA-03 classified machine shops (approximately 156,700-gsf) are planned for disposition under the proposed FDP funding when consolidation and replacement facilities are completed (Figure 2.18). Much of this capability will be moved to the WMESF located at TA-16 when it is completed and operational, but no earlier than 2021.

CHALLENGES AND VULNERABILITIES

The next 5 to 10 years will be extremely critical to the NNSA's weapons program mission execution. The initial emphasis will focus on continuing to execute the surveillance activities, as well as the modeling and simulation activities that underpin the annual assessment process that culminates in the Laboratory Director's letter to the Secretaries of Energy and Defense. The next major activities at the Laboratory include supporting the W76-1 LEP and the development activities for the B61 LEP. All of this work is supported by a future-looking science and engineering campaign set of program activities, as well as the High-Performance Computing (HPC) and scientific activities associated with the ASC. To execute this diverse set of missions and to continue to support the health of science at the Laboratory, the weapons facilities and infrastructure must be supported in a sustainable manner (Figure 2.19).

Risks can be created by program changes that require infrastructure and/or operational modifications not in the current plan. The timing of programmatic changes generally permit the Laboratory enough time to plan adjustments, but improved coordination with the program areas operating within the facilities is the best mitigation tool currently being applied. Changing construction schedules can also contribute to facility and infrastructure risk. Schedule delays often mean that existing facilities must operate beyond their design life and result in increased dependence on operational funds for "other project cost" activities usually included in the construction project. Extending the life of aged facilities has resulted in increased budget requirements that place other operations at risk. Limited funding continues to force ongoing minimal maintenance and the surveillance of facilities that should be taken offline, decontaminated, and demolished. Many competing funding priorities exist, and trade-off decisions are reached annually in an attempt to provide a balance between operational and maintenance considerations.

Figure 2.19: The Laboratory's contribution to the NNSA's weapons program will continue to focus on surveillance activities, modeling and simulation, and support of LEPs for our nation's nuclear weapons. To continue execution of these diverse missions, the Laboratory's weapons facilities and infrastructure must be sustainably supported.

CHAPTER 3: SCIENCE, TECHNOLOGY & ENGINEERING

INFRASTRUCTURE CHALLENGES

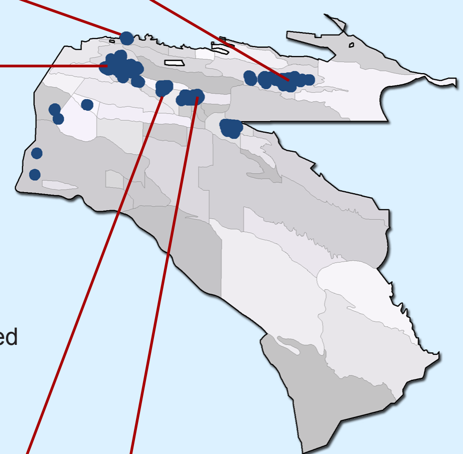
- Science facilities, dispersed through-out the entire Laboratory site, must be consolidated and co-located to improve efficiencies and decrease site footprint. Some of these facilities are in poor condition which negatively impacts the Laboratory's ability to attract and retain staff.
- Small-scale office and light laboratory facilities must be sustained to maintain current science capabilities, while new facilities are necessary to meet future mission obligations and be responsive to developing capabilities.
- Potential funding challenges are evident, compounded by the urgent need for specialized facilities as dictated by evolving missions and ongoing experimental efforts.

EXISTING FACILITIES

TA-43: The Bioscience Capability supports meta-genome sequencing, bioenergy research, gene cloning and protein production, nondestructive radioactive sample analyses, and in vivo radioactive material monitoring.

TA-53: Accelerators and Electrodynamics; Bioscience; Energy; Engineering; and Nuclear and Particle Physics, Astrophysics, Cosmology Capabilities support particle physics research, neutron diffraction techniques, advanced nuclear fuels research, isotope production, and high-energy neutron experiments.

TA-03: Chemical Science, Energy, and Materials Science Capabilities support analytical chemistry and metallurgy, fuel cells and advanced nuclear fuels, integrated nano-technology, and materials research for non-weapon applications.

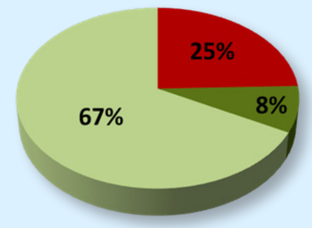


TA-48/55: Chemical Science and Energy Capabilities support radiochemistry R&D in RC-1, as well as advanced nuclear fuels research at PF-4.

TA-35: Accelerators and Electrodynamics, Bioscience, and Materials Science Capabilities support ultra-intense lasers and laser acceleration research, stable isotope synthesis, and pulsed magnetic field research.

FACILITY STATUS

- STE is responsible for 26% of the Laboratory's owned operating permanent building space.
- About 25% of this building space has a limited life and will be eligible for disposition within the next 20 years.
- The average age of these enduring facilities (>20 years old) is 36, ranging from 21-67.



Enduring, ≤20 years old: (~165k gsf) 21 structures including CINT, MSL/Office Bldg, Isotope Production Facility, Pulsed Power Research Facility, TA-48 Analytical Chemistry.

Enduring, >20 years old: (~1,346k gsf) 63 structures including LANSCE admin office & labs, Target Fabrication Bldg, Sigma, Applied Physics Lab, TA-35 Laser, institutional computing facilities.

Limited Life: (~491k gsf) 40 structures including, Physics bldg, HRL, Cryogenics bldg "B".

IMPLEMENTING STRATEGY

STRATEGY	PRIOR ACCOMPLISHMENTS	FUTURE PLANS
Targeted Reinvestment/ Life Extension / Asset Sustainment	• RC-1 reinvestments at TA-48 to allow for continued use of these chemistry facilities • TA-51 interior reinvestments to allow for facility use until future disposition	• Sigma reinvestment to allow for continued use of this facility • TA-35, Building 189 reinvestment to support materials design, fabrication, and assembly for wet chemistry • HVAC upgrades for HRL and Bioenergy/Environmental Science at TA-35 • The main Accelerator/Operations building at LANSCE will undergo life extension projects • F3 Experimental Hall Renovation to complement the new MaRIE facilities
Strategic Recapitalization and Replacement of Assets Beyond Useful Life	• TA-59, Building 1 recapitalization for chemistry laboratories • MSL in-fill project adds a chemistry laboratory to a previously underdeveloped space on the second floor	• Proposed SM-30 Institutional Computing • TA-64, Building 1, 67 and 68 repurposing for secure chemistry capabilities, per Pajarito Corridor Modernization Plan, LACP 13-00648. • Replacement facility for Earth and Environmental Sciences campus at TA-03 • Replacement Physics IGPP's at TA-53 support disposition of obsolete space in TA-03 • TA-03/48 Chemistry IGPP's to provide office, laboratory, and machining facilities for signature science and consolidation of Advanced Nuclear Fuel Laboratories and Fuel Cell Laboratories • BSL-III to be repurposed for work previously done at the HRL and other locations across the Laboratory
Investment in New Facilities and Infrastructure/Signature Facility	• CINT is a national user facility supporting the design, performance and integration of nanoscale materials	• MaRIE Signature Facility planning project • Plans for Analytical and Measurements Dosimetry Center allows for consolidation of radiation protection facilities, per Health Research Laboratory Facility Modernization Plan (LACP-12-01076). • TA-53 expansion will allow for consolidation of personnel and laboratories into a secure space • WNR expansion will increase capacity to accommodate the expected increase in facility use • IPF expansion will improve transportation operations and production rates of medical isotopes • Lujan addition will provide increased assembly space for new instruments and office space for personnel • Proposed Space Data Center has potential to promote analysis and interpretation of signatures of anthropogenic events
Facility Disposition	• Trailers and transportables in support of consolidation efforts, footprint reduction initiatives, and site closure activities.	• Disposition of transportables at TA-53, -35, and -48 • TA-46 and TA-51 site closures • Disposition of TA-43 facilities and future land transfer to Los Alamos County
Leasing / Divested Ownership	• Research Park I, renovated and reconfigured existing office space into laboratory space for bioenergy	• Research Park II has the potential to expedite relocation of work scope from HRL to modern facilities, per Health Research Laboratory Facility Modernization Plan (LACP-12-01076).

OVERVIEW

Introduction

National security depends on science and technology, and the US relies on LANL for the best of both. The National and GS environment is rapidly evolving, as are other emerging national challenges and science and engineering advances that can mitigate vulnerabilities. The core fundamentals of the Laboratory's experimental activity are ST&E. Various Laboratory programs ensure a world-class ST&E base that underpins all of the national security missions that are conducted at LANL.

Mission Areas

The Laboratory's national security mission requires a multidisciplinary approach to solve some of the nation's toughest science and engineering challenges. Our missions are to ensure the safety, security, and reliability of the US nuclear deterrent; reduce global threats; and address energy security and other emerging challenges. The broad range of activities needed to succeed in this mission requires a flexible and forward-looking approach to managing our ST&E. That flexibility comes from a concept we call the Science Pillars:

- Science of Signatures (SOS);
- Integrating Information, Science, and Technology (IS&T) for Prediction; and
- Experimental Science Focused on Materials for the Future.

The Science Pillar concept is the primary tool the Laboratory uses to plan how to accomplish current and future missions. These Science Pillars enable us to manage diverse activities in an agile and responsive manner and to adapt to new challenges as they arise. Each of the pillars has discrete science goals that are fundamental to our success, and as with pillars that hold up a building, they support each other and together ensure the integrity of the whole. This cooperative and combined strength makes the Science Pillars an effective management tool.

The Science Pillars also inform our investments in science and engineering infrastructure and equipment, guide recruitment and training strategies, and serve as a framework for our partnerships with other leading research institutions worldwide.

Science of Signatures

The Laboratory's SOS strategic thrust pillar addresses emerging challenges in Laboratory mission areas by developing science and technology to detect vulnerabilities and threats, developing signatures, and understanding a component species or process that has a major impact on a large, complex system. Within the pillar, the scope of signature discovery spans nuclear devices, nuclear nonproliferation, environmental impacts, genome science, stockpile stewardship, weapons life extension, threat reduction, and more recently, energy security, climate, and global health.

The SOS pillars links LANL's capabilities to pressing national needs in LANL's primary mission areas of national security science, GS, and emerging national challenges. The SOS pillars does so by developing a scientific understanding of the origin and evolution of signatures and backgrounds, new measurement techniques and strategies for signature identification, and new analysis and interpretation tools for the development of knowledge from these signatures. The science themes to develop solutions to important application areas are signature discovery, the revolution of measurements, and forward deployment of technologies.

Information Science and Technology

The IS&T for Prediction pillar addresses emerging challenges in national security, societal prosperity, and fundamental science. This pillar leverages advances in theory, algorithms, and the exponential growth of HPC to accelerate the integrative and predictive capability of the scientific method. The IS&T thrust focuses on the integration of LANL assets for the understanding, quantified prediction, and design of complex natural and engineered systems.

Strong capabilities are being developed in three common, crosscutting IS&T areas:

- **Complex Networks—**Description of complex systems by their interdependent subsystems and components: cyber systems, national infrastructure, biological systems, social networks, terrorist networks, smart grid, etc.
- **Computational Co-Design—**Design of interacting components of a computational system as a whole, producing significantly better, perhaps even revolutionary, designs.

- **Data Science at Scale—**Extremely large datasets and extremely high-rate data streams in cyber security, energy security, climate modeling, astrophysics, biology, etc.

Materials for the Future

The Laboratory anticipates the advent of a new era in materials science, transitioning from observing and exploiting the properties of materials to a science-based capability that creates materials with properties optimized for specific functions (Figure 3.1). Today, the performance we expect and achieve from many materials is at least 10 times less than what we believe the fundamental limits to be. This gap reflects our current inability to connect atomic-scale understanding (limited by computational tools to <1 micron) to bulk, integrated performance at dimensions >>1 micron. Although bridging this "micron frontier" from atomic understanding to bulk performance overtly refers to a length scale, understanding dynamic and stochastic processes on relevant temporal scales (especially in extreme environments) is central to this vision.

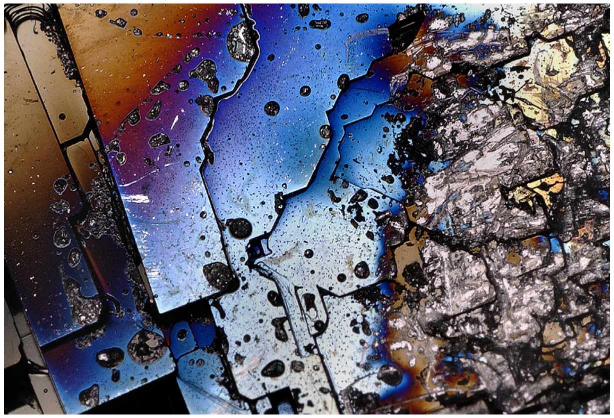


Figure 3.1: Crystal of a cerium-based analogue of the plutonium-based superconductor.

CORE CAPABILITIES

Accelerators, Electrodynamics

The Laboratory prides itself on its continuing record of excellence in the field of accelerator science and technology directed toward both fundamental scientific research and issues of national security and energy security. Likewise, the Laboratory has made and continues to make significant contributions to national security using its expertise in diverse areas of electrodynamics.

Capabilities in this area are nested around four major facilities: LANSCE, DARHT, FEL, and Trident Laser.

Bioscience: Bioenergy, Biosecurity, and Health

The fate and security of human health and progress are inextricably tied to humanity's relationship with plants, animals, and the environment. At LANL, scientists and engineers are working to unlock many of the mechanisms found in nature to improve humanity's ability to battle diseases (Figure 3.2), create new forms of environmentally friendly and abundant energy, bolster human and animal immune systems, and improve agriculture to facilitate the growing of crops for food.

Bioscience research also plays a critical role in America's national security. Scientific efforts at LANL include finding ways to counter bioterrorism, predicting or mitigating disease epidemics and pandemics, and creating sustainable energy for a secure future. For these reasons, bioscience plays a critical role in the Laboratory's ability to address many of the nation's health and security concerns.

Research directions include bioenergy, biosecurity and health, cognitive and neuroscience, genomics and systems biology, and proteins.

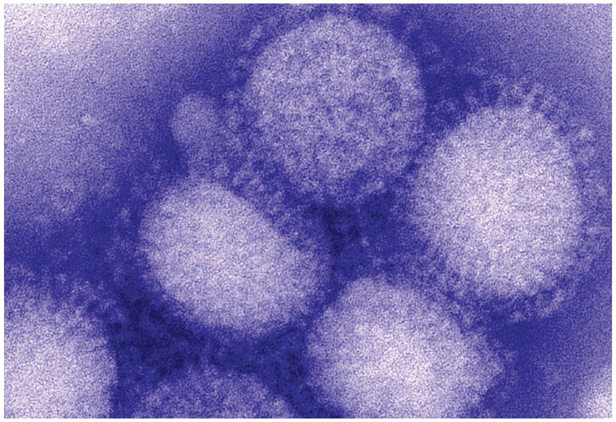


Figure 3.2: The newly identified H1N1 influenza virus is a unique variant of an H1N1 subtype, a "novel H1N1 influenza A virus."

Chemical Science

Chemical science at the Laboratory started with the production and subsequent chemical separation of plutonium during the Manhattan Project. Additional mission-related chemistry was required in the disciplines of HE synthesis and characterization, nuclear materials process chemistry, and chemical characterization, among others. Over the years these core capabilities have grown, and today a strong core of chemistry capability at the Laboratory is essential to nearly every aspect of the Laboratory's national security science mission.

Research directions include actinide chemistry, chemical processing and engineering, chemistry of materials, isotope science, measurement and detection science, modeling and simulation, and synthetic mechanistic chemistry.

Earth and Space Sciences

Earth and space sciences span from the Earth's core to the sun's atmosphere to stellar explosions at the infancy of our universe. (Figure 3.3) This capability has elements that spread across the Laboratory. By conjoining basic research and weapons program needs in the earth and space sciences, research has expanded rapidly.

Figure 3.3: A supernova (bright spot, lower left) was observed in the outskirts of spiral galaxy ngC 4526. nearly as bright as its entire galaxy, this type of supernova known as type Ia—can be seen at great distances, making it a useful indicator of dark energy's accelerating effect on the expansion of the universe.

The program continues to address the original missions but also to apply capabilities to a wide range of national and energy security issues, from assessing the safety of underground carbon dioxide sequestration sites to monitoring and analyzing human and natural activities and processes from space.

Research directions include atmospheric science; carbon management; climate processes; computational science; ecology; energy systems analysis; engineering; environmental science and transport; geochemistry; geoscience/hydrology; monitoring, measurement, and verification; nuclear weapons effects; predictive modeling; repository science; waste characterization; and water resources.

Energy

With energy use increasing across the nation and the world, LANL is using its world-class scientific capabilities to enhance national energy security by developing energy sources with limited impacts on the environment and improving the efficiency and reliability of the nation's energy infrastructure. LANL's diverse energy security research enterprise has three main focus areas:

1. Materials and concepts for clean energy, including science for renewable energy sources, photovoltaics, energy storage, and fuel cells.
2. Mitigation of the impacts of global energy demand, including climate change prediction, infrastructure reliability and security, greenhouse gas monitoring and measurement, and carbon dioxide capture and sequestration.
3. Sustainable nuclear energy, including fundamental advances in nuclear fuels, nonproliferation safeguards, reactor concepts, and reactor waste disposition.

Research directions include advanced modeling and simulation; biofuels and bioenergy (Figure 3.4); carbon dioxide separation, capture, and sequestration; climate and earth system science; energy storage; fuel cells; geothermal energy; hydrogen storage, safety codes, and standards; infrastructure analysis; nanomaterials and composites; nuclear repository science; nuclear fuels

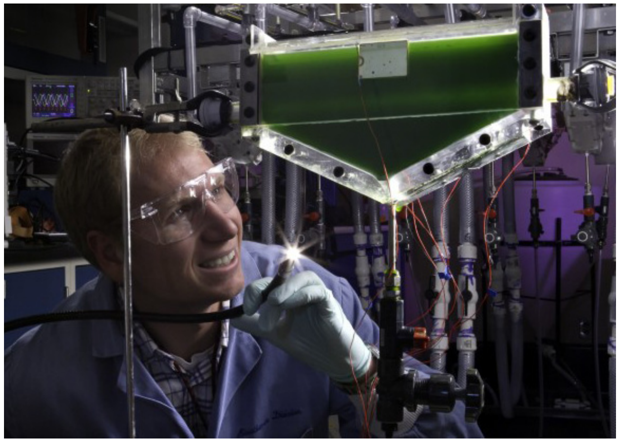


Figure 3.4: The ultrasonic algae harvesting system is used to harvest microalgae for biofuel production.

design and processing; nuclear materials management and regulatory analysis; materials behavior under radiation; reactor design and modeling; smart grid network science; solid-state lighting; superconductivity; unconventional fossil fuels; and wind and renewable systems integration.

Engineering

LANL engineers create, design, and build the tools, instruments, and systems that Laboratory scientists use to explore, monitor, experiment with, and discover natural and manmade phenomena. Engineering's obligation is to be an involved partner to enable and facilitate success in science and national security projects and programs. Thus, the engineering profession at the Laboratory is rich and diverse in disciplines and capabilities. The Laboratory's cadres of engineers seek ways to put knowledge into practice to meet national security challenges. Various specialized engineering competencies arise from the interdisciplinary problem solving required to tackle and accomplish the Laboratory's national security mission.

Research directions include hybrid mechanical, electrical, chemical design of specialty systems, and prototypes; measurement, test, evaluation, and advanced diagnostics; materials characterization and processing; nuclear engineering for nuclear energy development and monitoring nuclear facilities energy conversion, transmission and storage; space and other forward-deployed systems; and systems engineering.

High-Energy-Density Plasmas and Fluids

The HED plasmas and fluids capability is central to the science of thermonuclear weapons and LANL's mission of ensuring the safety, reliability, and performance of the nation's nuclear deterrence. HED plasmas and fluids capability covers three areas with strong overlap: HED plasma physics in particular, laboratory plasma physics for weapons science and work on the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL); plasma physics; and fluid dynamics and turbulent mixing.

Research directions include HED plasma physics, plasma physics, and fluid dynamics and turbulent mixing (Figure 3.5).

Information Science, Computing, and Applied Math

A close coupling of information science with computational science helps us seek to deepen our understanding of a variety of complex systems through the integrated use of physical and mathematical models implemented on high-performance computers and applied mathematics, which focuses on practical problems and uses the formulation and study of mathematical models.

LANL has one of the largest supercomputing centers on the planet, with massive resources available for both classified and unclassified scientific simulation, along with world-class computational physicists, computer scientists, and mathematicians. The result is a unique and tight integration of theory, modeling, and computational science.

With LANL's expertise in the use of HPC for modeling and simulation of complex physical phenomena and working within the auspices of the ASC program, extensive research is done in materials science, weapons stockpile stewardship, and environmental management.

LANL's ability to simulate large, complex, nonlinear systems and generate unique insights from extremely large data sets creates advances in threat-reduction activities, such as intelligence analysis, cyber security, and nuclear nonproliferation.

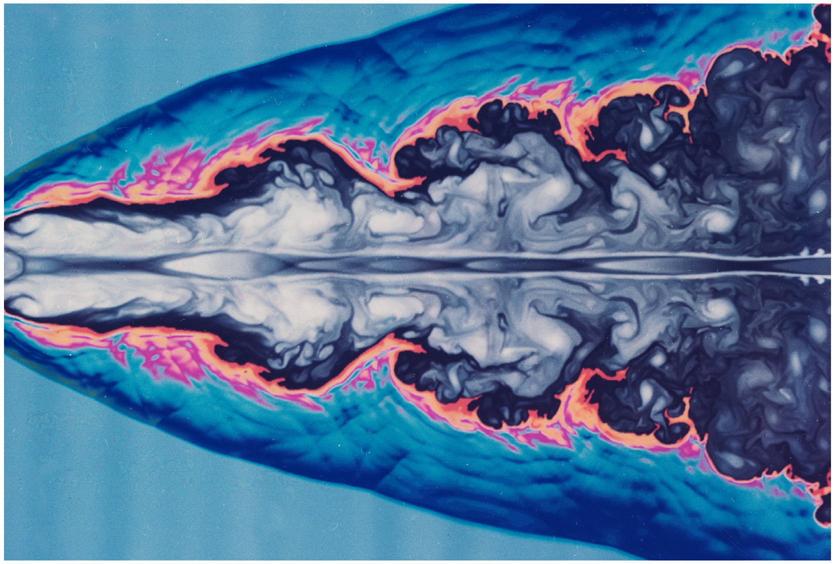


Figure 3.5: Model of turbulence using fractals and computer simulation.

Research directions include computational co-design, coupled computational physics applications and simulations at scale, data science at scale, digital libraries, next-generation file systems, bioinformatics, infectious disease surveillance, climate change and energy security, and smart grids.

Materials Science

The scientific and technical area of materials has been a foundational capability at the Laboratory since its inception. The materials capability encompasses a wide array of technical disciplines, research topics, organizations, and sponsors (Figure 3.6). The materials program enables innovative research and development at the boundaries of chemistry, physics, theory, and materials science that translates fundamental discovery to materials production in strategic areas, such as actinide science.

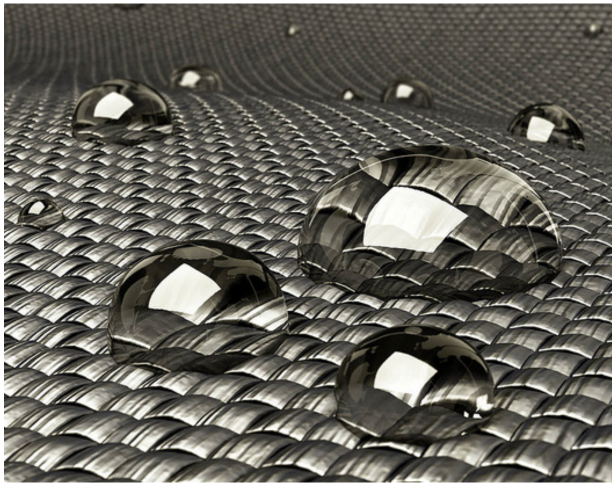


Figure 3.6: Plasma-treated fabric at APJeT's Santa Fe lab: LANL technology may transform performance apparel.

LANL's vision for its Experimental Science Focused on Materials for the Future Pillar is intentional control of the functionality of materials. This vision will be achieved through the discovery science and engineering required to establish design principles, synthesis pathways, and manufacturing processes for advanced and new materials. The materials science capability is driven by scientific challenges in understanding defects and interfaces in materials, exploiting emergent phenomena, and enabling materials performance in extreme environments.

Research directions include materials dynamics, actinide and correlated electron materials, energetic materials, complex functional materials, materials in radiation extremes, and integrated nano-materials.

National Security and Weapons Science

National security and weapons science is at the core of ensuring the safety, security, and effectiveness of the US nuclear deterrent and protecting against a radiological or nuclear attack on the US. The research performed by laboratory scientists and engineers provides the base from which new, innovative solutions are developed for the nation's nuclear security problems. National security and weapons science at the Laboratory spans essentially all physical, life, and engineering sciences.

National security and weapons science supports a variety of deployed systems, both for the nuclear stockpile and for monitoring and understanding natural and manmade phenomena. LANL is the design agency for the W76 and W88 submarine-launched ballistic missile warheads, the W78 intercontinental ballistic missile warhead, and the B61 gravity bomb. These four systems constitute the majority of the nation's on-alert nuclear deterrent. Examples of monitoring systems include ground and space-based systems that LANL produces for detecting violations of nuclear test treaties.

Research directions include nuclear physics, chemistry, engineering, computer and information science, earth and space sciences, materials science, engineering, chemistry, biosciences, and energetic materials.

Nuclear and Particle Physics, Astrophysics, and Cosmology

Basic experimental and theoretical research addresses tests of the standard model and studies of quantum chromo dynamics. A great breadth exists in the research being done in astrophysics and cosmology, including gravitation and gravitational waves; precision cosmology; dark matter and dark energy; neutrino physics; astroparticle physics; high-energy astrophysics, cosmology, and galaxy formation (Figure 3.7); plasma astrophysics; proto-planet formation and migration; and astrophysical data analysis and processing.

Research directions include nuclear astrophysics and nuclear data; neutrino physics and fundamental symmetries; the application of basic research to isotope production, nuclear weapons, and nuclear

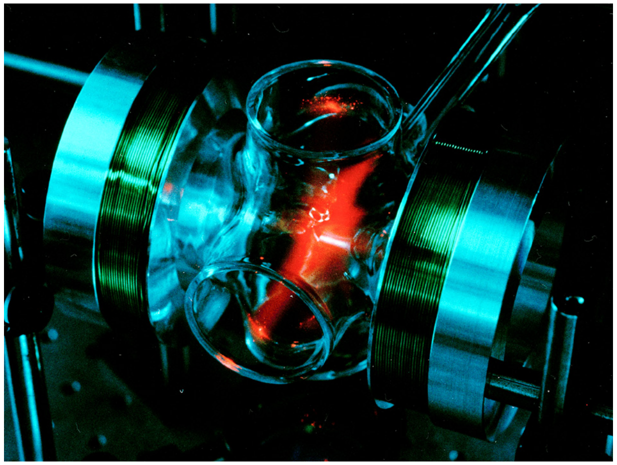


Figure 3.7: Research in fundamental nuclear and particle physics probes subatomic reactions, searching for a better understanding of the basic building blocks that make up our universe. This magneto-optical trap's laser beams intersect in a glass vacuum cell that confines cesium atoms.

threat reduction; proton radiography; muon tomography; proton active interrogation; and wide-angle, fast-response optical telescopes.

Sensors and Instrumentation Systems

Signatures are the unique elements of a threat that allow us to locate it within the environments and describe it. At LANL, our complete technological sensor toolbox is applied to developing signature science applicable across our mission areas. Our science approach is to discover new signatures, revolutionize the measurement of existing signatures, and engineer and deploy practical new signature related technologies. The SOS explores both in situ (primarily laboratory-based) approaches and remote and standoff sensing. Research directions include acoustic/seismic sensing, biological signatures and sensing, chemical sensing, ecology/ecosystem sensing, imaging, nuclear and radiation sensing, space and planetary sensing, and space plasmas and energetic particles.

MISSION CAPABILITY ALIGNMENT OF INFRASTRUCTURE ASSETS—EXISTING FACILITIES

Accelerators and Electrodynamics

Los Alamos Neutron Science Center: One of the world's most productive multidisciplinary international user facilities, LANSCE consists of a nearly 1-mile-long, 800-MeV proton LINAC with a demonstrated capability of delivering 1-MW beam power. The LANSCE accelerator facility (Figure 3.8) provides research and experimental opportunities in particle physics by providing intense sources of neutrons to the scientific community. LANSCE supports research in the national security programs and operates as an international user facility. Research in neutron scattering, neutron science, and proton radiography addresses scientific issues and maintains research excellence to attract best-in-class engineering and scientific staff. This DOE-designated user facility has five main experimental parts: the Manuel Lujan Neutron Scattering Center (Lujan Center), the Ultra-Cold Neutron (UCN) facility, the WNR facility, and the pRAD facility. Their capabilities are described below.

- The Isotope Production Facility (IPF) uses a 100-MeV proton beam to generate radioisotopes for medical research purposes. The 800-MeV H-ion beam is delivered to four additional major experimental facilities.

Figure 3.8: Los Alamos Neutron Science Center.

- The proton beam delivery through a proton storage ring—a high-peak-intensity accumulator/compressor ring—to the Lujan Center's spallation target can provide thermal and cold neutrons to 17 experimental flight paths.
- A micro-pulse proton beam is delivered to the unmoderated spallation target at the WNR facility for high-energy neutron experiments on seven flight paths.
- A special, tailored beam is delivered to the pRAD facility to acquire time-sequenced images of dynamic or gas-gun-driven shock events.
- High-peak-intensity-proton pulses are delivered, at required intervals, to the UCN facility.

Although a significant portion of LANSCE is supported through the Science Program, many of the facilities are funded by the Weapons Program. Infrastructure projects related to the Science Program are discussed later in this chapter, whereas weapons-related projects may be found in Chapter 2, Weapons Program.

Dual-Axis Radiographic Hydrodynamic Test Facility: This DARHT facility (Figure 3.9) consists of two linear induction accelerators oriented at two right angles to one another. Each electron beam is focused onto a metal target that converts the beam's kinetic energy into x-rays. Multiple x-ray pulses produce multiple-view radiographic images of a full-scale nonnuclear weapon mockup as it implodes. A more in-depth discussion of DARHT may be found in Chapter 2, Weapons Program.

Figure 3.9: The Laboratory built DARHT to position two massive x-ray machines perpendicularly to capture two- and three-dimensional images of materials imploding at speeds greater than 10,000 miles per hour.

Free Electron Laser: This FEL facility is a versatile tool for applications requiring high-brightness electron beams or a tunable source of high-energy infrared light pulses in the wavelength range of 4 to 100 microns. This machine has been used to address a wide diversity of research topics. For example, the FEL has been used to measure the wavelength-dependent absorption of tissue, to characterize the infrared transmission of fibers at long wavelengths, to generate plasmas for atomic line x-ray production, and for the Compton-scattering generation of x-rays. An X-Ray Free Electron Laser (XFEL) is planned for LANL's future signature facility, MaRIE.

Trident Laser: Research using the trident laser at LANL continues to yield new and exciting results in the field of ultra-intense lasers and the laser acceleration of ions. This facility is an extremely versatile, three-beam, neodymium-glass laser system dedicated to HED physics research and fundamental laser-matter interactions. Trident's one-of-a-kind, long-pulse capabilities have enabled state-of-the-art innovations in laser-launched flyer plates and other unique loading techniques for material dynamics research.

The LANL user facility provides a combination of capabilities for high-energy-density physics not found elsewhere in the world. Discoveries include

- laser-accelerated, mega-electron-volt, mono-energetic ions;
- nonlinear kinetic plasma waves;
- the transition between kinetic and fluid nonlinear behavior for plasma waves; and
- other fundamental laser-matter interaction processes.

Bioscience: Bioenergy, Biosecurity, and Health

Protein Crystallography Station: This facility uses neutron diffraction techniques to perform ground-breaking work in understanding enzyme structure and function.

Los Alamos Genome Center: The Genome Center houses all of the newest sequencing technologies, focusing primarily on sequencing critical pathogens and near neighbors, as well as microorganisms useful to bioenergy research. In addition to initial sequencing, the Center engages in computational finishing and bioinformatics characterization, database and web services for genome comparisons, and meta-genome sequencing and analysis for pathogen discovery and bio surveillance.

High-Throughput Gene Cloning and Protein Production Facility: This facility serves the Tuberculosis Structural Genomics Consortium, the Integrated Center for Structure and Function Innovation, and a National Institute of Health (NIH) project to select antibodies to be used against every human protein.

Health Research Laboratory: The Health Research Laboratory (HRL) consists of the Radioanalytic Services Laboratories (RSL) and the In Vivo Measurement Laboratory (IVML). RSL performs nondestructive radioactive sample analyses in support of LANL's Radiation Protection and Environmental Stewardship programs. IVML performs routine monitoring on over 2000 workers per year for intakes of radioactive materials using chest and whole-body counts.

Stable Isotope Resource: This facility fosters the creation of new, efficient routes **to synthesize** stable isotopically labeled compounds.

Chemical Science

Chemistry and Metallurgy Research Laboratory: The CMR building supports research and experimental activities for plutonium and uranium analytical chemistry and metallurgy. A more in-depth discussion of CMR may be found in Chapter 2, Weapons Program.

Plutonium Facility Chemistry Laboratories: PF-4 at TA-55 is the nation's most modern fully operational plutonium science and manufacturing facility. PF-4 supports a wide range of national security programs that involve stockpile stewardship, plutonium processing, nuclear materials stabilization, materials disposition, nuclear forensics, nuclear counterterrorism, and nuclear energy. A more in-depth discussion of PF-4 may be found in Chapter 2, Weapons Program.

Earth, Space Sciences

Space Science Laboratory: For 45 years, LANL has engaged in space projects with a multidisciplinary concept-to-operations approach for applications that range from fundamental science and military functions to commercial and civilian activities. Through mostly repurposed and dispersed facilities, the space science laboratory has developed more than 1400 sensors and 400 instruments for 60 satellites and spacecraft. In addition, this laboratory is responsible for designing revolutionary optical, radiofrequency, gamma, x-ray, particle, and space environmental sensors.

Energy

Fuel Cell Laboratories: Experimental equipment that is essential for fuel cell research is housed in 24 laboratories dispersed across LANL. Supporting equipment includes numerous test stands for a variety of fuel cells; modular fuel processors; a gasoline reformer, and various supporting hardware for fuel cell spatial performance diagnostics.

Advanced Nuclear Fuels Laboratories: Fabrication and testing of new nuclear materials require unique facilities available across the lab including resources in its PF and MSL to develop advanced ceramic fuels. LANSCE and the Laboratory's Lujan Center also make possible highly accurate measurement of key nuclear data. "Hot cells" at the Laboratory's Chemistry and Metallurgy Research facility allow safe and remote research into the development of new fuels and cladding and structural materials. Researchers are currently using this facility to analyze an irradiated fuel duct retrieved from a decommissioned fast reactor, providing valuable data for the future design of fast reactors.

Engineering

Beryllium Technology Facility: The BTF provides machining, molding, joining, metallurgy, and inspection and nondestructive testing of classified beryllium parts in a controlled area defined by the structural walls and exhaust systems surrounding the process rooms. A more in-depth discussion of BTF may be found in Chapter 2, Weapons Program.

Low Energy Demonstration Accelerator Building: The LEDA facility supports the FEL Project, as well as other projects for both engineering and accelerators and electrodynamics capabilities.

Microtron (Betatron) Facility: This radiological facility supports high-energy radiography and high-explosives capabilities. It provides research, development, and application of state-of-the-art methods of inspection and nondestructive testing in support of the nuclear weapons stockpile.

High-Energy-Density Plasmas and Fluids

Trident Laser Facility: This facility, previously described, supports capabilities for both accelerators and electrodynamics and high-energy-density plasmas and fluids (Figure 3.10).

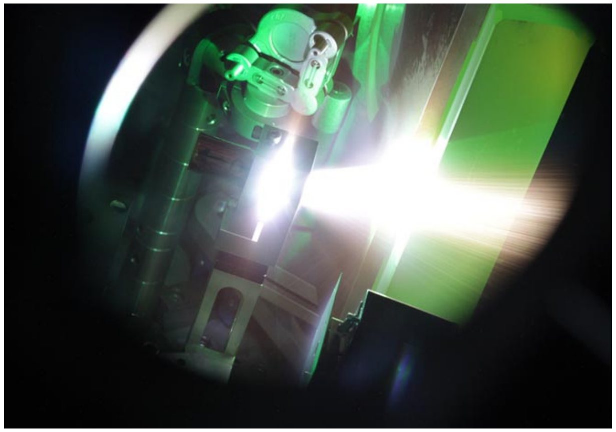


Figure 3.10: A burst of laser energy 50 times greater than the worldwide output of electrical power slams into an extremely thin foil target to produce neutrons at LANL's TRIDENT laser facility.

Information Science, Computing, and Applied Math

Metropolis Center: The Metropolis Center is a three-story, 303,000-gsf facility that houses high-performance, complex computing operations that support the calculation, modeling, simulation, and visualization of complex nuclear weapons data in support of the Stockpile Stewardship program. It houses all of the classified HPC resources at the Laboratory, including Roadrunner, Cielo, and Luna. Together with the Laboratory Data Communication Center (LDCC), Central Computing Facility (CCF), and Advanced Computing Laboratory (ACL), the Metropolis Center forms the center for HPC at LANL. The Metropolis Center is funded by the Weapons Program and is discussed in greater detail in Chapter 2.

Laboratory Data Communication Center: The LDCC currently houses the Laboratory's virtual server infrastructure, dubbed the Infrastructure on Demand (IOD). IOD is an in-house example of cloud computing, where users lease institutional server space maintained by IT rather than install remote standalone systems. This IOD system can be expanded as needed for many unclassified institutional applications.

Research Library: The Research Library provides extensive collections of books, journals, databases, patents, and technical reports and offers literature searching, training, and outreach services. The library's R&D component pursues cutting-edge work in areas such as open archives, recommendation systems and visualization, emergency response information systems, and discovery systems.

Materials Science

Center for Integrated Nano-Technology: CINT facility is a DOE/Office of Science Nanoscale Science Research Center operating as a national user facility devoted to establishing the scientific principles that govern the design, performance, and integration of nanoscale materials. Through its core facility at Sandia National Laboratories and Gateway to Los Alamos Facility (Figure 3.11), CINT provides access to tools and expertise to explore the continuum from scientific discovery to the integration of nanostructures into the micro- and macro-worlds. CINT has a broad portfolio of programs in support of discovery science and national security missions; it provides laboratory and office space for researchers to synthesize and characterize nanostructured materials, theoretically model and simulate their performance, and integrate nanoscale materials into larger-scale systems in a flexible, clean-room environment.

Figure 3.11: Center for Integrated Nano-Technology.

National High Magnetic Field Laboratory: Supported by the National Science Foundation (NSF), the NHMFL is a DOE-designated user facility designed for a pulsed magnetic field and is available to qualified researchers through a proposal review process. In 2012, the NHMFL broke a 100-Tesla magnet record.

Materials Science Laboratory: The MSL, which is located in a 55,000-gsf building, supports four major types of experimentation: materials processing, mechanical behavior in extreme environments, advanced materials development, and materials characterization. These four areas contain operational capabilities that support materials research activities related to energy, environment, nuclear weapons, and industrial competitiveness.

National Security and Weapons Science

Nonproliferation and International Security Center: NISC, a 164,000-gsf building, was built to increase the efficiency and effectiveness of support to the DOE's Office of Nonproliferation and National Security through the consolidation of personnel at a central location at LANL, as well as provide them with instrumentation and calibration laboratories. These personnel were previously located in about 47 facilities across the LANL site. NISC also supports GS Programs at the Laboratory; a more in-depth discussion may be found in Chapter 4.

Nuclear and Particle Physics, Astrophysics, and Cosmology

Los Alamos Neutron Science Center: Of the five previously described experimental parts of LANSCE, the following support this capability:

- **Isotope Production Facility—**The IPF uses a 100-MeV proton beam to generate radioisotopes for medical research purposes. The 800-MeV H-ion beam is delivered to four additional major experimental facilities.
- **Weapons Neutron Research Facility—**A micro-pulse proton beam is delivered to the unmoderated spallation target at the WNR facility for high-energy neutron experiments on seven flight paths.

Sensor and Instrumentation Systems

This capability was developed using a cross-cutting, integrated approach, allowing researchers and programs to increase the use of equipment and facilities investments and broaden the application of these resources. Many of the facilities previously described are used in multidisciplinary research that supports this capability. This approach results in a greater return on investment for the existing facilities, enhanced application of multiple laboratory capabilities, and increased efficiencies in procurement and usage of equipment and personnel. There are no existing facilities that currently uniquely support the Sensor and Instrumentation Systems capability.

IMPLEMENTING STRATEGIES BY PROGRAMMATIC CAPABILITY—FUTURE PROJECTS

The Science, Technology, and Engineering programs plan a mix of efforts in meeting strategic infrastructure goals. The need for more flexible, sustainable, and effective facilities is increasing. The approach in meeting those requirements will include recapitalization for the construction of line-item projects to replace aging and obsolete facilities to maintain existing capabilities. New projects will also be pursued to either expand existing capabilities or introduce new capabilities. There is also a significant need to make prioritized reinvestments to sustain enduring facilities within all capabilities to avoid capability deterioration and program losses to competitors. In selected areas, facility investments will be made to achieve a consolidation of operations to improve program effectiveness and operational efficiencies. New construction, replacements, and reinvestments will provide a foundation for program excellence and compliment efforts in recruitment and retention.

Designated facility disposition projects are planned that will assist in achieving cost savings and increased operational efficiencies as a result of consolidation of operations and/or removal of existing facilities.

Opportunities in the area of leased facilities will also become more important in meeting near-term requirements for light-laboratory as well as office support. In a competitive environment, an option for lease facilities, constructed through design-build delivery systems, has the potential to provide necessary facilities in a compressed timeframe.

Targeted Reinvestment / Life Extension / Asset Sustainment

Accelerators and Electrodynamics

LANSCE Reinvestments: Main accelerator/operations buildings (TA-53, building 6) will undergo life-extension projects, including roof repair, HVAC, plumbing, and electrical upgrades.

MaRIE—F3 Experimental Hall Renovation: F3 is a renovation of the existing "Area A" to support the mission of MaRIE. F3 will house two target cells for MaRIE in the large experimental hall. Renovations will transform the existing experimental hall into appropriate space for the MaRIE mission. The renovation of Area A into F3 allows the opportunity to transform the building and site into a more integrated element of MaRIE.

3-GeV pRAD: An upgrade of the current proton radiography facilities at TA-53 will provide nearly a factor of 10 improvement in radiographic resolution while simultaneously extending the capabilities of proton radiography to thicker systems, providing a higher-resolution validation tool for the intermediate range of radiographic experimentation within the nuclear weapons program.

Bioscience and Energy

Bioenergy and Environmental Science: TA-35, Building 85E will be reinvested to continue to support bioenergy and environmental science research (primarily HVAC upgrades) for the next 15–20 years, after which operations will be relocated to TA-03.

TA-35 Upgrades: Most of the buildings at TA-35 will need some upgrades to continue to function well. Projects have been gathered by type of upgrade to use the economy of scale. Projects such as engineering studies, design and construction of HVAC upgrades, fire protection upgrades, electrical upgrades, and new roofing upgrades are needed in many buildings. Crane upgrades and repair projects are also part of the refurbishment of TA-35.

Health Research Laboratory: TA-43, Building 1 (Figure 3.12) will upgrade the HVAC in the near term to achieve 5 more years of usage as the Laboratory plans and implements the movement out of TA-43, Building 1, per the Health Research Laboratory Facility Modernization Plan (LACP-12-01076).

Figure 3.12: Reinvestments to the HVAC system will be necessary for the Health Research Laboratory.

Chemical Science

TA-35 Reinvestments Projects: These projects are to (1) refurbish TA-35, Building 189 to support materials design, fabrication, and assembly for wet chemistry for MST-7 after the loss of that space when TA-35, Building 2 is removed; (2) reinvest in TA-35, Building 85E to continue support of Bioenergy and Environmental Science research; primarily HVAC upgrades; (3) reroof and update fire protection systems in TA-35, Building 86 to support unclassified equipment cold development laboratory used for general hardware assembly and testing; (4) open office space for Applied Engineering and Technology (AET), Bioenergy and Environmental Science, and STO staff; and (5) reinvest in TA-35, Buildings 124, 125, 126, 294, 301, and 595 to support the NHMFL operations and open office space. Proposed work includes reroofing, fire protection, HVAC upgrades, and crane repairs.

RC-1 Life Extension: The upgrades currently are underway to extend the life of Radiological Campus (RC)-1 (Figure 3.13) until the new buildings can be built and people can be moved out of RC-1 into the specialized laboratories planned for TA-48. The hot cells will remain as the only part of RC-1 and will be secured and separated as a standalone building in the outyears for long-term use.

Figure 3.13: RC-1 Life Extension Upgrades.

RC-107 Life Extension: The design and funding are available to complete construction on the planned renovation.

TA-48 Infrastructure Upgrades: As buildings are removed and new ones are planned and built, parking must stay current with the number of occupants. Periodic parking upgrades and new lots must be planned and built along with the growth of TA-48. Also under consideration is a new road that will provide connectivity with TA-03 and facilitate collaborative opportunities between the sites. Additionally, utility upgrades should be studied and engineered at the onset of development. A conceptual framework for TA-48 redevelopment is presented in the TA-48 Radiological Facilities Modernization Plan (LACP-11-01026).

TA-59 Renovation: Currently under renovation; laboratories at TA-59, Building 1 are being upgraded.

Earth and Space Sciences

TA-52 Renovation: The office building is currently being upgraded for long-term use for the TRU waste facility or other waste management functions. A more in-depth discussion of TA-52, Building 33 may be found in Chapter 5, Operations and Business.

Engineering

TA-35 Reinvestment Projects: Reinvestments at TA-35 are planned for the future. The consolidation of AET-DO, AET-1, and AET-5 near their customers at TA-55 will create a more efficient and effective working environment. The buildings are already suited for the work they do. Minor alterations are planned for TA-35, Buildings 86, 87, 125, 128, and 129. Building 128 could provide a secure facility need for classified work, whereas building 87 would provide space for both classified and unclassified work. Unclassified office space will also be available at nearby TA-35, Building 86.

Physics Building: Renovations to room N161 (Figure 3.14) for fuel cell research include refurbishing the old plating shop into the new Fuel Cell Engineering Laboratory. The project is currently funded and moving forward.

Figure 3.14: Physics building renovations.

Information Science, Computing, and Applied Math

TA-03 Reinvestments: Gaps need to be addressed in the facilities and physical infrastructure for business computing and associated IT systems, as well as institutional computing systems in the LDCC (TA-03, Building 1498) and CCF (TA-03, Building 132). IT and institutional computing are not synonymous at the Laboratory, but the systems are co-located (primarily in TA-03, Building 1498) and share some of the same utility systems. Each new machine generation comes with dramatic processor density increases, as well as corresponding increases in power consumption, cooling load, and floor weight load.

LDCC Upgrades: Room 290 houses some of the Laboratory's Oracle system processors and servers. This room also houses Laboratory desktop computing servers, network switches, and a few servers interconnected with the institutional computing in room 270. Room 270 contains primarily institutional computing servers, tape storage libraries, and test bed equipment for the ASC program. No backup power generation is available for these machines or for any other equipment in this building. Limited UPS systems serve designated storage racks in both rooms.

Materials Science

Sigma Life Extension: A life-extension reinvestment project in the near term will extend the life of systems, roofs, HVACs, etc., supporting the continued operations in this facility. Repurposing space for shops and laboratories will support the disposition of SM-39 and material science capabilities.

MSL Infill Project: This project is currently under construction and adds nearly 8,000-gsf of chemistry and materials science laboratory space on the second floor. The area was left unfinished during the MSL construction project and was always intended for laboratory expansion.

TA-35 Projects: Several reinvestment projects will be required at TA-35 to support enduring material science operations, which are discussed in more detail in the TA-35

Facility Evolution Plan (LACP-12-00363). Reinvestment in Building 87 (Figure 3.15) is necessary to support a classified-equipment, cold-development laboratory used for general hardware assembly and testing and to support classified office space for AET. Proposed work includes reroofing and fire protection. Reinvestments in Building 128 will provide laboratory space for AET missions, including an unclassified-equipment, cold-development, general hardware assembly and testing, high-bay facility used for the assembly and staging of equipment before being installed into TA-55, CMR, or other radiological facilities. Proposed work includes reroofing, HVAC, lighting, and crane repairs.

Figure 3.15: Reinvestments to TA-35, building 87.

Sensors and Instrumentation Systems

Radiological Complex Modernization: Funding is being secured for design on Phase 1 of the TA-48 Radiological Complex modernization (a new office building). LANL has an unmatched ability to receive, handle, and analyze SNM in a scientific setting using facilities and equipment that are specifically designed for that purpose. However, many of those facilities were constructed during the 1950s (CMR, RC-1) and are well beyond their design life. To address existing and future facility needs, the Laboratory has been engaging in a coordinated facility development plan that has as its core a radiological and nuclear mission scope. Facilities under the umbrella of this capability are the RLUOB, the CMR, PF-4, RC-1, the Sigma complex, RC-45 (clean chemistry and radiology), the LANSCE-Materials Test Station (under development), and the NISC. Eventually, the MaRIE signature facility will figure heavily into this capability, as well.

The plan has three parts: (1) upgrade existing facilities to meet changing programmatic needs, (2) Leverage any available resources of the RLUOB, and (3) further the Institutional plan for a consolidated Radiological and Nuclear Science Complex.

Physics Building Life Extension: Reinvestment will be required to continue use of the existing facility to allow time for replacement facilities to be constructed. Life extension would be conducted to address critical building systems, such as HVAC and fire protection, along with programmatic upgrades to maintain current program functions. Lifecyle cost analysis would be included in an evaluation of proposed life extension work, and staging of construction activities to minimize program activities would be integrated into the overall project scope.

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

Bioscience and Energy

Biosafety Level-3 Repurposing: The Biosafety Level (BSL) -3 containment is necessary for biosurveillence research to understand pathogenesis and the host-pathogen relationship. This research is critical to developing medical countermeasures for public health threats, as well as bioterror events. The Laboratory built a state-of-the-art facility (Figure 3.16) 2002. Controversy concerning seismic location has limited it's use.

Figure 3.16: Bio Safety Laboratory (BSL-3) at TA-03.

TA-03 Bio Science Relocation: Planning has been conducted for the relocation and consolidation of staff and operations out of the HRL to support the decommissioning of the building. Current organizations include the bulk of Bioscience Division, and Radiation Protection Division's in vivo monitoring laboratory (IVML). The primary drivers for replacement facilities and the decommissioning of the HRL are that (1) the existing building is a 1953 facility that is no longer able to meet the needs of vastly different requirements than what it was originally designed for, and (2) the ~104k-gsf, multi-story HRL presents significant maintenance and operational challenges. A Bioscience long-term plan includes a Bioscience campus at TA-03, adjacent to the current Occupational Medicine building. This campus would comprise office buildings and laboratory buildings to support specific and unique functions, including protein engineering, bioenergy, sequencing, and biosecurity.

A BSL-2 pathogenic facility, which would be (Figure 3.17) the initial element of the TA-03 Bioscience campus, is proposed for BSL-2 pathogens work relocated from the HRL and other locations across the Laboratory. This area of Bioscience is significant now and is expected to grow considerably. Pathogens are considered to be of moderate risk within the BSL-2 safety envelope; therefore, the work is required to be conducted on LANL-owned property.

Figure 3.17: BSL-2 Pathogenic Building.

Chemical Science

TA-64 Repurposing for Secure Chemistry: Buildings 1, 67, and 68 are potential future locations for Secure Chemistry, depending on the relocation of Protective Force activities to new facilities at TA-16. Design could start in the midterm. These buildings are located inside the vehicle access point (VAP), which simplifies collaboration with other chemistry activities at the TA-48 campus. A complete renovation of this building is needed to add the necessary laboratories in half of the building, and updating is needed to bring the building up to code in the other half for offices. The relocation of Secure Chemistry to this location may require additional new buildings to be constructed, which would allow consolidation of other compatible chemistry operations.

Chemistry Modernization Plan: The modernization plan for Chemistry will involve work at TAs-03, 35, and 48. The following is a description of the planning elements, and further detail is provided in specific planning studies referenced below.

- **Open/Secure Office and Laboratory—**The TA-03 component of the modernization plan is proposed to be located along Eniwetok Drive, in the vicinity of the CINT building. Various facilities are proposed as new construction to consolidate replace and upgrade facilities. Existing programs are operating at diverse locations and often in outdated facilities that are 60 years old. Presently, the existing facilities are a limiting factor for the Laboratory meeting current national-security mission. The existing facilities also are highly inefficient to operate and carry extended DM.

  Facilities slated for inclusion in the TA-03 campus include the Flexible Fabrication for Chemistry (Figure 3.18) and Materials Light Laboratory for materials synthesis and fabrication, including laser, electron-, atom-, and molecular-beam approaches; Spectroscopy Open/Secure Office Building housing Materials Physics and Applications (MPA) Division-CINT and consolidating staff from various locations at TA-35, TA-46, and TA-03 to perform compatible synergistic work; the Ultrafast Spectroscopy Light-Laboratory Facility for the laser-based interrogation of materials performance and properties at sub-nanosecond time scales and development of new diagnostics at the mesoscale (See project 1, TA-35 Facility Evolution Plan (LACP-12-00363); and the Chemistry and Applied Spectroscopy Laboratory, which supports the investigation of kinetics, molecular dynamics, and energy transfer processes and homogeneous/heterogeneous systems.

- **Open Office/Auditorium Building—**The Chemistry Modernization Plan includes the proposed the new construction of an open office building primarily housing MPA-Condensed Matter and Magnetic Science (CMMS) staff. The new building is also planned to incorporate a large, open conference space for TA-35 staff that will be displaced with the D&D of TA-35, Building 2. The new building is planned to be constructed on the existing site of TA-35, Building 127. This work is described in more detail, under Project 6, of the TA-35 Facility Evolution Plan (LACP-12-00363).

Figure 3.18: The Chemistry Modernization Plan accounts for flexible fabrication and light-laboratory space.

- **Secure Office and Laboratory Facilities—**The TA-48 plan incorporates consolidation of program activities and is collaboration with GS to leverage facility effectiveness and efficiencies. A primary shared facility is the Secure Office building (see Chapter 4, Global Security, for additional information). The Secure Office facility will house classified operations and network computing in support of classified Chemistry programs.

  Laboratory facilities will include wet laboratories in open and secure environments for Radiometric Measurement and Instrumentation supporting ultrasensitive measurement capability and instrumentation development laboratories, the Open Multi-Program Environmental-Level Radiochemistry Facility, the Secure Multi-Program Environmental-Level Radiochemistry Facility, the Synthetic Chemistry Laboratory, the Secure Alpha/TRU Radiochemistry Facility, the Open Alpha/TRU Radiochemistry Facility, and a Hot Cell Facility.

- **RC45 Expansion—**Design on the addition to building TA-48, Building 262 is complete, but construction is on hold waiting on funding. If funding is approved, the project would begin construction in FY14. The building's function is to extend and expand the laboratory space of TA-48, Building 45.

Earth and Space Sciences

EES Replacement Building: This new building will replace TA-03, Building 51 at the EES campus in the northwest part of TA-03.

Engineering

Manufacturing, Engineering, and Technologies: The preferred long-term path forward for the capabilities in this facility is to relocate to TA-03, Building 39 (main shops), which would allow consolidation with other Manufacturing, Engineering, and Technologies (MET) capabilities; or to relocate to TA-35, Building 125 after space in that building is vacated by the relocation of MPA-CINT Division staff.

Weapons Manufacturing and Engineering Support Facility: The WMESF facility represents a consolidated fabrication and engineering capability required to provide reliable, effective, safe, non-nuclear component machining in concert with enhanced engineering design, analysis, and prototype testing for the Site Sustainability Plan (SSP), Enduring Stockpile, Pit Manufacturing, and Plutonium Sustainment efforts. The current suite of eight machining facilities is antiquated, oversized, and has become a financial burden to operate. In addition to their lack of adequate auxiliary systems necessary to support ongoing and anticipated needs, these facilities are geographically dispersed across the site, which creates logistical problems related to component transport and production control. This construction project would allow older, non-compliant and expensive-to-maintain facilities to be retired and decommissioned. The WMESF project is proposed through the Weapons Program (see Chapter 2).

Energy

Advanced Nuclear Fuels Laboratory: Because of the current condition of dispersed multiple-user facilities across the Laboratory for nuclear fuels and materials testing, a facility is needed that will allow for co-location of this work and a reduction in the potential to cross contaminate between projects. When such a facility is constructed, there would be opportunities to decommission excess legacy facilities.

Information Science, Computing, and Applied Math

Institutional Computing: TA-03, Building 30 is currently being evaluated as a potential site for Sensitive Compartmentalized Information (SCI) computing, as well as institutional computing (Figure 3.19). The LDCC raised floor machine rooms cannot sustain the weight of the next generation of HPC equipment. The warehouse has a slab-on-grade, which will be required for the future computing equipment. This building also poses the possibility for adaptive reuse of a Cold-War-Era building.

LDCC Reconfiguration: Roughly 1,440-gsf of its 7,185 total gsf will become vacant in Room 105 when the Voice-Over Internet Protocol (VoIP) project is completed. The Laboratory's telephony equipment that occupies this space will be removed, and the space can then be adapted for computing equipment or other IT equipment requiring high reliability. The LDCC floor-loading limitation will pose a formidable infrastructure challenge within the next decade because the anticipated demand for unclassified HPC space is expected to grow. The VoIP project also vacates approximately 110-gsf of floor space on each floor of almost every facility (including GPP facilities) built within the last decade. The space is currently designated as a telecommunications room.

Institutional Computing Facility Replacements: Two buildings are planned to replace TA-03, Building 123 in the extended timeframe at TA 03.

Figure 3.19: The receiving and distribution center (TA-03, building 30) is currently being evaluated for potential SCI and institutional computing opportunities.

Materials Science

MSL Expansion: This building will replace TA-03, Building 35 near MSL for Materials Science staff.

Physics Replacement Facilities: This project effort will consist of a number of co-located buildings to be located at the TA-53 campus. These buildings will support secure office requirements and laboratory facilities for Experimental Physical Science and for a Heavy Equipment Laboratory. See the TA-35 Facility Evolution Plan (LACP-12-00363). The secure office space will consolidate Physics personnel from various TAs, including TA-35, TA-53, and TA-03, or classified and vault-type room (VTR) activities for various programs, including MaRIE. The Experimental Physics laboratory will provide light-laboratory space to consolidate Physics Division activities at TA-53. The Heavy Equipment laboratory will afford more generic heavy operations (bridge crane) for large-scale physical science experiments and small-scale programs, such as for Fusion Energy Science.

Investments in New Facilities and Infrastructure / Signature Facilities

Accelerators and Electrodynamics

LANSCE Expansion: Investment opportunities to the Lujan Center can expand the beamline interface, additional laboratory and office space, and a separate fabrication shop. The Lujan Center provides direct access to beamline activity, with laboratory and office support. As with the site as a whole, the Lujan Center is situated to accommodate the geometry of the beamline. Logistics limit opportunities for expansion; however, sufficient area is available for the proposed uses. Some grading/retaining will be required to accommodate adequate parking for the new additions.

- **Physics Secure Office Building—**Physics personnel from TA-35, Building 87, TA-53, Building 1, and TA-03, Building 216 will be consolidated into this two-story structure. See the TA-35 Facility Evolution Plan (LACP-12-00363). This building will accommodate the programmatic need for secure office space and Rednet computer access for classified work, while reducing security risks from the current use of TA-53, Building 1 and using a modern, fully compliant, secure, VTR at TA-53.
- **Heavy-Equipment Laboratory—**This laboratory will provide generic heavy-equipment (with overhead crane) laboratory space for large-scale physical science experiments. See the TA-35 Facility Evolution Plan (LACP-12-00363). This laboratory will be used to conduct smaller projects (such as for Fusion Energy Sciences or Nuclear Physics), replacing work conducted in TA-35.
- **Experimental Physical Science Laboratory—**This facility will provide light-laboratory space for experimental use, allowing the movement of personnel and projects from TA-35, Buildings 86, 87, 125, 128, 189, and 207. See the TA-35 Facility Evolution Plan (LACP-12-00363). The laboratory will support the consolidation of experimental physics work in new strategic facilities at LANSCE. This investment opportunity would accommodate at least two new experimental instruments for this user facility.
- **pRAD Transportable Replacement and/or Upgrades—**This transportable provides the only life and safety accessibility to the north side of the LINAC in the pRAD experimental area. This 26-year-old building will be eliminated with the MaRIE construction but will need upgrades or replacement in the interim.
- **Operations Building Replacement—**This building will replace the TA-53, Building 24 Laboratory/office building for operations and maintenance personnel at LANSCE in the strategic term.
- **LANSCE Maintenance Support Building Replacement—**This building will replace 43-year-old TA-53, Building 41, which is the maintenance support building for LANSCE in the strategic term.

WNR Office/Light-Laboratory Building: More users are expected to use the WNR facility because of the increase in capacity; therefore, experimental support areas are needed. An investment opportunity in a light-laboratory building with offices and the replacement of aging temporary buildings will create a more user-friendly environment at the WNR facility. A two- to three-story building (12,000-gsf) can provide assembly areas, sample storage areas, shipping and receiving protections, guest user space, and staff offices. This building will replace TA-53, Buildings 406, 407, 882, 387, and 541 and conference space from TA-53, Building 7.

IPF Expansion: Issues identified occur in transporting the short-lived radioactive isotopes from TA-53 to TA-48 for radiometric measurement. The Department of Transportation (DOT) and DOE rules and regulations of transport of radioactive materials must be followed on the public roads; therefore, the isotopes must be moved in large, specialized containers. A small, 400-gsf addition to the high-bay area would allow efficient access to the beam while allowing for a more permanent space to store the containers in the facility. In the long term, investment in a radiometric measurement capability at LANSCE would limit the expense and inefficiencies of transportation to TA-48. Investment opportunities for this program include expanding research into the Materials Test Station (MTS), Area A using the energies delivered to this area to produce more medical isotopes at a higher rate to meet the growing demand and enhance research.

Figure 3.20: An additional floor may be added to the Manuel Lujan Center.

Manuel Lujan Addition: If the need arises with the increase in users of this facility, an investment opportunity is to build an additional floor on the top of this building (Figure 3.20). Ground space is very limited in this experimental area for any new buildings; however, the building was designed to add an additional floor to the top level. An additional experimental support laboratory may also be necessary provide increased experimental assembly space for the additional use of new instruments.

Matter-Radiation Interactions In Extremes: To achieve a predictive understanding of materials performance, MaRIE will provide the tools needed to transform the science of microstructure, interfaces, and defects and enable the transition from "observation and validation" to "prediction and control," which is both a mission driver from energy science to weapons certification and the frontier of materials research. MaRIE will provide in situ, dynamic measurements of multigrain materials in relevant extremes combined with directed synthesis and characterization through predictive theory. These integrated tools will be made available to the external scientific community as an international user facility. As such, the path to MaRIE overtly includes collaborations with and preliminary experiments at other national and international user facilities.

MaRIE consists of several key projects (see Figure 3.21 on the following pages for a detailed layout):

- **Modeling, Measuring, and Making Materials (M4) Laboratory/Office—**This facility will become the flagship laboratory/office building at TA-53. The facility will not only support the scientific research of MaRIE with laboratory and office space, but also will be intersected by the accelerator at the basement level that will house an experimental hall and target cell. At approximately 300,000-gsf, the building will be configured with an estimated 60% laboratory space and 40% office space. A large auditorium will also be included in the building.
- **MPDH Experimental Hall Laboratory/Office—**The Multipurpose Diagnostic Hall (MPDH) houses the heart of MaRIE activities. This facility integrates three of the five target cells, which are major elements of testing and experimentation. The building is a highly industrial arrangement, having large high bays (to accommodate bridge cranes) and highly flexible dimensional shielding arrangements. The building will include a laboratory/office wing capable of directly supporting experimental activity.
- **Accelerator and Support Utility Buildings—**The accelerator is a predominantly subterrain structure that includes three utility buildings, undulators, and the Electron Injector building (5,000-gsf).

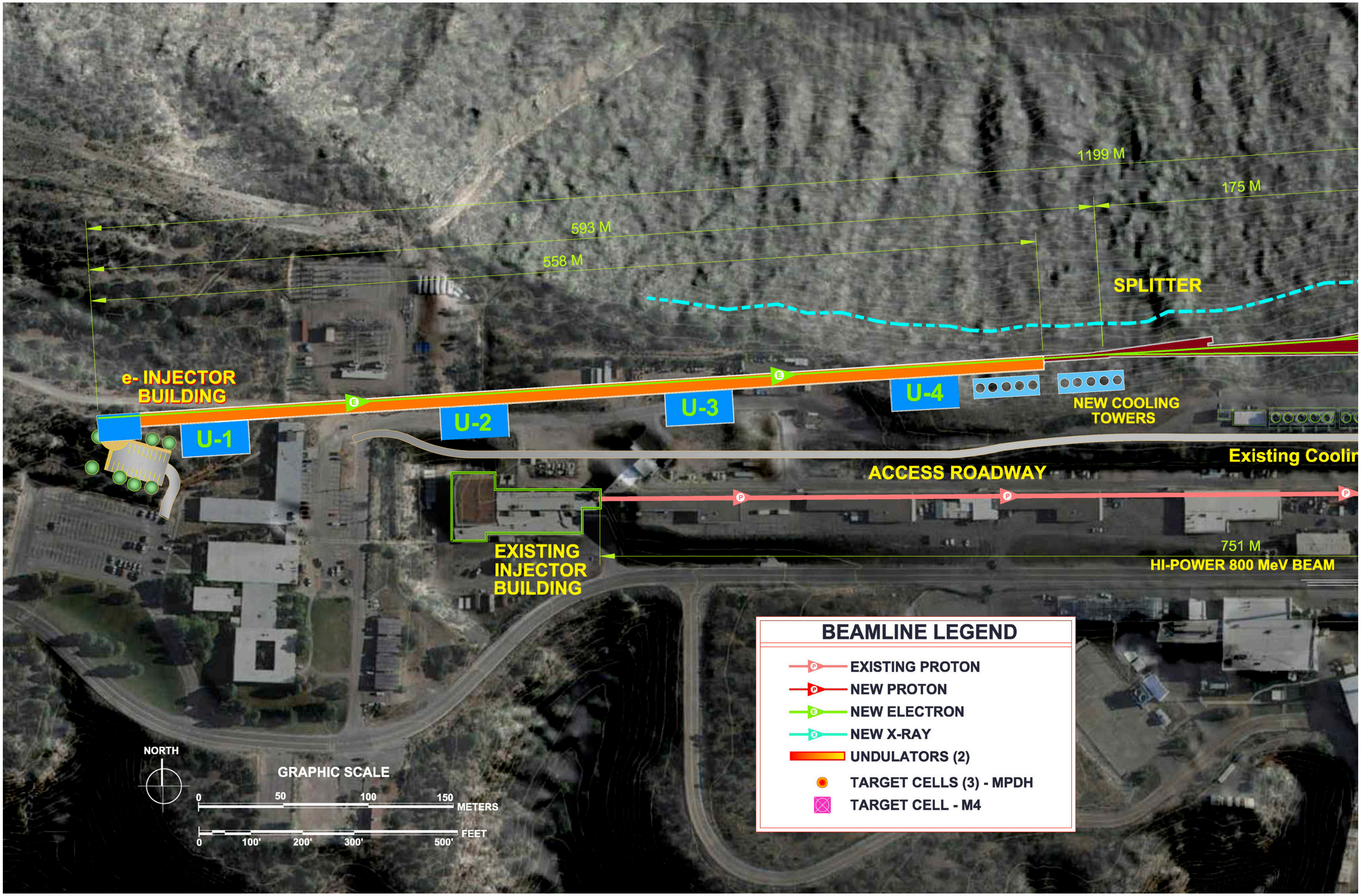
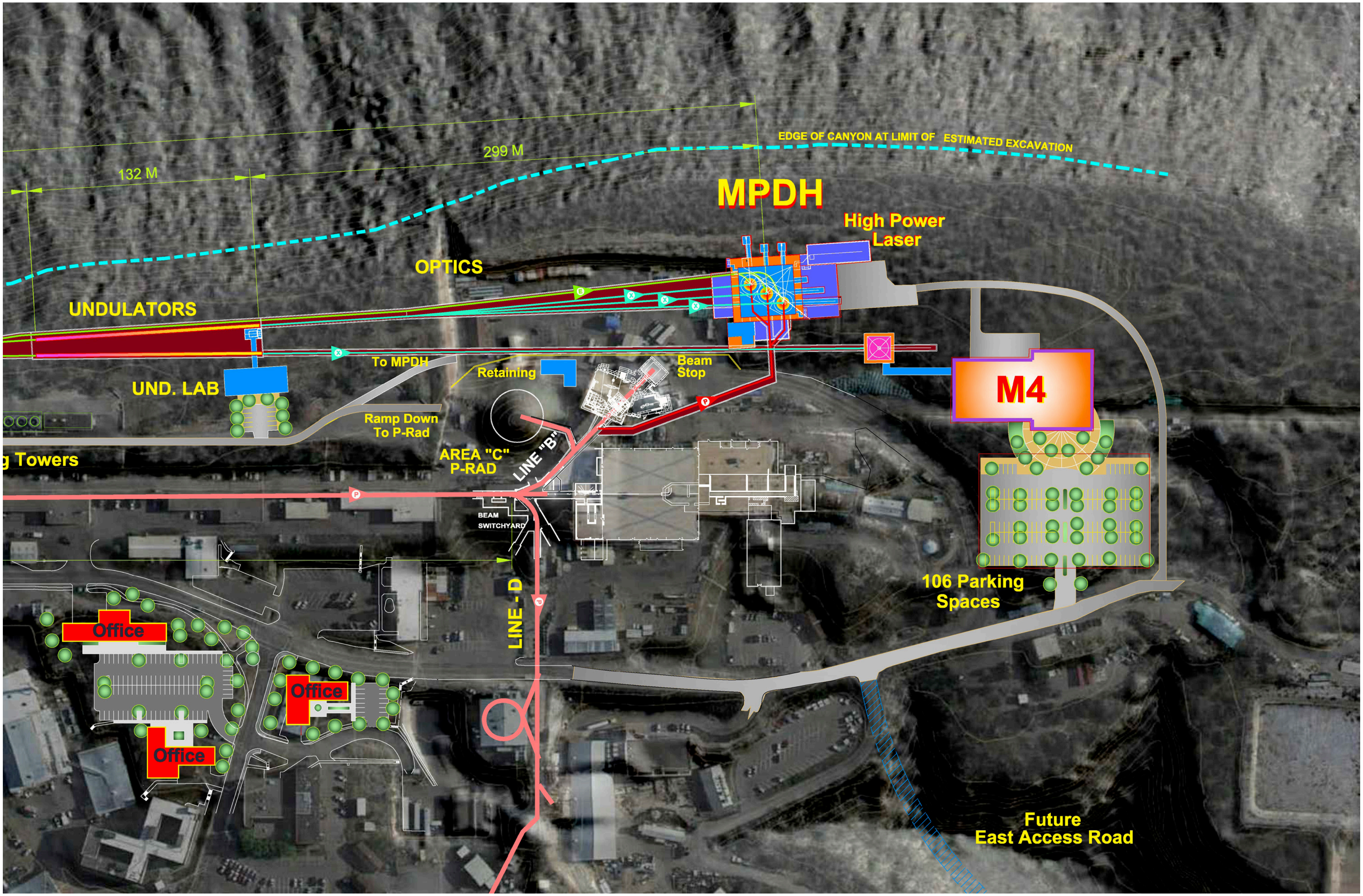


Figure 3.21: Detailed layout of proposed Matter-Radiation Interactions In Extremes project.



EDGE OF CANYON AT LIMIT OF ESTIMATED EXCAVATION
299 M
132 M
MPDH
High Power
Laser
OPTICS
UNDULATORS
To MPDH
Retaining
Beam
Stop
UND. LAB
M4
Ramp Down
To P-Rad
AREA "C"
P-RAD
LINE "B"
g Towers
BEAM
SWITCHYARD
LINE - D
106 Parking
Spaces
Office
Office
Office
Future
East Access Road

Bioscience and Energy

Analytical Measurements and Dosimetry Center: This GPP building (Figure 3.22), planned to be built behind the Occupational Medicine building, is a consolidated, multifunctional facility designed to allow the relocation of four related radiation protection operations. See the Health Research Laboratory Facility Modernization Plan (LACP-12-01076). Facility Evolution Plan (LACP-12-00363). In vivo and in vitro internal dosimetry, external dosimetry, and the TA-03 Health Physics Analytical Laboratory will be consolidated into a single facility to support cost savings through the sharing of resources and personnel. A new chamber for the IVML will be installed with a new shield to be purchased from a private entity using programmatic funding, and a second shield is to be relocated from the current HRL. One replacement office building at the radiation protection campus is planned for the long term.

Chemical Science

Chemistry and Metallurgy Research Replacement Project: In response to numerous issues associated with the aging CMR facility, LANL began the CMRR project. The CMRR project includes the design, construction, and start-up of modern laboratory facilities and office space, as well as the relocation of mission-critical technical capabilities from the existing CMR facility to the new CMRR facility. A more in-depth discussion of CMRR may be found in Chapter 2, Weapons Program.

Earth and Space Sciences

TRU Waste Facility: The new TRU Waste Facility, which will support future site-generated waste, is currently under construction at TA-63, with a target completion date of 2017. The phased project has completed the first phase of installing the utility infrastructure and preparing the site for the next two phases. The second phase will be to complete the design and construction of the Operations building. The final phase will be to design and construct the storage and the support buildings on site after the permit has been approved. A more in-depth discussion of the TRU Waste Facility may be found in Chapter 2, Weapons Program.

High-Energy-Density Plasmas and Fluids

High Intensity Laser Laboratory: The High Intensity Laser Laboratory (HILL) would allow detailed, controlled tests of models for boost and burn as needed to understand the conditions of the stockpile by creating states of matter through rapid, controlled heating at constant density. To comprehensively validate these models, it is vital to have a flexible facility capable of accessing and probing extreme states of matter that are inaccessible with existing facilities. Building this facility at LANL in conjunction with MaRIE 1.0 would provide both benefits, as well as ensure HED science excellence at LANL to meet the nuclear weapons mission.

Figure 3.22: Conceptual view of the proposed Analytical Measurements and Dosimetry Center.

Information Science, Computing, and Applied Math

Continuity of Operations Facility: IT redundancy is a major concern for business system operations at the Laboratory. Currently, the Metropolis Center provides some redundancy for the LDCC and CCF, but it is insufficient for the entire primary data center. Additionally, a backup electrical generation system is not available for the Metropolis Building or the CCF. A new facility to back up Laboratory business systems would ensure a continuity of operations.

Cloud Computing Off-Site Data Highway: As cloud computing expands globally and its cyber security issues are mitigated, the Laboratory will be exploring increased use of the cloud. In addition to the cyber security concerns, an impediment for its increased usage today is the single optical-fiber path for both data and telecommunications needed outside the Laboratory. This single fiber path is part of the GEOMAX system owned by CenturyLink, which has no redundancy between Los Alamos and Santa Fe. The Laboratory is dependent on a single CenturyLink fiber connection to its ringed fiber path between Santa Fe and Albuquerque. Redundancy for the connection into the GeoMax system is currently being planned as a project using an electrical transmission line corridor to Santa Fe.

Sensors and Instrumentation Systems

Energy and Climate Research Facility: This facility at TA-51 would include institutional support of SOS-energy test beds (e.g., Four Corners, smart grid pilot, digital buildings, solar farm, etc., and co-location of SOS-energy practitioners. A clear and pressing need exists to co-locate primarily the energy and climate communities (but also from a variety of additional communities: water, infrastructure, and structural health), which can be accomplished by a new building with offices, light-lab facilities, and computational capacity to house 200 staff (to realize synergies).

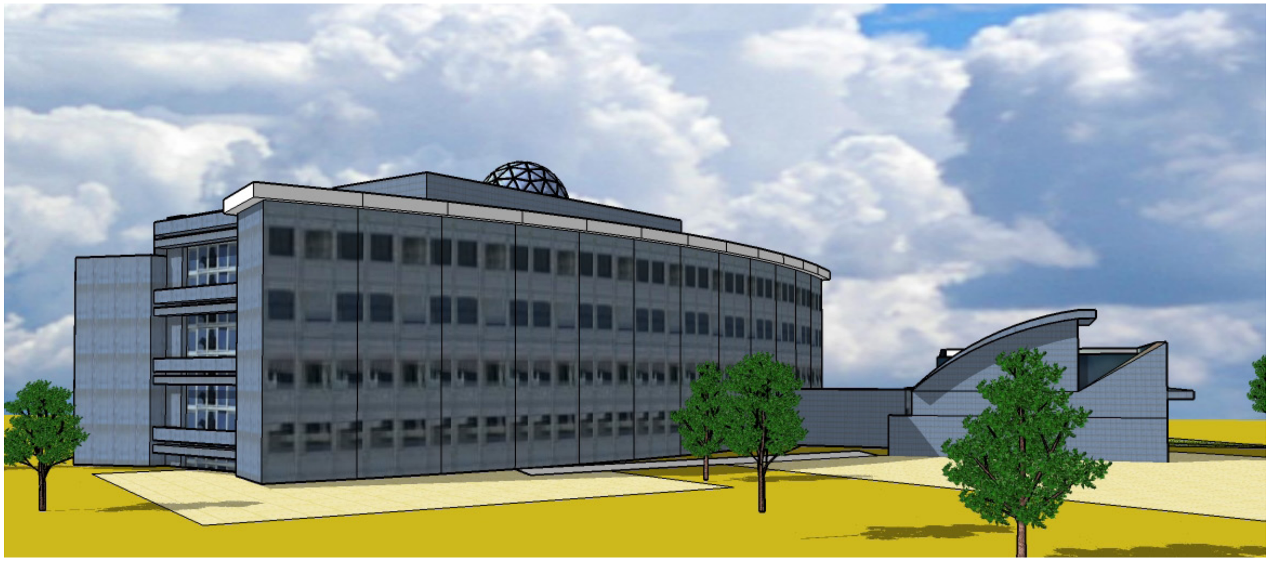


Figure 3.23: Conceptual view of the proposed Spade Data center.

Micro/Nano Fabrication Facility: LANL needs to deliver deployable sensors with new functionality by integrating novel materials structures into sensing platforms tailored to the specific applications. This integration requires both developing the capability for fabrication, prototyping and testing, and coordinating novel materials development and ultimately its compatibility with sensor platform requirements.

Space Data Center: This facility (Figure 3.23) would promote analysis and interpretation of signatures of natural processes that represent backgrounds for anthropogenic events. It would also support the Earth and Space Science capability. A more in-depth discussion of Space Data Center may be found in Chapter 4, Global Security.

Facility Disposition

Accelerators and Electrodynamics

LANSCE Disposition: The Footprint Reduction Program has identified approximately 30,000-gsf of obsolete structures that will be removed in the next 5 to 10 years: small storage buildings, transportables, utility buildings, and an obsolete cooling tower. Additional buildings (TA-53, Buildings 39, 26, 27, 24, 22, and 315) will be dispositioned in the outyears as MaRIE is developed.

Bioscience and Energy

TA-43 Site Closure: Most of the buildings at TA-43 are currently in the disposition process. Buildings 1 and 12 will remain active until the HRL is vacated, at which time they and remaining trailers/transportables will enter the D&D process. Disposition of the HRL can be done in one of three ways: (1) decontamination to free release standards by the Laboratory, then transfer to and renovation for reuse by Los Alamos County (LAC); (2) decontamination and disposition by the Laboratory, then transfer land to LAC; or (3) decontamination to free release standards by the Laboratory, then transfer to LAC for disposition with funding.

Mitigation of legacy issues In the HRL include some fixed radioactive contamination and several programmatic radioactive sources previously used by Bioscience that need to be dispositioned (HRL Facility modernization planning document (LACP-12-01076). Another issue complicating disposition of the HRL is removal of the two IVML shields from the subbasement, which will be relocated to a new facility as the primary and backup shields. Preliminary discussions with D&D engineers indicate that these issues will require careful evaluation and creative engineering.

Relocation of personnel and laboratories will occur in stages, and various locations will be treated as separate projects. BSL-1 and BSL 2 cell culture work out of TA-43, Building 1 and elsewhere will be temporarily consolidated at the New Mexico Consortium /Entrada Park in Los Alamos until the BSL-2 Pathogens Facility in the new Bioscience campus at TA-03 is completed.

Figure 3.24: The entire TA-51 site is planned for long-term disposition.

Chemical Science

TA-35 Disposition: The major buildings at TA-35 to be removed are 2, 85W, 127, 207, and 421.

TA-48 Disposition: In the near term, the south section of RC-1 (Data Wing) can be demolished as a manageably sized project to work toward the removal of 90% of the building over time. Workers and laboratories will be moved to upgraded conditions in the new laboratories and offices as periodic disposition of sections of RC-1 is completed. Other wings that will be removed at a later time are the count room in approximately the midterm and the remaining portion of RC-1, leaving the hot cells in place (midterm). The hot cells will be isolated for the facility to have standalone operability and reliability and to eliminate any interference with analytical and counting activities in other facilities at TA-48 sometime in the outyears. Additional disposition activities include RC-8, following completion of the Specialized Fabrication Services Machine Shop, and obsolete buildings (9000, 242, 213, 234, and 235) in accordance with the LRIDP.

Earth and Space Sciences

TA-51 Site Closure: The entire TA-51 site (Figure 3.24) will be demolished in the long term. Some environmental research plots will be retained, but most structures and utilities will be removed, including Buildings 11, 12, 23, 91, and 92. Where practical, the research plots will be removed or remediated, along with the building D&D efforts. In the near term, unused research structures, TA-51, Buildings 91 and -92, sheds, and transportainers associated with inactive research will be removed. D&D of three research buildings, nine transportables and trailers used for office buildings, associated utilities, sheds/transportainers, and inactive research plots will occur in the midterm. After disposition of the structures on the site, TA-51 will be restored and closed (Figure 3.22).

Engineering

TA-46 Removals: In the near term, many of the buildings that AET and MET occupy at TA-46 are slated for removal (Buildings 17, 18, 42, 128, 178, and 179). Midterm disposition projects include TA-46, Buildings 25 and 37.

Information Science, Computing, and Applied Math

TA-03 Disposition: TA-03, Buildings 123, 132 (CCF), and 200 are slated for shutdown in the outyear timeframe.

Figure 3.25: Office space within the Research Park is currently being renovated into laboratory space for bioenergy.

Material Science

TA-35 Disposition: Physics-related buildings 207 and 421 will be removed from TA-35.

Leasing / Divested Ownership

Bioscience and Energy

Research Park 1 Laboratory Renovation: This renovation, currently underway, will reconfigure existing office space at the research park (TA-03, Building 4200) into laboratory space for bioenergy (Figure 3.25).

Research Park 2: This proposed future construction project has the potential to expedite the relocation of cell culture work scope from HRL to modern facilities.

CHALLENGES AND VULNERABILITIES

Although small-scale office and light-laboratory-based facilities are not included in this plan, they are also essential elements of the science capabilities and must be sustained and continually revitalized to maintain the vitality of the current science capabilities. Many of these facilities, as described in plans for future construction or reinvestment, are dispersed across the over 40 acres of the LANL site. To improve efficiencies and decrease site footprint, many of these facilities are planned to be collocated with new construction or reinvestment. To meet the LANL mission in the future, maintaining existing facilities and developing new facilities will be required. However, given a sober analysis of the urgency of the need for each of these facilities and potential funding opportunities, the most urgency exists for those facilities that support the capabilities for prediction and control for a range of applications from materials and devices to manufacturing processes. Evolving mission needs and ongoing experimental efforts are likely to influence the relative urgency and definition of future facility concepts. Nevertheless, efforts to further their preconceptual maturation should continue.

Cooling of new-generation IT systems currently requires a significant quantity of water for cooling. The high silica content of water in the Los Alamos aquifer necessitates minimal cycles of concentration in cooling towers, thus exacerbating the quantity problem. Expansion of computing capacity therefore requires consistent, reliable operation of the SERF, which removes the silica and possible contaminants.

CHAPTER 4:
GLOBAL SECURITY

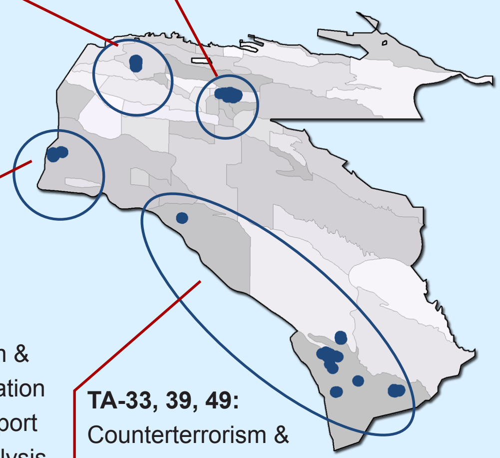
INFRASTRUCTURE CHALLENGES

- Global Security programs are closely integrated with the Weapons and Science, Technology, and Engineering Programs and consequently need to be co-located. Consolidation and leveraging of capabilities is important for collaboration and creativity.
- Global Security facility operations have taken advantage of facilities vacated by the Weapons Program making reinvestment essential.
- Continued success in the global security mission will require investments in and replacements of existing facilities. In some cases, Work for Others customers are anticipated to fund refurbishment of existing facilities.

EXISTING FACILITIES

TA-03: Non-nuclear and Counterterrorism & Counter-proliferation Capabilities support LEU fuel research, intelligence analysis, and space research.

TA-55: Plutonium and SNM Capabilities R&D of process & conversion of Pu to metal oxide, production of Pu heat sources, and storage & processing of recovered Pu neutron sources.



TA-16: High Explosives and Counterterrorism & Counter-proliferation Capabilities support intelligence, analysis, space research, nuclear engineering and sensitive programs.

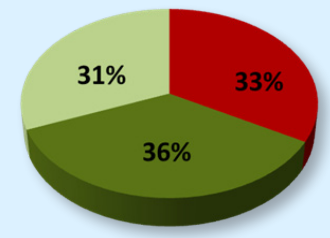
TA-33, 39, 49: Counterterrorism & Counter-proliferation Capabilities and Work for Others Capabilities support applied electromagnetics and sensitive programs.

Other Facilities Supporting GS Missions: Non-Nuclear, High Explosives, and Work for Others Capabilities occur in non-GS facilities in support of Mo-99 extraction, FEL accelerator and highly energetic materials R&D.

TA-57 (Fenton Hill): Work for Others Capability supports space science research.

FACILITY STATUS

- GS is responsible for 6.2% of the Laboratory's owned operating permanent building space.
- About 33% of this building space has a limited life and will be eligible for disposition within the next 20 years.
- The average age of these enduring facilities (>20 years old) is 50 years, ranging from 25-69.



Enduring, ≤20 years old: (~169k gsf) In the last 20 years, only the NISC and DDOB have been built to support these capabilities.

Enduring, >20 years old: (~147k gsf) 37 structures utilized as office, warehouse, laboratory, and other space at TA-33 and -57.

Limited Life: (~157k gsf) 13 structures utilized as laboratory, warehouse, and other space at TA-35, 39, 49, and 57.

IMPLEMENTING STRATEGY

STRATEGY	PRIOR ACCOMPLISHMENTS	FUTURE PLANS
Targeted Reinvestment/ Life Extension / Asset Sustainment	• Repurposed space at NISC to expand SCIF space, repurpose lab space, and provide training. • Reinvestments in TA-16, Buildings 200, 204, and 218 allowed continued use of enduring facilities for GS capabilities. • TA-35, Building 27 fire protection system and plant equipment recapitalization.	• TA-48 RC-107 Revitalization project will allow lab space to be utilized for GS programs. • Life extension project in the TA-33 enduring facilities will allow the capability to continue to be supported. • Facility upgrades in the LEDA facility will support the Free Electron Laser. • TA-16, Building 200 HVAC.
Strategic Recapitalization and Replacement of Assets Beyond Useful Life	• Upgraded fire protection at the LEDA facility and TA-16. • Relocated the SLD program from TA-35 to TA-16.	• Reinvestment in TA-66, Building 1 will provide space for the IAEA Schoolhouse. • Repurposing space for SCIFs is essential to GS. • Repurposing firing sites will support a growing GS capability. • The extraction of Mo-99 capability will need reinvestment at LANSCE.
Investment in New Facilities and Infrastructure/Signature Facility	• The Criticality Experimental Facility project relocated specified equipment, SNM, and capabilities from TA-18 to the DAF at NNSS. This relocation provided a long-term base criticality experiments capability, improved the security and safety posture, and maximized the use of existing facilities.	• The proposed Energetic Materials Characterization Facility project is an example of a facility that could be utilized by GS, WP and ST&E. • Relocating non-proliferation activities into new facilities at TA-48 will allow the TA-35 area facilities to be repurposed for mission utilization. (Ref: TA-35 Facility Evolution Plan, LACP 12-00363. • Several GS Programs (CPCT and Space Sciences) would benefit from consoldiation into co-located facilities. • A new building (RC-45 Expansion) will expand clean chemistry capabilities at TA-48.
Facility Disposition	• TA-41 was vacated, cleaned, and placed as a historical building. • Relocated the OSRP to TA-35 allowed the disposition of transportables at TA-46. • Relocation of the CEF allowed disposition of TA-18.	• Vacating obsolete facilities at TA-57 (Fenton Hill) will allow disposition of excessed facilities.

OVERVIEW

Introduction

Developing and applying science, technology, and engineering solutions to reducing global threats is a core laboratory mission. The Laboratory's commitment to protect against emerging, proliferant, and unconventional nuclear threats, regardless of origin, reduces global threats. Global Security programs develop science and technologies that counter terrorism and proliferation, support nuclear threat response and the war fighter, and perform one-of-a-kind analysis to ensure a safe and secure nation.

Many of the facilities supporting the GS programs are nearing the end of their lifecycle, with the exception of the Nonproliferation and Internal Security (NISC), the D Division Office Building (DDOB) and Low-Energy Demonstration Accelerator (LEDA) facilities. One-third of the GS space is scheduled to be shut down in the next 15 years, avoiding more than $11M in deferred maintenance. Many of the capabilities in these facilities will move to replacement or recapitalized facilities. Relocation and consolidation of nuclear nonproliferation capabilities from TA-35 to proposed facilities in TA-48 will allow TA-35 to support Stockpile Stewardship programs in close proximity to the Plutonium Facility. Facilities supporting intelligence, defense, and counterterrorism are proposed to consolidate at TA-16 while using capabilities at TA-39 and TA-33. This consolidation will require new buildings. The NISC facility will remain a hub for GS programs. Long-term moves from the Physics Building (TA-03, Building 40), to allow the disposition of the aging facility, and high demand space in NISC may force the relocation of some activities.

A proposed facility for the space sciences capability is planned at TA-03 near the space science laboratory (TA-03, Building 502). Facility space for HPC for analysis and modeling and modern Sensitive Compartmentalized Information Facility (SCIF) space is planned at TA-03 and TA-16.

Mission Areas

Mission execution focus areas include nuclear forensics, treaty verification, space defense, bio-security, large data to decision, and persistent surveillance (GS Strategic Plan 2012). The Laboratory plays a national leadership role when opportunities arise in national agendas by leveraging our capabilities for those opportunities. The Laboratory contributes directly to national strategies and international initiatives, helping ensure global stability by leveraging existing infrastructure and assets and mission-specific equipment. Much of the Laboratory's infrastructure that supports the stockpile mission is essential in supporting GS capabilities, including PF-4, LANSCE, and waste facilities. The strategy of providing agile, flexible facilities and infrastructure for GS missions is critically important because new threats can emerge very quickly and response time is limited.

The GS programs are vital in the NNSA Strategic Plan (May 2011). Primary sponsors of the GS portfolio are the NNSA Defense Nuclear Nonproliferation (DNN) activities, the DoD, State, Homeland Security (HS), other Federal agencies, and private corporations. These programs and the Strategic Outcomes Office support the Laboratory's missions through:

- Emerging Threats (ET)
- Intelligence, Defense, and Counterterrorism
- Nuclear Nonproliferation and Security
- Technology Partnerships
- Counterintelligence
- Sensitive and Special Programs Operations

GS aligns with the DNN programs supporting the NNSA goals of reducing nuclear dangers; modernizing the NNSA infrastructure; and strengthening the science, technology, and engineering base. These programs provide priority and emphasis to NNSA programs that are responsible for implementing the President's nuclear security priorities and the 2010 Nuclear Posture Review. Its core competencies are to:

- remove, eliminate, and minimize the use of proliferation-sensitive materials
- detect and prevent the illicit trafficking of nuclear/radiological materials, technology, information and expertise
- safeguard and secure materials, technologies, and facilities
- provide R&D technology solutions for unilateral and cooperative monitoring of foreign nuclear weapons activities, detection of illicit diversions of material, and detection of nuclear detonations

Global Threat Reduction Initiative

The Global Threat Reduction Initiative (GTRI) program reduces and protects vulnerable nuclear and radiological materials located at civilian sites worldwide. The GTRI activities enhance nuclear security and reduce global nuclear dangers through efforts to improve nuclear and radiological material security.

The LANL activities provide science-based support to NNSA's Material Protection, Control and Accounting Program; work with commercial partners to develop options for a domestic supply of molybdenum-99; conduct R&D to support conversion of highly enriched uranium (HEU)-fueled research reactors to LEU fuel; and recover excess and unwanted radioactive sealed sources through the Off-Site Source Recovery Program (OSRP).

Defense Nuclear Nonproliferation R&D

The Defense Nuclear Nonproliferation (DNN) R&D program drives the innovations of unilateral and multi-lateral technical capabilities to detect, identify, and characterize (1) foreign nuclear weapons programs, (2) illicit diversion of special nuclear materials, and (3) foreign nuclear detonations.

The Laboratory activities execute the basic and applied research needs to develop solutions for detecting, locating, and characterizing activities related to development of nuclear weapons. The Laboratory develops capabilities applicable to understanding SNM production, weapons component fabrication, and testing activities needed to develop a nuclear weapon and continues to develop and deploy technology used for safeguarding nuclear facilities and used to verify arms control agreements in support of the nation. In addition, the Laboratory provides the capabilities to detect and report nuclear detonations on the surface of the Earth, develops the understanding of systems to detect underground and underwater explosions and the science and modeling to make reliable assessments, and provides enabling techniques and capabilities needed to analyze the signatures left by interdicted illicit nuclear materials or the aftermath of a nuclear event.

Nonproliferation and International Security

The Nonproliferation and International Security (NIS) program directly contributes to meeting the DOE strategic goal to "Secure our Nation" and plays a critical role in enhancing nuclear security through defense, nonproliferation, and environmental efforts; reducing global nuclear dangers; enhancing nonproliferation efforts and the security of nuclear materials; and supporting the President's arms control and nonproliferation agendas. NIS programs are Nuclear Safeguards and Security, Nuclear Controls, Nuclear Verification, and Nonproliferation Policy.

The Laboratory activities support the IAEA safeguards by developing neutron nondestructive assay instruments, developing technology for the verification of arms control treaties and multilateral agreements; limiting the spread of sensitive materials and technologies by supporting the Nuclear Suppliers Group U.S. export licensing reviews and Weapons of Mass Destruction (WMD) interdiction efforts; engaging international partners to strengthen nonproliferation and nuclear security, conducting educational training programs of safeguards technology and nonproliferation, and providing technical expertise to the U. S. Government on international treaties and agreements.

International Material Protection and Cooperation

The International Material Protection and Cooperation (IMPC) supports enhancing nuclear security through defense, nonproliferation, and environmental efforts by significantly increasing the security of vulnerable stockpiles of nuclear weapons and weapons-usable nuclear materials worldwide, preventing the loss of such material; and significantly improving the ability to deter, detect, and interdict their illicit trafficking.

The Laboratory activities provide science-based support to NNSA's Material Protection, Control and Accounting Program and provide science-based support to NNSA's Second-Line-of-Defense (SLD) Program (Figure 4.1). The Laboratory serves national needs to understand and improve infrastructure

Figure 4.1: NNSA's Second-Line-of-Defense (SLD) Program.

resilience, stability, security, and reliability to prevent calamity and avoid crises while ensuring global, economic, political, and social stability.

Fissile Material Disposition

The Fissile Material Disposition (FMD) program enhances nuclear security through defense, nonproliferation, and environmental efforts by eliminating surplus Russian weapon-grade plutonium and surplus US weapons-grade plutonium and HEU. The program also plays an important role in the international discussion of the management and disposition of plutonium.

The LANL activities meet national needs to dispose of excess weapons-grade plutonium and repurpose plutonium stockpiles for peaceful and non-stockpile purposes. In contribution to the amended US-Russia Plutonium and Disposition Agreement, the Laboratory converted 200 kg of plutonium metal to oxide as early feedstock for the US Mixed Oxide Fuel Fabrication Facility. By 2018, the goal is to complete operations of 2 MT (2,000 kg) of plutonium converted to oxide.

Nuclear Counterterrorism Incident Response Program

The Nuclear Counterterrorism Incident Response Program (NCIRP) program, managed by the NNSA Office of Emergency Operations, responds to and mitigates nuclear and radiological incidents worldwide and has a lead role in defending the Nation from the threat of nuclear terrorism.

The Laboratory provides personnel, equipment, training, facilities, and communication to respond to worldwide nuclear and radiological events; supports DOE through direct intelligence analysis, intelligence-related research and development, and intelligence operations support to understand, detect, and respond to emerging national security threats, including threat analysis, detection, and technologies to respond to nuclear and radiological, biological and chemical, and explosives events.

Counterterrorism and Counterproliferation Programs

The Counterterrorism and Counterproliferation (CTCP) program supports science to understand nuclear threat devices, including improvised nuclear devices, foreign nuclear weapons (with emphasis on loss of custody), and their constituents (namely nuclear and energetic materials). Key CTCP technical activities sustain and exercise the US Government's ability to understand and prevent nuclear terrorism and to counter nuclear device proliferation. CTCP supports interagency efforts through jointly funded, long-term R&D.

The LANL activities develop and integrate counter terrorism and counter proliferation solutions relevant to end-users working in tactical operations; research, develop, and apply unique technologies supporting the Warfighter and DoD missions; and provide operational support to address national security threats and strengthen US armed forces (Figure 4.2).

Figure 4.2: The Laboratory's Event Response Program.

Work for Others

Working with NNSA, DoD, Department of State (DoS), Department of Homeland Security (DHS), other federal agencies and foreign partners, the Laboratory contributes on multiple fronts to develop science and technologies that counter terrorism and proliferation, support nuclear threat response, support the war fighter, and perform unique analyses to ensure a safe and secure nation.

The Laboratory manages several non-NNSA DOE programs, including the Office of Nuclear Energy for the Pu-238 heat source program supporting the National Aeronautic and Space Administration (NASA) deep-space missions, the Office of Intelligence (IN), and the Office of Health and Safety (HS). The Intelligence Analysis, Integration, and Exploitation DOE-IN program solves critical and challenging technical intelligence and cyber problems.

In support of the DHS, the Laboratory develops technologies to better detect and recognize nuclear and radiological threats; support test and evaluation activities of new detectors; assess performance of nuclear detection systems; play an operational role in real-world nuclear threat assessments; and advance the nation's nuclear forensics capabilities for the Domestic Nuclear Detection Office. The DHS-supported Warfighter Support program provides high-leverage, game-changing technology to the American warfighter (Figure 4.3). This program contains respected experts and R&D capabilities on weapons of mass effect (WME) threats; contributes to global architectures for identifying, detecting, and defeating WME threats; and provides vital technologies and options for responding to and mitigating WME events.

Figure 4.3: Warfighter support training.

The Laboratory's Emerging Threats Program works with other federal agencies, such as DoD, DHS, and the intelligence community, to provide technical solutions that counter new foreign technologies that could result in strategic and tactical advantages; predict and/or prevent catastrophic threats executed by pathologic actors; improve technical security and surveillance measures without destroying US civil liberties and the economy; and enable rapid sharing and composting of critical actionable intelligence.

The Special Support for the DoD is one of the DoD's special operations community's preferred providers for rapid response counterterrorism applications in the areas of tagging, tracking, and locating; reconnaissance and surveillance; command, control, and communication; and energetic materials and is a significant contributor to the NNSA laboratory's nuclear CP team.

The DoD Navy free electron laser (FEL) at LANSCE supports the Office of Naval Research in collaboration with Boeing Company, other national laboratories, and industrial and academic partners. The mission of the FEL is to develop a countermeasure against anti-ship cruise missiles and other threats by finding the potential of using photons to destroy cruise (and ballistic) missiles. Recently, a beam of electrons was produced from an advanced photoelectron injector, creating enough power for a megawatt-class antimissile FEL weapon.

The Energy and Resilient Infrastructure effort focuses on mitigating the impacts of energy demand growth, sustainable nuclear energy, and materials and concepts for clean energy. Potential partners include the DoD, Department of the Interior (DOI), US intelligence community, and industry partners.

CORE CAPABILITIES

The diverse portfolio of GS program support to the Nation relies on an equally diverse set of capabilities and activities. GS capabilities integrate with the Laboratory's Science Pillars (See Chapter 3). Specific technology needs for sponsors and six focus areas (Figure 4.4) align with NNSA Core Capabilities and are key to the Laboratory for prioritizing investments, resources, capability sustainment, and technology combinations. GS capabilities by NNSA Core Capability are listed below.

Plutonium

R&D of processes and conversion of plutonium metal to oxide.

High Explosives

Highly energetic material research, development, and training.

Non-Nuclear

LEU fuel development and qualification and molybdenum (Mo)-99 R&D capabilities.

SNM Accountability, Storage, Protection, Handling, and Disposition

- Radioactive sealed source recovery; science-based expertise to improve the security of nuclear weapons
- Materials at their source and evaluation, approval of technologies, and science-based expertise to "SLD" capabilities

Counterterrorism and Counterproliferation

- Decision support systems
- Analysis, technological solutions, capability deployment and leadership to respond to emergent national security threats
- Development and application of sensors, remote sensing, instruments, and detection, monitoring, or assessment technology systems
- Remote sensing technologies, satellite interfaces, command, control, and system testing, on-board and real-time signal processing, knowledge extraction, and information infusion
- Space-based mechanical engineering and design, fabrication and assembly, system testing and integration, production and project controls, and quality assurance
- Development of techniques and systems for nondestructive assay of nuclear materials control and accountability
- R&D, training, and operations in applications of nuclear measurements techniques and radiography
- Leading of readiness and deployment of nuclear monitoring and physical security systems and technology
- Provision of modeling and analysis of complex systems
- Hands-on and remotely operated experiments conducted with significant quantities of nuclear material
- Provision of the operational backbone for the National Criticality Experiments Research Center
- R&D of a full electron laser

Nuclear Forensics	Treaty Verification	Space Defense	Bio-Security	Large Data to Decision	Persistent Surveillance
Nuclear materials, facilities, and radiochemistry	International relationships	Satellite Technology	High-performance Computing	Remote Sensing	Remote Sensors
High-performance computing	Safeguards and Security	Space and Situational Awareness	Computational Biology	Novel Image Processing	Materials
Nuclear weapons design	Remote Sensing	High-performance Computing	Bio-surveillance	Decision-making tools	Systems

Figure 4.4: Global Security program focus areas.

Support of Other Mission/Program Capability (Work for Others)

R&D of science and technologies for government agencies, universities, and the scientific community

MISSION CAPABILITY ALIGNMENT OF INFRASTRUCTURE ASSETS – EXISTING FACILITIES

With the national focus on issues of nonproliferation, intelligence, defense, and homeland security, the GS programs are likely to see some programmatic growth in the future. Modern facilities with the capability of rapid revamping to precede, succeed, or span a world event continues to be a mission need and a priority gap. Continued maintenance and modernization of facilities built specifically for this mission, leveraging of existing weapons activities infrastructure, and reinvestment in non-stockpile scientific facilities will support the GS capabilities.

Plutonium

PF-3 and PF-4: As the Center of Excellence for Plutonium, this facility is used for non-stockpile plutonium activities, including R&D of processes and conversion of plutonium metal to oxide for the US Mixed Oxide Fuel Fabrication Facility and the continuation of production of Pu-238 heat sources for the NASA deep space missions. The plutonium facilities are funded by the Weapons Program and are discussed in greater detail under Chapter 2, Weapons Program.

TA-54 Low-Level Waste (LLW) Disposal Site: OSRP-recovered, low-level radioactive waste is stored, processed, and packaged to ship to WIPP.

High Explosives

Firing Sites: The firing sites at TAs-15, 36, and 39 provide non-stockpile R&D in highly energetic materials. Large-scale testing facilities, contained firing facilities, and outdoor testing facilities are needed for this R&D supporting the American Warfighter program and counterterrorism programs. Firing sites are funded by the Weapons Program and are discussed in greater detail under Chapter 2, Weapons Program.

Non-Nuclear

Sigma Facility: The Sigma facility is used to develop and qualify LEU fuel for high-power research reactors and the scaling-up processes for LEU fuel and to provide pilot-scale quantities of fuel for fuel qualification tests. Sigma is a mission-critical facility under the Weapons Program but is institutionally funded. As such, a more detailed description of the facility can be found under Chapter 2, Weapons Program and Chapter 3, Science Programs.

The Los Alamos Neutron Science Center: The LANSCE facility supports the GTRI program through the R&D of processes to produce Mo-99, a critical isotope of medicine, from LEU through the acceleration of the development of a diverse set of non-HEU technologies; because LANSCE is co-funded by the Weapons Program as well as the Institution, a more detailed description of the facility can be found under Chapter 2, Weapons Program and Chapter 3, Science Programs.

SNM Accountability, Storage, Protection, Handling, and Disposition

TA-55, Building 3: The OSRP currently uses PF-3 for storage and processing of quantities of recovered Pu-239 neutron sources requiring the use of a CAT III C Material Balance Area (MBA) because of material-at-risk (MAR) requirements. Relocation of this work allowed disposition of transportables at TA-46.

TA-35, Building 186: This 40-year-old temporary facility is currently used by the OSRP for administration of the program.

TA-35, Building 86: The Office of International Material Protection and Cooperation's "First Line of Defense" program uses this laboratory to provide science-based expertise to the accounting, control, and protection of material globally to improve the security of nuclear weapons and materials at their source. This program uses detection system performance assurance and system validation and testing.

TA-16 Site SLD Facility: An outdoor facility is currently used by the IMPC SLD program. The Laboratory evaluates, approves program technologies, and provides science-based expertise as leadership to the globally located SLD program.

Counterterrorism and Counterproliferation

Nonproliferation & Internal Security Complex: The NISC is an ~170,000-gsf laboratory/office building is 10 years old and holds over 400 occupants (Figure 4.5). It is used for intelligence, analysis, and technology; intelligence and space research; nuclear engineering and nonproliferation; counterintelligence; and sensitive and special program operations. The DOE is responsible for the development and implementation of several programs supporting its core national security mission. These programs (Nonproliferation, Foreign Energy Intelligence, Nuclear Safeguards and Security, Classification and Declassification, and Emergency Management) respond to presidentially and congressionally mandated national security objectives.

Figure 4.5: Nonprofileration and International Security Building (NISC) at TA-3.

TA-03, Building 502: This ~24,000-gsf laboratory is 25 years old and is used for space electronics and signal processing, and space instrumentation.

TA-16, Building 200: This ~31,000-gsf laboratory is a 60-year-old facility that is used for international threat reduction and systems analysis and surveillance.

TA-16, Building 218: This ~11,000-gsf building is 27 years old and is used for threat reduction, science and engineering.

TA-16, Building 16: This ~6,000-gsf building is 69 years old and is used for defense systems, systems design, and analysis. This building was formerly the cafeteria in the Manhattan Project era but cannot be claimed as historical because of the renovations over the years.

TA-35, Building 2: This ~84,000-gsf building is 62 years old and is used for safeguards, science, and technology.

TA-33 HP Site: This site is currently used for applied electromagnetics. Major buildings are the Laboratory and Office Building (TA-33, Building 19), Machine Shop (TA-33, Building 39), Laboratory (TA-33, Building 20), Well Logging Support Building (TA-33, Building 113), Laboratory and Office Building (TA-33, Building-114), Warehouse (TA-33, Building 25), Storage Building (TA-33, Building 87), and Bunker (TA-33, Building 151).

Figure 4.6: Some Global Security activity will continue to take place at remote technical areas, such as the TA-33 Campus, until the Laboratory consolidates to a smaller centralized campus.

Support of Other Mission/Program Capability (Work for Others)

Fenton Hill: This US Forest area is used by the Laboratory's Space Sciences program through an interagency agreement with the US Department of Agriculture. The Space R&D program uses observatories capabilities.

LEDA Facility: The 381k-gsf LEDA facility (TA-53, Buildings 365, 14, 18, and 19), built in 1989 for the Accelerator Production of Tritium Project, houses the FEL proton accelerator that has achieved the highest proton beam current and produced the highest resulting continuous-wave proton beam power ever achieved. The facility consists of four main laboratories (TA-53, Buildings 14, 18, 19, and 365) and cryogenic buildings (TA-53, Buildings 617 and 758). Offices are located in the mixed-use TA-50, Building 31 and in TA-53, Building 365.

IMPLEMENTING STRATEGIES BY PROGRAMMATIC CAPABILITY—FUTURE PROJECTS

As GS programs evolve, the synergies for much of the new programmatic work cluster around the existing programmatic work at TA-03 and the co-location of the Weapons Program's capabilities at TA-16. Life Extension and Targeted Reinvestment in enduring buildings provides a strategy for selected existing facilities to allow transition into new facilities over an extended time-frame. Activity at TA-33 (Figure 4.6) and TA-39 will remain until such time as the activities evolve to a smaller centralized campus, through Replacement and Recapitalization project strategies. The approach for selected Life Extensions will enable the strategy of constructing new facilities to support existing and emerging missions on a priority basis.

Targeted Reinvestment / Life Extension / Asset Sustainment

Plutonium

Plutonium Facility Adjustments: The FMD, GTRI, and NASA program efforts diversify the activities performed at PF-3 and PF-4. Facility adjustments and operation modifications may require consideration to meet potential expanded or accelerated program requirements.

Expansion of storage structures at TA-55 for CAT-III MBA will improve loading and departure methods. Training for CAT-III/IV up to CAT-I activities require additional space at the facility.

Non-Nuclear

The Los Alamos Neutron Science Center: Recycling LEU fuel for reuse as Mo-99 capability is considering the use of the LINAC Material Test Station (MTS) for isotope production targets. This area, along with the radioactive isotope separator, would enable the rapid preparation of radioactive isotopes. This facility will need a life extension project to upgrade electrical, fire protection, HVAC, stairs, and roofing.

Special Nuclear Material Accountability, Storage, Protection, Handling, and Disposition

TA-16 Site SLD: After a previous relocation of the program from TA-35, the SLD capability needs continued investment in the facilities supporting the capabilities.

Counterterrorism and Counterproliferation

Nonproliferation & Internal Security Complex: This building is on the list to implement high-performance, sustainable building efforts and will require upgrades in computing physical infrastructure.

TA-03, Building 502: This building will need a life extension upgrade in the next 5-10 years.

RC-107 Life Extension: This revitalization will provide new chemistry laboratory space and infrastructure, including a clean room with mass spectrometer instrumentation, HVAC, and electrical system upgrades.

TA-16, Building 200: Reinvestment of supplemental projects is planned to continue until 2015.

TA-16, Building 218: Reinvestment is continued into 2014 for this facility.

TA-16, Building 16: This 69-year-old facility will require continued maintenance until such time as replacement space is found for its occupants.

TA-35, Building 2: Planned life extension for this 62-year-old facility is scheduled in the next 5 years. Replacement facilities are planned at TA-48 for these capabilities.

TA-33 and 39: Aging facilities at TA-33 and TA-39 will require life extension projects to ensure continued support of counterterrorism programs requiring a remote location. Any reinvestments would be coordinated with the GS Strategic Plan and GS Program Management Plan objectives.

TA-03 HPC SCIF Office/Laboratory Space: Reinvestment in existing facilities and construction of new SCIF office and lab space will promote and accommodate the need for expanded HPC capability in a secure cyber environment. Ancillary cooling and power upgrades will be required to support new HPC systems. The effort focusing on energy and resilient infrastructures provides infrastructure-related analytic development and operations capability centers for major branches of government and utilizes capability knowledge and expertise to provide forward-thinking infrastructure solutions. These capabilities occupy space in several TA-16 facilities first developed for the nuclear weapons programs during the Cold War. The near-term plan for accommodating future expansion for this planned activity is to utilize existing facilities and capabilities throughout several organizations and areas at the Laboratory (i.e., increased space utilization). This approach may need to be augmented with additional HPC and TA-03 facility space to meet the Work for Others energy security program demands.

Support of Other Mission/Program Capability (Work for Others)

LEDA Facility: The laboratory buildings will need life extension upgrades in the next 15–25 years, for improved versatility (Figure 4.7). With the increase in programmatic equipment, new ventilation systems and water-cooling system and fire protection upgrades and expansion will be needed. With successes in experimentation and industry complete, the FEL capability will result in increased R&D opportunities in the next 10 years, which will include a small increase in staff. This staff may be accommodated in Building 31 or 365 if space is found for unrelated staff. In 10 to 15 years, the program will need additional heavy lab and assembly testing areas. Power upgrades may be needed up to 20 MW.

Figure 4.7: LEDA/FEL facility will require life extension upgrades to the facility.

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

High Explosives

Firing Sites: Activities require repurposed firing sites and/or a new containment facility to support a mix of highly energetic materials activities. Also, large-scale energetic materials' testing is being considered at DARHT and other existing firing sites.

Non-Nuclear

Sigma Facility: The program converting HEU-fuel to LEU fuel needs specialized machining space in the Sigma facility. Repurposing certain office space into lab space would support the need for specialized machining space.

Counterterrorism and Counterproliferation

IAEA Training Schoolhouse: In FY12 LANL began the effort to renovate TA-66, Building 1 (Figure 4.8) to meet the needs of the IAEA training schoolhouse program. Necessary Laboratory space for the IAEA activities will be provided temporarily in RC-1.

Figure 4.8: Future IAEA Schoolhouse will be located at TA-66 Building 1.

Investments in New Facilities and Infrastructure / Signature Facilities

High Explosives

Energetic Materials Characterization Facility: The EMCF will replace and modernize many of the aging facilities at TA-09. Use of this facility is also a major priority to the GS programs supporting the warfighter and counterterrorism and countering WME. The EMCF is considered a signature facility for the energetics materials capability at the Laboratory, with proposed funding from the Weapons Program (see Chapter 2, Weapons Program for expanded project description).

Counterterrorism and Counterproliferation

RC-45 Expansion: Growing programmatic demands of plutonium bioassay analysis call for expansion of the capability at the RC-45 facility (TA-48, Building 262). This new ~10k-gsf clean chemistry and mass spectrometry laboratory building will be located next to RC-45 and built to Leadership in Energy and Environmental Design (LEED) gold certification standards.

Radiological Facilities Modernization: Aging radiological facilities must be replaced to accomplish present and anticipated missions in nuclear technology. Significant operational benefits can be expected when separating incompatible work, while simultaneously consolidating synergistic and compatible work from multiple locations. Therefore, a set of narrowly focused, single-purpose radiological laboratory and support facilities is proposed. Relocation and consolidation of critical staff and operations in support of compatible radiological capabilities will include construction of office and specialized laboratory buildings, providing both secure and open access; which will support various current and anticipated GS activities. It is expected that these smaller and capability-centric buildings will provide high-quality, efficient, and functional lab, office, and storage space; improve the cost of facility operations by consolidating dispersed organizations and functions; consolidate related functions in close proximity to maximize efficiency of operations; maintain security and safety more effectively and efficiently, including management of MAR limits; increase opportunities for shared workspace; and accommodate projected future growth more efficiently. The overall goal of this effort is to consolidate functionally compatible radiological capabilities, while maintaining programmatic flexibility and maximizing operational efficiency. These radiological facilities will benefit not only GS but also Science capabilities, which are further discussed in Chapter 3, Science Programs. Details of the specific requirements can also be found in the TA-48 Radiological Facilities Modernization Plan (LACP-11 01026).

Proposed Rapid Response Laboratory: A 4,000-gsf laboratory building is proposed to support the laboratory's rapid response for programs such as the Joint Technical Operations Team (JTOT), the Accident Response Group (ARG), Disposition Field Evidence Analysis Team (DFEAT), and the DOE Field Operations (DFO) is a priority. Facilities supporting this growing program are quickly becoming obsolete. Real-time deployment of these resource teams is critical in terms of ability to impact and viability of any given response. These organizations are highly dependent on facility logistical support for effective response ability. Existing outdated and adapted facilities impede the effectiveness of response teams as the need for these programs expands. A facility with designated functionality and the flexibility for growth will match program requirements to infrastructure support.

Proposed Nuclear Counterproliferation/ Terrorism Central Facility: This proposed line item will be a secure facility supporting the Intelligence, Defense, and Counterterrorism (IDC) programs and capabilities. Currently, activities for these programs are being accommodated at various locations, often in aging facilities that have been adapted to serve a critical need. Opportunities for increased effectiveness and operational efficiencies are not achieved because of existing logistical and facility limitations. A new facility will provide appropriate facilities for programs to function effectively and will also consolidate and integrate related activities to enhance mission effectiveness and to gain functional efficiencies. A new facility will provide a mission resource that currently is unavailable. In a secure facility environment, the building will accommodate configurable and adaptable office, conference, SCIF space, and laboratory space, as well as classified machine shops, environmental testing labs, nuclear weapon training and demonstration space, computer modeling and simulation rooms, analysis centers, and computer machine rooms. This consolidation and expanded capacity will allow the elimination of adapted Cold-War-era facilities and contribute to the modernization and sustainability of facilities and programs. The construction of the NCP/T Facility will result in the closure of end-of lifecycle facilities at TAs-16, 33, and 49, totaling approximately 250,000 square feet.

Proposed Space Systems, Instrumentation, Assembly, and Testing: Supporting the intelligence and space research capabilities, this line-item facility will increase the capacity for R&D, design, fabrication, calibration, and testing of space instrumentation with its reconfigurable space (Figure 4.9). Currently, these activities are located in aging facilities that are not capable of meeting present or future program requirements. Many of the current activities are supported in temporary facilities that are beyond normal lifecycle use and/or are scheduled for deactivation and decommissioning (D&D) activities. Continued use of aging and temporary facilities has led to ineffective and inefficient program operations. Construction of an energy efficient and environmentally sound facility will allow the removal of aging and inefficient buildings, which will assist in establishing a more sustainable Infrastructure support system. The new facility will accommodate a visualization and data analyses center, satellite communication equipment, engineering and design, fabrication and assembly, testing, and production areas. This facility will contribute to the elimination of TA-03, Building 40 and modernization and sustainability of facilities.

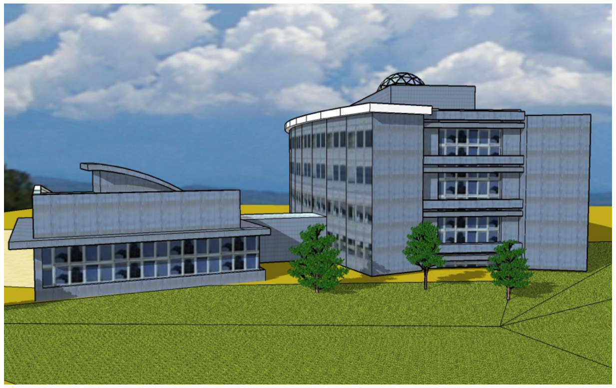


Figure 4.9: Conceptual rendering of the proposed Space Systems, Instrumentation, Assembly, and Testing facilities.

Proton Interrogation: Supporting the Optical Systems and Lasers capability, this facility will be located at LANSCE to enable use of the existing proton beamline infrastructure. This program will facilitate the testing and analysis of proton beam experimentation to develop field applications for long-range detection of radioactive material using proton beam technology.

Facility Disposition

Plutonium

Tunnel Vault: TA-41 facilities were vacated and placed under historical building status. These actions facilitated the strategy of reducing the Laboratory footprint in the Townsite.

Non-nuclear

Sigma Facility: The Sigma facility will be nearing the end of its lifecycle within the next 20 years. Planning is needed for the next generation of facilities for these capabilities.

SNM Accountability, Storage, Protection, Handling, and Disposition

TA-18 Site Closure: The 2008 move of Cat-III/IV SNM work from the Laboratory to the Device Assembly Facility (DAF) NNSS and other Laboratory locations increased the need for new or refurbished facilities that support working with Cat-III/IV SNM for safeguards and other capabilities. Some nonproliferation programs at NNSS that use Category I/II SNM, particularly the safeguards training program, cannot currently be conducted at NNSS because the

NNSS Authorization Basis does not allow for the handling of these materials. The Laboratory is in the process of exploring future nuclear facility requirements for threat reduction missions. This move allowed the disposition of TA-18 facilities (Figure 4.10). The move of activities from TA-18 removes operations from a site vulnerable to flooding and security risks and achieves the strategy of moving operations away from Townsite areas (White Rock).

TA-35, Building 186 Transportable: This building housing OSRP is planned to be excessed in 2015.

Counterterrorism and Counterproliferation

TA-35, Building 2: This building is on the Proposed Federal Disposition list to be excessed in 2025.

TA-35, Building 27: This building is planned to be excessed in 2026.

Figure 4.10: After the relocation of all Category III/IV SNM work to NNSS, the shutdown process commenced for TA-18. Panel a) depicts the site before disposition activities, while panel b) shows the site following demolition of most structures.

TA-33 HP Site: Buildings 20, 26, 39, 129, 168, 173, and 280, a total of 2,082 square feet, are on the Proposed Federal Disposition list to be excessed in 2018 if not already excessed.

Support of Other Mission/Program Capability (Work for Others)

Fenton Hill: Disposition of ~5,000 gsf of excessed facilities (Figure 4.11) is planned to occur within the next 2 years in compliance with the Consent Order. Another 5,000 gsf could be dispositioned if enclosed modular buildings were provided at this site.

LEDA Area: Three transportable buildings (3,283 gsf) are planned to be demolished or removed in the next 5 years (TA-53, Buildings 885, 886, 889). In addition, the water treatment shed (TA-53, Building 961) and cooling tower (TA-53, Building 1032) are not in use and are scheduled to be dispositioned.

CHALLENGES AND VULNERABILITIES

Maintaining, recapitalizing, and providing the facilities and infrastructure to support the GS capabilities is challenging because of the rapid dynamics of global threats. A responsive modern infrastructure providing a creative atmosphere for solving problems or responding to world events will contribute to the security of the nation and its allies. The GS Program calls upon the expertise and talent throughout the Laboratory and is not readily bound in a single geographical corridor. Its programs are interwoven with the Weapons and ST&E programs. Co-location

Figure 4.11: Disposition of excessed facilities is planned at Fenton Hill.

and leverage with these programs is important for collaboration and creativity.

The GS program is responsible for over 525k gsf or 6% of the Laboratory's facility space and utilizes both WP and ST&E facilities. Only one major facility, the NISC, has been built in the last 20 years to support the capabilities of this program. About 40% of the GS space is scheduled for disposition in the next 15 years. Of the remaining facility space, the average facility is 50 years old and will need continued maintenance or recapitalization.

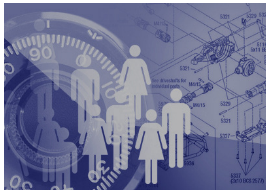
Alternatives include status quo, limited reinvestment, or new facilities. Status quo in maintaining current facilities for these important capabilities will be expensive, increase deferred maintenance, and lack quality space, thereby creating vulnerabilities in program capabilities and sponsor support. Limited reinvestment in aging facilities and some replacement facilities will afford continued capability support in most areas. Investment in new facilities, including one or two line-item-size facilities, will support continuing and new capabilities and capacities to reduce global threats and secure the nation.

The ability for NNSA to fund current and new infrastructure for the DNN programs will be a challenge in the near future. Sponsors may fund repurposing space and an occasional building. Further program development and mission need is expected to create new facility and infrastructure requirements in the following areas:

- Development of improved intelligence and surveillance
- Expansion of information analysis products and tools
- Nuclear forensics development
- Nuclear emergency response instruction and training
- Energy security research and development
- Environmental security research and development

Investments will be required in staffing and the concomitant classified computing infrastructure, SCIF space, and light laboratories.

With the Nation's increased focus on global nuclear security and the transformation of the Cold-War-era nuclear weapons complex into a 21st century NSE, the GS missions can be highly effective, efficient, and modern with the shared use of facilities and infrastructure, the transfer and reinvestment/repurpose of capable facilities, and the construction of modern facilities to close the gap. Reinvestment in existing facilities will need to remain a priority for GS programs to accomplish their mission.



CHAPTER 5: OPERATIONS

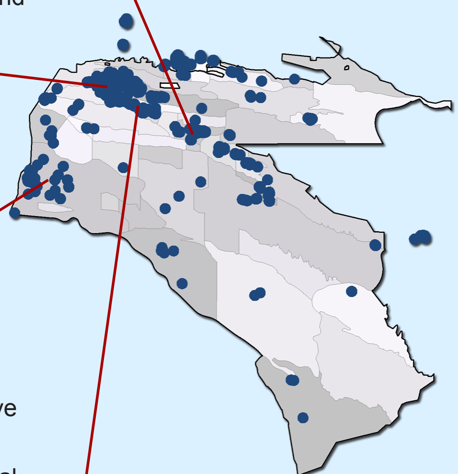
INFRASTRUCTURE CHALLENGES

- Key elements of the Laboratory facility and utility infrastructure have aged beyond their useful life and are not currently configured for long-term future mission need. The most immediate and continual challenge for Operations is continuing to provide the Laboratory reliable, safe, secure, compliant, and sustainable infrastructure assets with limited government direct investment.
- The Deferred Maintenance backlog for assets in the infrastructure portfolio require successful implementation of strategies such as those presented in this LRIDP to focus available funding and maintenance program resources to best align with mission dependencies.
- Managing operations organizations spread out around the Laboratory and within leased properties requires improved space utilization strategies for improved efficiency.
- Extended surveillance and maintenance of excess facilities incurs ongoing costs in the absence of a federal program to fund disposition.

EXISTING FACILITIES

TA-03/60: This location is the central core of the Laboratory. As the population center, it is also centric for Operations organizations. These functions include: Utilities, Maintenance, Business Services, Quality, Security, Shipping and Receiving, Human Resources, and ESH.

Pajarito Corridor: Nuclear & High Hazard Operations provide services across the Laboratory with a focus within the Pajarito corridor. They have key responsibilies serving TA-55 and the surrounding area. Safeguards and Security has a significan presence throughout the corridor.

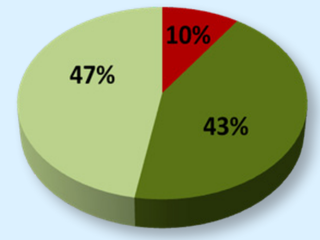


TA-16: Security training facilities have been co-located for increased operational efficiency

TA-59: ESH operations are located a numerous facilities at TA-59 as well as locations including TA-03, TA-30 and TA-36. There are also operations situated within Los Alamos Townsite and White Rock lease facilities.

FACILITY STATUS

- OPS is responsible for 26.2% of the Laboratory's owned operating permanent building space.
- About 10% of this building space has a limited life and will be eligible for disposition within the next 20 years.
- The average age of these enduring facilities (>20 years old) is 41, ranging from 21-66.



Enduring, ≤20 years old: (~866k gsf) 93 structures including NSSB, EOC, Occupational Medicine, Radio Shop, SERF, Tactical Training Facility, Indoor Firing Range.

Enduring, >20 years old: (~947k gsf) 93 structures including Otowi Bldg, Crafts Shops, Receiving and Distribution Center, Study Center.

Limited Life: (~192k gsf) 29 structures including TA-03, building 28, 410, and 142 warehouse; Fire Stations 1 and 5, TA-51 facilities, TA-63 craft shop.

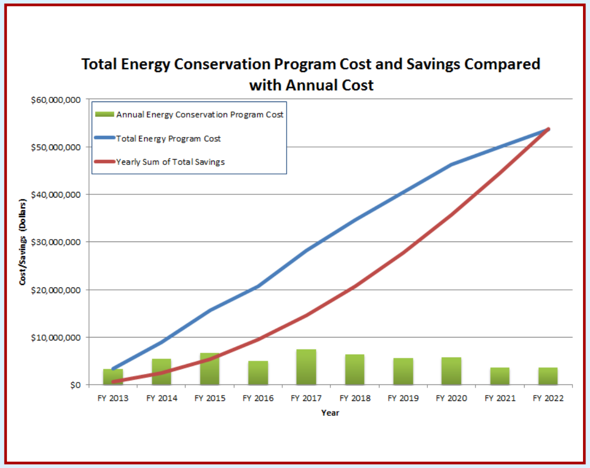
IMPLEMENTING STRATEGY

STRATEGY	PRIOR ACCOMPLISHMENTS	FUTURE PLANS
Targeted Reinvestment/ Life Extension / Asset Sustainment	• TA-03, Buildings 510, 28 repurpose • Otowi Building., S-Site Cafeteria, Wellness Center renovations • Fire panel replacements, pressure safety equipment upgrades • TA-03, Buildings 38, 40, 123, 200; TA-59 Building 1 reinvestments • Gas plant life extension • Low voltage test and maintenance program	• Life extensions to various buildings will allow effective operations at existing facilities such as: Fire Stations; Otowi; Research Library; Wellness Center; Physics Auditorium; TA-03, Buildings 30, 38, 40, 123, 200, 508, 1690, 2011; TA-52, Building 33; TA-59, Building 3 • Otowi bridge refurbishments • Outdoor shooting range modernization for weatherization and safety improvements. • Waste infrastructure consolidation projects will improve the efficiency, recycling and capacity of existing and future operations • Roof replacement program • EOC Upgrades
Strategic Recapitalization and Replacement of Assets Beyond Useful Life	• Repurposed space at TA-35 for Protective Forces • DOE Site Field Office Building • NMSSUP II	• TA-03 Security Office Building will consolidate operations and replace existing transportable offices • Security Post automation • Receiving Distribution Center will remove transport trucks from TA-03 and improve security controls on shipping • Fire station #5 replacement will provide updated and expanded facilities and services in the TA-16 vicinity • Satellite badge office
Investment in New Facilities and Infrastructure/Signature Facility	• Tactical Training Facility, Indoor Firing Range • Parking Lot behind NSSB • SERF II expansion	• TA-03 site security envelope will allow the Laboratory to improve control of vehicle access to the site and impede unauthorized vehicular access • Protective Forces security office at TA-16
Facility Disposition	• Trailers/transportables, TA-03, Building 43, TA-03, -35, -43, -46, -48, -52, -53, -54 • TA-18 Site Closure	• D&D of TA-03 security offices will allow siting for new secure office building • TA-59 trailers will remove outdated temporary facilities
Leasing / Divested Ownership	• Central Training	• Business, ESH, RP leased facilities will continue to seek cost effective use of lease space

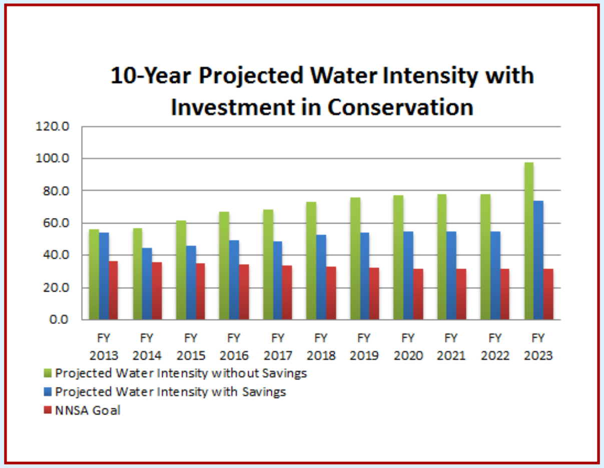
UTILITIES

INFRASTRUCTURE CHALLENGES

- With aging infrastructure throughout, extending the life-cycle viability of primary utility systems will require sustained reinvestment for mission needs. Meanwhile, alternative solutions to existing systems, such as a steam plant replacement and Cogen faciilty, must be considered.
- Increasing demands for electrical and cooling capacity to meet mission needs, such as LANSCE and computing, conflict with DOE requirements to decrease water and energy use.
- New requirements for upgrading older facilities must meet requirements for innovative energy/environmental solutions, including renewable energy sources, sustainability practices, alternative energy systems, energy and water conservation methods, net-zero energy building solutions, and related approaches.

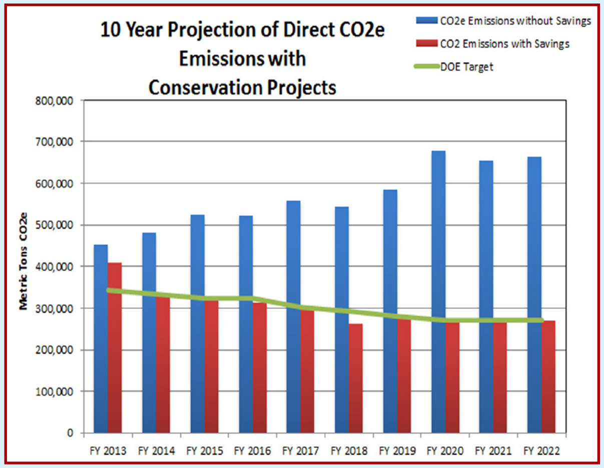


ELECTRICAL LOAD



WATER INTENSITY

STEAM PLANT



GREENHOUSE GAS EMMISIONS

IMPLEMENTING STRATEGY

STRATEGY	PRIOR ACCOMPLISHMENTS	FUTURE PLANS
Targeted Reinvestment/ Life Extension / Asset Sustainment	• ESPC for lighting and HVAC upgrades • TA-16 water tank refinishing • West Jemez, Pajarito, and Anchor Ranch roads resurfacing • Sustainability — High Performance Sustainable Buildings program requirement implemented at multiple buildings	• 115 kV Norton Line improvements increases reliability and capacity for existing and future mission loads • High Performance Sustainable Buildings program will continue energy conservation with additional facilities • Omega Bridge reinvestments will insure safety and life extension benefits • Primary/secondary road upgrades will improve safety • Pedestrian safety program provides increased protection at vehicle interface locations • Sustainability — HVAC recommissioning program, building automation system upgrades, and continued facility metering for enhanced system feedback and conservation efforts
Strategic Recapitalization and Replacement of Assets Beyond Useful Life	• Improved electrical metering	• TA-03 sub-station replacement will update aging infrastructure and increase reliability • Steam plant replacement project will replace outdated equipment and inefficient system operations at TA-03 • TA-53 sub-station recapitalized for reliability and replacement of outdated equipment • Continued facility metering enhances system feedback and promotes conservation efforts
Investment in New Facilities and Infrastructure/Signature Facility	• Los Alamos Field Office Utility Extension Corridor • Sanitary Effluent Reclamation Facility	• 13.8 kV electrical ductbank provides required capacity to serve ASC mission program expansions at Metropolis
Facility Disposition	• Disposition of 1.5 million gsf has resulted in corresponding reductions in utility requirements. • TA-21 and other site disposition activities divest the Laboratory from outdated sites that no longer require utility service.	• Planned D&D, selected projects will continue to reduce maintenance costs for utility systems
Leasing / Divested Ownership	• Low-flow turbine at Abiquiu	• Purchase electrical energy through projects to meet on-site demands and DOE goals for renewable energy

OVERVIEW

The Principal Associate Directorate for Operations (PADOPS) provides essential resources and systems necessary to operate the Laboratory in a safe, secure, compliant, productive, and sustainable manner that enables mission execution. Focus areas include providing strategic leadership, direction, and executive advisement for Laboratory operations, and establishing operational requirement priorities. Program elements include:

- Security and Safeguards
- Emergency Management
- Fire Department Coordination
- Nuclear and High Hazard Operations
- Site-wide Utilities and Infrastructure
- Maintenance and Infrastructure Services
- Environmental, Safety and Health Programs
- Operations and Infrastructure Program Office
- Quality and Performance Assurance Programs
- Business Services

Nuclear and High Hazard Facilities

TA-03
NSSB
DOE/NSSB L. A. Site Office
Otowi Building
University House
Fire Station 1
General Office Buildings
Liquid and Compressed Gas Facility
Calibration Bldg.
Computation Lab.
Computational Physics
CNLS Technical Research

TA-16 Fire Station 5

TA-46 Chemistry Technical Support

TA-52 Weapons Support Office

TA-60
Radio Shop,
Communications Operations
Materials Handling/Processing Fac.
LDCC Dispatch Facility

TA-63 General Office

TA-64
HAZ Mat Response and Storage
Shell-Dome

Utilities
Steam Plant, SERF, CGTG, Gas Metering Station, SWWS, STA
Garage Building, utilities control, relay, mechanical assembly, water control buildings

Security and Safeguards

TA-03/36/48/58
Security Perimeter Guard Stations

TA-3
Guard stations,
Office Building
Shop Storage
Secondary Alarm Station

TA-16
Tactical Training Facility
Indoor Fire Range
Guard stations

TA-55 Entry Controls

TA-49
HAZ DEV Team Training Facility
Explosives Magazine
Garage Bldg.

TA-64
Central Guard Facility
Storage buildings

TA-69 Emergency Operations Center

TA 72
Close Quarter Battle Simulator
Firing Range
Training Tower
Skeet houses
Storage
Craft shop

Maintenance and Infrastructure Services

TA-03
Crafts Shops
Electrical/Motor Repair Shop
Roads & Grounds
Heavy Equipment

TA-60
Maintenance Shops
Warehouse
Storage facilities
Vehicle repair shops

Environment, Safety, Health

TA-03
Occupation Medical,
Source Storage Bldg.
Sample Management Facility
Wellness Center

TA-36
Laboratory
Storage
Calibration bldg.

TA-59 General Office

Business Services

TA-03 Materials Receiving and Distribution Center

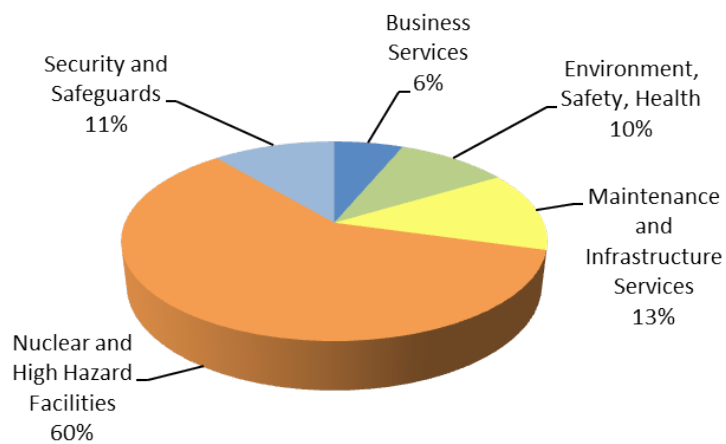


Figure 5.1: Operations facilities by organization.

Deployment of these elements leverage strong core organizations that develop essential operations and business capabilities and programs for the Laboratory, and utilize a deployed matrix of resources that enable field implementation of key program components. As a result the infrastructure necessary to maintain these capabilities and ensure success of these programs is distributed across the entire Laboratory. However, in this Chapter, the discussion will center on needs and challenges associated with assets necessary for core capability and program success.

Each of the following sections will define the status of current facilities and infrastructure within Operations (Figure 5.1). They will also address the infrastructure strategies necessary to support current and future missions at the Laboratory.

SECURITY, SAFEGUARDS, AND EMERGENCY RESPONSE

Contributions

The nature of the Laboratory mission requires protection of sensitive materials, intellectual product, people, property and facilities, from security threats as well as catastrophic events. These resources must be protected from physical and cyber-attack, theft, fire, flood and other threats. The diversity of lab missions, materials, and locations poses unique challenges in planning for an effective security envelope.

The Security and Safeguards Directorate (ADSS) initiates its annual strategic planning process by ensuring its alignment with the Defense National Security (DNS) Strategic Framework and the Laboratory's vision, mission, and values. This alignment is crucial in achieving synergy between the NNSA's strategic objectives and LANL's core capabilities and support functions.

The ADSS strategic plan identifies the following elements as the primary operations drivers for the Directorate:

- Enable World Class Science (i.e., classification): ADSS works synergistically to support LANL's engineering and science endeavors.
- Leverage Technology that Supports / Enhances Business Operations: ADSS uses technology to maximize the efficient use of funding resources.
- Grow Future Leaders: The growth of new leaders is critical to the sustainment of a world class organization.
- Fund/Build/Sustain First Class Security Infrastructure: ADSS plans, seeks funding, and builds a robust physical security infrastructure that provides a working environment that supports world class security programs.
- Protecting the Site: The protection of LANL's site infrastructure, information, property, and employees is crucial to its mission.
- Protect Classified Matter: A key mission of ADSS is the protection of classified matter.
- Protect & Account for SNM: The primary mission of ADSS is the protection and accountability of SNM.

Programs

Security and Safeguards has four major areas of program focus: Physical Security, Safeguards, Security Operations and Emergency Operations.

Physical Security Division: Physical Security (PS) Division's priorities are to secure and protect materials, secrets, people, and property and to deter security threats.

Safeguards Division: Safeguards Division's priority is to safeguard and account for sensitive materials, review Laboratory publications, and process security clearances.

Security Operations: Includes the Self-Assessment Teams, Security Integration and the Security Investigation Team (SIT).

Emergency Operations Division (EO): Emergency Operations consolidates the Laboratory's emergency response organizations into a single unit reporting to ADSS.

Strategy

In recent years, the facilities and infrastructure essential to Security and Safeguards have benefited from program direct investment. Some level of institutional investment is also planned to replace TA-72 vehicle inspection station, and improve existing facilities at TA-03, -35, and -64.

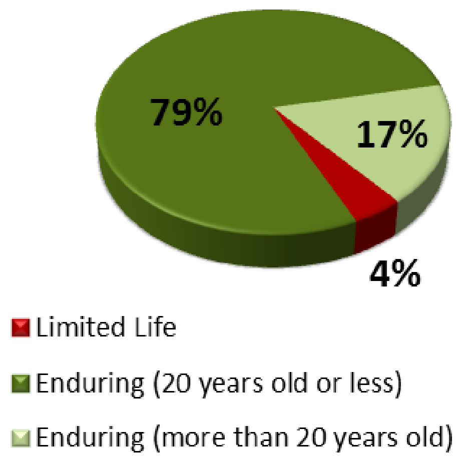


Figure 5.2: Facility status of owned / operated Security and Safeguards buildings at the Laboratory

Plans to improve existing facilities will contribute to organizational consolidation necessary to allow obsolete office trailers at TA-03 to be removed. Figure 5.2 depicts the status of the facilities within this portfolio.

Mission Capability Alignment of Infrastructure Assets – Existing Facilities

TA-64: Training, vehicle storage, equipment storage, offices

TA-03: Buildings 440 and 1409, transportable structures 400, 500 series, Secondary Alarm System (SAS), Vehicle Access Point (VAP) Entrance facilities and vehicle checks

TA-72: Outdoor Firing Range and Live-Fire Shoot House

TA-16: Indoor Firing Range (Figure 5.3), Tactical Training Facility

TA-54: Vehicle Access Point (VAP) Entrance facilities and vehicle checks

TA-72: Truck inspection station

TA-55: Central Alarm System (CAS), NMSSUP security project

Targeted Reinvestment / Life Extension / Asset Sustainment

Outdoor Firing Range: Upgrade the TA-72 Outdoor Range, completing a full suite of modern Protective Force training facilities. Improvements to the TA-72 Shooting Range to include range enhancements and improved weapons cleaning facilities.

Figure 5.3: Indoor Firing Range.

Security Office Building: Reinvestment to TA-03, Building 1409 is part of the consolidation strategy that will allow the removal of existing transportable offices.

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

Nuclear Materials Safeguards & Security Upgrades Project Phase II : The NMSSUP Phase II project addresses the security system upgrades at TA-55 where processing of Security Category I/II quantities of SNM occurs. Phase II includes the upgrade or replacement of the existing intrusion detection, assessment, delay, access control, and security communication equipment for TA-55. Access control facilities for the Perimeter Intrusion Detection and Alarm System (PIDAS) will be replaced or upgraded. The systems will be integrated with the Argus security control system that has been installed under NMSSUP Phase I. The project is funded and executing to completion.

Investments in New Facilities and Infrastructure / Signature Facilities

Pro-Force Consolidated Facility: Consolidated muster/administration facilities for Protective Force staff at TA-16, adjacent to existing training facilities. Facilities would replace existing facilities located at TA-64 and TA-59 and would include expanded ability to provide classroom and conference training.

Security Envelope Enhancement Project: Construction of the Security Envelope Enhancement Project (Lab By-Pass) to afford the Laboratory the most effective perimeter protection possible. This project will establish an enforceable perimeter for the core work areas, including the TA-03 region and the Pajarito Corridor. The project will include significant upgrades to the VAP's and a separation between public and Laboratory vehicle traffic.

Legacy Field Panel Replacements: Develop, fund and execute project plans required to replace aging physical security infrastructure. This will include the implementation of upgrades to the Legacy Field Panels across the Laboratory. Convert all existing systems to Argus based installations to provide consistency in quality and uniformity in application.

Secure Office Building: Continue to seek funding for the replacement facilities for the ADSS staff and SOC (projects identified in annual Future Year

Nuclear Security Plan (FYNSP) requests). This effort will consolidate and upgrade secure administrative office space. Construct secure office space at TA-03 to consolidate work groups to improve logistical operations and to replace inefficient obsolete trailers.

Emergency Management Division Office Support Building: Reserve a location at TA-69 for future emergency management office/support building. This site reservation will preserve the potential for a future office building to house EMS staff in a more logistically beneficial basis. There are no current plans in development for this facility; however, the future need is foreseeable for the organization.

Protective Force Administration Building: Construct new Protective Force administrative offices at TA-16, to provide consolidation efficiencies with the Indoor Shooting range and the Tactical Training Facility and to provide an efficient work setting for Protective Force employees.

Satellite Badge Office: The current location of the Badge Office is inconsistent with Security goals and a new location, determined in coordination with the Security Envelope Enhancement project will align security profiles for badging.

Permanent Vehicle Inspection Station: Construct a permanent vehicle inspection station to replace the existing temporary facility. The current temporary facility was constructed to address a short-term need. That time has significantly passed and a facility appropriate for a long-term function is required to properly provide processing on a permanent basis.

Facility Disposition

- Disposition of TA-03 office transportables housing security personnel.

Challenges and Vulnerabilities

- Establishing a secure defensive perimeter to better secure national security assets
- Changing nature of threat (cyber, activists)
- Acquisition and maintenance of quality security systems
- TA-72 – Firing Range has significant lead contamination and flood issues that will require future remediation

NUCLEAR AND HIGH HAZARD OPERATIONS

Contributions

The Associate Directorate for Nuclear and High Hazard Operations (ADNHHO) ensures that Laboratory facilities are operated safely, securely, and compliantly. Seven Facility Operations Directors (FODs) function as the deployed agent to Responsible Associate Directors to manage, operate, and maintain all Laboratory facilities:

- Environmental Waste Management Operations (EWMO)
- LANSCE Facility Operations (LFO)
- Radiological Chemistry Operations (RCO)
- TA-55 Facility Operations
- Science Technology Operations (STO)
- Utilities and Infrastructure (U&I)
- Weapons Facility Operations (WFO)

Programs

In addition to the seven FODs, ADNHHO is also responsible for four divisions: Safety Basis, Operations Support, Fire Protection, and Engineering Services:

- The Safety Basis Division's mission is to develop safety basis for all Laboratory facilities, both nuclear and nonnuclear.
- The Nuclear Criticality Safety Division provides criticality safety analysis for nuclear facilities at the Laboratory.
- The Operations Support Division includes both operational and administrative support within ADNHHO and across the Laboratory. Operations Support includes Packaging and Transportation, Readiness Technical Support, and Business Systems Integration.
- The Fire Protection Division provides fire protection engineering and operation/maintenance of the Laboratory's fire detection and alarm systems.
- The Engineering Services Division provides systems engineering support to operations and maintenance activities of the FOD organizations and provides design and project engineering services in support of projects throughout the Laboratory.

Strategy

The infrastructure associated with ADNHHO include offices at TA-63 that house the core organization, utilities facilities and infrastructure (discussed later in this section), a common set of institutional general purpose and office facilities, shutdown facilities that are managed collectively through a surveillance and maintenance program, and those institutional facilities such as the Gas Plant that contain a level of hazards above that of office space.

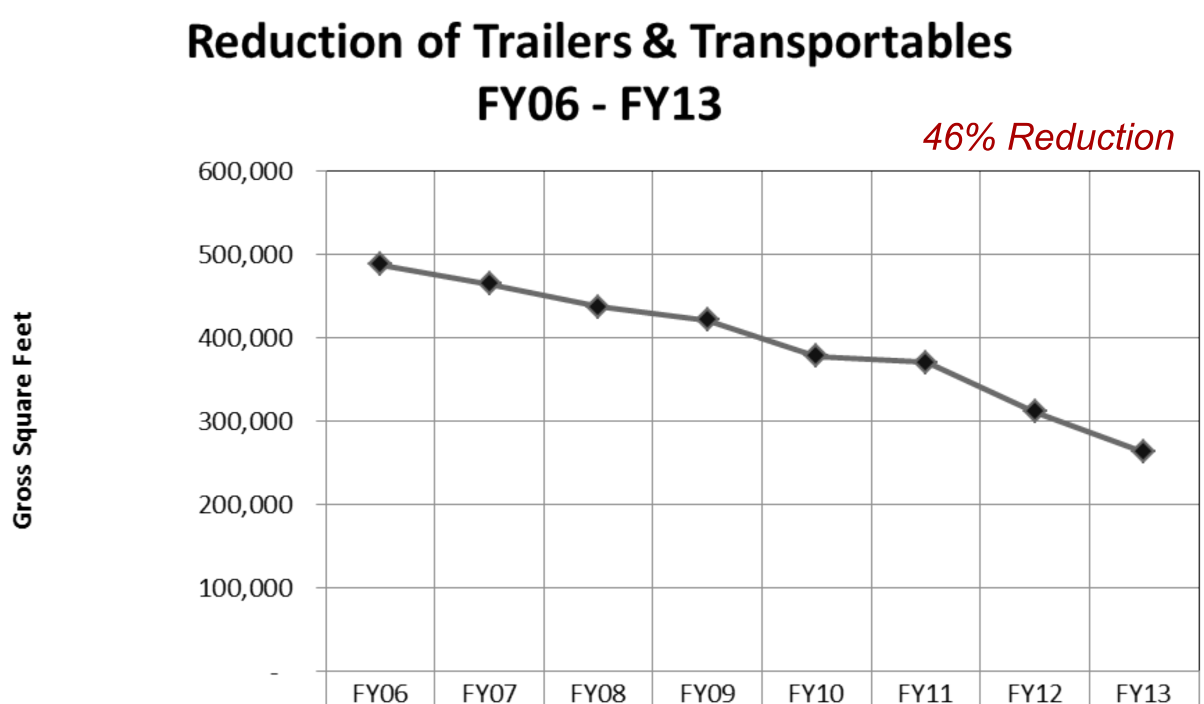
The portfolio of general purpose and office buildings is retained under a single organization to allow the most effective implementation of a graded approach for operating low hazard facilities. This portfolio retained within a single FOD area offers the optimum economy of scale for maintenance and operation of these facilities. This approach to improved cost effectiveness has been incorporated into the maintenance asset sustainment strategy defined within this LRIDP.

Trailers and Transportable Structures: A portion of the office and general purpose portfolio includes the majority of remaining trailers and transportable structures at the Laboratory. Due to the high maintenance costs and generally poor condition of these assets, it has been an ongoing strategy to be aggressive in removal of these temporary structures. The majority of these structures are well over 20 years old with associated conditions that have become problematic. Recognizing the primary use of this type of structure is for offices, the basic quality of the indoor environment, the fire protection and rodent control risk, and the deterioration of the structures/systems have been fundamental drivers. Consequently, continued effort has been invested into the relocation of functions and people to permanent space of a better condition, followed by the formal shutdown, and then demolition of these structures. During the seven year period from the end of FY06 to the end of FY13 the total owned trailer and transportable space has been reduced by 46% as shown on Figure 5.4 chart. These efforts will continue in the coming years.

Mission Capability Alignment of Infrastructure Assets – Existing Facilities

The enduring facilities in this portfolio are evenly split between relatively new (<20 years) and assets greater than 20 years of age (Figure 5.5). Non-enduring facilities, such as the excess buildings, are not included in this figure. Facilities in this portfolio include:

- General Purpose and Office Facility Portfolio
- Utility Facilities



	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
Trailers & Transportables	487,810	464,402	437,234	421,496	378,332	370,372	311,713	263,551

Figure 5.4: Decline in the use of trailers and transportable buildings from 2006 to 2013.

- Communication Buildings
- On Site Fire Stations; TA-03, Building 41; TA-16, Building 180
- Gas Facility - TA-03, Building 170
- Excess (Shutdown) and Historical Facility Portfolio

Targeted Reinvestment / Life Extension / Asset Sustainment

On-site Fire Stations will require additional life extension projects to bridge the gap to facility replacement. Numerous office and general purpose facilities >20 years old within this portfolio such as the Otowi Building (TA-03, Building 261), Study Center (TA-03, Building 207), Support Office Building (TA-52, Building 33), are planned for targeted reinvestment or life extension projects. The ATAC Office Building (TA-66, Building 1) is in the process of being repurposed for a new GS mission and will be reassigned to that program once renovations are complete. Newer facilities such as the Radio Shop, Communication Buildings, and General Purpose/ Office Buildings <20 years old will be included within the maintenance asset sustainment strategy.

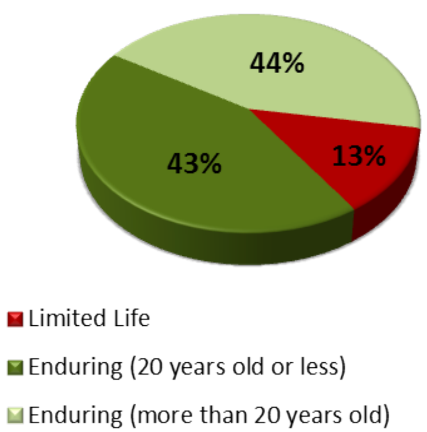


Figure 5.5: Facility status of owned / operated facilities within the ADNHHO portfolio.

A complex of general purpose and office facilities within the core of TA-03, once considered to have a limited life, are now considered enduring assets. These facilities TA-03, Buildings 123, 200, 332, 508, 1690, and 2011 now require targeted reinvestment and recapitalization of major plant systems. While some work has been accomplished on interior improvements, additional work will be necessary over a period of years for these facilities to remain viable.

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

On-site Fire Stations are beyond useful life and require replacement. Fire Station #1 (TA-03, Building 41) has been determined to require Line Item funding to replace. The Fire Station #5 (TA-16, Building 180) replacement facility continues to be pursued as a General Plant Project.

Utilities infrastructure and facilities require significant recapitalization due to age and condition; these will be discussed later in the Utilities portion of this chapter.

Investments in New Facilities and Infrastructure / Signature Facilities

Planned investment for new or replacement facilities is limited to essential replacements to maintain current capability levels.

Facility Disposition

Shutdown Facilities: The last stage in the life cycle for any facility is “shutdown pending D&D.” The most cost efficient and low risk scenario is when a structure is taken down as soon as possible after it is shut down. However, funding for disposition is not typically available for most facilities in a timely manner. Consequently, those structures waiting funding for removal must be managed within the ADNHHO Surveillance and Maintenance program. The goal is to provide regular surveillance and the level of maintenance necessary in order to not incur unacceptable risk to workers, the public, or the environment.

At the end of FY13 LANS is managing approximately 300,000 gsf of shutdown space pending D&D. While the associated cost varies by structure and is dependent on associated deterioration and risk, the overall annual cost is in the $3/gsf. ft. range for this portion of the facility portfolio. The largest structure currently in shutdown status is the 56,000-gsf Ion Beam facility in TA-03, which has been in surveillance and maintenance since 1994.

As previously noted, footprint reduction in the FY10 – FY13 timeframe across all funding sources has removed approximately 800,000-gsf at the Laboratory. All of this space was considered in shutdown status for some period of time. In addition, consistent with strategies previously discussed, 25% of currently operating owned buildings are anticipated to be shut down in the next 20 years, and consequently become part of the Surveillance and Maintenance program prior to demolition.

Institutional funding continues to address the removal of trailers and transportable structures, as well as smaller permanent buildings as appropriate. EM funding will address removal of facilities as required by the NMED Consent Order in the coming years. In addition, NNSA has been working to establish the Facilities Disposition Program (FDP) to address its obsolete structures across the complex. FY14 is anticipated to be the first year of funding, but at a very low level. At this time, Los Alamos is not anticipated to receive any funding before FY15.

Historical Facilities: As has been noted in this LRIDP, many facilities constructed during this Laboratory's first few decades are still in service, which is consistent with preservation goals. LANS manages approximately 43,000k-gsf of shutdown historical facilities, including buildings, structures, experimental areas, and discrete groupings of properties considered together as historic districts. Since 2005, there have been major restoration projects at some of the most significant historic properties, including TA-16's V-Site ("Gadget" assembly) (Figure 5.6), TA-08's Gun Site (Little Boy design and assembly), and TA-22's Quonset Hut (Fat Man design and assembly). In addition to these special restoration projects, long-term surveillance and maintenance plans are being developed for all historic properties to ensure the structures do not degrade.

Figure 5.6: V-site was constructed during the Manhattan Project and used to assemble the "Gadget", the world's first atomic bomb.

Challenges and Vulnerabilities

Extended surveillance and maintenance of obsolete facilities incurs ongoing costs in lieu of a Federal program to fund disposition.

UTILITIES AND INFRASTRUCTURE

Contributions

Every employee and every mission activity at LANL depends on reliable water, electrical power, natural gas or steam heating, and wastewater services to carry out basic functions. The Laboratory is a major consumer of energy and water resources, and future missions depend on sufficient supplies and efficient delivery systems. The Laboratory's extensive utility network is essentially its life support system. Therefore, planning to ensure effective and efficient utility system capacity and sustainability is vital to enable various programs to evolve and progress in support of national missions.

Programs

Utility systems at the Laboratory include electrical service, natural gas, steam, water, sanitary wastewater, and roads and grounds (roads, guardrails, parking lots, curbs and gutters, sidewalks, and grounds). In addition the Utilities and Infrastructure (U&I) Division is responsible for the development and execution of the Site Sustainability Plan (SSP). The SSP defines strategies for the Laboratory to achieve improved and sustainable infrastructure systems leading to efficiencies in energy use. An important feature of the Site Sustainability Plan is the High Performance Sustainable Buildings (HPSB) program, working at the local level to improve facility energy and work space performance. This DOE directive involves energy and environmental performance levels for existing and new buildings.

Program Integration with Interdependent Goals and Objectives

DOE sets long-term goals for sustainability though DOE Order 436.1, Departmental Sustainability, which reflects Federal requirements set forth in Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance. Each DOE and NNSA site is required to implement an Environmental Management System (EMS), as well as a SSP. The Laboratory's SSP is well integrated with the ISO 14001 certified EMS through common institutional objectives and targets and is also tightly aligned with the Long-Term Strategy for Environmental Stewardship and Sustainability. The SSP has three primary objectives: to make targeted investments that improve efficiencies and resource use, transparently track our progress through metrics, and engage employees and programs at all levels in the organization to sustain changes that reduce resource use at each step in the process. The requirements of the SSP have a direct impact on infrastructure planning, construction, maintenance, and facility operation. Of the eight DOE sustainability goals, Goal 2 poses a significant impact on infrastructure planning as highlighted in Table 5.1. The SSP verifies compliance with DOE directives for energy and resource management.

Table 5.1: SSP Goal 2 actions impacting facility and infrastructure planning.

GOAL 2: Buildings, ESPC Initiative Schedule, and Regional & Local Planning	
2.1	30% energy intensity (Btu per gross square foot) reduction by FY 2015 from a FY 2003 baseline.
2.2	Energy Independence and Security Act (EISA) Section 432 energy and water evaluations.
2.3	Individual buildings metering for 90% of electricity (by October 1, 2012); for 90% of steam, natural gas, and chilled water (by October 1, 2015).
2.4	Cool roofs, unless uneconomical, for roof replacements unless project already has CD-2 approval. New roofs must have thermal resistance of at least R-30.3
2.5	15% of existing buildings greather than 5,000 gross square feet (GSF) are compliant with the Guiding Principles (GPs) of HPSB by FY2015.
2.6	All new construction, major renovations, and alterations of buildings greater than 5,000 GSF must comply with the GPs.
2.7	7.5% of annual electricity consumption from renewable sources by FY2013 and thereafter.

Strategy

Mission Capability Alignment of Infrastructure Assets—Existing Facilities

A large portion of the utilities infrastructure at LANL was installed over 40 years ago, with some equipment now exceeding 60 years. Table 5.2 shows when underground piping was installed at the Laboratory and illustrates the aging utility infrastructure.

Although these numbers individually do not portend imminent utility failure, they do indicate that prudent reinvestments are necessary to ensure continued high reliability. The utility systems are extensive when considering the installed miles of distribution systems, as shown in Table 5.3.

Electric Utility

Electrical service includes a Public Utility of New Mexico (PNM) 115-kV line that runs from Albuquerque, a DOE-owned 115-kV line that runs from the Norton substation, near Santa Fe, (see Figure 5.7) and a steam/power plant and combustion gas turbine generator (CGTG) at TA-03, which is used on an as needed basis. The Laboratory has a 115-kV grid system. Transformers at the substations shown in

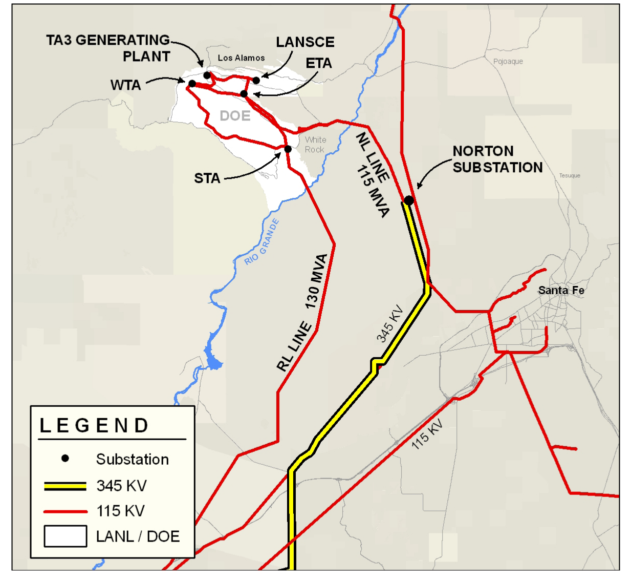


Figure 5.7: Laboratory 115 kV transmission grid and substation location.

Figure 5.9 step the voltage down to 13.2 kV, which provides the primary overhead and underground distribution systems connecting to the input side of low-voltage transformers at Laboratory facilities.

Several small projects are underway or are planned to improve redundancy within the distribution system network between substations. Although many components of the system are obsolete, the TA-03 substation, which is slated for replacement by 2018, poses the greatest risk to the Laboratory. Its failure could upset some computing, laboratory, and

Table 5.2: Percentage of underground utility piping installation by decade.

Utility	1940s	1950s	1960s	1970s	1980s	1990s
Sanitary Sewer	N/A	22%	11%	6%	17%	44%
Natural Gas	N/A	46%	36%	10%	7%	1%
Steam	N/A	86%	0%	4%	10%	0%
Water	38%	26%	12%	5%	16%	3%

Table 5.3: Utility system lengths.

Utility System		Approximate Length (miles)
Electrical System	Primary	16.3
	Secondary	113.5
	Total	**129.8**
Sanitary Wastewater System	Effluent	3.5
	Force Mains	11.0
	Gravity	126.5
	Total Sanitary	**141.0**
Water System	Distribution	90.3
	Service	16.7
	Total Water	**107.0**
Natural Gas System	Distribution	58.2
	Service	31.8
	Total Natural	**90.0**
Steam System	Steam	6.3
	Condensate	5.6
	Total Steam	**11.9**

office environments for several days until mobile units are rendered and installed.

The TA-03 substation is part of an approved line item that has been deferred to start in 2015.

Natural Gas Utility

Commodity natural gas is supplied through the Defense Energy Support Center at the DoD Defense Logistics Agency. The New Mexico Gas Company transports the natural gas to the Laboratory. The high-pressure natural gas piping

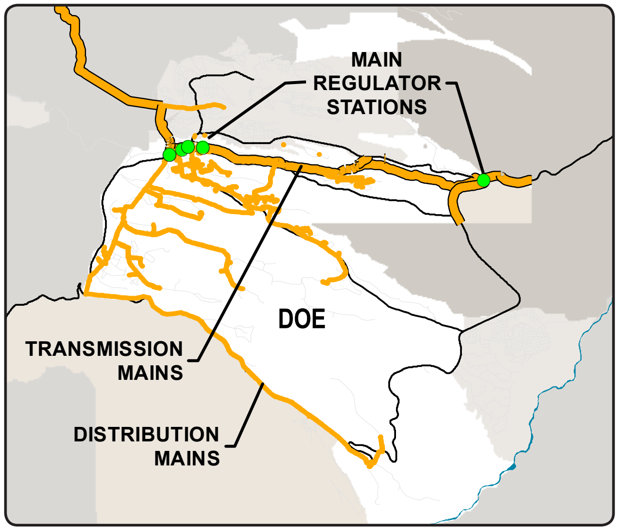


Figure 5.8: National Gas Transmission System serving the Laboratory and Los Alamos County.

serving the Laboratory is shown in Figure 5.8. The natural gas system includes a DOE-owned, high-pressure main and distribution system throughout LAC and pressure-reducing stations at Laboratory buildings.

The natural gas system is generally in good shape, with the exception of many regulators that are worn out and are slowly being replaced.

Water Utility

The Laboratory purchases water from Los Alamos County (LAC). The water system includes supply wells, water chlorination, pumping stations, transmission storage tanks (owned and operated by LAC), and distribution storage tanks and piping owned by the DOE.

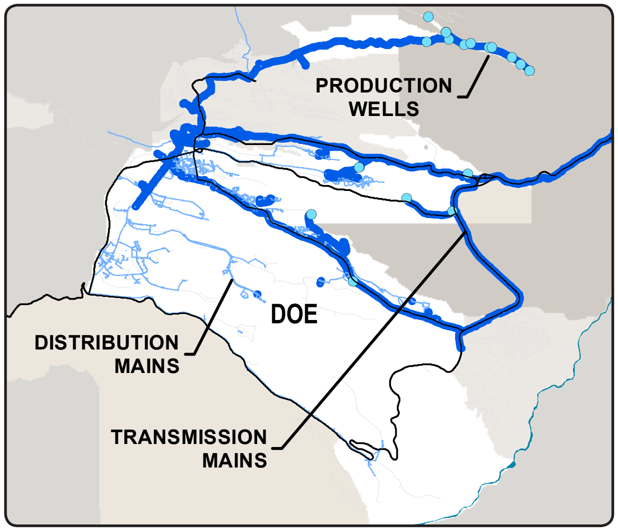


Figure 5.9: Los Alamos County water supply system and Laboratory distribution pipelines.

The LAC-owned supply piping system is shown in dark blue in Figure 5.9. The remainder of the Laboratory's water main system is owned by the NNSA and maintained by the Laboratory.

Some of the water main system is over-60-year-old cast iron piping that needs replacing. Some storage tanks are also in various stages of disrepair, with interior coatings becoming a primary maintenance concern.

Wastewater Utility

The Laboratory's wastewater system consists of both gravity-fed and forced pipeline systems and a treatment plant at TA-46. TA-46, Buildings 333, 335, 336, 339, and 3754

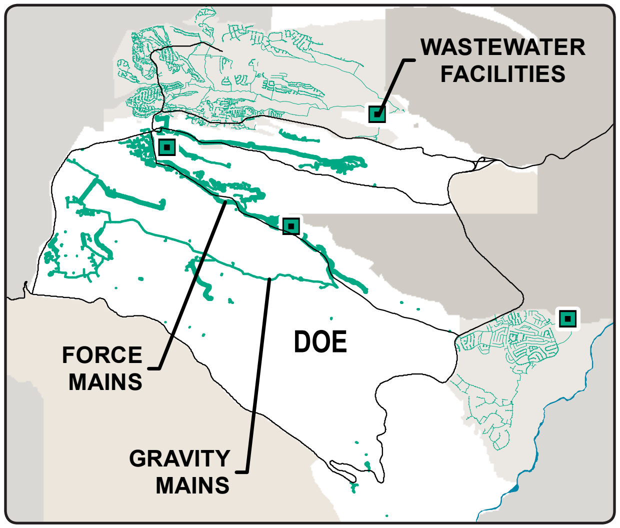


Figure 5.10: Laboratory sanitary wastewater system.

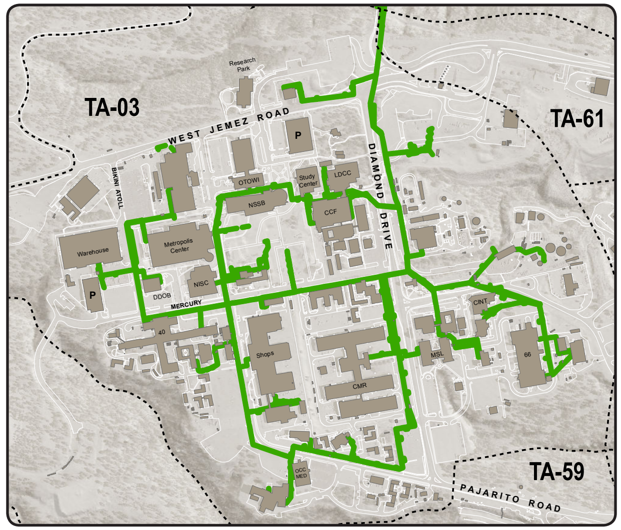


Figure 5.11: TA-03 heating system and condensate return piping system.

comprise the Sanitary Wastewater System (SWWS) - treated sanitary liquid effluent. The Sanitary Effluent Reclamation Facility (SERF) was installed in 2003 and expanded in 2012 to chemically treat and reverse-osmosis process the TA-46 SWWS gray water and blend it for reuse in the Metropolis Building cooling towers. Blended water is a mixture of TA-46-treated SWWS water, raw water, reverse-osmosis-system water, and recirculation water within the SERF process system. Approximately 110 million gal/year of SWWS effluent is processed. The SWWS system assumes an 80% recovery (availability), and the SERF is anticipated to provide 88 million gal/year of blended product water to the Metropolis Building cooling towers. An operating equilibrium for the entire system (and consequently, the amount of makeup raw water needed in future years) is yet to be determined. Two major input factors are still undefined:

- The minimum blowdown required to sustain the regulated wetland in Sandia Canyon. The Sandia Canyon wetland is currently fed from three outfalls: 001 (TA-03 power plant blowdown), 027 (Metropolis Building cooling tower blowdown), and 199 [the Laboratory Data Communication Center (LDCC) cooling tower blowdown]. The LDCC blowdown has no piping connection for SERF recovery.

- The maximum cycles of concentration that the cooling tower system can achieve before silica deposition degrades its performance.

Many remote septic systems and holding tanks are also used around the Laboratory. Treated wastewater returns to TA-03 for additional treatment in the SERF plant (TA-03, Building 1398) and subsequent use in cooling towers. Figure 5.10 provides a map showing the major components of the wastewater system.

In general, the wastewater system is in fair to good condition. Its age dictates the need for replacement of obsolete system components, such as PC-based control systems.

Heating Steam / Cogen / CGTG

The heating steam for TA-03 is supplied from a cogeneration plant and distribution piping that is over 60 years old. The steam piping is in fair condition, whereas the condensate-return piping is only returning roughly 40% of the steam flow due to system losses. Three steam boilers are available, and two out of three are normally operating for redundancy during the heating season. Two 5-MW, steam-driven turbine generators are available, but they operate only in emergency situations. Also, a 27-MW combustion gas turbine generator is available and operates when needed for system reliability. The 27 MW is the winter rating. The unit derates for altitude to 21 MW during the summer months. Figure 5.11 is a diagram of the TA-03 steam-heating piping system.

Roads and Grounds

U&I responsibility for the Roads and Grounds of the Laboratory includes the maintenance and repair of roadways, parking, sidewalks, landscaping and all related site features. The New Mexico State Transportation Department has two primary highways that adjoin the perimeter of the Laboratory. State Road 501/502 generally bound Laboratory property along the westerly and northern borders and State Road 4, generally to the Southerly and Eastern borders. East Jemez Road (commonly referred to as the “Truck Route”) and Pajarito Road also serve as major arterial networks. These are in addition to the roadways that serve the various Technical Areas of the Laboratory. Roadways are in fair to good condition, and receive periodic upgrades as conditions require, along with routine maintenance.

Parking areas are also part of scheduled routine maintenance and a new parking lot was recently completed near the previous site of SM-43. This addition alleviated significant parking pressure in the core of TA-03.

The Laboratory “grounds” have received attention in the area of landscaping related to water use. Several landscaping projects have been undertaken to replace high water use landscaping, such as Blue-grass lawns and install xeric landscaping schemes to reduce overall water use.

In conjunction with safety efforts, site improvements have also been occurring to sidewalks across the laboratory. This effort has been beneficial in reducing accident and injuries to pedestrians and contributed to meeting safety goals.

Site Sustainability Program

SSP projects include: the recently completed Energy Savings Performance Contract (ESPC), SERF expansion, HPSB implementation, lighting retrofits and HVAC re-commissioning, Other associated projects, such as footprint reduction efforts continue to contribute towards DOE energy and water goals and achieve GHG reduction. Through the SSP initiatives, LANL plans to achieve a 3% energy intensity reduction in FY14 and reduce water consumption by 33M gals. In addition, LANL is relying on broad employee engagement through LANL’s EMS to reduce energy use, water use, and waste generation. In FY13, using indirect funding, the Director funded the Site Sustainability Program at a level of $3.35M. Additionally, the Laboratory is investing $4.8M per year of indirect funding in the operation of SERF to achieve its water reductions. The Laboratory is also investing in facility renovation and rehabilitation to improve material condition in the facilities and consolidate operations. This effort is being conducted in conjunction with the footprint reduction efforts at the Laboratory to right-size available institutional space. Many of the facility renovation, rehabilitation, or footprint reduction efforts have a corresponding benefit to reduce energy and water consumption.

Implementing Strategies by Programmatic Capability—Future Projects

Many projects planned by U&I operations consist of construction focusing on strategic recapitalization, replacement of assets, and new infrastructure to support areas of program expansion. However, there will be ongoing reinvestments to sustain enduring facilities within all utility categories. Targeted investments will be made to achieve a more efficient infrastructure that is less costly to maintain and provides reliability, security and opportunities for energy conservation and renewable resources. Projects are planned that will achieve longer-term energy and cost savings, coupled with improved operational efficiencies. Savings through D&D of inefficient facilities will be captured for strategic reinvestment into prioritized infrastructure projects.

For more detailed information on topics within this section, refer to the Utilities Modernization Program Plan (UI-PLAN-015-R1).

Targeted Reinvestment / Life Extension / Asset Sustainment

Electric Utility

115 kV Norton Line improvements: Project will increase reliability and capacity for existing and future mission loads. Projected electrical demand will require improvements to the Norton Line, in order to meet future mission and project requirements.

Upgrade electric distribution feeders in TA-03: Install new 1000 MCM cables (and duct bank in some locations) between Western Tech Area (WTA) and TA-03 substations to be designated as circuits WA11 and WA12. This 2017 project adds redundancy, as well as a feeder to serve new switchgear for exascale supercomputing in the Metropolis Building.

Lighting Retrofits: ESPC lighting retrofit projects for lamp/ballast upgrades at various buildings are continually under evaluation for energy savings. Lighting retrofit projects typically provide near-term financial recovery. The improved viability of LED light fixtures provides opportunities for additional energy savings, with shorter financial recovery terms.

Natural Gas Utility

HVAC Upgrades: Projects conducted through ESPC resources, on inefficient HVAC systems and controls will provide natural gas energy savings. These projects are typically identified through individual building evaluations where outdated equipment can benefit from improved technology and equipment.

Water Utility

TA-16 Water Tank Refurbishment: Planned work on the TA-16 Water Tank will restore the tank to a higher performance level and extend the service life of the asset. The tank serves a significant extent of the TA-16 area and reliance on the water tank for utility services is fundamental to operation in the building the system serves.

Roads and Grounds

Omega Bridge Reinvestments: Work planned under this project will insure safety of the bridge asset and provide necessary life extension benefits for the structure and roadway.

Primary/Secondary Road Upgrades: These planned improvements to various road assets will improve safety and provide necessary life extension to the roadways that serve all vehicle access areas of the Laboratory.

Pedestrian Safety Program: Projects planned under this program will provide increased protection at vehicle and pedestrian interface locations. These are primarily intersections, parking lots and loading areas.

West Jemez Road and Anchor Ranch Road Resurfacing: Resurfacing of these roads in the TA-16 area is a necessary investment in existing infrastructure. This work is within the normal schedule for reinvestment for this type of infrastructure. The improvements will bring roadway surfaces back to a high level of service and prevent deterioration. Road safety will also be improved.

Site Sustainability

Building Efficiency: HPSB initiatives have successfully been conducted on a number of LANL buildings, such as TA-03, Building 1409 and 1411. Water use, energy and environmental issues have been addressed and the buildings have been improved through the process, with net benefits on utility use and occupant comfort/health. Sustainability projects for HVAC re-commissioning, controls, lighting and metering will continue to impact utility uses and efficiency and conservation efforts.

Waste Water Utility

Prioritized Refurbishment of Wastewater Utility Infrastructure in TA-03: This project (extending from 2015 to 2018) includes the repair and replacement of selected lines, refurbishment of lift stations and manholes, and removal of known restrictions in the TA-03 system.

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

Electric Utility

Install Replacement TA-03 Substation: This line-item project, scheduled to start in 2015, replaces the obsolete transformers, switches, circuit breakers, support structures, and ground grid. The project provides additional transformer capacity to serve anticipated supercomputing loads, as well as provides redundancy for secondary-side interconnects between Eastern Tech Area (ETA) and WTA substations. Install replacement TA-53 substation switchgear. This project replaces the existing obsolete, secondary-side switchgear for the transformers at ETA. This project is a lower priority than the TA-03 substation and is scheduled beyond 2020.

Continued Electrical Metering: Installation of electrical metering capabilities on new construction and existing facilities has improved operations and reduced electrical demand. Metering information has enabled Utility staff to more accurately assess existing and plan for future electrical demands. Metering has also shown to provide intrinsic value in reducing actual demand. Metering as an element of HPSP requirements has become an integrated aspect of LANL facility management activities.

Water Utility

Prioritized Replacement of TA-03 Water Main: This project is the first phase (extending from 2015 to 2018) of a laboratory-wide replacement of water mains, which is at approximately twice its design life.

Replace and Up-size "Bandelier" Water Line: This project (scheduled for 2020) replaces the existing 6-in.-diam line with an 8-in.-diam line servicing TA-49, TA-33, TA-39, and nearby areas.

Heating Steam / Cogen / Combustion Gas Turbine Generator

Steam Utility Recapitalization: Operational issues with the 60-year-old TA-03 steam system are well understood. The current equipment is aging, inefficient and maintenance intensive. The existing distribution system also suffers from age and on-going maintenance requirements. Even with extensive studies and analysis, a strong direction for addressing those issues is unclear due to cost/benefit trade-offs between options considered and the sheer magnitude of cost of the project scope involved. The existing system faces on-going operational and capital costs to remain in service. In the coming years, capital costs to remain operational will increase, which places an emphasis on proceeding with a selected recapitalization approach. There are many sub-set projects that may contribute to a particular solution; however, there are essentially three primary options to recapitalize the existing system with a reliable and efficient replacement system for TA-03:

- **Update** the existing steam system with new and efficient central steam generation equipment and controls. Replace the existing steam supply distribution piping and the condensate return with new updated material. This strategy is to replace the existing system through modernization of equipment and materials to achieve higher efficiencies, reliability, and reduced maintenance with a new system life-cycle. This approach could be accomplished in phases.
- **Convert** the existing steam system to a hot water based system. This would involve the conversion to new equipment and controls to a hot-water based system. This would replace the steam-based system and include replacement of the distribution piping for supply and return lines. This would also require some modifications to the individual buildings to accommodate the conversion from steam to hot water.
- **Transition** a phase-out of the existing steam system, by installing a distributed boiler system, where standalone boilers would serve individual or selected groups of buildings to replace the existing steam system. The transition would involve a phased transition of buildings from the central plant service to standalone boilers. This could be accomplished in phases, until all buildings would be accommodated with a new boiler system and the existing steam boiler and associated supply/return distribution would be excessed or removed.

Each of these recapitalization options has the ability to be funded and accomplished through various procurement methods and strategies: Line Item funding, GPP funded project series, ESPC/Lease Agreements or a combination of any of these mechanisms. Currently, the preferred option is to proceed with the Conversion to Hot Water approach and seek funding through a combination of requests for Line Item or GPP projects. A secondary approach is to seek a suitable ESPC agreement to accomplish the Conversion option.

Investments in New Facilities and Infrastructure / Signature Facilities

Electric Utility

Increase 115-kV NL Line Import Transmission Capability to LANL: The need for this project is currently anticipated in 2020 to maintain full redundancy of the two 115-kV import lines. The project reconductors the NL line with larger-diameter power conductors to carry at least the 146-MW import capability that matches the Reeves to Los Alamos (RL) line capability.

Install Additional "Express" 13.8-kV Feeders: This project adds an interconnecting tie feeder between TA-03 and the ETA substations to increase redundancy within the distribution system. This project is scheduled for 2018.

SCC Electrical Utilities Upgrades: This project adds additional electrical switchgear outside the Metropolis Building to serve ATS-3 supercomputing platforms. This project is scheduled for 2018.

Waste Water Utility

Install Aerobic Digester at TA-46: This project (scheduled for 2016) treats increased industrial wastewater flow into the treatment plant and eliminates the use of a clarifier unit for this purpose.

Natural Gas Utility

High-pressure Natural Gas: This project (scheduled for 2018) will include a high-pressure gas line and either a topping gas compressor or an upgrade to the supplier's pipeline. The project enables a black start of the CGTG and eliminates the need for the existing gas compressor.

Natural Gas Line Replacement: Replacement of 100-psi natural gas lines in TA-03 and TA-16: These line replacements (scheduled in 2017 and 2018, respectively) replace the existing bare steel buried lines to improve reliability and safety.

Heating Steam / Cogen / CGTG

CGTG Control System Replacement: This project (scheduled for 2016) replaces the obsolete programmable logic controller (PLC) system (replacement parts are scarce or no longer available) with an upgraded system.

Steam System Replacement: This proposed line-item (or ESPC) project (scheduled between 2019 and 2022) replaces the existing steam distribution and condensate return piping system with a new hot-water supply and return piping network (also see recapitalization strategy above).

Roads and Grounds

By-pass Road: As part of the proposed Security Envelope Enhancement Project, a major alteration in road infrastructure is the "By-Pass" road, which will divert public traffic from State Road 502, and allow controlled vehicle access to the primary areas of the Laboratory.

Facility Disposition

Heating Steam / Cogen / CGTG

Steam Heating System Disposition: A future line-item project will be requirement to remove the existing steam generation and distribution piping system beyond 2025.

Planned D&D: Moving through D&D to removal of selected buildings will continue to reduce maintenance and utility costs for operations, allowing for reinvestment of operational funding. Additionally, removing highly inefficient facilities from the facility portfolio will improve the overall site energy utilization factor.

Leasing / Divested Ownership

Electric Utility

Additional Photovoltaic Expansion: Leasing agreements will continue to present opportunities for LANL to leverage renewable energy performance and resources. The recent photovoltaic project completed at the reclaimed landfill site is an example of a successful lease project.

Challenges and Vulnerabilities

The Cogen plant-water-discharge to the environment is regulated by the Environmental Protection Agency (EPA)-National Pollutant Discharge Elimination System (NPDES) and New Mexico Environment Department (NMED). Current conditions limit electricity generation to about 2 days before exceeding NPDES limits. Future industrial wastewater quality compliance is tied to SERF performance. The CGTG and the Cogen plant air emissions are regulated by the EPA air quality (AQ) rules. Current CGTG operations are constrained by carbon monoxide emissions, and work is underway to modify the AQ Title V permit for greater operating flexibility.

MAINTENANCE AND INFRASTRUCTURE SERVICES

Contributions

The Associate Directorate for Maintenance and Infrastructure Services (ADMIS) provides safe, reliable and efficient infrastructure maintenance and utilities support for both nuclear and non-nuclear facilities. Laboratory-wide maintenance and infrastructure services include:

- Development and execution of compliant maintenance programs
- Deployment of skilled craft resources
- Transportation services (including taxi service)
- Subcontract and subcontractor technical representative management
- Roads and grounds maintenance and heavy equipment services

- Maintenance and construction field work
- Management of Laboratory leased property portfolio
- Management of central maintenance shops
- Management of Laboratory facility data systems

Programs

- Maintenance and Site Services is a multidisciplinary organization whose primary mission is to provide the Laboratory with deployed support for facility and programmatic equipment maintenance.
- The Logistics organization provides craft and superintendent resources, subcontract management, heavy equipment /roads & grounds support, and transportation services.
- Lease Program Office manages the day-to-day administration of Laboratory real property leases
- The Facility Data organization maintains institutional database systems for the Laboratory

Strategy

The ADMIS organization faces the significant challenge of relying on facilities that are old but still required for enduring mission need (Figure 5.12). Key facilities necessary for core maintenance functions such as TA-03, Building 38, are 60+ years old, and have been reconfigured numerous times to adapt for changes in program need over this period. Limited life extension projects

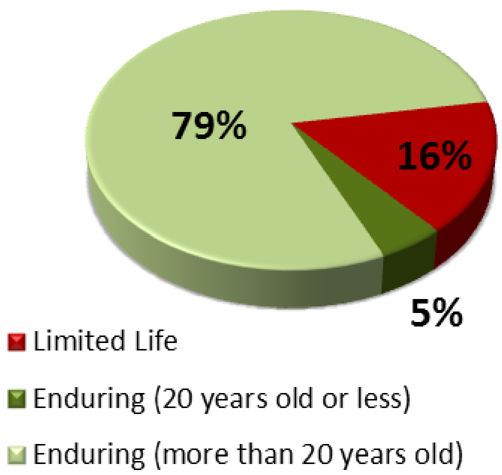


Figure 5.12: Facility status of owned / operated Maintenance and Infrastructure Services buildings at the Laboratory.

will be necessary to bridge these assets to remain viable until replacement facilities can be constructed. The strategy is to construct multiple smaller more purposefully designed replacement facilities at TA-60 to replace capabilities supported by TA-03, Building 38. This will then allow for needed redevelopment of that portion of TA-03 once the existing Building 38 is demolished.

Mission Capability Alignment of Infrastructure Assets—Existing Facilities

- All Maintenance core facilities and shops utilized for program administration and deployment of non-distributed resources
- The Laboratory portfolio of real property leases

Targeted Reinvestment / Life Extension / Asset Sustainment

Most immediate needs are related to the existing condition of facilities that support core shop capabilities. Targeted reinvestment into the TA-03, Building 38 complex; TA-03, Building 223; and TA-60, Buildings 1 and 2 is envisioned. These reinvestment projects will be scaled to provide a life extension for key assets based on the planned future and term of these facilities. The small portion of this portfolio that is <20yrs old is considered as part of the maintenance asset sustainment strategy.

Strategic Recapitalization and Replacement of Assets Beyond Useful Life

The replacement of key facilities necessary for core maintenance functions is planned to occur over a period of years, and includes a series of General Plant Projects necessary to right size replacement facilities at TA-60 to house the essential capabilities of the maintenance program.

Facility Disposition

The largest disposition challenge in this portfolio will be funds necessary to demolish the TA-03, Building 38 complex once successful replacement facilities have been constructed.

Leasing / Divested Ownership

Leasing of office space by the Laboratory has been a long standing strategy to house operations support staff off site to allow on site facilities to be utilized by scientific staff. In recent years the leasing strategy has been revisited and incorporated into strategic infrastructure planning. As a result the number and square footage of leased office facilities has been steadily decreasing to track with Laboratory staffing trends, and more emphasis has been devoted to only retaining leased properties with the attributes most beneficial to the flexibility and improved agility desirable from this strategy. As a result the Laboratory has begun to explore utilization of leased properties for suitable light laboratories and research work. This benefits the laboratory in a number of ways, by providing incubator type space for collaboration with private industry and outside partners, and by providing temporary lab space to relocate ongoing work while on site lab facilities are being renovated. This strategy continues to evolve, but has already realized benefits.

Challenges and Vulnerabilities

- Replacement of TA-03, Building 38 functions will be difficult. The shops and high bay areas required are large, electrical distribution is extensive, multiple overhead cranes are required, significant slab construction, mechanical exhaust systems, etc. will make replacement facilities a challenge to construct without Line Item funding.
- DM remains a challenge for all portions of the Laboratory facility portfolio. The successful implementation of strategies such as those presented within this plan will be essential to focus available funding and maintenance program resources to best align with mission needs.

ENVIRONMENT, SAFETY AND HEALTH

Contributions

The Laboratory operates on public lands under intense public and regulatory scrutiny of health, safety and environmental performance. The Associate Directorate of Environment, Safety and Health (ADESH) Directorate's mission is to enable mission success by protecting the workers, public, and environment while getting work done. ADESH supports Laboratory operations with the anticipation, recognition, evaluation, control, and professional/technical resources for managing environmental, safety, and health risks.

Programs

Four major programs address segments of the ESH protection work scope:

- The Environmental Protection (ENV) Division is responsible for regulatory compliance (air, surface water and industrial water), pollution prevention, the Site-Wide Environmental Impact Statement (SWEIS), as well as cultural, historical and biological resources (Figure 5.13).
- The Waste Management Division is responsible for enduring waste management compliance, permitting, and operations. This responsibility includes day-to-day waste operations at the generator site, off-site shipping to the NNSS or Waste Control Specialists facility in Texas, data management, sampling, and the off-site radioactive source recovery program. The RTBF program provides the bulk of funding for enduring waste management facilities and infrastructure.
- The Occupational Safety and Health Division provides a comprehensive program that protects and promotes the physical and mental health of workers. The Division also manages Occupational

Figure 5.13: The Pond Cabin is a historical structure located at TA-18 and monitored by the Environmental Protection Division.

Medicine and Health Promotion Programs including the Wellness Center. Within OSH, the Industrial Hygiene (IH) Division mission is to identify and control workplace hazards, prevent injuries and illnesses, develop IHS policy and programs for biological, chemical, and physical hazards, develop and provide training, maintain centralized data, encourage continual improvement in workplace safety and health, and manage safety concerns

- The Radiation Protection Program provides for worker safety, emergency response (onsite and offsite), regulatory compliance & oversight, facility operability, and programmatic support through:
  - Core, centralized, and deployed capabilities from RP Division
  - Facility-specific radiation protection requirements
  - Line & facility organization implementation of requirements

Laboratory operations include active nuclear facilities, radiological facilities, and numerous facilities and other areas with active or legacy radiological hazards. The radiological programmatic, facility, decommissioning, and remediation work taking place in all of these facilities requires the subject matter expertise and services of the Radiation Protection Division to help ensure mission accomplishment, worker safety, and regulatory compliance.

Strategy

The health and safety of all Laboratory workers and the public is a prerequisite to continued operations. The condition of Laboratory facilities and infrastructure is an essential element to maintaining a protective work environment. The nature of the Laboratory's ongoing and potential new missions will continue to generate a variety of solid and liquid radioactive wastes, hazardous wastes, and often-unique wastes, as well as solid and liquid sanitary waste. A transition period is underway as legacy wastes are dispositioned and storage and disposal sites at TA-54 Area G achieve closure. An Enduring Waste Management Plan is being formulated to identify waste sources, predict future volumes, plan for the required infrastructure to manage these wastes, and ensure that potential gaps in waste management capability are mitigated. The enduring capability can be defined and developed through the following strategies:

- Establish waste infrastructure that is cost effective and sized to meet enduring mission needs.
- Improve waste management structures and processes to best meet the needs of the programs that generate waste.
- Cultivate support and commitment for enduring infrastructure and the transition to that future capability.

Environmental protection and site stewardship are integral to all aspects of site planning, development, infrastructure, maintenance, and disposition. Infrastructure strategies within this LRIDP directly align with the Laboratory's Environmental Management System (EMS), Long-Term Strategy for Site Stewardship and Sustainability, Ten Year Site Plan, Site Sustainability Plan (SSP), Master Plan for Enduring Waste Management, Power Master Plan and Site-wide Environmental Impact Statement and NEPA process.

Mission Capability Alignment of Infrastructure Assets—Existing Facilities

As represented in Figure 5.14, more than half of ESH facilities are greater than 20 years old and will require some level of modernization or reinvestment.

As can be seen from the facility lists below, the distribution of ESH personnel is distributed

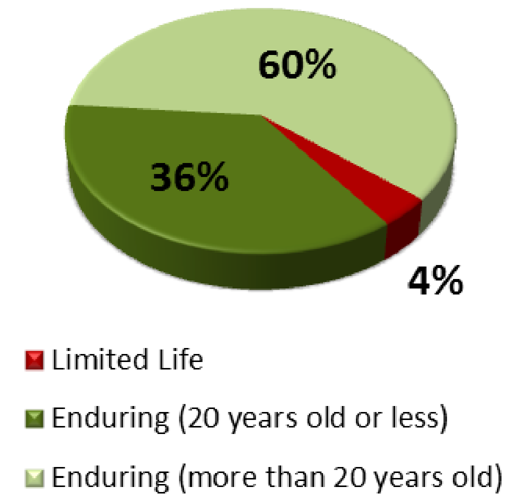


Figure 5.14: Facility status of owned / operated Environmental, Safety and Health buildings at the Laboratory.

widely across the Laboratory in both owned and leased spaces. Consolidation would be a benefit for organizational efficiencies.

Office Space

- TA-00, Buildings 1197 Mesa Complex leased office space, 1308, 771, 1331, and 1329, White Rock-leased office space (ENV) with some equipment storage, 1237 Pueblo Complex leased office space (ENV, ADEP)
- TA-03, Buildings 271 office space (ENV), 1612, 2006, 2007 (RP), 510, 28 (ESH, RP), 1911/12—Occupational Health/ Health Promotion—Wellness Center, 1411—Occupational Health—Medical Clinic
- TA-46, Building 326 office space (ADEP)
- TA-54, Building 1005 office space (ENV)
- TA-54 Area L—Hazardous and chemical material packaging, storage, and transportation facility (WM)
- TA-59, Buildings 3 office space (WM, ENV, WM, OSH, RP), 53, 96, 97, 116 and 117 office space (ENV)
- TA-63, Building 33 office space for TRU Waste Program (ADEP)
- WM, RP, ENV, IHS staff deployed within FOD operations

Storage and Lab Space

- TA-03, Buildings 2008, 2009, 2010, 1522, 1762, 1898, 65—RP Services and Radiation Protection Programs-Dosimetry, Health Physics Measurements, Laboratories, Building 65—RP-Vault, TA-03, Buildings 130, and 3046—RP Services-Aerosol Engineering Facility Laboratory and Office Space, Buildings 1762, 1898, 65—RP Services-HP Measurements and offices, TA-03, Building 271 lab space (ENV)
- TA-35, Building 110 storage space and metrology wind tunnel, plus adjacent transportainers (ENV)
- TA-36, Buildings 1, 214, 46, 47, and 53–RP Services-Radiation Instrumentation Calibration Labs, Radiological Calibration Facility
- TA-43, Building 1—RP Programs-IVML, TA-50, Building 37—RP Programs-ALARA Center
- TA-54, Building 1001 lab space (ENV)
- TA-55, Buildings 2,11—RP Services-Satellite Health Physics Analysis Laboratory (HPAL).
- TA-59, Building 1—IH Program Services-Respiratory Training/Maintenance and Industrial Hygiene and Safety Equipment Room, Asbestos Laboratory

Hazardous (RCRA-Listed) waste (WM)

- Currently managed at TA-54, the strategy for all hazardous, low-level, and mixed low-level waste is to contract for off-site shipping and disposal. A contract should be issued in FY13 for the transportation and disposition of all LANL hazardous/chemical wastes from on-site consolidation points.

Targeted Reinvestment / Life Extension / Asset Sustainment

- Fitness Facility—The current Wellness Center is planned for additional refurbishment to extend its useful life. Employee fitness programs are widely used and are a key contributor to preventive care programs, as well as to employee attraction and retention.
- TA-59, Building 3 is planned for reinvestment upgrades to plant systems including HVAC, electrical, and structural.
- TA-59, Building 1 renovation includes new laboratory space for the respirator program

Trails Management

The LANL site has an extensive network of trails that are both culturally historical and recreationally valuable. Currently, the focus is on trails in TA-70 and -71 (near Pajarito Acres), where over the next few years, improvements will be made to trailheads with better gates, information kiosks, and some trail rerouting to protect cultural resources. In the longer term, it may be desirable to repurpose existing roads in Los Alamos Canyon to create a pedestrian and bicycle connection between NM-4, near Tsankawi and Diamond Drive, in Los Alamos. Such a connection in Los Alamos Canyon could be part of a countywide non-motorized transportation network, providing commuting and recreational opportunities. An access trail from TA-53 (LANSCE) to TA-03 has also been requested as an improvement in TA-53 working and recreation conditions.

Investments in New Facilities and Infrastructure / Signature Facilities

Two major waste management facilities are planned for the near future. Projects to replace the functions of the Radioactive Liquid Waste Treatment Facility (TA-50) and a new Transuranic Waste Facility (TA-63) are described in detail in Chapter 2 under Weapons Program infrastructure.

Current plans for replacement ESH core office Building at TA-59 is envisioned to provide this organization the space necessary to consolidate multiple organizations that are currently spread throughout the Laboratory and in leased space.

An institutional infrastructure plan for the HRL modernization identifies impacts and provisions for accommodating radiation protection programs and radiation protection services (see Chapter 3). Specifically, the plan involves vacating the HRL Building (TA-43, Building 1), in which the radiation program's In Vivo Monitoring Lab (IVML) resides and creating a bioscience campus to be located on the current location of a substantial amount of Radiation Protection Division laboratories and offices, including TA-03, Buildings 2006, 2010, 1612, 1522, 1762, 1898, and 65. To accommodate the RP-DO's needs, this plan includes a provision for the creation of a radiation protection campus, to be located near the current Occupational Medicine facility.

Facility Disposition

Planned disposition of portables structures at TA-59 will take place once ESH operations can be relocated.

Challenges and Vulnerabilities

- Challenges and vulnerabilities are related to resource constraints. For example, aging infrastructure and equipment running to failure creates environmental safety and health risks. These risks include environmental releases, waste management system weaknesses, and work activity exposures to physical, chemical, and radiation hazards.
- Waste issues require an enduring waste management strategy to address storage consolidation, TRU volume reduction and wastes from future D&D of facilities. Transition from legacy waste cleanup to enduring waste management is an issue for ADESH, ADEP and the Weapons Program (RTBF).
- TRU production projections do not include planned or likely upgrades. A majority of PF-4 gloveboxes are more than 30 years old. These boxes should be replaced according to a plan that is informed by mission need and risk reduction. This type of infrastructure improvement generates large volumes of waste, which are not included in out-year estimates.
- On-site remediation of oversize TRU waste is currently performed at Area-G and will be lost when MDA-G is closed because the current remediation facilities overlie SWMUs on which corrective actions must be performed under the Consent Order. This capability must be replaced by either establishing it in an enduring facility or having the work executed by a commercial contractor.
- The current RLWTF must be considered as single-point failure for upstream liquid generating processes.
- Processing without WCRR is problematic, and a replacement facility may be necessary.
- Distributed waste storage facilities to facilitate off-site shipping need to be considered as part of the Enduring Waste Management Plan as does consolidation of the 360+ satellite accumulation areas.
- The eventual D&D of CMR, LANSCE, and other LANL facilities will generate large amounts of TRU and other solid wastes. LANL projections of capability needs and TRU generation do not include any of these projects. This may or may not be appropriate, depending on the scope of the project and the capabilities of the contractor base that will respond to the request for proposal (RFP).
- ESH programs are geographically spread across a wide range of facilities that are both DOE owned and leased. Divisions are distributed across multiple buildings, which limits staff interactions and increases travel costs. A consolidation strategy will increase organizational effectiveness.
- Obsolete transportable buildings occupied by ENV at TA-59 (53, 96,97,116, 117) will be removed and the staff will be co-located with other ENV staff in improved space.

OPERATIONS AND INFRASTRUCTURE PROGRAM OFFICE

Contributions

The Operation and Infrastructure Program Office (OI-PO) is the focal point for coordination of Laboratory long-range infrastructure planning. The Office manages the infrastructure portion of the Site Support Budget, incorporates the Institutional Projects Program Office, manages the institutional Footprint Reduction and Asset Disposition programs, oversees the Site Improvement and Clean-up programs, and provides facility utilization services to the Laboratory.

Programs

The Operations and Infrastructure Program Office has six Program areas:

- Site Support Program Management includes budget allocations, work packages, and execution oversight of the Site Support Institutional Budget. This program includes financial planning, funding strategies, programming and execution metrics.
- Long Range Facility and Infrastructure Planning provides ongoing assessment of Laboratory infrastructure against the criteria of mission capabilities. This program integrates the various interdependent needs and objectives related to infrastructure, and recommends strategic direction for cost effective reinvestment and recapitalization approaches.
- The Institutional General Plant Project (IGPP) Program Office manages and coordinates institutionally funded projects with a value up to $10M. This office also manages the institutional Footprint Reduction and Asset Disposition programs for the Laboratory.
- The Pollution Prevention Program Team coordinates with ESH to provide support for process improvements, waste elimination, environmental awareness and sustainability. The program implements recycling, energy conservation, environmental reporting and local and national P2 award programs in support of life-cycle infrastructure and facility planning.
- The Site Improvement and Clean-up program is institutionally funded to expedite the cleanup and removal of legacy equipment and items no longer utilized from across the Laboratory. This program establishes effective processes to deal with existing cleanup issues, and encourages worker involvement to sustain positive practices to prevent reoccurrences of legacy buildup.
- The Infrastructure Planning and Facility Utilization organization provides project initiation services, site selection and designation, land use planning, GIS mapping, facility and space utilization, and interior furnishing services.

Strategy

The OI-PO is the primary architect of the long-range infrastructure planning process, strategy and implementation. This Program Office has been actively executing the facility and infrastructure reinvestment strategies defined within this LRIDP for the last several years.

Through significant efforts to integrate common goals, objectives, and strategies associated with infrastructure planning from across the Laboratory, progress on implementation of LRIDP strategies has been very positive over the last year. Leveraging of interdependent planning activities have led to significant operational cost reduction, improved condition and utilization of Laboratory assets, reduction in Deferred Maintenance, and targeted reinvestment and recapitalization of infrastructure. Implementation of these integrated strategies has demonstrated positive impact on operational efficiency and effectiveness, and is focused on providing a sustainable and viable future for the Laboratory.

Facility Disposition

The Operations and Infrastructure Program Office is responsible for execution of the Footprint Reduction and Disposition programs. These programs have successfully eliminated properties from the active facility portfolio at the Laboratory while creating significant cost avoidance, eliminating significant deferred maintenance, and reducing pressure on operations and maintenance budgets. Key accomplishments include:

- Footprint Reduction at the Laboratory is approaching 1.5M sq. ft. of poor condition, obsolete structures that have been vacated and removed. Of that total >800,000 sq. ft. has been achieved in just the last 4 years. This represents approximately a 17% (7%

from 2001 to 2009, and 10% since 2009) reduction in the active facility portfolio.

- Footprint reduction has also executed the strategy of consolidating Laboratory operations by removing facilities co-mingled with the town site (HRL will be the last) and facilities closest to White Rock (TA-18 and the planned closure of TA-54, Area G).
- $10M/yr. direct reduction in operation / maintenance costs resulting from the shutdown of under-utilized facilities (savings are improving each year).
- $160M reduction in Deferred Maintenance in the last 4 years (13 percent reduction) from the removal of excess facilities.
- >45,000 sq. ft. of unfavorable properties have been vacated, and >47,000 sq. ft. of excess properties have been demolished / removed from the Laboratory in FY13.

QUALITY AND PERFORMANCE ASSURANCE (QPA) PROGRAMS

Contributions

The QPA mission is to develop, guide, support, and ensure a compliant, implemented, and effective quality assurance program in support of the Laboratory's mission. QPA provides a comprehensive suite of performance management tools to aid the Laboratory, manage risk, and improve safe and secure mission delivery. Services include:

- Occurrence Investigation & Assessments
- Metrics and Operational Experience
- System Infrastructure
- Calibrations
- Vendor Evaluations
- Receipt Inspection
- Product Certification
- Performance Support
- Engineering Assurance

Strategy

Effective and efficient QPA program development, administration, and deployment require the co-location of key staff and appropriate office/conference facilities necessary for program success. Current reinvestment in the Otowi Building (TA-03-261) is enabling this co-location to take place, and providing the necessary attributes for QPA interactions.

BUSINESS SERVICES

Contributions

The Laboratory operates largely on public funds and therefore carries significant fiduciary responsibilities. Personnel management, procurement, warehousing, delivery, training and information management are functions that touch every Laboratory employee.

Programs

The Business Services Directorate (ADBS) provides support for the Laboratory in accomplishing its overall mission. By working effectively and compliantly, ADBS is able to meet the Laboratory's needs for information, people, material, training, technology, and process improvements. ADBS supports every program and operation at the Laboratory through the following subordinate organizations:

Acquisition Services Management (ASM) Division

- Materials management
- Property management
- Procurement
- Small business programs

The Human Resources (HR) Division

- Benefits
- Compensation
- Field (deployed) services
- Diversity and staffing
- Employee relations
- Labor relations

The Lean Six Sigma

- Helps teams define and achieve goals
- Trains and mentors individuals who demonstrate drive, inclination, and ability to apply business management tools and succeed as continuous improvement practitioners
- Applies focused problem-solving methodologies that identify and eliminate the root causes of ineffective and inefficient processes.

The Information Resource Management (IRM) Division

- Communication arts and services (websites, technical and nontechnical publications, and media services)
- Document control services
- Records management services
- Institutional electronic document management systems

Central Training (CT) Division

- Training policies and infrastructure
- Web-based training
- UTrain, a full-function training management system for course registration, access to online training, and training reports and notifications
- Institutional and deployed training services

Strategy

Business Operations currently occupies office facilities on site and leased properties off site. The split of functions and locations has been accomplished with efficiencies in mind. Some examples include providing appropriate space for Acquisition Services in an efficient location for interactions with the vendor community, or consolidation of records storage and retention resources in locations that improve the delivery of these services. However efforts continue to optimize the mix of real property leases with owned facility assets, and that process will need to have continued consideration for the productivity of this organization.

The only major facility asset under Business Services to discuss within this section is the TA-03, Building 30 Receiving and Distribution Center. This large asset is >60 years old, is considered a security concern at its current location, and is subdivided with multiple occupancies. The current strategy is replacement of this large asset with multiple smaller more purposefully designed facilities at a different location.

Mission Capability Alignment of Infrastructure Assets—Existing Facilities

- Office space on-site within the Otowi facility TA-03, Building 261
- TA-03, Building 30 Receiving and Distribution Center
- Records Centers
- IRM Division Office TA-00, Building 769
- IRM Communication, Arts, and Services TA-03 Building 30 (Will be moving to TA-00, Building 769)
- Records Management TA-03, Building 1400
- ASM and CT TA-00 Building 787
- Disposition - Salvage Yard TA-03
- Logistics Heavy Equipment and Roads and Grounds TA-60, Building 001
- Lean Six Sigma TA-03, Building 456

Investments in New Facilities and Infrastructure / Signature Facilities

Replacement Receiving and Distribution Center would remove commercial delivery trucks from traversing through TA-03 and improve security controls on large vehicle traffic within the Laboratory boundary.

Disposition

Current plans for potential repurposing of TA-03, Building 30 can be found in Chapter 3, Science Programs. Providing the facility is not repurposed for another utilization, funding its disposition will become a challenge.

Challenges and Vulnerabilities

- Replacement of TA-03, Building 30 facility functions will be difficult. High-bay-receiving space requirements, electrical distribution, material handling equipment, significant slab construction, mechanical exhaust systems, etc. will make replacement facilities a challenge to construct without Line Item funding.
- Business Services programs are geographically spread across a wide range of facilities that are both DOE owned and leased. A consolidation strategy will increase organizational effectiveness.

CHAPTER 6: CAPITAL PROJECTS

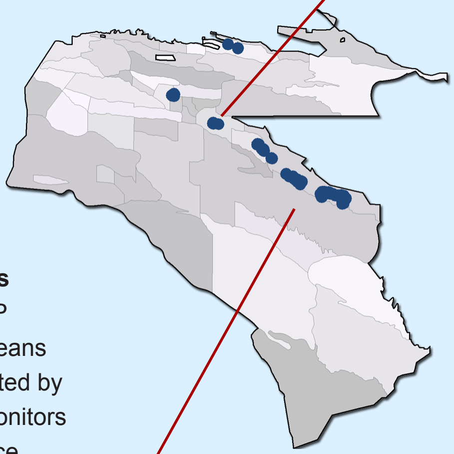
INFRASTRUCTURE CHALLENGES

- Consent Order liabilities associated with facilities are being transitioned to the NNSA landlord from EM.
- Transition from legacy-waste cleanup to enduring waste management is an issue for ADESH, ADEP, and the Weapons Program (RTBF).
- The challenge is to achieve a balance between field deployed and core resources and the facilities to support these operations.

EXISTING FACILITIES

TA-00: Project Management operations utilize leased space for office work. Additionally, the Laboratory is considering leased space for suitable light laboratories and research work

Pajarito Corridor: Major Capital Projects along the corridor include Line Items such as NMSSUP, CMRR-NF, RLUOB, RLWTF-UP, and TRU Waste Facility



Corrective Actions Program: The CAP investigates and cleans up sites contaminated by past operations, monitors area ground, surface and storm water, and ensures compliance with applicable state and federal regulations. Key projects include:

- Nuclear Environmental Sites and TA-21
- Surface Water and Canyons
- Groundwater monitoring

TA-54: Order on Consent and Framework Agreement with NMED call for 3706 cubic meters of legacy transuranic waste to be shipped to the WIPP by June 30, 2014

OVERVIEW

The Principal Associate Directorate for Capital Projects (PADCAP) provides a focus in two areas:

- Project Management: Delivering quality projects safely, securely, and in compliance with scope, schedule and budget baselines
- Environmental Programs: Identifying and remediating environmental hazards

In addition to the infrastructure systems described in Chapter 5, the missions of the Laboratory depend on a core capability to deliver projects that shape the infrastructure and enable the success of current and future programs.

PROJECT MANAGEMENT

Contributions

Project management implements the following types of projects across the institution:

- Line Item – construction projects over $10M
- General Plant Projects (including Institutional General Plant Projects) – construction projects between $500K and $10M
- Expense funded projects
- Major Items of Equipment (MIE) projects
- D&D Execution
- Programmatic projects

Programs

Functional support to projects includes the following integrated capabilities:

- Project Management
- Estimating
- Cost and Scheduling
- Construction
- Project Engineering
- Project Quality Assurance
- Project Safety
- Project Procurement
- Document Control / Records Management
- Project Information Technology

Strategy

Infrastructure necessary for success of the Associate Directorate of Project Management (ADPM) requires an appropriate balance of core offices and field project deployment locations. Currently this mix involves off-site leased facilities, which are conducive to contractor/vendor interactions, and site facilities that allow a basis for project execution. A major on-site facility for centralized functions exists on the Pajarito Corridor at TA-52, Building 33 and a series of project trailers generally located at each project site. The strategy is to continue to work toward an appropriate balance between a presence at project sites and centrally located core facilities.Recent space allocations have included a shift toward field resources on-site, in particular on the Pajarito Corridor, as an improvement to overall execution functionality.

Mission Capability Alignment of Infrastructure Assets – Existing Facilities

- The leased property TA-00, Building 480, Pajarito Complex houses core offices for the Project Management Directorate and includes engineering, cost estimating and procurement support functions.
- TA-52, Building 33 provides centralized office and conferencing capabilities on the Pajarito Corridor project management. Adjacent to this permanent facility are several transportables supporting project teams including Buildings 44, and 45.
- Project trailers at TA-48 and TA-55 support the ongoing construction projects at TA-55 and at this time are anticipated to be removed at the completion of the projects.

Strategic Recapitalization of Assets Beyond Useful Life

The strategy for the TA-52, Building 33 is planned to include recapitalization of major plant systems and equipment. This facility has a long-term plan to be repurposed for another use once capital projects are relocated to another suitable location.

Challenges and Vulnerabilities

The challenge is to achieve a balance between field deployed and core resources and the facilities to support these operations.

ENVIRONMENTAL PROGRAMS

Contributions

The Associate Directorate for Environmental Programs (ADEP) in PADCAP identifies and remediates environmental hazards associated with past Laboratory operations, manages and disposes of legacy waste at the Laboratory, and conducts environmental surveillance to ensure the protection of the environment and the public.

Programs

ADEP is responsible for legacy cleanup and the disposition. ADEP is also responsible for groundwater monitoring, protection, and cleanup. The Corrective Actions Program investigates and cleans up sites contaminated by past operations, monitors area ground, surface, and storm water, and ensures compliance with all state and federal regulations. The TRU Program manages handling, packaging and shipping of legacy wastes including shipment to the Waste Isolation Pilot Plant (WIPP) and other disposal sites (Figure 6.1).

Figure 6.1: A shipment of waste is transported to WIPP

Strategy

The Laboratory has made a strong commitment in the strategies incorporated in the Long-Term Strategy for Site Stewardship and Sustainability; to clean up legacy contamination, control emissions from current operations, and manage for a sustainable future. ADEP executes the “clean the past” portion of that strategy. Removal of excess facilities achieves several LRIDP strategies. By reducing the footprint of obsolete facilities surveillance and maintenance costs can be eliminated. Cleanup and divestiture of sites such as TA-21 and Materials Disposal Areas along DP road implement the strategy by consolidating the footprint of the Laboratory outside of the town site. These areas are slated for eventual transfer from DOE ownership to public or private ownership to be used for economic development. Similarly, the eventual removal of wastes from TA-54 Area G will allow the Vehicle Access Portal on Pajarito Road to potentially be moved west, reducing the security footprint. Finally, as individual sites of potential contamination (known as brownfield sites or solid-waste management units) are surveyed, sampled, remediated, or cleared if uncontaminated, they can then be redeveloped to meet new missions. Developing such brownfield sites is a preferred alternative to greenfield development.

Infrastructure necessary for success of the Environmental Programs Associate Directorate is similar to Project Managment strategies and requires an appropriate balance of core offices and field project deployment locations. This, where a mix involves off-site leased facilities, which are conducive to contractor / vendor interactions, and site facilities that allow a basis for program execution. An example of an on-site facilities currently exits on the Pajarito Corridor at TA-52, Building 33. It is also typical for a series of project trailers to generally be located at each project site. The strategy is to continue to work toward an appropriate balance between a presence at project sites and centrally located core facilities. Recent space allocations have included a shift toward field resources on-site in particular on the Pajarito Corridor as an improvement to overall execution functionality.

Mission Capability Alignment of Infrastructure Assets – Existing Facilities

- TA-00, Building 1237 Pueblo Complex leased office
- TA-21, remaining project trailers
- TA-46, Buildings 326, 577 and 578, office
- TA-54 Legacy Waste Operations Complex - 70 buildings, including Radioassay Non-Destructive Testing Facility (RANT), Waste Characterization, Reduction, and Repackaging Facility (WCRR), waste storage domes, waste characterization trailers and support office structures
- TA-63, Building 121 office space for TRU Waste Program
- TA-66, Building 1 (occupants to be relocated to TA-63, Building 121)

Figure 6.2: Area G storage domes at TA-54.

TA-54 is located along Pajarito Corridor (Figure 6.2) and is one of the largest TAs at the Laboratory. Area G has been used for the management of Laboratory-generated radioactive solid wastes. Waste historically handled at Area G is characterized as low-level radioactive waste, low-level mixed waste, TRU waste, hazardous waste, polychlorinated biphenyl (PCB) waste, and non-regulated chemical wastes. Hazardous waste and non-regulated chemical wastes are managed at Area L, which is located adjacent to and at the west end of Area G. It is the Laboratory strategy and commitment to the Compliance Order on Consent (Consent Order) to remove specified legacy TRU waste from Area G, consolidate TRU operations at the new TRU Facility (see Chapter 2) and eventually vacate Area G. The above ground TRU waste that is not part of the 3706-m^3 campaign still represents the equivalent of about 3,500 55-gal. drums of TRU waste. This waste will be the primary focus of the TRU waste disposition effort after the 3706-m^3 campaign is completed and before the below ground TRU waste is shipped.

Active waste management operations are currently ongoing at TA-54, including legacy waste container remediation, characterization, and TRU waste shipments to the WIPP. The container remediation operations are conducted at these five facilities:

- WCRR facility, which processes drums containing highly radioactive material;
- Dome 231, which processes oversize containers such as fiberglass-reinforced plywood boxes;
- Building 412 “box line” facility, which processes small fiberglass-reinforced plywood boxes (and is being reconfigured to process drums with low levels of radioactivity);
- Building 375 “box line” facility, which processes larger fiberglass-reinforced plywood boxes; and
- Dome 33, which contains the drum-venting system to vent and place WIPP-approved filters on unvented drums.

Area G also includes a total of nine large domes for storage of TRU waste and a pad that contains the units used to characterize TRU waste to demonstrate that it meets the WIPP waste acceptance criteria.

These activities must be completed to allow access to the facilities for D&D. Almost all of the processing and storage facilities are located on Resource Conservation and Recovery Act (RCRA) units that must undergo RCRA closure. Nearly all structures funded by EM overlie SWMUs, requiring corrective action and subsequent closure.

All structures that overlie MDA-G will be completely removed in the long-term. The portion of Area G identified as Zone 4 may be developed for low-level waste disposal of the small fraction of the Laboratory’s low-level waste that cannot be shipped off site for disposition. The portion of Area L that does not have to be closed for compliance with the Consent Order will continue to be used for the storage of hazardous and mixed low-level waste, at least through the period of the current Hazardous Waste Facility Permit. This portion includes the RANT facility (TA-54, Building 38), which is the enduring Laboratory facility for TRU shipments, and the water tank and distribution buildings (TA-54, Buildings 1006, 1007, and 1008) that are leased to LAC. The new TRU Waste Facility (TWF) is currently under construction at TA-63, with a target completion date of 2017, which will support future Laboratory-generated TRU waste (see Waste Management section in Chapter 5). However, the RANT facility is expected to be used indefinitely to support off-site shipments once waste is received from the TWF. Ongoing renovations and upgrades are being made to the RANT facility, and no outstanding issues have been identified at this time.

Surface and Groundwater Monitoring Programs

The Laboratory’s groundwater monitoring program (Figure 6.3) maintains an integrated network of groundwater monitoring wells that

Figure 6.3: Sandia Canyon Wetlands – surface and groundwater monitoring site

work in conjunction with each other to determine groundwater quality. Such wells require roads, pads, power, gas supplies, and maintenance. The network monitors three geologic groundwater zones and numerous springs on and downstream of the Laboratory. The Laboratory routinely analyzes groundwater samples to monitor water quality and to identify contamination issues that could impact human health or harm the ecosystem. Wells are also used to monitor the efficacy of remedial actions. Monitoring data are reviewed on a real-time basis, and changes to the monitoring program, including the installation of new wells, are implemented as necessary.. The monitoring program is regulated by the NMED under the Consent Order.

Using a water quality Individual Permit (IP) with the U.S. EPA and in compliance with a consent agreement settling a lawsuit, The Laboratory has an extensive program to sample surface water and test for possible legacy contaminants. Currently there are 405 Solid Waste Management Unit (SWMUs) / Areas of Concern (AOCs) scattered throughout the Laboratory's 40 square miles that are covered under the IP. The IP requires extensive road access to sites, construction of diversion structures to prevent runoff, and future monitoring.

Facility Disposition

TA-54 Disposition

The purpose of the TA-54 disposition project is to remove and dispose of structures located with the northern portion of Area L and a subset of Area G structures to support corrective actions, stabilization, and subsequent closure of technical area. D&D is required to allow completion of LANL's ER Program's environmental corrective actions at Area L by the deadlines specified in the Consent Order. These include the investigation and correction actions for TA-54 SWMUs and implementation of the remedies for MDA-G and MDA-L selected by NMED [(currently assumed to include engineered covers (caps)]. Proposed D&D activities include removal of remaining internal process systems and decontamination and/or abatement; demolition and/or deconstruction of above grade structures (trailers, domes, etc.); an optional removal of foundations and subgrade building components; removal of miscellaneous items outside of buildings within the work boundary; and waste management, packaging, staging, and transportation to appropriate treatment and disposal facilities. TA-54 inventories have identified over 600 structures (buildings, domes, transportainers, manholes, etc.).

Initial footprint reduction projects to remove excess transportable buildings and trailers began in FY13 (11 structures totalling 12,155 sq. ft.)

American Recovery and Reinvestment Act Projects

The Laboratory received $212 million in 2010-11 in funding from the American Recovery and Reinvestment Act (ARRA) for three environmental cleanup projects that have since been completed:

- Decontaminate and demolish 24 buildings at TA-21 (Figure 6.4)
- Install 16 groundwater monitoring wells
- Excavate Material Disposal Area B, the Laboratory's oldest waste disposal site, used from 1944–1948

By early 2011, the first two projects listed above were complete. The third project was completed on September 14, 2011. By the time the two projects were completed in 2011, about 200,000 sq. ft. of buildings were demolished, more than 45,000 cubic yards of soil were excavated, and 16 wells with an average depth of 1,000 ft. were drilled. Most trailers leased for project use at TA-21 have been removed.

Long-term Site Disposition

Long-term site disposition planning is consistent with the current LRIDP facility-planning strategies. Sites along the eastern portion of Pajarito Corridor will be closed to allow potential relocation of the Vehicle Access Portal further west than its present location, at the intersection with State Route 4.

To accomplish the D&D, there will be two phases: near-term (0-5 years) to remove those facilities that are not essential to ongoing TRU waste disposition activities; and long-term (5-10 years) to support for those facilities necessary to the closure of MDAs H, L, and G. The specific D&D schedule will be included in Corrective Measures Implementation Plans, which will be submitted to the NMED after selection of corrective measures under the Consent Order.

Figure 6.4: TA-21 a) before environmental cleanup as seen in May 2010, b) and after cleanup by May 2011

Challenges and Vulnerabilities

- Consent Order liabilities associated with facilities are being transitioned to the NNSA landlord from EM.
- Transition from legacy-waste cleanup to enduring waste management is an issue for ADESH, ADEP, and the Weapons Program (RTBF).
- The environmental management organization faces ongoing challenges in having to rely on a combination of a leased off-site facility that is some distance from the core of the Laboratory, leased on-site trailers and transportables, on-site owned structures, and contractor provided trailers and transportables. As previously noted, the core organization is located in the leased Pueblo Complex on the north side of the town-site. This structure is leased from the Los Alamos Public Schools. However, project teams are primarily located in TA-21 and on the Pajarito Corridor supporting TA-54 work.
- Future accommodation of the environmental programs core and distributed functions will be dependent on several factors including the projected federal funding, which has proven to be quite dynamic, as well as the basic quantity and quality of space available. Typically, projects will have project teams located in trailers and transportables adjacent to the project site. These structures are normally leased by the Laboratory or provided by the contractor in accordance with their contract. While the leased Pueblo Complex has housed core environmental program functions for several years, a long-term the challenge is especially with regard to the quickly ramping up or quickly ramping down of TA-21 and TA-54 activities directly in response to the federal funding. As this occurs, associated impacts on staff and their office needs must be accommodated.
- The challenge is to achieve a balance between field deployed and core resources and the facilities to support these operations.

KEY DEFINITIONS

Colocation: Situating separate functions or organizational elements, which share common attributes, in a manner that facilitates interaction at an operational level to promote efficient and effective use of those attributes.

D & D: Decontamination and decommissioning of a designated facility or structure.

Deactivation: Placing a facility in a stable and known condition including the removal of hazardous and radioactive materials to ensure adequate protection of workers, public health and safety, and the environment, thereby limiting the long-term cost of surveillance and maintenance. Actions include the removal of fuel, draining and/or de-energizing nonessential systems, removal of stored radioactive and hazardous materials, and related actions. Deactivation does not include all decontamination necessary for the dismantlement and demolition phase of decommissioning (e.g., removal of contamination remaining in the fixed structures and equipment after deactivation).

Decommissioning: Is the process of closing and securing a nuclear facility or nuclear materials storage facility to provide adequate protection from radiation exposure and to isolate radioactive contamination from the human environment. It takes place after deactivation and includes surveillance, maintenance, decontamination, and/or dismantlement. These actions are taken at the end of the life of a facility to retire it from service with adequate regard for the health and safety of workers and the public and protection of the environment. The ultimate goal of decommissioning is unrestricted release or restricted use of the site.

Deferred Maintenance: Maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period.

Demolition: Complete removal and disposal of a facility, which normally includes the structural foundation and utility extensions that occur below the surface of the ground.

Disposal: Permanent or temporary transfer of DOE control and custody of real property assets to a third party who thereby acquires rights to control, use, or relinquish the property.

Disposition: Final facility status at the end of initial service life. Disposition includes stabilizing, preparing for reuse, deactivating, decommissioning, decontaminating, dismantling, demolishing, and/or disposing of real property assets.

Enduring Facility: An existing facility identified for indefinite continued use based on a lasting capability that it supports. Enduring facilities will require periodic investment(s) to preserve existing or create new functionality.

Facility: Land, buildings, and other structures, their functional systems and equipment, and other fixed systems and equipment installed therein, including site development features outside the plant, such as landscaping, roads, walks, parking areas, outside lighting and communication systems, central utility plants, utilities supply and distribution systems, and other physical plant features. These include any of the DOE-owned, -leased, or -controlled facilities, and they may or may not be furnished to a contractor under a contract with DOE.

Greenfield: A project site for construction of a facility, which lacks any constraints imposed by prior work on that site, such as a previous structure, utilities, site work or disposal that has occurred on the site.

Infrastructure: All real property, installed equipment, and related real property that is not solely supporting a single program mission at a multi-program site or that is not programmatic real property at a single program site.

Infrastructure Asset(s): The term used to collectively describe the Laboratory’s facilities, structures, and utility systems.

Investment: Expenditure of new and separate project funds, obtained by appropriation or through an acquisition from an independent source for the purpose of improving and existing facility or constructing a new facility, in order to expand or acquire a new capability.

Life Cycle: The life of an asset from planning through acquisition, maintenance, operation, remediation, disposition, long-term stewardship, and disposal.

Life-Cycle Cost: The sum total of the direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the design, development, production, operation, maintenance, support, and final disposition of real property over its anticipated useful life span.

Life Extension: Investing in an infrastructure asset to extend the useful life for a designated time frame without a planned end date.

Limited Life Extension: Investing in an infrastructure asset to extend the useful life for a designated time frame with a planned end date.

Maintenance: Day to day work that is required to sustain property in a condition suitable for it to be used for its designated purposes, including preventive, predictive, and corrective maintenance.

Recapitalization: Major renovations or reconstruction activities, including facility replacements, needed to keep existing facilities modern and relevant in an environment of changing standards and missions. This includes the restoration and modernization of existing facilities but not the acquisition of new facilities or the demolition of old ones, unless the demolition is carried out as part of a renovation project or in conjunction with construction of replacement footprint elsewhere.

Recast: To make significant and major changes, modifications or alterations to infrastructure assets to improve the overall utilization.

Reinvestment: Utilization of existing infrastructure funding which are reapplied back into the remaining asset portfolio to improve an asset condition.

Repair: The restoration of failed or malfunctioning equipment, system, or facility to its intended function or design condition. Repair does not result in a significant extension of the expected useful life.

Replacement: Construct a new facility, comparable in size and function to an existing facility; using current technology, codes, standards, and materials to replicate and accommodate the existing functions and uses of the existing facility.

Repurpose: A deviation from an existing or original use of a facility; to serve a new role or to accommodate a new function, program or operation.

Signature Facilities: Facilities that are linked to step-change growth potential in capability supporting current or evolving Laboratory mission areas.

Surveillance and Maintenance: Activities conducted throughout the facility life-cycle, including providing, in a cost effective manner, periodic inspections and maintenance of structures, systems and equipment necessary for the satisfactory containment of contamination, and for the protection of workers, the public, and the environment.

Sustainment: Maintenance and repair activities necessary to keep the inventory of facilities in good working order. This includes regularly scheduled maintenance as well as anticipated major repairs or replacement of components that occur periodically over the expected service life of the facilities.

ACRONYMS

ACL	Advanced Computing Laboratory
ADA	Americans with Disabilities Act
ADBS	Business Services Directorate
ADEP	Environmental Programs Associate Directorate
ADESH	Associate Directorate for Environmental Safety and Health
ADMIS	Associate Directorate for Maintenance and Infrastructure Services
ADNHHO	Associate Directorate for Nuclear and High-Hazard Operations
ADSS	Associate Directorate for Safeguards and Security
AET	Applied Engineering and Technology
ALARA	As Low as Reasonably Achievable
AOC	Area of Concern
AQ	Air Quality
ARG	Accident Response Group
ARRA	American Recovery and Reinvestment Act
ASC	Advanced Simulation and Computing
ASM	Acquisition Services Management
ATAC	Advanced Technology Assessment Center
ATS	Advanced Technology Systems
BAS	Building Automation System
BSL	Biosafety Level
BTF	Beryllium Technology Facility
CAP	Corrective Actions Program
CAS	Central Alarm System
CAT	Category
CCF	Central Computing Facility
CD	Critical Decision
CEF	Criticality Experiments Facility
CGTG	Combustion Gas Turbine Generator
CINT	Center for Integrated Nano-Technology
CMMS	Condensed Matter and Magnetic Science
CMR	Chemistry and Metallurgy Research
CMRR	Chemistry and Metallurgy Research Replacement
CPIBP	Corporate Physical Infrastructure Business Plan
CT	Central Training
CTCP	Counterterrorism and Counterproliferation Programs
D	Decision Applications
D&D	Decontamination and Decommissioning
DAF	Device Assembly Facility
DARHT	Dual-Axis Radiographic Hydrodynamic Test
DDOB	D-div Office Building (TA-03, Building 1405)
DEOS	Dynamic Equation of State
DFEAT	Disposition Field Evidence Analysis Team
DHS	Department of Homeland Security
DFO	DOE Field Operations
DM	Deferred Maintenance
DNN	Defense Nuclear Nonproliferation
DNS	Defense National Security
DO	Division Office
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DoS	Department of State
DOT	Department of Transportation
DSA	Documented Safety Analysis or Decision Support Application
DSW	Directed Stockpile Work
EES	Earth and Environmental Science
EISA	Energy Independence and Security Act
EM	Environmental Management or Emergency Management
EM	Environmental Management

EMCF	Energetic Materials Characterization Facility
EMS	Environmental Management System
ENV	Environmental
EO	Emergency Operations or Executive Order
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ER	Environmental Restoration
ESH	Environmental Safety and Health
ESPC	Energy Savings Performance Contracts
ET	Emerging Threats
ETA	Eastern Tech Area
EWMO	Environmental Waste Management Operations
FDP	Federal or Facilities Disposition Program
FEL	Free Electron Laser
FIRP	Facilities and Infrastructure Recapitalization Program
FMD	Fissile Material Disposition
FOD	Facility Operations Division or Director
FT2	Square Foot
FY	Fiscal Year
FYNSP	Future Year Nuclear Security Plan
GFCI	Ground-Fault Circuit Interrupter
GHG	Green House Gas
GIS	Geographic Information System
GP	Guiding Principles
GPP	General Plant Project
GS	Global Security
GSF	Gross Square Foot
GTRI	Global Threat Reduction Initiative
HAZ	Hazardous
HE	High Explosives
HED	High-Energy Density
HEU	Highly Enriched Uranium
HILL	High Intensity Laser Laboratory
HRL	Health Research Laboratory
HP	Health Physics
HPAL	Health Physics Analysis Laboratory
HPC	High-Performance Computing
HPSB	High Performance Sustainable Buildings
HR	Human Resources
HRL	Health Research Laboratory
HS	Office of Health and Safety or Homeland Security
HVAC	Heating, Ventilation, and Air Conditioning
IAEA	International Atomic Energy Agency
IAT	International Applied Technology
ICF	Inertial Confinement Fusion
IDC	Intelligence, Defense, and Counterterrorism
IGPP	Institutional General Plant Project
IH	Industrial Hygiene
IHS	Industrial Hygiene and Safety
IMPC	International Material Protection and Cooperation
IOD	Infrastructure on Demand
IP	Individual Permit
IPF	Isotope Production Facility
IN	Office of Intelligence
IRM	Information Resource Management
IS&T	Information, Science, and Technology
ISR	International Space and Response
IT	Information Technology
IVML	In Vivo Measurement Laboratory
JTOT	Joint Technical Operations Team
LAC	Los Alamos County
LACP	Los Alamos controlled publication
LANL	Los Alamos National Laboratory (or the Laboratory)
LANS	Los Alamos National Security, LLC

LANSCE	Los Alamos Neutron Science Center
LASL	Los Alamos Scientific Laboratory
LAUR	Los Alamos unlimited release
LDCC	Laboratory Data Communication Center
LED	Light-Emitting Diode
LEDA	Low-Energy Demonstration Accelerator
LEED	Leadership in Energy and Environmental Design
LEP	Life-Extension Program
LEU	Low Enrichment Uranium
LFO	LANSCE Facility Operations
LINAC	Linear Accelerator
LLNL	Lawrence Livermore National Laboratory
LLW	Low-Level Liquid Waste
LRIDP	Long-Range Infrastructure Development Plan
LSS	Lean Six Sigma
Lujan Center	Manuel Lujan Neutron Scattering Center
M	Million
M4	Modeling, Measuring, and Making Materials
MAR	Material at Risk
MaRIE	Matter-Radiation Interactions In Extremes
MBA	Material Balance Area
MDA	Material Disposal Area
MET	Manufacturing, Engineering, and Technologies
Metropolis Center	The Nicholas C. Metropolis Center for Modeling and Simulation
Mo	Molybdenum
MPA	Materials Physics and Applications Division
MPDH	Multipurpose Diagnostic Hall
MSL	Materials Science Laboratory
MST	Materials Science and Technology
MT	Megaton
MTS	Materials Test Station
MW	Mega Watt or one million watts
NASA	National Aeronautics and Space Administration
NCIRP	Nuclear Counterterrorism Incident Response Program
NCP/T	Nuclear Counter-Proliferation Terrorism
NEN	Nuclear Engineering and Nonproliferation
NEPA	National Environmental Policy Act
NF	Nuclear Facility
NFPA	National Fire Protection Association
NHL	National Historic Landmark
NHMFL	National High Magnetic Field Laboratory
NHPA	National Historic Preservation Act
NIF	National Ignition Facility
NIH	National Institute of Health
NIS	Nonproliferation and International Security
NISC	Nonproliferation and Internal Security Center
NL	Norton to Los Alamos
NMED	New Mexico Environmental Department
NMSSUP	Nuclear Materials Safeguards and Security Upgrades Project
NNSA	National Nuclear Security Administration
NSSB	National Security Sciences Building
NNS	Nuclear Nonproliferation and Security
NNSS	Nevada National Security Site
NPDES	National Pollutant Discharge Elimination System
NPR	Nuclear Posture Review
NPS	National Park Service
NSE	National Security Enterprise

NSF	Natioanl Science Foundation
NTOF	Neutron Time of Flight
OI-PO	Operations and Infrastructure Program Office
OPS	Operations
OSH	Occupational Safety and Health
OSRP	Off-site Source Recovery Program
P	Physics
PAD	Principal Associate Directorate
PADCAP	Principal Associate Directorate for Capital Projects
PADOPS	Principal Associate Directorate for Operations and Business
PC	Performance Category
PCB	Polychlorinated Biphenyl
Permit	Hazardous Waste Facility Permit
PF	Plutonium Facility
PIDAS	Perimeter Intrusion Detection and Alarm System
PHERMEX	Pulsed High-Energy Radiographic Machine Emitting X-Rays
PLC	Programmable Logic Controller
PNM	Power Company of New Mexico
PPE	Personal Protective Equipment
pRAD	Proton Radiography
PS	Physical Security
Pu	Plutonium
QPA	Quality and Performance Assurance
R&D	Research and Development
RANT	Radioassay and Nondestructive Testing
RC	Radiological Campus
RCO	Radiological Chemistry Operations
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
RL	Reeves to Los Alamos
RLUOB	Radiological Laboratory Utility Office Building
RLW	Radioactive Liquid Waste
RLWTF	Radioactive Liquid Waste Treatment Facility
RLWTF-UP	RLWTF Upgrade Project
RM	Risk Mitigation
ROD	Record of Decision
RP	Radiation Protection
RPV	Replacement Plant Value
RSL	Radioanalytic Services Laboratories
RTBF	Readiness in Technical Base and Facilities
S&S	Security and Safeguards
SAFER	Seismic Analysis of Facilities and Evaluation of Risk
SAS	Secondary Alarm System
SCC	Strategic Computer Complex
SCI	Sensitive Compartmentalized Information
SCIF	Sensitive Compartmentalized Information Facility
SERF	Sanitary Effluent Reclamation Facility
Sigma	TA-03 building 66
SIT	Security Investigation Team
SLD	Second Line of Defense
SM	South Mesa
SNM	Special Nuclear Material
SOC	Protection Force, not an Acronym
SOS	Science of Signatures
sq	square
SSP	Site Sustainability Plan or Stockpile Stewardship Plan
START	Strategic Arms Reduction Treaty
ST&E	Science, Technology, and Engineering
STO	Science and Technology Operations
SWEIS	Site-Wide Environmental Impact Statement
SWMU	Solid Waste Management Unit
SWWS	Sanitary Waste Water System
TA	Technical Area

TLW	Transuranic Liquid Waste
TRP	TA-55 Reinvestment Project
TRU	Transuranic
TWF	TRU Waste Facility
UCN	Ultra-Cold Neutron
U&I	Utilities and Infrastructure
UPS	Uninterruptible Power Supply
US	United States
VAP	Vehicle Access Point
VoIP	Voice-Over Internet Protocol
VTR	Vault-Type Room
WCRR	Waste Characterization, Reduction, and Repackaging
WETF	Weapons Engineering Tritium Facility
WFO	Work for Others or Weapons Facility Operations
WIPP	Waste Isolation Pilot Plant
WM	Waste Management
WMD	Weapons of Mass Destruction
WME	Weapons of Mass Effect
WMESF	Weapons Manufacturing and Engineering Support Facility
WNR	Weapons Neutron Research
WP	Weapons Plant
WTA	Western Tech Area
XFEL	X-Ray Free Electron Laser
ZLD	Zero Liquid Discharge

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