U.S. Department of Energy
Categorical Exclusion Determination Form

Proposed Action Title: ALS-U Installation and Operation at the Lawrence Berkeley National Laboratory LB-CX-18-02

Program or Field Office: Berkeley Site Office

Location(s) (City/County/State): Berkeley, California

Proposed Action Description:

Under the ALS Upgrade (ALS-U) project, the U.S. Department of Energy (DOE) proposes to provide the 25-year-old Advanced Light Source (ALS) synchrotron facility at the Lawrence Berkeley National Laboratory (LBNL) with new world-leading light source capabilities (see Figure 1). Recent accelerator technology breakthroughs would enable the ALS-U to produce a thousand-fold increase in soft x-ray brightness while operating within the general accelerator beam energy parameters of the original ALS.

The ALS occupies the majority of space in the largely open, circular interior of Building 6 (see Figure 2). In the machine's center are a linear accelerator and booster synchrotron ring; these produce and accelerate the electrons comprising the hair-thin beam to 0.99999996 light speed. The electron beam travels from the booster ring to the encompassing 200-meter "storage ring" – a vacuum tube surrounded by magnets that guide the electrons through their continuous curved trajectory. The storage ring is encased in protective concrete shielding on all sides forming a structure called the shielding "tunnel." Outside of the storage ring tunnel is the ALS "Experimental Floor," an area occupied by 42 "beam lines." The beam lines radiate out obliquely from the storage ring and terminate at individual research work or "end stations." Accelerated electrons are magnetically manipulated in the storage ring so as to emit intense wavelengths of spectral light (e.g., soft x-rays); this light is channeled through the beam lines into the end stations for research and experimentation. This would continue to be the case under ALS-U operations.

The ALS was the subject of a NEPA Environmental Assessment and Finding of No Significant Impact in 1989 (DOE/EA-0367); the original NEPA analysis and approval considered the ALS primary beam as operating at up to 2 billion electron volts (GeV). The current ALS is authorized to use a maximum stored circulating electron beam current of 550 mA at a maximum electron energy level of 1.9 GeV. The ALS-U would continue to use a stored circulating beam of up to 550 mA but would raise the beam energy to 2.0 GeV (as per the original NEPA approval). Radiation external to the shielding would not be increased above current levels as a result of the higher energy.

The upgrade would retain the ALS' existing buildings, storage ring tunnel and shielding, linear accelerator, booster synchrotron ring, beamlines, and infrastructure to provide a state-of-the-art facility at a fraction of the cost of new construction. The major components of the ALS-U project upgrades are (see Figure 3):

- The existing ALS storage ring would be removed and replaced with a new, high-performance ring utilizing a multi-bend achromat (MBA) lattice technology. The new MBA-enabled storage ring would have the same general length and configuration as its predecessor (approximately 200 meter circumference), but its central vacuum chamber would be much narrower in cross- section (about 5 cm^2 vs. ≤254 cm^2). The new storage ring vacuum chamber would be lined with a greater number of bending and focusing magnets than the current ring.

- A new secondary ring – an accumulator ring – would be introduced within the storage ring area. This 180-meter-long, ≤33 cm^2-gauge ring would serve as a parallel "side track" to allow exchanges of accelerated electron bunches between itself and the main storage ring. Both rings would fit within the existing storage ring shielding tunnel.

- Existing beamlines would be outfitted with upgraded optics (e.g., light focusing instrumentation) to accommodate the ALS-U enhancements. Some beamlines may be slightly realigned, as needed. Up to three new "undulator" beamlines would be added to the Experimental Floor to replace up to two existing beamlines that would be removed.

- Some aging infrastructure systems within the facility may be updated or upgraded during the ALS-U construction period to take advantage of the facility's lengthy operational "down time." These may include preventative maintenance to and/or replacement of HVAC, electrical, and plumbing components within the affected portion of Building 6.

No structural changes would be made to Building 6; almost all of the new ALS-U components would be contained within the existing permanent shielding tunnel and Experimental Floor. Air and penetrating radiation emissions would not increase under this project and existing shielding would continue to provide fully adequate protection. All other potential hazards associated with operation of the ALS-U are expected to be consistent with and bounded by hazards already managed for the ALS, including those involving electrical, fire, seismic, cryogenic, and chemical use risks. Waste streams, including chemical, radioactive, and mixed wastes, are not expected to change in character or quantity. Existing safety systems, management, protocols, and oversight would continue under ALS-U operations, as would strict adherence to all applicable DOE and regulatory requirements.

ALS-U operational activities would remain the same as with the ALS: hours and days of operation would not change; water and electrical power consumption would remain the same or may slightly decrease; staffing and guest user levels and related vehicle trips are not expected to increase.

Project construction is expected to begin around 2021 and to end approximately 4 years later (around 2025). Up to 50-60 workers would be on site at any one time; 80 total trucks trips are expected over the construction period for the transportation of materials, equipment, and debris. An estimated 46,000 square feet of nearby exterior, paved space would be used for lay-down, staging, loading, and debris bins (see Figure 4). Over the course of the construction period, equipment is expected to include up to two overhead bridge cranes, forklifts and tugs, delivery trucks, and small equipment, such as air hammers, concrete saws, air casters, torches, and grinders, the latter being used mostly indoors. All established LBNL "Special Project Features" would be followed to minimize any environmental consequences related to ALS-U construction. Construction debris would be characterized per LBNL protocols and transported to appropriate reuse, recycling, or disposal facilities.

LBNL is a DOE National Laboratory located on 202 acres owned by the University of California (UC or the University); LBNL straddles the border between the cities of Berkeley and Oakland in the east bay hills of Alameda County. Most of the facilities on the site are owned or in the service of DOE. LBNL is managed and operated by the University under contract with DOE.

The ALS resides in Building 6 in the geographic center of the LBNL main site (see Figure 1). It is surrounded by laboratory and shop buildings to the north and east; LBNL roads, support structures, and open space to the south; and LBNL roads, open space, and employee service areas to the west. The 120,000 gross square foot (gsf) building was constructed around the extant 184-inch Cyclotron facility during the early 1990s and retains the original building's iconic domed roof (see Figure 1). Total ALS staff is around 200 people, but the machine also attracts many temporary guest users. None of the structures in the area of potential effect (including Building 6) are listed on or have been found potentially eligible for listing on the National Register of Historic Places. While groves of trees, including designated visual "screening" trees, exist in the vicinity of Building 6, none exist within the immediate project or construction lay-down areas. Similarly, there is no natural vegetation or wildlife habitat within the Building 6 footprint or the project laydown areas.

If additional space were needed for temporary storage and/or staging/assembly of construction materials, warehouse space (likely along the nearby interstate-80 industrial corridor) might be leased to accommodate those needs. Any such activities would conform with local zoning and land use regulations as well as DOE and LBNL safety requirements and practices. All leases undertaken by DOE are subject to NEPA review at the time they are proposed.

Categorical Exclusion(s) Applied:

B1.6 – Asbestos Removal

B1.7 – Polychlorinated biphenyl removal

B1.23 – Demolition and disposal of buildings

B1.31 – Installation or relocation of machinery and equipment

B2.5 – Facility safety and environmental improvements

B3.6 – Small-scale research and development, laboratory operations, and pilot projects

B3.10 – Particle Accelerators

For the complete DOE National Environmental Policy Act regulations regarding categorical exclusions, including the full text of each categorical exclusion, see Subpart D of 10 CFR Part 1021.

Regulatory Requirements in 10 CFR 1021.410(b): (See full text in regulation)

☒ The proposal fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D.

To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.

☒ There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal.

☒ The proposal has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

I concur that the above description accurately describes the proposed action.

LBNL Environmental Planner: J. Phillber — Date Determined: 5-17-18
Jeff Philliber

I concur that the above description accurately describes the proposed action.

BSO Project Manager: — Date Determined: 5/17/18
Hannibal Joma

The above description accurately describes the proposed action, which reflects the requirements of the CX cited above. Therefore, I recommend that the proposed action be categorically excluded from further NEPA review and documentation.

BSO NEPA Program Manager: Sue Fields — Date Determined: 5/18/18
Susan Fields

Based on my review of the proposed action, as NEPA Compliance Officer (as authorized under DOE Order 451.1 B), I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

NEPA Compliance Officer: — **Date Determined:** 5/30/2018
Peter R. Siebach

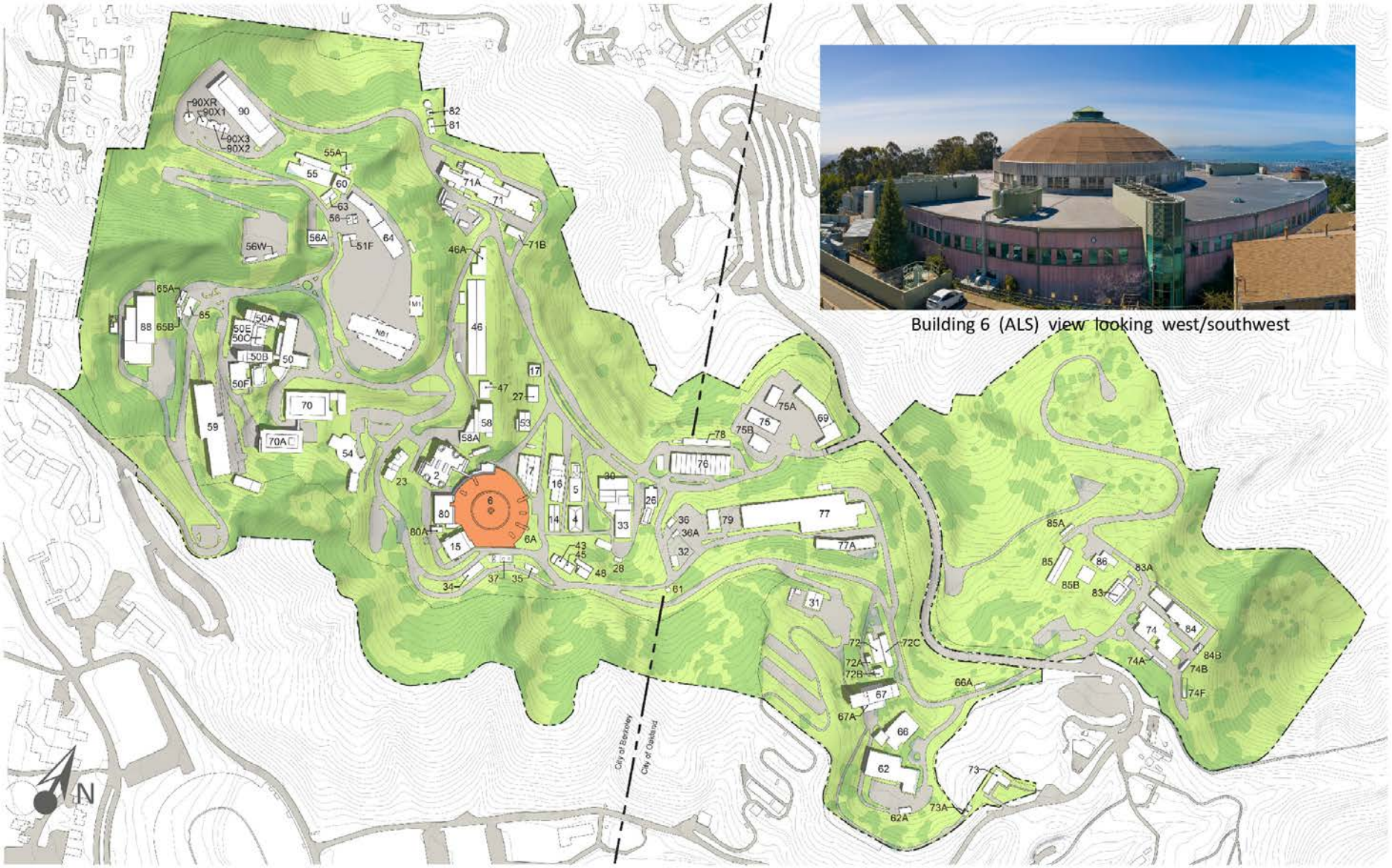

FIGURE 1: Location

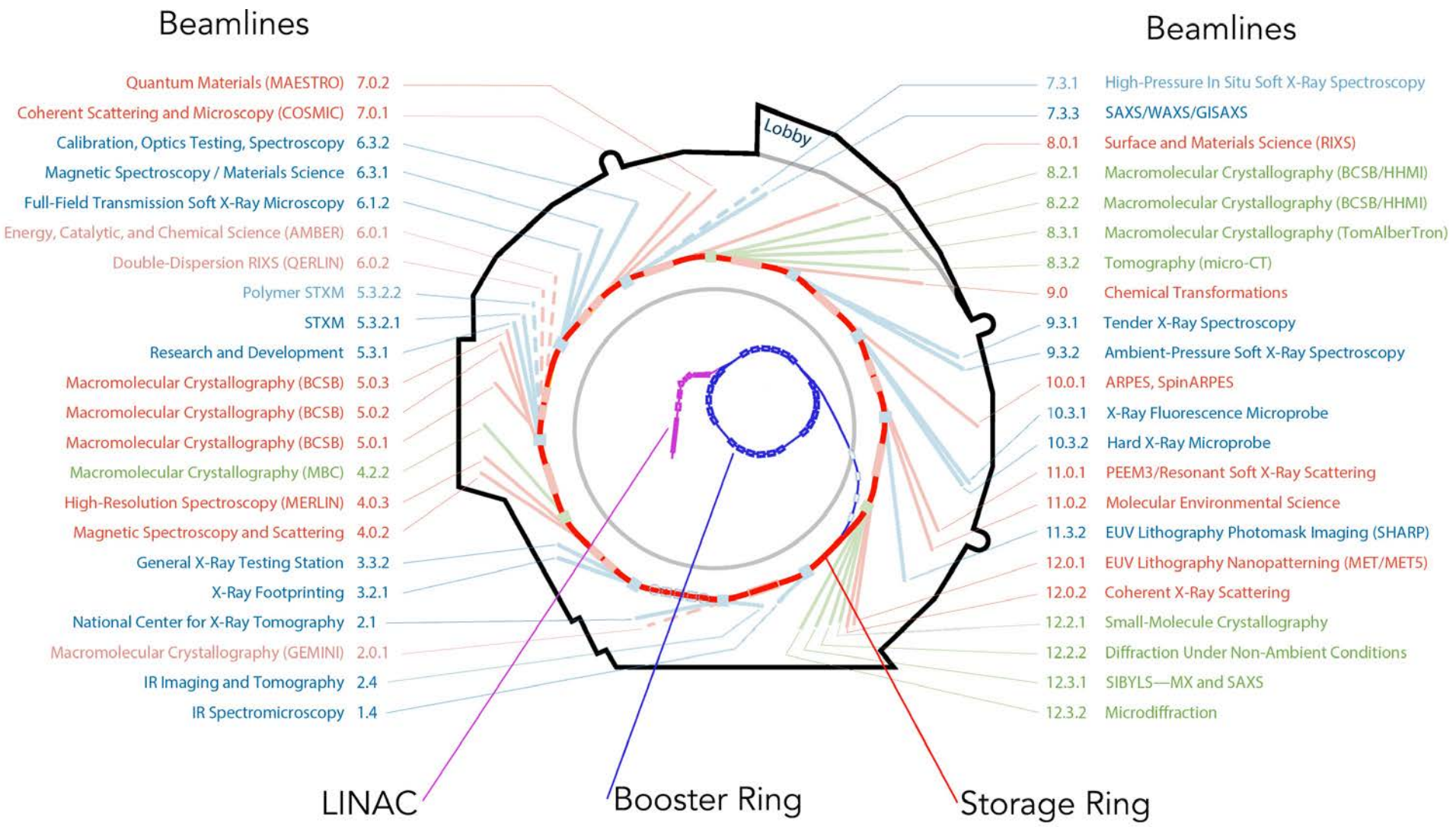

Figure 2: ALS “Beamclock” Layout

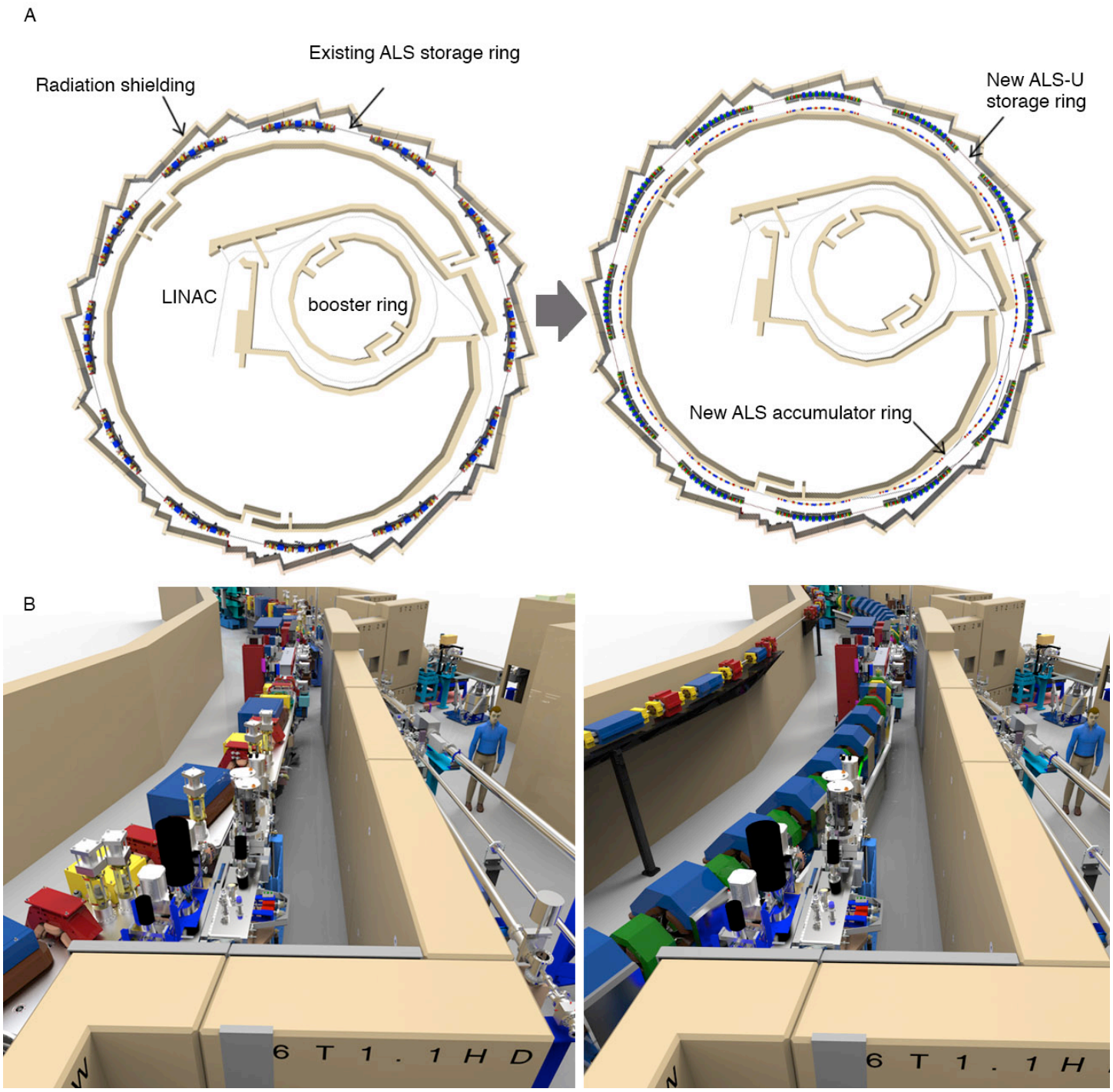

FIGURE 3: ALS / ALS-U Side-by-Side Comparison

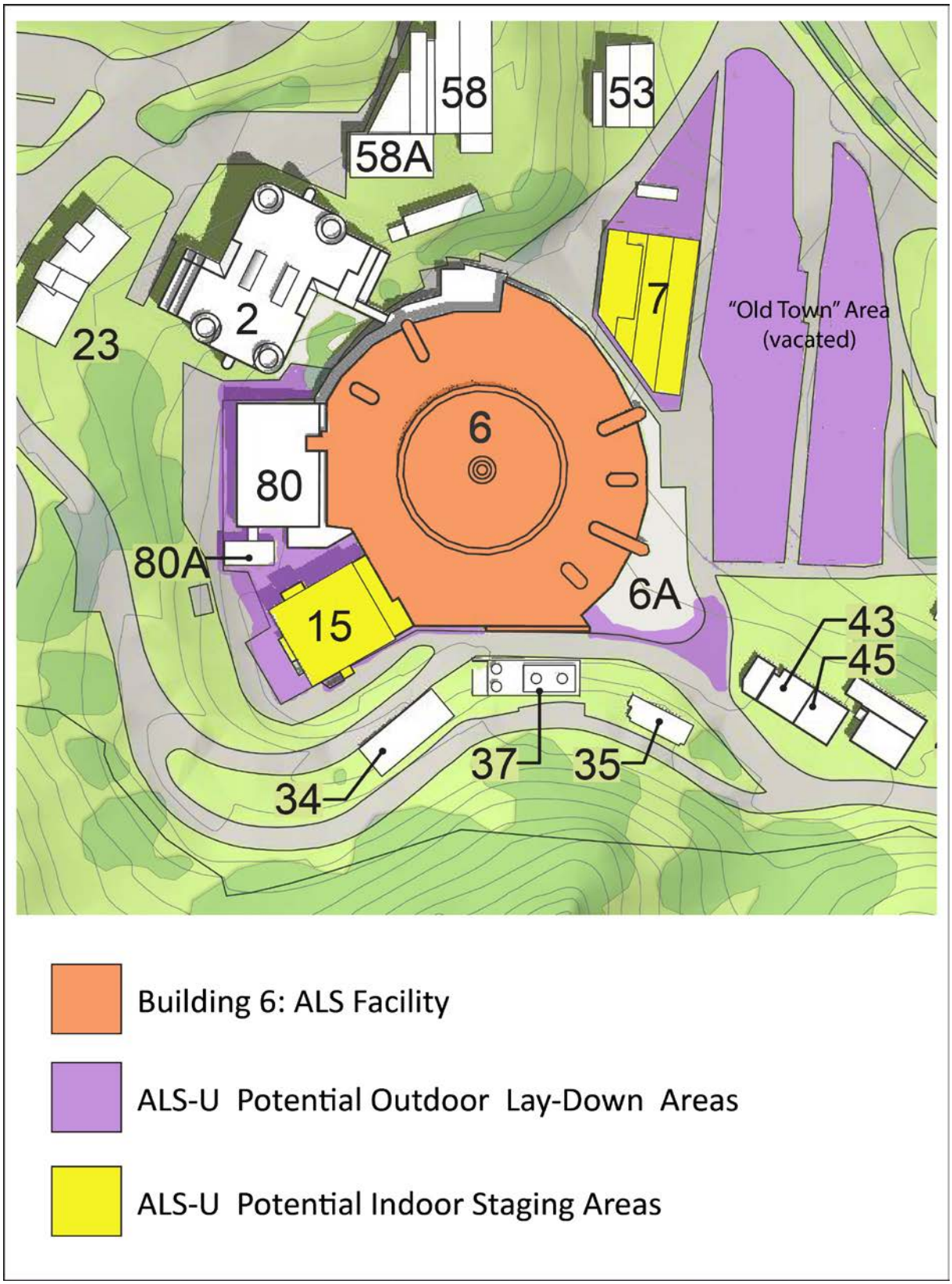

Figure 4: ALS-U Main Laydown and Staging