

## Report of the Management Subgroup

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A comprehensive review of the management of the Deep Underground Science and Engineering Laboratory, DUSEL, is described in the Homestake Conceptual Design Report (CDR) <http://www.lbl.gov/nsd/homestake/>. The planned development has several parts:

1. The conversion of the Homestake mine to the Interim Laboratory (The Sanford Lab) down to the 4850L and the operations for an early suite of experiments,
2. The pre-construction planning,
3. The construction of the Deep Underground Science and Engineering Laboratory from the surface 4850L to the 8000L, expansion of the 4850L campus and other levels, and concurrent operations of the facility
4. The creation of an Education and Outreach Center and
5. The operation of the completed laboratory.

Several open questions identified during the workshop will have to be resolved later in the development of the Laboratory.

**The Homestake Interim Laboratory** (the Sanford Underground Science and Engineering Laboratory, or simply the Sanford Lab) is funded with State and private moneys. The State of South Dakota has appropriated \$35 million, there is an existing Federal Grant of \$10M, and philanthropist T. Denny Sanford has pledged \$50 million for the development of Homestake Interim Laboratory. With these funds the Homestake mine will be converted into a functioning laboratory and operated for experiments. The mine has been transferred to the State of South Dakota for dedicated use as a scientific laboratory. A major milestone for the Sanford Laboratory is the beneficial occupancy of the mid-levels of the facility in 2008 when the implementation of the early scientific and engineering investigations will commence.

The Sanford Laboratory is operated by the South Dakota Science and Technology Authority, SDSTA. While the Laboratory facility receives its funds through the Authority, funding for the early experiments will likely be borne by traditional sources, including the National Science Foundation and the Department of Energy. The Authority funding will support facility management, operations, and site services until about 2011 when federal funding is expected both for the construction of the DUSEL through the NSF Major Research and Facilities budget line and for the operations. A Program Advisory Committee exists and has already commented on an early suite of experiments solicited through the call for Letters of Interest.

The organizational structure for the Sanford Laboratory has two components:

- 1) Management of the reentry, rehabilitation and operations is provided by the South Dakota Science and Technology Authority. The principal functional units

include project management, user support, and facility operations and maintenance. To emphasize the importance of the environment, health, and safety function, the ES&H unit reports directly to the Executive Director of SDSTA.

2) The engineering, integration, and scientific oversight of the early scientific program are provided by the SDSTA with significant assistance from LBNL prior to the Preconstruction Planning funding. It is emphasized that the efforts for the early scientific program are closely coordinated with the efforts in establishing the DUSEL proposal and its initial suite of experiments. The DUSEL facility development is managed through UC Berkeley, LBNL and SDSMT. The roles and responsibilities are described in a memorandum of understanding between LBNL and the SDSTA.

The current collaboration of the UC Berkeley, LBNL, the SDSMT, and the scientific community with the Homestake Sanford Laboratory, will provide a starting point for the organization of the future development of DUSEL facilities and operations. The collaboration is open and welcomes additional participation and new membership.

**The Pre-construction Planning** funds from the NSF were awarded in September 2007 in the amount of \$15 million distributed over three years. A cooperative agreement was executed between the NSF and the University of California, Berkeley to prepare the preliminary design for the DUSEL facility. Prior to the initiation of construction, the science and engineering staff at LBNL will develop the initial design for surface and underground infrastructure, excavation, and underground construction. Pre-construction planning for the initial suite of DUSEL experiments is not included in the existing cooperative agreement. The process for the DUSEL experiments will be initiated with the NSF "Solicitation 4" to be announced soon. A major milestone is a recommendation by the National Science Board for the initiation of construction and the federal support for the operations of the DUSEL, expected no earlier than FY 2011.

Operation of the Interim Laboratory described above will be concurrent with the Pre-Construction Planning.

**Construction of the Deep Underground Science and Engineering Laboratory** will commence with a detailed design and follow with the rehabilitation, excavation and services from the surface to the 8000 L. The project management and systems engineering functions developed during preconstruction planning will move from LBNL to Homestake as soon as the appropriate expertise exists at the site. It is expected that the design of the underground excavation, the underground and surface facilities will be contracted to architect/engineering firms and to construction/management firms. This would avoid the in-house employment of engineers and other staff during the period of design and construction but who will no longer be needed after construction is complete. Scientific investigations will continue during construction of the DUSEL facility. Operations of the NSF's DUSEL will be concurrent with the construction of the initial suite of experiments. A major milestone is the beneficial occupancy of the deep laboratory to the 8000 Level four years after the commencement of construction. The initial suite of experiments will likely involve installations at several levels in the facility

and can begin nearly contemporaneously with the facility construction at some levels, while the deep levels will require an additional 18 months following the reentry to the 8000 Level. .

An **Education and Outreach** center will be integral with the engineering and science program from the very beginning. T. Denny Sanford contributed \$20 million for the creation of the Sanford Center for Science Education (in addition to \$50 million for the Sanford Laboratory). Plans for constructing and operating the Center are underway.

The proposed management of the operation of the completed laboratory was compared to that developed during the S1 process for a single-site laboratory. They were very similar.

The S1 study recommended that the laboratory program should be managed by scientists and engineers, that the managing organization should have strong links to the science and engineering community, and that the laboratory facilities should be open and accessible to all those authorized by laboratory. All of these are incorporated in the currently planned organization.

The structure of the organization is now dictated by the selection of Homestake and the desires of the owner, SDSTA. At the time of the S1 study it was not known whether there would be concurrent mining operations with the DUSEL program or whether there would be a single site or multiple sites managed by the same central structure. With the selection of Homestake these are now resolved. We have a single site dedicated to research with perhaps small associated satellite operations at other laboratories like WIPP and cooperative efforts with foreign laboratories.

The functions of the laboratory foreseen in the S1 study are almost all included in the proposed Homestake structure. For example the laboratory will build, equip, maintain and operate the underground facilities; employ an expert in-house staff to participate in experiments and be a resource to the laboratory; be a technical resource to the scientific community by organizing workshops and operating a low background counting facility. One function not explicitly included is the conduct of an R&D program for technology development.

The interface between the Laboratory and the site owner, the SDSTA, is defined in a memorandum of understanding. Environment safety and health functions are the responsibility of the Laboratory. Liability for these and other hazards rest with the Laboratory. The Laboratory will excavate the drifts and caves, and provide common services and infrastructure such as access, electricity, water, ventilation for both underground and surface space.

Several open questions emerged during the workshop. One was the coordination of the Laboratory with other underground sites, with other laboratories and with funding agencies. For example a neutrino beam will presumably be built at Fermilab, supported by the DOE, and pointing to the Homestake DUSEL laboratory supported by NSF. A large detector at the Homestake may be funded in its entirety or in part by the DOE for

neutrino physics and proton decay. Many experiments in progress at existing laboratories receive support by the DOE but they will move to the NSF supported DUSEL. Except for related committee recommendations, discussions on the future coordination of these activities have yet to begin. There is a precedent of support of activities by one of these agencies at laboratories funded by the other. For example the NSF has strongly supported research at DOE accelerator facilities and the DOE supported research at the NSF supported Cornell Electron Synchrotron. There is a strong partnership between the two agencies at CERN's Large Hadron Collider.

A second open question is the role of DUSEL in the development, construction and deployment of experiments. There is yet no funding planned for the review and integration by the Laboratory of experiments to be performed at the DUSEL. Furthermore, there is not yet a plan to use Laboratory expertise in R&D, engineering, and management for the development and construction of major pieces of experimental apparatus. For example, a large detector (~ 55m diameter) would likely strain the engineering and managerial resources of a university group. The practices at existing National Laboratories in the United States and CERN serve as models for DUSEL; they provide resources without which many activities would be very costly and in some cases completely impractical. Incorporation of these resources will enlarge the facility operations support requirements beyond those presented in the Conceptual Design Report.

A third open question is the expansion of the Program Advisory Committee. The DUSEL initial suite of experiments will include proposals from many disciplines and some proposals will be large and complex. Each discipline may require several members on the Committee who work in sub-panels that report to the full Committee.

In conclusion, the steps from the conversion of the Homestake mine to a functioning Deep Underground Science and Engineering Laboratory are described on the Conceptual Design Report. EH&S activities will be built into the Laboratory from the very beginning. With a few exceptions, the proposed management of the completed laboratory is similar to that developed during the S1 process. Unresolved issues have been identified which will have to be resolved as the laboratory develops. The organization for the experimental program is yet to be defined but the NSF "Solicitation 4" is expected to lead to its rapid development. Interagency cooperation in the conduct of the DUSEL program should follow.