EARTH SCIENCES DIVISION

EH&S SELF-ASSESSMENT REPORT

JULY 1, 2006 – SEPTEMBER 30, 2007

OCTOBER 15, 2007

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DIVISION OVERVIEW

The Earth Sciences Division (ESD) at Berkeley Lab performs fundamental and applied geosciences research related to subsurface energy resources, nuclear waste disposal, environmental restoration and ecology, and climate change. ESD maintains experimental (laboratory and field) and computational core-capabilities in the disciplines of vadose and saturated zone hydrology, fracture hydrology, atmospheric and ocean sciences, petroleum and geothermal reservoir engineering, seismic and electromagnetic geophysics, isotope geochemistry, microbiology and bioremediation technology, and rock and soil physics.

Each ESD staff member belongs to a Resource Department (Geophysics, Hydrogeology, Geochemistry, Climate Science, and Ecology) aligned with their professional expertise, which also serves as their administrative home. Department Heads are responsible for safety, staffing, promotions, and training matters. Departments are further divided into Research Areas, each with a scientific focus, led by a Research-Area Leader. Departments provide the people and the facilities to do the research, but do not control research funds. Administrative support is provided by Division Support Staff, led by ESD's Business Manager.

Research in ESD is conducted within six Programs (Nuclear Waste, Energy Resources, Fundamental and Exploratory Research, Environmental Remediation and Water Supply, Climate and Carbon Sciences, and Geologic Carbon Sequestration) that are aligned to our major DOE funding sources. Each Program is lead by a Program Head who is the principal point-of-contact between ESD researchers and DOE, and has a major responsibility for sustaining and building programs. Research-Area Leaders (described above) and Program Coordinators (if appointed by a Program Head) may also share in program responsibility. Every member of the ESD scientific/technical staff is assigned to work on one or more projects in these six Programs. Projects are led by one or more Principal Investigators (PIs), who typically develop the research proposal and obtain the funding contract. Employees typically work on more than one project during a fiscal year, and as a consequence often work under the direction of more than one PI. In addition, an employee can be a participant on one project and the PI for another project. Regardless of how many projects an employee works on or leads, that employee has only one administrative Supervisor, or Supervisor of Record as listed in Human Resources.

ESD SELF ASSESSMENT

The remainder of this report responds to the questions posed in the "Guidance for Performing FY07 ES&H Division Self Assessment" from 7/10/2007, relating to each of the five ISM core functions. The solid round bullets paraphrase the specific question. A list of acronyms can be found at the end of the report.

ISM CORE FUNCTION 1: DEFINE WORK

E1. *Revise Division ISM plan to reflect a) ES&H policy changes, and b) updates to the Institutional ISM plan. Line management communicates updates to the plan to division personnel*

- Review ISM Plan, address all updates:

– ESD'S Integrated Safety Management (ISM) Plan was revised, incorporating recent changes to Pub 3000. Specifically the following revisions were made:

1. The safety walkaround program was changed to be consistent with Pub 3000, Chapter 1. The ISM Plan specificies types of walkarounds, frequency, and responsible staff. Training will be conducted in the Fall of 2007.

2. The ergonomic program was changed to incorporate the role of Ergo Advocate, and explicitly state frequency of ergonomic evaluations for different employees.

3. The link to Pub 3000 Section 1.3.2 was included with the description of Division Safety Coordinator responsibilities.

- Communication of ISM Plan changes to entire division

  The approved Plan has been distributed to Division Council (Dept. Heads, Program Managers), Division Safety Committee, and posted to the ESD ES&H website (http://www-esd.lbl.gov/ESDEHS/safety_plan/index.html). DSC met one-on-one with DD to review plan updates. The Plan will also be presented at the next ESD Town Hall Meeting and posted to the next ESD ES&H newsletter. All ESD staff members and guests are required to read and understand the Plan.

- Effectiveness of ISM Plan change communication:

  Cannot be evaluated yet, as not all communication efforts have been completed.

Noteworthy accomplishments in the ISM core function *Define Work*:

✓ The Division Director (DD) supports the Division's safety program, and leads through articulating ES&H vision and expectations at all divisional and department level gatherings and during facility walk throughs. In FY07, ESD's Acting Director made it a priority to emphasize safety 24/7, and to encourage staff to see safety as an integral part of their daily lives, and not merely a job requirement. This message was communicated in ESD Level 1 emails, and at Town Hall meetings. This approach has been used in Industry with positive results. It could be applied in EH&S training classes by including examples that apply ES&H practices outside of the Berkeley Lab.

✓ ES&H is a standing agenda item at quarterly Town Hall meetings as well as weekly Division Council meetings. The DSC submits a quarterly ES&H report to Division Council. The DD participates in the Division Safety Committee meetings on a quarterly or more frequent basis.

✓ The ESD Health and Safety Web Page is continually updated. ES&H information is sent ESD Level 1 on a quarterly basis, and is used for Departmental/Group safety discussions.

✓ A special meeting of ESD Shop Users was held in mid-September to institute the requirements of Pub 3000, Chapter 25 on Shop Safety and Power Tools. A shop manager was designated to authorize users. All users are required to read Chapter 25

Opportunities for improvement:

✓ Complete communication of ISM plan changes to division staff

✓ Revise ESD's ISM Plan to address the following:
- requirements in Pub 3000, Chapter 32, Job Hazards Analysis
- consistency with revised Institutional ISM Plan (once plan is available)

ISM CORE FUNCTION 2: IDENTIFY HAZARDS

E2. *Workspaces (including outside workspaces) are inspected/observed and evaluated on a regular basis.*

- Review of division inspection records:

  ESD conducted two management safety walkthroughs of all ESD space (office, shop and lab) with the DD, Division Safety Coordinator (DSC), Division Business Manager, and Labspace Lead PIs per ESD's ISM Plan. ESD conducted 4 quarterly SAA inspections (by the DSC and EH&S waste management specialist). The Ecology Department conducted 4 safety walkthroughs of their lab and office space.

- Inspection of workspaces per requirements in ISM Plan

  - Individuals performing the inspections are those defined in ISM Plan

  - Documentation per requirements of ISM Plan:

  - ESD's Safety Checklist (http://www-esd.lbl.gov/ESDEHS/index.html) is completed by all staff for their work areas before the management walkthroughs, and collected by the DSC at the time of the walkthrough. Staff are encouraged to perform peer-inspections beforehand to invite "fresh-eyes" to carefully evaluate workspace. All findings (approximately 50 low level findings) were entered into CATS by the DSC, and tracked to completion.

E3. *Divisions review work activities to identify, analyze, and categorize hazards and environmental impacts for the associated work.*

- Review of Division's hazard identification and inventory documentation

  - ESD's ISM Plan specifies several procedures to identify hazards, including Formal Work Authorizations, the Safety Review Questionnaire (SRQ), the Offsite Safety Environmental Protection Plan (OSSEPP), and through the responsibilities of the "Labspace Lead PI." The DSC maintains a list of "hazardous" equipment owned by ESD (http://www-esd.lbl.gov/ESDEHS/index.html, left sidebar "Hazardous Equipment Requirements"). This includes equipment that may not meet the thresholds listed in Pub 3000.

- The Chemical Management Database was reviewed by the DSC; cases where records had not been updated were identified and corrected. Legacy chemicals were requisitioned as hazardous waste.

- Review work activities to identify, analyze and categorize hazards consistent with Lab policy

  - An SRQ (http://www-esd.lbl.gov/ESDEHS/safequest.html) is completed by the PI of every proposed project, reviewed by the DSC, and referred to EH&S subject matter experts if necessary. This is part of the proposal initiation form (http://www-esd.lbl.gov/workplace_resources/esd_proposal_center.html)

  - An site-specific OSSEPP (http://www-esd.lbl.gov/ESDEHS/ossep.html) is prepared by the PI before conducting offsite field work. The OSSEPP identifies hazards and defines measures to reduce risks. This year, the generic OSSEPP was revised to incorporate identification of ergonomic hazards. The site-specific OSSEPP is read and signed by all participants in the field project. It is reviewed by the DSC, who determines if Subject Matter Experts are also required to review the document.

  - Every ESD lab has one designated Labspace Lead PI (LLPI) who is responsible for overseeing EH&S issues in the specific lab (http://www-esd.lbl.gov/ESDEHS/ labsafety.html). Any new work to be performed in a given lab must be discussed with the LLPI to identify hazards, and anyone working in a lab must meet with the LLPI before work commences.

  - Annual updates of the HEAR database are required (an ESD Inspection Checklist item). Chemical Inventory Database is reviewed as an ESD Inspection Checklist item. Both databases are periodically reviewed by DSC for accuracy and currency.

  - ESD staff and DSC contact EH&S Liaison and subject matter experts for guidance on new work and hazard evaluation.

- Inventory includes all of our workspaces

  - All workspaces were reviewed in the two Management walkthroughs. OSSEPPs cover off-site work. Off-site work sites are not inspected during walkthroughs.

E4. *Divisions review the environmental impact of their activities and participate in pollution prevention, energy conservation, recycling, and waste minimization programs.*

- The Environmental Review Checklist was completed by ESD's Business Manager

- Opportunities for improvement are identified below

- Opportunities for improvement are documented in this SA report

Noteworthy accomplishments in ISM core function *Identify Hazards:*

✓ The Ecology Department Head regularly performs safety walkarounds, each time asking a different staff member to accompany him. In FY07, walkthroughs were performed on 7/19/06, 11/3/06, 5/30/07 and 9/6/07. Findings are distributed via email, and 'validation of completion walkthroughs' are performed afterwards.

✓ A new benchtop neutralization procedure was approved by Waste Management for ESD researchers, minimizing waste generated, "Acid Waste Benchtop Neutralization for Rad Mixed Waste…".

✓ The photocopier in the Division Office defaults to double-sided copying

✓ ESD staff identified mercury manometers and barometers and these were disposed of as universal waste

Opportunities for improvement:

✓ Institute the Safety Walkthrough program per ESD's revised ISM Plan

✓ Revise ESD's ISM Plan to incorporate requirements for listing hazardous equipment that falls outside the scope of Pub 3000.

✓ Develop procedure for follow-up on SRQs for projects that receive funding, and annual reviews.

✓ Review settings for other copiers and printers throughout ESD to see where they could be set to double-sided copying/printing as default.

✓ Employees should seek more energy efficient computers when replacing them

✓ When feasible, employees should shut down equipment including computers when not in use..

✓ Distribute the Environmental Review Checklist more broadly

✓ Reconcile the Chemical Management System inventory using bar-code reader

ISM CORE FUNCTION 3: CONTROL HAZARDS

E5. *Divisions ensure administrative controls are in place and maintained. Examples of administrative controls include, Formal authorizations, Work procedures, Project safety reviews, Responsibilities for matrixed employees*

- Review of formally authorized work on schedule:

  The DSC checks the status of all Work Authorizations quarterly as part of the reporting to the DD, so that upcoming renewals are completed on schedule. All AHDs have been converted to the electronic system.

- Addressing changing in work scope:

Changes in work scope are captured for new projects by means of the Safety Review Questionnaire. Changes in work scope for field (offsite) projects require revision of the Offsite Safety and Environmental Protection Plan (OSSEPP). Changes in work scope in individual labs are captured in ESD inspection checklist item L3 "*Re-evaluate work for* **new hazards***- are there new procedures, personnel or equip? Is HEAR database current? Has* equipment or apparatus been modified or adapted** *in any way that may not be in compliance or safe?*" The checklist is completed before the management walkthroughs. All new work in a lab must be discussed with the Labspace Lead PI; this policy is posted on all ESD labs.

- All the above processes are described in ESD's ISM Plan.

E6. *Divisions ensure that ergonomic hazards (computer, laboratory, and material handling) are adequately controlled and that employees and line management are knowledgeable and engaged in this process, including the early reporting of ergonomic pain or discomfort (before an injury): Ergonomic issues/concerns/discomfort/pain are reported promptly for immediate corrective action*

- Implementation of ergonomic program per ESD's ISM plan:

  - Per ESD's policy, any employee can request an ergo evaluation, and all employees have an evaluation when they begin work in ESD, following a move, or at the first sign of discomfort, regardless of whether or not they meet the 4 hour/day of computer work threshold used in the JHQ. The ESD ISM Plan was revised at the end of FY07 to explicitly state that annual ergonomic evaluations be performed for staff who perform computer-intensive work, or have previously reported ergonomic discomfort. The number of ergonomic evaluations performed this year was almost double the number of the preceding year. The Division funds ergonomic furniture when project funds are lacking. Multiple channels are used to communicate ESD's ergonomic program and policy, including quarterly ESD Town Hall meetings (meeting last June highlighted "computer shortcuts"), ESD's quarterly ES&H Emails (http://www-esd.lbl.gov/ESDEHS/safety_emails.html) (Spring 2007 "computer shortcuts", Summer 2006 "early injury symptoms"). ESD's ES&H website (http://www-esd.lbl.gov/ESDEHS/ergo_info.html) describes ESD's ergonomic program and posts information from various sources – IT, EH&S (including the EH&S 1 minute 4 safety slides describing awkward positions, workload issues, guidelines for supervisors to check for early symptoms, and reminders to employees to report early signs). The website also includes ergonomic guidelines for laboratory and field work.

- Communication of importance of early reporting of ergonomic discomfort/workload management:

  - Ergonomics is frequently the topic of the safety discussions of the Division Council, including efforts to promote informal Supervisor check-ins with employees to detect early-warning signs of ergonomic injury and workload issues. Department Heads bring the topics of discussion from Division Council to their respective department discussions.

- In response to Dr. Chu's request for divisions to conduct ergonomic assessments last March, all ESD supervisors were instructed to visit their employees' workstations and learn of any ergonomic issues. This effort identified several staff members who subsequently had ergo evaluations and improvements to their workstations.

- Ergo training completion rate

  - EH&S 52 is not required for any ESD Staff. Eight staff members engaged in field work were offered a special ergonomic class by Ira Janowitz, and given credit for EH&S 62 "Worksmart Ergonomics".

  - EH&S 60 "Ergonomics for Computer Users" completion rate by ESD staff is 88% of those required to take it by their JHQ. It is anticipated that once the class is available online, the completion rate will improve.

- Timeliness of ergo evaluations & corrective actions

  - Out of 85 evaluations, the median time to perform the evaluation was 2 days. The longer times typically occurred when the ergo evaluator and employee had trouble making an appointment. For those reporting pain, the median time of 18 cases was 2 days, except in those cases where the ergo evaluator and employee had trouble making an appointment, or discomfort subsided.

  - Corrective action completion rate is 89%; significant time delays occurred due to the length of time to acquire furnishings and chairs, as well the iterative nature of some cases that required testing of different options before a solution was found.

- Review of Ergo Advocate Program

  - The DSC and one person from the ESD admin group were partially trained as ergo advocates. Neither has received credit for EH&S 61 "Ergonomic Advocate Training" because not all sessions were completed. ESD has continued to use the services of EHSD for routine ergo evaluations. In all other aspects, the safety coordinator provides the ergo advocate functions of advancing the division's ergo program, communication of ergo issues (via website, emails, meetings etc.), follows up on all ESD ergo cases to ensure implementation of the recommendations, and identifies staff who require more frequent evaluations. The DSC initiated the "ergo for fieldwork" class noted previously.

Noteworthy accomplishments in ISM core function *Control Hazards*:

- ✓ The hazard-analysis table of the OSSEPP was updated to include ergonomic hazards

- ✓ Ergonomic issues in field work were addressed in special training session

- ✓ 5 AHDs are available online

- ✓ ESD manages approximately 30 active OSSEPPs

Opportunities for improvement:

- ✓ Designate additional staff for ergo advocate training, who will also perform routine ergonomic evaluations.

- ✓ Develop a mechanism to follow-up on projects that receive funding (SRQ is completed for all projects at time of proposal).

ISM CORE FUNCTION 4: PERFORM WORK

E7. Work is performed within the ES&H conditions and requirements specified by Lab policies and procedures

- Assessment of SAA compliance:

  – All ESD SAAs are inspected quarterly by the Safety Coordinator and Waste Management Specialist. Results are communicated to the SAA custodians, LLPIs, and to ESD management. SAAs are also inspected during the management safety walkthroughs, and by LLPIs; they are an item on the ESD inspection checklist.

- Formal Work Authorizations:

  – ESD has 10 Rad and X-ray authorizations, and 5 AHDs. In addition, ESD has 31 'Offsite Safety and Environmental Protection Plans' for fieldwork.

- Work performed within scope of formal authorizations and hazardous work permits; assurance work is performed within scope:

  – All work authorizations undergo periodic review by the PI and designated signature authorities per the schedule prescribed by the authorization program. The safety coordinator reports the status of all authorizations to ESD management in ESD's quarterly ES&H report. Identification of new work and hazards is an item on ESD's Inspection Checklist, used during the DD's and LLPI's walkaround.

- No notices of violation from external regulatory agencies were received

E8. Staff is properly trained

- 87% of staff completed JHQ in past 12 months. (Out of 35 who have not taken the JHQ, 24 are guests and 6 are faculty)

- 86% required training completion rate. (out of 174 incomplete training records, about 38% of the courses not completed are for guests; 23 incomplete records are for EH&S 10 "Introduction to ES&H at LBNL" , 17 of whom are guests; 4 incomplete records are for courses not yet offered – EH&S 33 & 34)

– Records of incomplete training are reported to Division Council on a quarterly basis. An ESD Level 1 email was distributed to remind supervisors and employees to complete their JHQ and training, and to use the training profile in PRD discussions. DSC has contacted individual supervisors to address staff JHQ compliance and staff training requirements.

E9. Division ensures that student safety issues are effectively addressed.

- Policy on student safety is described in ESD's ISM Plan

- Assurance that students complete JHQ and required training:

    – Students' supervisors are responsible to ensure that their JHQ and required training are completed before working outside 'line-of-sight' of trained individual.

- Assure students are in safe work spaces and conduct work safely:

    – All ESD space and work is inspected through our safety walkthrough program to ensure safety of work spaces and practices.

- Completion of EH&S 24 ES&H for Mentors and Supervisors or EH&S 26 ES&H for Supervisors, Managers & PIs:

    – 78% of ESD staff required to take EH&S 26 have completed the course.

Noteworthy accomplishments in the ISM core function *Perform Work:*

- ✓ ESD's had 100% compliance of Waste Management's Quality Assurance waste samples

- ✓ The five ESD SAAs that were inspected by the City of Berkeley were all in compliance

- ✓ ESD has a 6 month limit on waste storage in an SAA, to ensure that no waste exceeds the lab's time limit

- ✓ Discussed student and guest safety at ESD's Town Hall at beginning of summer 2007

Opportunities for improvement:

- ✓ More involvement by Supervisors is needed to ensure their staff is trained, with special attention to guests. Training needs to be an explicit performance criteria. Increase in online training classes – particularly EH&S 10 and 60 – will greatly assist ESD in improving its training completion rate.

- ✓ JHQ and training compliance also needs to be addressed at the institutional level with regards to how guests and campus staff are incorporated into the statistics.

ISM CORE FUNCTION 5: FEEDBACK AND IMPROVEMENT

E10. ES&H deficiencies that cannot be resolved upon discovery are entered and tracked in CATS to resolution

- Documentation of findings from workspace inspections:

  – 55 CATS entries were made during the year during self-assessment activities. Entries were made within two weeks following the walkthroughs.

- Deficiencies identified from inspections, Self Assessments, SAARs etc. are entered into CATS in a timely manner:

  – The DSC is responsible for entering all items into CATS. Anything that requires tracking (not fixed within 24 hours) is entered into CATS.

- Opportunities for improvement identified in FY06 SA were addressed as follows:

  1. **Increase rate of training completion**

     – Efforts to improve the ESD's training completion rates included the following: The records of incomplete training were added to the quarterly ES&H report sent to Division Council. Individual supervisors were contacted to inform them of training deficiencies and opportunities for online training. An ESD Level 1 email was sent to inform Supervisors and Staff to complete training and discuss training profiles in PRDs, this was also a topic in one of ESD's ES&H newsletters. Nevertheless, training completion rates were essentially the same in FY07. Improvement will require more involvement by ESD supervisors, with particular attention to the records of their guests.

  2. **Improve SAA compliance rate**

     – More attention was given to communicating with SAA custodians during the quarterly SAA inspections, with positive results and improvement in the SAA compliance rate.

  3. **Improve efficiency of administrative aspects of safety program**

     – ESD Safety Coordinator and Business Manager worked to improve the administration of our safety program. We initiated an effort to put OSSEPPs online (still ongoing), ESD's ES&H website is updated regularly and is a repository for more information.

  4. **Enter lessons learned into new database**

     – ESD contributed one "lessons learned" to the database, involving a fire in a muffle oven.

  5. **Improve use of CATS for all corrective actions derived from lessons learned and SAARs.**

     – ESD entered issues relating to general facility safety, including slip hazards from accumulating pine needles, emergency lighting requirements, bldg 70A liquid nitrogen supply into CATS. CATS was also used to track completion of shop safety and machine guarding issues. Corrective actions arising from SAARs were completed in less than two weeks, and so were not entered into CATS.

6. **Minimize hazardous waste generation**
   – One new benchtop neutralization procedure was approved.

- CATS completion rate was 97%

- CATS on-time completion rate 60% (does not include CATS that generated work orders).

E11. Division employees report injuries and the division performs a thorough review of all staff injuries and accidents, including analysis of conditions that led to injury. Corrective actions to prevent recurrence are identified and effectively implemented

- Review of injury and accident reports *: 3 ergo first aid cases, one ergo recordable case, five other first aid cases (head bump, splinter, minor burn, bumped hand)*

- Process for investigating staff injuries and accidents

  DSC took EH&S 32 "incident review process and procedures". Process is according to LBNL requirements: for all ES&H incidents, DSC supports Supervisor to hold a meeting with employee, supervisor, DSC, EH&S liaison, subject matter expert(s) when needed, to understand causes and develop corrective actions. For recordable injuries, a tap-root analysis is performed, with an individual trained in tap-root analysis. ESD policy is to notify Department Heads of all injuries in their department, and Safety Committee reviews any incidents in their monthly meetings.

- Process is detailed in ESD's ISM Plan

- Process was followed for all ESD's ES&H incidents in FY 07.

- Effectiveness of corrective actions:

  Corrective actions have been effective. No first aid ergo injuries in FY07 progressed to recordable injuries. No other first aid incidents have recurred.

Noteworthy accomplishments in the ISM core function *Feedback and Improvement*:

✓ No first aid ergo injuries in FY07 progressed to recordable injuries. No other first aid incidents have recurred.

Opportunities for improvement:

✓ Improve training completion rates; this will require more involvement by ESD supervisors, with particular attention to the records of their guests.

✓ More time should be allocated by the division to the DSC.

ACRONYMS

ISM	Integrated Safety Management
DD	Division Director
DSC	Division Safety Coordinator
PI	Principal Investigator
ESD	Earth Sciences Division
DH	Department Head
SRQ	Safety review questionnaire

AHD	Activity Hazard Document
CATS	Corrective Action Tracking System
HEAR	Hazards Equipment, Authorizations, Reviews Database
QA	Quality Assurance
SA	Self Assessment
ES&H	Environmental Safety & Health
EH&S/EHSD	Environmental Health and Safety Division
OSSEPP	Offsite safety and environmental protection plan
LLPI	Labspace Lead PI