DOE/EA - #1634

Final Environmental Assessment for

The Lawrence Berkeley National Laboratory Seismic Life-Safety, Modernization and Replacement of General Purpose Buildings, Phase 2B

U.S. DEPARTMENT OF ENERGY

Volume 1

August 2010

FINDING OF NO SIGNIFICANT IMPACT
ENVIRONMENTAL ASSESSMENT
OF THE LAWRENCE BERKELEY NATIONAL LABORATORY
SEISMIC LIFE-SAFETY MODERNIZATION, AND REPLACEMENT OF
GENERAL PURPOSE BUILDINGS, PHASE 2B (DOE/EA-1634)

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has completed an Environmental Assessment (EA) (DOE/EA-1634) for the Lawrence Berkeley National Laboratory (LBNL) Seismic Life-Safety Modernization, and Replacement of General Purpose Buildings, Phase 2B. Seventeen comment letters were received and addressed in the Final EA. Based on the analysis in the EA including the responses to the comments, DOE has determined that the Proposed Action is not a major federal action that would significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an Environmental Impact Statement (EIS) is not necessary and DOE is issuing this Finding of No Significant Impact (FONSI).

PURPOSE AND NEED: The purpose and need of the LBNL Seismic Phase 2B Project is to remedy or remove LBNL space which poses seismic life-safety risks and to provide seismically safe and modern research space at LBNL.

DESCRIPTION OF PROPOSED ACTION: The Proposed Action would remove approximately 43,000 gross square feet (gsf) of office and laboratory space through the demolition of two buildings (25/25B and 55) deemed seismically deficient under the University of California (UC) Seismic Rating system and six antiquated trailers (71C, D, F, J, K, and P) that cannot be cost-effectively upgraded. Approximately 43,000 gsf of new space would be provided in a new general-purpose laboratory and office building (GPL), which meets all federal requirements regarding energy conservation and sustainability. The proposed GPL would be constructed at the Building 25/25B demolition site. The Proposed Action would also seismically upgrade Building 85/85A, the site-wide Hazardous Waste Handling Facility (HWHF), which is deemed seismically deficient under the UC Seismic Rating system.

ALTERNATIVES CONSIDERED: The EA assessed a No-Action Alternative, several alternate GPL locations, an alternative to constructing a GPL, and a reduced scope alternative. Assessment of the No-Action Alternative was used as a baseline against which to compare the impacts of the Proposed Action. The EA also identified other alternatives that were considered but rejected and therefore not assessed in the EA.

ENVIRONMENTAL IMPACTS: DOE evaluated the potential environmental consequences of the Proposed Action, the alternatives, and the No Action Alternative and found no potentially significant environmental impacts.

The EA supports the conclusion that population and housing, socioeconomics and environmental justice, public services, cultural resources, land use and planning, soils, intentional destructive acts, and aviation hazards would have clearly insignificant effects and thus further investigation and analysis was not required.

The EA identified minor impacts for geology and seismicity, hazardous substances and human health, biological resources, aesthetics, transportation and traffic, noise, air quality, greenhouse gases, utilities and waste management, wildland fires, and traffic accidents.

The seismic and geological analysis recognized that there is active faulting and an Alquist-Priolo Earthquake Fault Zone within LBNL. The EA considered the consequences of potential earthquakes, landslides, and liquefaction on the Proposed Action and found no significant impacts. The GPL would comply with the stringent seismic design requirements prescribed in the California Building Code to ensure that the building would be able to withstand likely earthquakes. Its design and construction would be specifically tailored to the site based on site-specific geotechnical assessments. The EA supports the conclusion that the proposed location of the GPL is appropriate for the siting and operation of this DOE facility. The seismic strengthening of Buildings 85/85A would also be based on site-specific geotechnical investigations and would enhance the safety of the HWHF.

The hazardous substances and human health analysis considered the potential risks of the hazardous and radioactive substances that might be encountered during the demolition and excavation phases of construction, as well as of those substances that would be used during the operational phase. The analysis found that construction workers, operational phase workers, the public, and the environment would be adequately protected from exposure to such substances.

The EA identified wildland fire risk as a potential concern at the LBNL site, and also described the considerable resources, infrastructure, and planning that has been devoted to fire protection. Construction activities have the potential to ignite adjacent areas, but the potential for uncontrolled wildland fires at LBNL would be very low as a result of LBNL-wide measures adopted to control fires. Potential release of toxic materials into the environment from the General Purpose Laboratory due to a wildland fire is not reasonably foreseeable. Potential effects of wildland fire on the HWHF were analyzed in an earlier HWHF EA but are not pertinent to the scope of this EA or Proposed Action.

The EA reflected that the GPL would scarcely be visible from medium-range and long-range viewpoints and the building's features would minimize light and glare. The demolition component would remove several functional structures that are aging and architecturally unremarkable.

In addition to the direct and indirect impacts described above, DOE analyzed potential cumulative effects of the Proposed Action. Included in the analyses were past, present and reasonably foreseeable future actions proposed in the same timeframe as the Proposed Action and either in the vicinity of the Proposed Action or the alternative sites. The EA reflects that there would only be minor environmental effects from the Proposed Action by itself, or cumulatively when taken in conjunction with the other projects planned for the timeframe of mid-2010 to late 2018.

PUBLIC AVAILABILITY: DOE issued the draft EA for public comment on June 28, 2010 and the comment period closed on July 28, 2010. A public information session was held on July 15, 2010. The draft EA was distributed to local, state, and federal government officials as well as members of the public. The Final EA and FONSI may be reviewed, and copies of the documents obtained, at the following website and/or location: http://www.lbl.gov/Community/SeismicPhase2B/index.html.

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The Final EA and FONSI may also be reviewed at the City of Berkeley Public Library:

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2090 Kittredge
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FURTHER INFORMATION ON NEPA PROCESS: For further information on the NEPA process, please contact:

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DETERMINATION: Based on the findings of this FONSI, and after careful consideration of all public and agency comments, DOE has determined that the Proposed Action does not constitute a major federal action that would significantly affect the quality of the human environment within the context of NEPA. Therefore, preparation of an EIS is not required.

Issued at Berkeley, California, this 4th day of August 2010.

Aundra Richards

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U.S. Department of Energy
Berkeley Site Office

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1 Executive Summary

The U.S. Department of Energy (DOE) is proposing the Seismic Phase 2B Project (Proposed Action) at the DOE Lawrence Berkeley National Laboratory (LBNL). LBNL is located on a 200-acre site in the hills above the UC Berkeley campus in Berkeley and Oakland, California. LBNL is a member of the national laboratory system supported by DOE and is managed by the University of California (UC) through a DOE Management and Operating (M&O) contract. The site includes research and support buildings and structures that conduct federally funded research and development.

The purpose and need of the Proposed Action and its alternatives is to remedy or remove space at LBNL which poses life safety risks and to provide seismically safe and modern research space at LBNL. The Proposed Action is subject to environmental review under the National Environmental Policy Act (NEPA) and is the subject of this Environmental Assessment (EA). This EA provides information and analysis that the DOE may use in its determination as to whether to pursue the Proposed Action or any of the alternative actions.

The Proposed Action[1] would remove approximately 43,000 gross square feet (gsf) of office and laboratory space through the demolition of two buildings (25/25B and 55) deemed seismically deficient under the UC Seismic Rating system[2] and six antiquated trailers (71C, D, F, J, K, and P) that cannot be cost-effectively upgraded. Approximately 43,000 gsf of new space would be provided in a new general-purpose laboratory and office building (GPL) which

[1] The Proposed Action identified and analyzed in this EA is a refinement of the project description presented earlier in the University of California's Seismic Phase 2 Draft Environmental Impact Report (EIR) and circulated for public review between January 29 and March 15, 2010. In the earlier project description, approximately 100 UC LBNL staff were to relocate to the proposed GPL building at the LBNL site from off-site locations such as the 717 Potter Street facility in Berkeley and the Donner Laboratory on the UC Berkeley Campus. Under this refined project description, those 100 LBNL staff would remain in place at off-site facilities.

[2] University Policy on Seismic Safety, http://www.ucop.edu/ucophome/coordrev/policy/1-17-95att.html, accessed on April 2, 2010.

meets all federal requirements regarding energy conservation and sustainability. Under the Proposed Action, this building would be built at the Building 25/25B demolition site. The Proposed Action would also seismically upgrade Building 85/85A, the site-wide Hazardous Waste Handling Facility (HWHF) which is deemed seismically deficient under the UC Seismic Rating system. The locations of these project components are shown on Figure III-1.

Five alternatives to the Proposed Action, labeled Alternatives A through D, and the No-Action Alternative, are also considered in this EA.

- **Alternative A** differs from the Proposed Action in the location proposed for the GPL. Under this alternative, demolition of the two seismically deficient buildings and six trailers would occur, as would seismic strengthening of Building 85/85A. However, the GPL would be built on the site of the existing Building 74 southeast (SE) parking lot. This site would be in the Strawberry Cluster, in close proximity to the UC Botanical Garden.
- **Alternative B** also differs from the Proposed Action in the location proposed for the GPL. Under this alternative, demolition of the two seismically deficient buildings and six trailers would occur, as would seismic strengthening of Building 85/85A. However, the GPL would be built off-site at the UC Berkeley Richmond Field Station (RFS), located approximately 6 miles to the northwest of the LBNL site. Selection of this site would not allow for near-term co-location of research programs and personnel with similar interests and specialized equipment needs. There would likely be more vehicle miles traveled (VMT) by UC LBNL personnel as a result of construction of the GPL at this location.
- **Alternative C** includes demolition of the two seismically deficient buildings and six trailers and seismic strengthening of Building 85/85A, but no new GPL construction. Instead of new building construction, Alternative C would use space in one or more existing buildings in the City of Berkeley or Emeryville. This alternative would not have the minor impacts of the new building construction activities, but also would likely not have the positive impacts associated with providing the replacement

space in an energy-efficient GPL. Additionally, as there would be no new GPL, safe, modern, high-accuracy research facilities suitable for co-located and coordinated research would not be built and this would challenge the ability of UC LBNL scientists to continue to successfully address the critical issues posed by the current and emerging DOE missions.

- **Alternative D** would not involve the demolition of seismically deficient structures or the construction of a new GPL. However, seismic strengthening of Building 85/85A would still occur. As per UC policies on seismic safety, personnel have already been moved from Building 25/25B that was deemed seismically deficient and the building has remained vacant. Although Building 55 and Building 71 trailers could remain occupied over the near term, UC LBNL would likely relocate personnel from these buildings in the long term. Limited capital costs would be required for this alternative as UC LBNL would continue to pay energy and maintenance costs for the older facilities, including costs for necessary upgrades. However as there would be no new GPL, safe, modern, high-accuracy research facilities suitable for co-located and coordinated research would not be built and this would challenge the ability of UC LBNL scientists to continue to successfully address the critical issues posed by the current and emerging DOE missions. Additionally, the benefits associated with the construction of a more energy efficient GPL building would not accrue.
- The **No-Action Alternative** is used for comparison with the other alternatives and serves as the baseline for the cumulative impact analysis. Under this alternative, the DOE would not fund any component of the Proposed Action and DOE programs and personnel would not be located in a new GPL facility. While the No-Action Alternative would not result in any new impacts at the project level, the environmental benefits of the Proposed Action, including increased seismic safety and development of modern, energy-efficient laboratory space, would not be realized.

In this EA, the Proposed Action and each of the alternatives are analyzed for environmental effects specific to the action alone, and also for cumulative effects of the Proposed Action or alternative in combination with other known past, present, and reasonably foreseeable actions. Table I-1 summarizes actions and impacts associated with the Proposed Action and alternatives.

The EA reflects that there would only be minor environmental effects from the Proposed Action by itself, or cumulatively when taken in conjunction with the other projects planned for the time frame of mid-2010 to late 2018.

Alternative A, with GPL construction at the Building 74 SE Parking Lot site, would result in project level impacts to biological resources and both construction and operational noise.

Alternative B, with GPL construction at the RFS, Alternative C, with use of an existing building in Berkeley or Emeryville, and Alternative D, which would involve only the seismic strengthening of Building 85/85A, would have only minor impacts at the project level.

TABLE I-1 **SUMMARY OF ACTIONS AND IMPACTS**

Action Description	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No-Action
Site Location	LBNL: GPL at B25/25B. Demolition of B25/25B, B55, B71 Trailers. B85/85A seismic strengthening.	LBNL: GPL at B74 SE Lot. Demolition of B25/25B, B55, B71 Trailers. B85/85A seismic strengthening.	GPL at RFS.[a] LBNL: Demolition of B25/25B, B55, B71 Trailers. B85/85A seismic strengthening.	No GPL, Leased space off-site. LBNL: Demolition of B25/25B, B55, B71 Trailers. B85/85A seismic strengthening.	LBNL: No GPL, continued use of B55 and B71 Trailers in short-term. B85/85A seismic strengthening.	LBNL: No GPL, continued use of B55 and B71 Trailers in short-term, no B85/85A seismic strengthening.
Impact Areas[b]						
Geology & Seismicity	Minor impacts	Minor impacts	Minor impacts	Minor impacts	Minor impacts	No new impacts, but no beneficial impact from seismic upgrade.
Hazardous Substances and Human Health	Minor impacts	Minor impacts	Minor impacts	Minor impacts	Minor impacts	No new impacts, but no beneficial impact from seismic upgrade.
Water Resources	Minor impacts	Minor impacts	Minor impacts	Minor impacts	Minor impacts	No impacts
Biological Resources	Minor impacts	Minor impacts including loss of 20,000 sf of Alameda Whipsnake habitat and up to 46 Coast live oak trees.	Minor impacts	Minor impacts	Minor impacts	No impacts
Aesthetics	Minor impacts	Moderate impacts as GPL would be highly visible from UC Botanical Garden.	Minor impacts	Minor impacts	No impacts	No impacts
Transportation and Traffic	Minor construction related impacts.	Minor construction related impacts.	Minor construction and operational impacts.	Minor impacts	Minor impacts	No impacts
Noise	Minor impacts	Temporary impacts as City of Oakland Noise Ordinance standards could be exceeded during construction.	Minor impacts	Minor impacts	Minor impacts	No impacts

TABLE 1-1 **SUMMARY OF ACTIONS AND IMPACTS** (CONTINUED)

Action Description	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No-Action
Air Quality	Minor impacts. General conformity de minimus levels and BAAQMD thresholds would not be exceeded.	Minor impacts. General conformity de minimus levels and BAAQMD thresholds would not be exceeded. But sensitive receptors in the UC Botanical Gardens would be in closer proximity.	Minor impacts. General conformity de minimus levels and BAAQMD thresholds would not be exceeded. But selection of this site for the GPL would initially result in more VMT and associated emissions.	Minor impacts. General conformity de minimus levels and BAAQMD thresholds would not be exceeded.	Minor impacts. General conformity de minimus levels and BAAQMD thresholds would not be exceeded.	No impacts
Greenhouse Gases	Minor impacts, emissions below CEQ GHG threshold.	Minor impacts, emissions below CEQ GHG threshold.	Minor impacts, emissions below CEQ GHG threshold. But selection of this site for the GPL would initially result in more VMT.	Minor impacts, emissions below CEQ GHG threshold.	Minor impacts, emissions below CEQ GHG threshold.	No impacts
Utilities	Minor impacts	Minor impacts	Minor impacts	Minor impacts. Existing building would require no new infrastructure or connections.	Minor impacts	No impacts
Wildland Fires	Minor impacts	Minor impacts, but risk slightly greater than Proposed Action due to vegetation surrounding Building 74 SE Parking Lot site.	Minor impacts	Minor impacts	Minor impacts	No impacts
Traffic Accidents	Minor impacts	Minor impacts	Minor impacts	Minor impacts	Minor impacts	No impacts

[a] Standard Project Features are not required at the RFS, but would be implemented voluntarily.

[b] The Proposed Action and alternatives incorporate standard project features that apply to all projects at LBNL. These features are identified in Appendix A which is incorporated into this EA by reference.

II PURPOSE AND NEED

The purpose and need of the LBNL Seismic Phase 2B Project is to remedy or remove LBNL space which poses seismic life-safety risks and to provide seismically safe and modern research space at LBNL.

UC LBNL completed seismic evaluations of all permanently owned and occupied LBNL buildings in 2007. These evaluations revealed that several buildings are seismically deficient, and would not be expected to survive a major earthquake without significant damage to the structure and appreciable life safety hazard to their occupants. UC LBNL has vacated the most seismically deficient buildings, which has created a need for suitable safe and modern replacement space. The U.S. Geological Survey has estimated the probability of a major seismic event in the San Francisco Bay Area at approximately 67 percent in the next 30 years. The LBNL site is located less than 1 kilometer from the Hayward Fault and would be subjected to severe shaking during a major seismic event on this fault.

The LBNL Seismic Phase 2B Project has the following objectives:

- Remedy or remove seismically deficient general-purpose research facilities and lab-wide resource buildings;
- Provide researchers with safe, modern, science research space that is fully suitable for 21st century science;
- Provide general-purpose research and institutional space that is upgradeable in the future and that can flexibly meet the high accuracy requirements of the DOE's 21st century missions. High accuracy laboratory space is essential for the continued development of the DOE's key program areas;
- Increase efficiency of LBNL research operations and promote scientific adjacencies by offering modern, cost-effective consolidated space at the LBNL site; and
- Co-locate researchers and graduate students within a cluster of science research facilities to expand opportunities for instrument sharing and interacting among scientists engaged in a wide range of research projects, and offer convenient access to LBNL user facilities and similar resources.

III PROPOSED ACTION AND ALTERNATIVES

III.A. Proposed Action

The Proposed Action would remove approximately 43,000 gross square feet (gsf) of office and laboratory space through the demolition of two buildings (25/25B and 55) rated "very poor" and "poor" respectively under the UC Seismic Rating system[1] and six antiquated trailers (71C, D, F, J, K, and P) that cannot be cost-effectively upgraded. Approximately 43,000 gsf of replacement space would be provided in a new general-purpose laboratory and office building (GPL). Under the Proposed Action, the GPL would be built at the Building 25/25B demolition site. The Proposed Action would also seismically upgrade Building 85/85A, the site-wide Hazardous Waste Handling Facility (HWHF), which is rated "poor" under the UC Seismic Rating system. The locations of these project components are shown on Figure III-1.

The Proposed Action would be funded by the Department of Energy (DOE) and operated and managed by the UC, under contract to the DOE. The DOE and UC would execute a supplemental lease agreement to define the lease parcel and its demised term for the final location of the GPL.

III.B. Components of the Proposed Action

The primary components of the Proposed Action are shown below in Table III-1 together with their anticipated timeframes. Work associated with the Proposed Action would begin in late 2010 and it is anticipated that demolition and construction components would be completed by late 2013 and that the GPL would become operational in early 2014.

DOE activities at LBNL comply with applicable laws and regulations that govern the exposure of workers, the public, and the environment to

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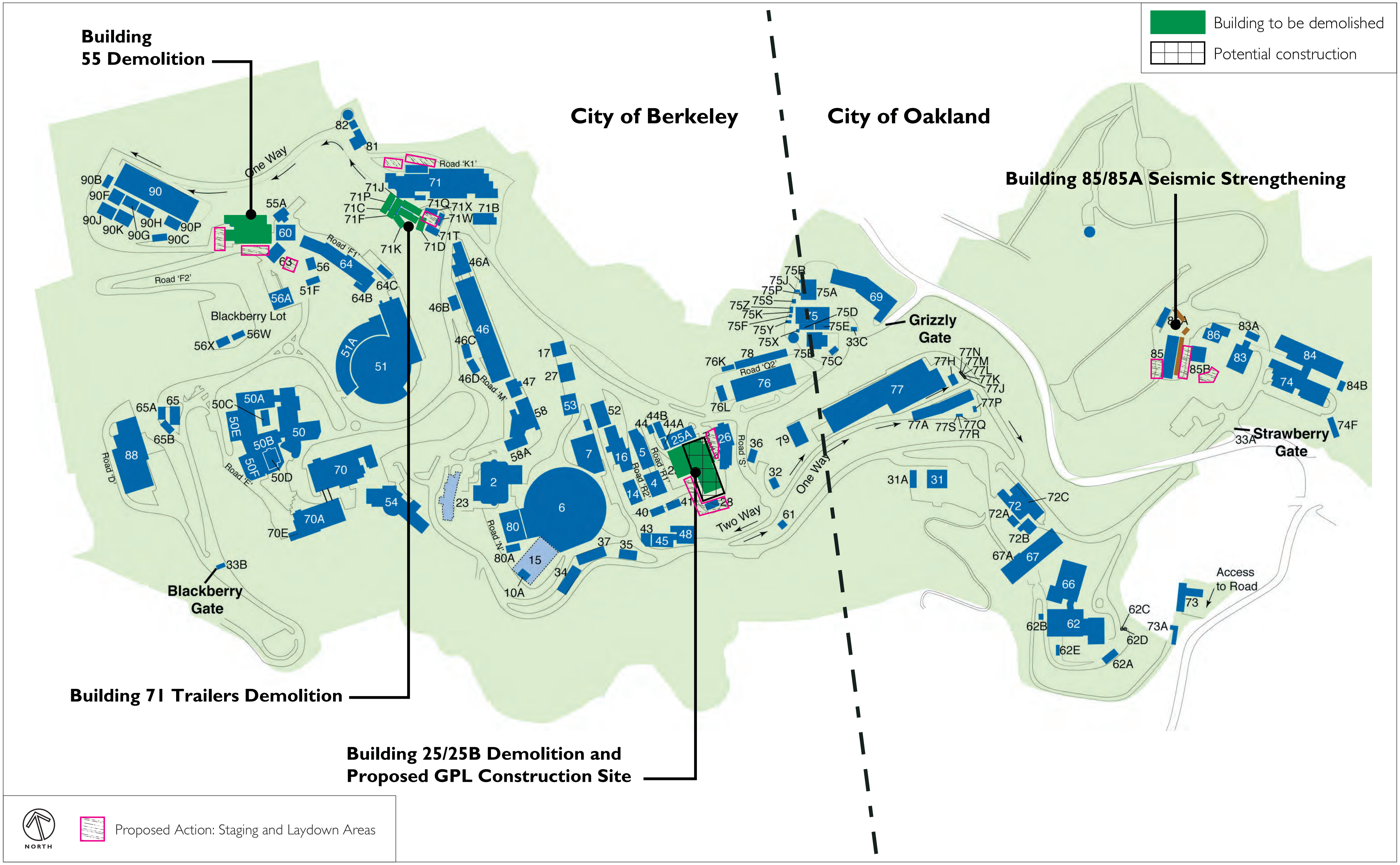
1 University Policy on Seismic Safety, http://www.ucop.edu/ucophome/coordrev/policy/1-17-95att.html, accessed on April 2, 2010.



Source: Lawrence Berkeley National Laboratory

FIGURE III-1

COMPONENTS OF THE PROPOSED ACTION

TABLE III-1 **TIMELINE AND COMPONENTS OF THE PROPOSED ACTION**

Component	Start	Finish
Demolition of Building 25/25B	late 2010	mid 2011
Demolition of Building 55	early 2013	early 2014
Demolition of Building 71 Trailers C, D, F, J, K, and P	late 2012	early 2013
Seismic strengthening of Building 85/85A	mid 2011	mid 2012
Construction and commissioning of a new General Purpose Laboratory (GPL) on the site of the existing Building 25/25B	mid 2011	late 2013
Relocation of personnel and equipment	early 2013	early 2014
Operation of the GPL (estimated)	early 2014	2064
Removal of the GPL (estimated)	2064	2064

hazardous materials. This project incorporates Standard Project Features (SPF) described in detail in Section III.E.

III.B.1. Demolition of Building 25/25B

This component of the Proposed Action would involve the demolition of Building 25 as well as the decommissioning and demolition of the smaller separate wooden building to the west that houses the Fixed Treatment Unit (FTU), known as Building 25B. The FTU has treated aqueous and metal-containing waste generated from operations at Building 25 since 1986. Along with five other FTUs at LBNL, the FTU at Building 25B has operated under a single permit from the City of Berkeley. The City has approved a plan for the decommissioning of Building 25B.[2]

[2] Al-Hadithy, Nabil. Toxics Management Division, City of Berkeley. Personal communication with DC&E, November 23, 2009.

Operations formerly located at Building 25 have already been relocated to Building 77 which has its own treatment facilities. A small metal chemical storage shed on the west side of Building 25, which is labeled 25C on the outside, would also be removed. These buildings slated for demolition are referred to in this report as Building 25/25B. Together they comprise 20,663 gsf with a footprint of 17,100 square feet. The adjacent Building 25A is not planned for demolition under the Proposed Action. Building 25/25B is currently vacant.

III.B.1.a. Building 25/25B: Site Preparation, Staging and Tree Protection

Staging and laydown areas would be located in paved or developed areas. The staging and laydown area for Building 25/25B demolition and for the GPL construction would be located between Building 25 and Building 26 and on the south and west sides of Building 25.

The Building 25/25B site is adjacent to an irrigated grove of redwood trees that would be protected during the construction of the proposed GPL.[3]

III.B.1.b. Building 25/25B: Pre-demolition Survey, Removal, and Disposal of Hazardous Materials/Equipment

A survey to identify hazardous materials at Building 25/25B, Building 55, and Building 71 trailers was conducted during 2008.[4] The survey identified asbestos-containing materials in thermal pipe insulation, sheetrock, floor tile, transite interior and exterior panels, acoustical ceiling tile, sink undercoating material, and roofing materials at Building 25. Lead-based paint was identified on interior surfaces in Building 25. Other hazardous materials noted during the Building 25/25B survey included fluorescent light fixtures with presumed PCB ballasts and lighting tubes, coolant gases, mercury thermostats, and an electrical trench with metal debris.

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[3] Brian W. Fenske, 2009. Arborist Report. Site: LBNL "Old Town" Demo Site, March 25, 2009.

[4] Winzler & Kelly, 2008, Hazardous Materials Survey, Seismic Upgrade Phase II, Lawrence Berkeley National Laboratory, October.

Interior materials likely requiring abatement would include thermal insulation, floor tile, and sheetrock walls. Exterior materials anticipated to require abatement include roofing, exterior building cladding, and painted surfaces. These materials would likely be removed by labor crews using small tools and equipment, but may also involve the use of equipment such as scaffolding or motorized boom lifts in order to reach the affected areas.

Building demolition would comply with the LBNL Radiological Work Permit Program. Building 25, where radiological materials have been used historically, would be surveyed by a Radiological Control Technician prior to removal of fume hoods, exhaust fans, ducting, vacuum systems, and flooring. LBNL Environment Health and Safety (EH&S) staff would perform a final inspection prior to releasing the space for demolition or construction activity. Any areas found to have building-related radiological or other hazards remaining would be cleaned and decontaminated under the oversight of UC LBNL industrial hygienists and health physicists.

The project manager would develop a communications plan to ensure that UC LBNL personnel and contractors are informed about hazards at the construction site in compliance with LBNL Environment Health and Safety Procedures. Regular project site evaluations would be performed during project construction by a safety professional and project engineer to monitor the effectiveness of implemented measures.

III.B.1.c. Building 25/25B: Demolition and Disposal

Debris resulting from demolition of the building superstructure would either be temporarily stockpiled at the site for future removal by truck, or would be removed concurrently with the demolition effort.

Demolition waste would be separated into four categories: material to be recycled, material to be salvaged, general construction waste, and hazardous waste. Hazardous waste would typically be asbestos or lead containing material. If any material is found with chemical or radiation contamination, it would be handled separately. General construction waste would be removed and trucked to a nearby landfill, such as the Altamont Landfill in Livermore, about 30 miles from LBNL. Hazardous waste disposal would be coordinated by the LBNL Waste Management (WM) Group.

III.B.1.d. Building 25/25B: Soil Excavation and Soil and Groundwater Sampling and Analysis

Initial testing found no indication of significant soil or groundwater contamination in the area around Building 25.[5] Building 25/25B would be demolished down to the concrete slab which underlies it, and then additional soil testing would be performed by drilling through the slab. Next, the slab would be demolished and additional soil testing would likely be performed. If Building 25/25B does not become the choice for GPL construction, it is expected that the area would be excavated to a depth of approximately 3 feet. As it is located in an area of active groundwater remediation, the excavation would then be paved over to prevent rainwater intrusion. If it is chosen as the site for GPL construction, excavation would be to a greater depth, sufficient to accommodate the foundations of the new GPL. The precise depth is not known at this time, but it is possible that groundwater could be encountered. If groundwater is encountered, it would be tested and disposed of in accordance with a site-specific Groundwater Monitoring and Management Plan (GMMP), required by UC LBNL standard operating procedures, as described in the LBNL Pub-3000, Section 11.3.7 Contaminated Soil and Groundwater Management. Likewise, soil from the excavation would be tested in accordance with the site-specific Soil Management Plan (SMP).

The soil and groundwater at the Building 25/25B site has been remediated for known contamination as part of a rigorous Resource Conservation and Recovery Act (RCRA) Corrective Measures Implementation (CMI). There is still an active groundwater remediation system in place. Levels measured most recently in soil and groundwater in the construction area are below

[5] Environment, Health and Safety Division, and Earth Sciences Division, LBNL, April, 2010. *Initial Evaluation of Potential Subsurface Contamination Under Building 25.*

those considered to pose a risk to construction workers, although it is possible that further contamination would be revealed after the building is demolished and the underlying concrete slab removed. The RCRA CMI required a Soil Management Plan and a Groundwater Monitoring and Management Plan. The Plans provide general procedures for the management and disposal of waste soils and contaminated groundwater generated during construction activities. Testing would be performed in accordance with the plans to evaluate potential risks and to comply with landfill screening criteria.

If contamination is detected during pre-construction testing, the specifications would incorporate necessary measures to prevent the detected contamination from migrating. Notification and corrective action for newly discovered environmental releases of hazardous constituents would meet the requirements in the LBNL Hazardous Waste Facility Permit (EPA ID No. CA 4890008986), Section VI.B "Newly Identified Releases." Cleanup standards and methods would be consistent with LBNL's *Environmental Assessment and Corrective Measures Study Report for Remediating Contamination at LBNL Regulated under the Resource Conservation and Recovery Act* (DOE/EA-1527). In the event that contamination is detected, LBNL Environmental Health and Safety (EH&S) procedures and SPF HAZ-3 (e) from the Standard Project Features included in Appendix A of this EA, which is incorporated by reference, would be implemented so as to prevent worker exposure or migration of that contamination by implementing employee communication and training requirements.

After testing, if contamination were to be found at levels considered to pose risk, excavated soil would be disposed of at a Class II/III[6] landfill such as Altamont Landfill in Livermore, about 30 miles from LBNL. No material would be stockpiled for an extended period.

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[6] Class II/III landfills receive a variety of materials, including construction material and debris, hazardous materials such as asbestos and contaminated soils, metal, organics, papers, and other special materials.

III.B.2. Building 55 Demolition

This component of the Proposed Action would involve the demolition of Building 55, a wet chemistry laboratory and office facility rated as seismically "poor" under the UC Seismic Rating System. Building 55 is a one-story structure with a two-story addition and 19,048 gsf of space (Figure III-1). The 75 occupants of the existing building would be relocated to other LBNL buildings.

III.B.2.a. Building 55: Site Preparation, Staging, and Vegetation Removal

The staging and laydown areas for Building 55 demolition would be in the parking lots on the west and south sides of Building 55 and southeast side of Building 63. Some ornamental shrubs would need to be removed from around Building 55 in the course of demolition work.

III.B.2.b. Building 55: Pre-demolition Survey, Removal, and Disposal of Hazardous Materials/Equipment

The hazardous materials survey identified asbestos-containing materials in carpet and other flooring materials, ventilation systems, and roofing materials in Building 55.[7] Lead-based paint was identified on interior surfaces in Building 55. Other hazardous materials noted during the survey included fluorescent light fixtures with presumed PCB ballasts and lighting tubes, coolant gases, mercury thermostats, and hydraulic fluid for elevators at Building 55. The process for removal of this material prior to demolition would be the same as described above for Building 25/25B in Section III.B.1.b.

Radiological materials have been used at Building 55. Procedures to ensure radiological contamination is detected and affected materials removed, would be the same as outlined above for Building 25/25B.

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[7] Winzler & Kelly, 2008, Hazardous Materials Survey, Seismic Upgrade Phase II, Lawrence Berkeley National Laboratory, October.

III.B.2.c. Building 55: Demolition and Disposal

Equipment and procedures used for demolition and disposal of the building superstructure and the concrete slab on which it rests would be the same as described above in Section III.B.1.c. Building 55 would be removed in its entirety and the site excavated to approximately 3 feet below grade.

III.B.2.d. Building 55: Soil Excavation and Soil and Groundwater Sampling and Analysis

Some soil removal is expected. Sampling, removal, handling, and disposal would be done as described in detail in Section III.B.1.d.

III.B.3. Building 71 Trailers C, D, F, J, K and P Demolition

This component of the Proposed Action would involve the demolition of six of the nine modular trailers (71C, D, F, J, K, and P) located to the southwest of Building 71. The trailers have a total gross square footage and footprint of 3,822 square feet and currently house 34 occupants, who would be relocated to other LBNL buildings upon demolition of the trailers. Building 71 Trailers T, W, and X would remain occupied and in use on the site.

III.B.3.a. Building 71 Trailers: Site Preparation and Staging

The staging and laydown area for Building 71 trailers would be in the parking lot around the trailers and the parking lot northwest of Building 71. No trees or plantings would be removed as a result of demolition activities.

III.B.3.b. Building 71 Trailers: Pre-Demolition Survey and Dismantling of Hazardous Material Structures

The hazardous materials survey identified asbestos-containing materials in floor tiles and window caulking at the Building 71 trailers. Other hazardous materials noted during the survey included fluorescent light fixtures with presumed PCB ballasts and lighting tubes, coolant gases, and mercury thermostats.[8] No lead containing paints or coatings were detected. The process for

[8] Winzler & Kelly, 2008, Hazardous Materials Survey, Seismic Upgrade Phase II, Lawrence Berkeley National Laboratory, October.

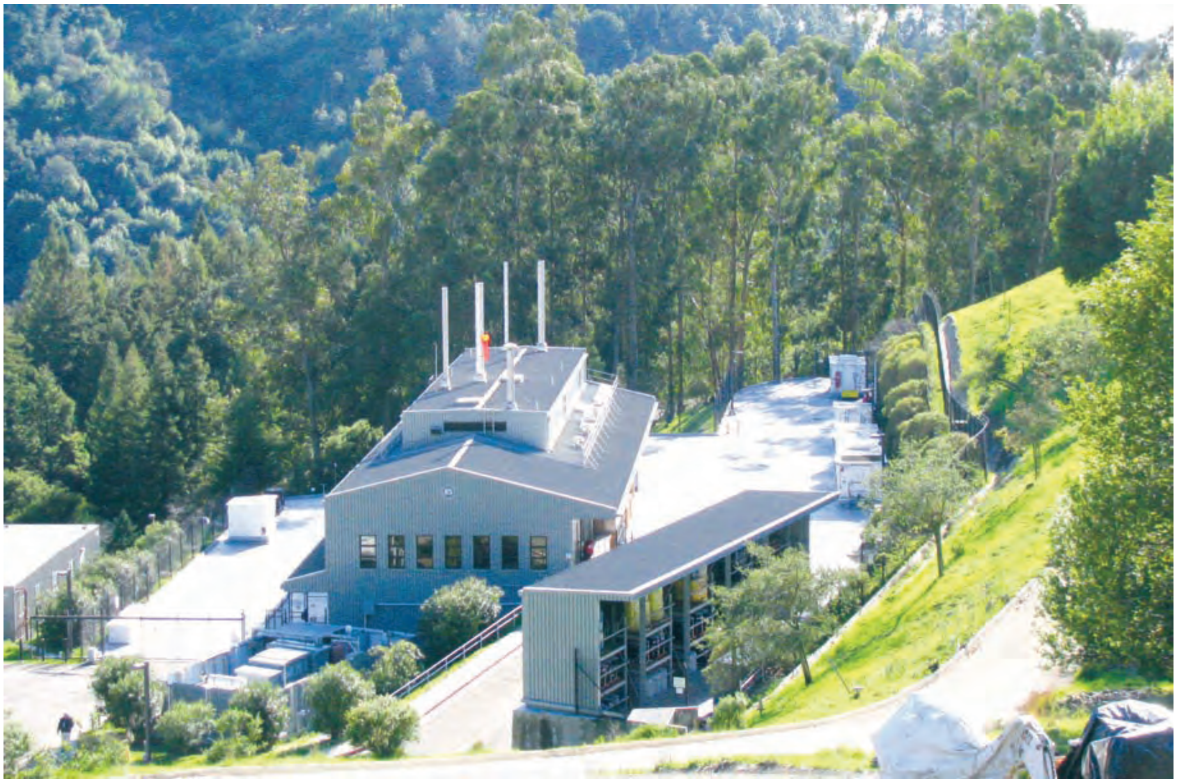
removal of this material prior to demolition would be the same as described above for Building 25/25B in Section III.B.1.b.

III.B.3.c. Building 71 Trailers: Demolition and Disposal
The trailers would be demolished and removed, including foundations, down to the level of the asphalt and trucked off-site for landfill disposal. No soil excavation is anticipated. Demolition would likely be performed using an excavator fitted with a processing head. These materials would either be temporarily stockpiled at the site for future loading out via truck, or would be loaded out concurrently with the demolition effort.

III.B.4. Building 85 Seismic Strengthening
This component of the Proposed Action includes a seismic upgrade to Building 85/85A, which is part of the LBNL HWHF. As shown in Figures III-2 and III-3, the HWHF consists of Building 85, Building 85A, the associated yard area, six hazardous waste handling sheds, a flammable solvents consolidation shed, a flammable/combustible liquid storage shed, a mixed waste storage shed, a storage shed, and a diesel generator with a 56-gallon diesel above-ground storage tank (used as a day tank) and a 2,500-gallon diesel underground storage tank. Hazardous wastes from UC LBNL laboratories are consolidated at Building 85, the main building of the facility. The environmental impacts of the construction and operation of the HWHF were addressed in DOE/EA-0423 (1992).

Building 85 has three floors. The first floor of Building 85 houses radioactive waste activities, including waste handling, storage, compaction, solidification, and decontamination. The first floor also contains a dry/clean waste storage area and one of two mechanical storage rooms. The second floor contains the chemical waste preparation and storage areas and administrative offices. The third floor houses HVAC equipment and the second mechanical equipment room.

The facility, referred to subsequently as Building 85/85A, provides treatment and storage of hazardous, radioactive, and mixed waste from LBNL.

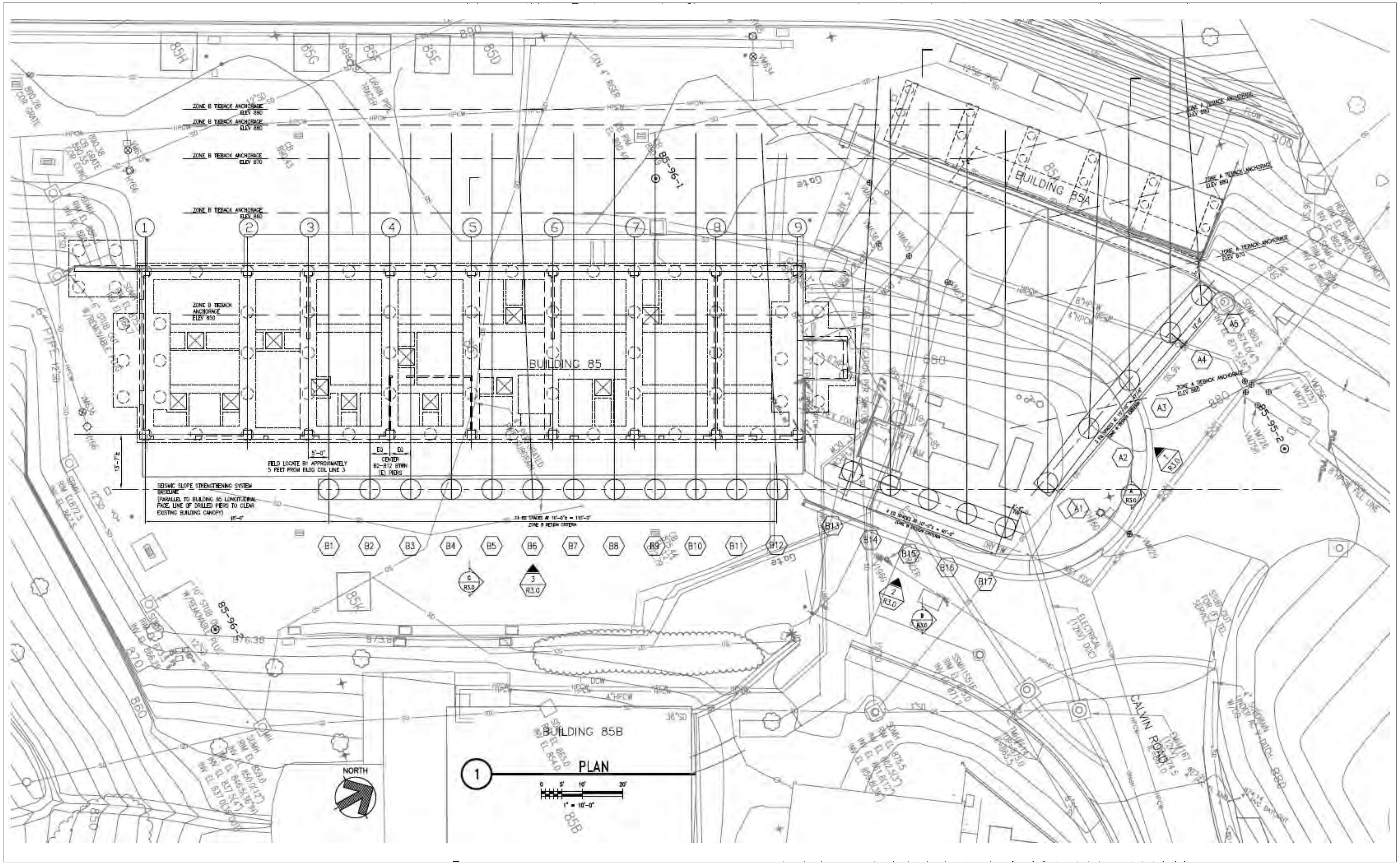


Proposed locations for underground retaining structures, such as pier foundations and tie backs

Source: Lawrence Berkeley National Laboratory

FIGURE III-2

AERIAL VIEW OF BUILDING 85/85A COMPLEX



Source: 100% Conceptual Design Report

FIGURE III-3

BUILDING 85/85A SEISMIC STRENGTHENING, PRELIMINARY DESIGN

Constructed in 1996, Building 85 became operational in April 1997. Geotechnical investigation of an adjacent construction site between 2004 and 2006 raised concerns that the ancient landslide deposits could present a hazard to existing buildings in the vicinity, including Building 85/85A. Additional review in 2007 indicated that, although the landslides are stable under normal conditions, they could be mobilized in the event of a major earthquake, posing a potential hazard to the Building 85/85A structures. The Proposed Action would include upgrades which would prevent movement of the underlying slide in an earthquake. The proposed upgrade does not change the operation of the building or extend its intended life. Building 85/85A would remain occupied and in use while the seismic strengthening work is performed.

III.B.4.a. Building 85/85A: Performance Standards for Seismic Strengthening
The proposed seismic strengthening system is designed to ensure that the facility would meet the following performance standards during a major seismic event:

- The hazardous/radioactive waste stored in Building 85 would not be released to the environment;
- The facility would be shut down safely; and
- Basic life safety would be achieved.[9]

The seismic strengthening system would be designed to resist the maximum ground motion from earthquakes that would be expected to occur, on average, once every 475 years. Building 85/85A would have a rating of "good" under the UC Seismic Rating system after completion of the improvements.

III.B.4.b. Building 85/85A: Seismic Strengthening Work
Sub-grade piers for the seismic strengthening at Building 85 would be installed below the building overhang in the lower yard. Piers would also be installed

[9] RMW Architecture and Interiors, July 15, 2008, *100% Conceptual Design Report, Seismic Life-Safety, Modernization, +Replacement of General Purpose Buildings, Phase II.*

on the southeast and northeast sides of Building 85A as shown in Figure III-3. These piers would prevent movement of the underlying slide in an earthquake. The piers would be drilled. To install the piers, holes approximately 4- to 5-foot-wide, 40- to 50-foot-deep would be drilled with an auger, and a metal cage or caisson would be inserted to support the hole. The hole would then be gradually filled with concrete. The work would not take place during rainy weather.

Additional work inside Building 85/85A, consisting of out-of-plane bracing for third floor girders supporting the discontinuous penthouse columns, would strengthen the building's first story shear walls and other lateral force systems.

III.B.4.c. Building 85/85A: Soil Excavation and Soil and Groundwater Sampling and Analysis

Site preparation for Building 85/85A improvements would include removal of a portion of the building's at-grade concrete operations area, asphalt driveways, and minor vegetation.

Excavation is expected to generate approximately 1,800 cubic yards of soil to be disposed off-site in a landfill. Sampling, removal, handling, and disposal would be done as described in detail in Section III.B.1.d.

In 1996, a pre-operational survey of the HWHF was conducted that included the collection and analysis of samples of soil, groundwater, air, sediment, stormwater, and sanitary sewer discharges.[10] Low concentrations of tritium and petroleum hydrocarbons were detected in some soil samples. The source of the tritium was past emissions from the former National Tritium Labeling Facility (NTLF), which ceased operations in December 2001.

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[10] The Envirosystems Group, October 1996, Baseline Report for Pre-Operational Monitoring of Hazardous Waste Handling Facility – B85.

Groundwater would probably be encountered during the installation of the piers and it would be tested according to specifications described in the GMMP. Depth to groundwater at monitoring well, MW 85-96-2, which is south of Building 85, is generally between 40 and 35 feet below ground surface, and groundwater at MW 85-96-1 north of Building 85 and southwest of Building 85A is between 16 and 12 feet below ground surface. Depth to groundwater at MW 85-95-2, which is located east of Building 85A, is between 24 and 0.3 feet below ground surface.

III.B.5. GPL Construction and Operation at the Building 25/25B Demolition Site

Under the Proposed Action, a GPL of approximately 43,000 gsf, with a footprint of approximately 13,600 square feet would be built on the Building 25/25B demolition site. This Proposed Action would take place on or adjacent to previously disturbed land. Figure III-4 shows an aerial view of the Building 25/25B site, which is in the center of LBNL. Figure III-5 shows the site plan for the GPL, and Figure III-6 shows an architectural rendering of the proposed building.

Staging and laydown areas would be the same as those used for demolition of Building 25/25B.

The proposed GPL would be three stories high and approximately 55 feet tall (as measured to the top of the building parapet). Two exhaust stacks approximately 30 feet in height would protrude from the top of the building bringing the tallest point of the building to around 85 feet.

III.B.5.a. GPL at Building 25/25B Site: Site Preparation and Staging

Site preparation and staging areas would be as described above under Section III.B.1.a.

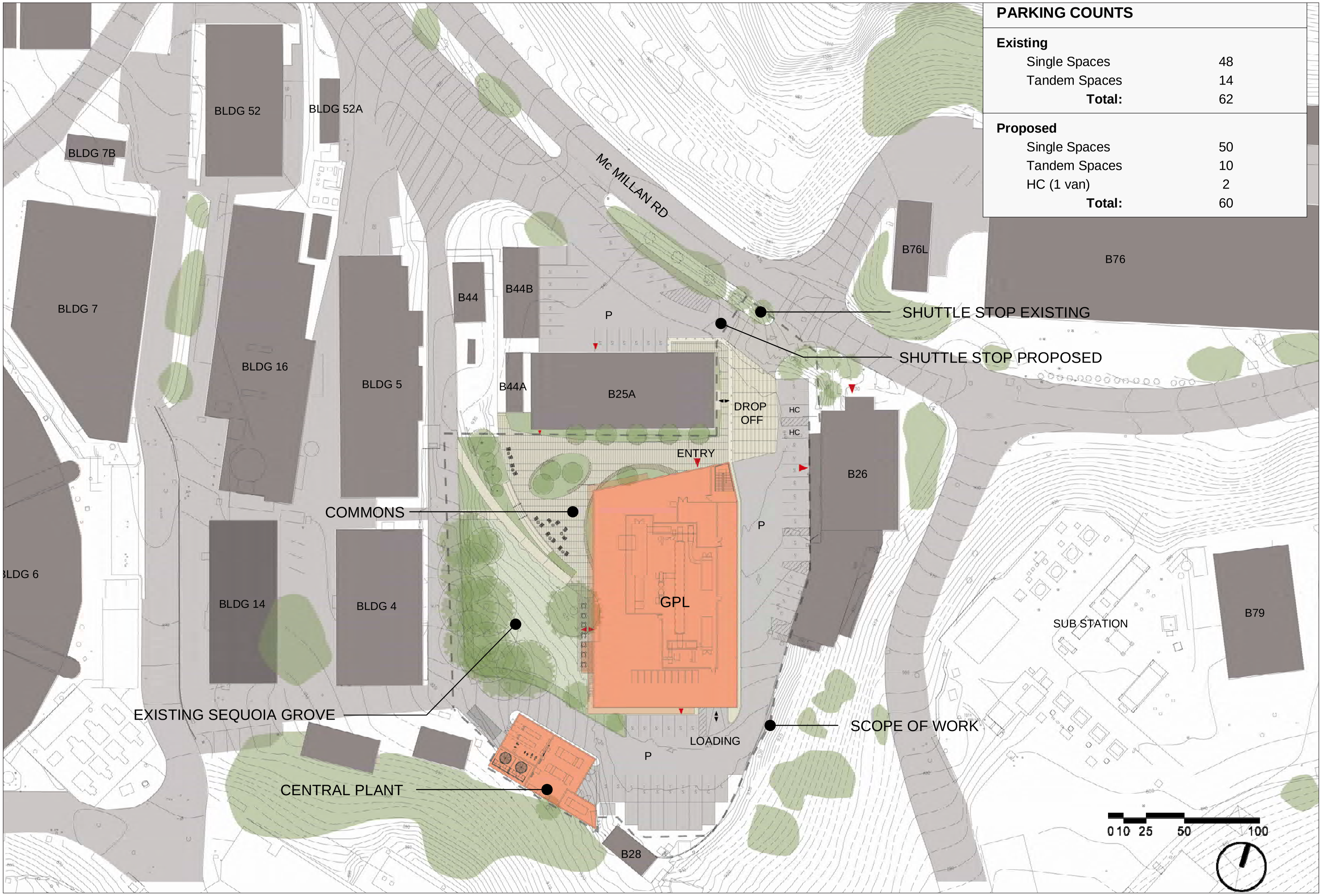
III.B.5.b. GPL at Building 25/25B Site: Excavation and Soil and Groundwater Sampling and Analysis

This was described above under Section III.B.1.d.

Source: RMW architecture & interiors

FIGURE III-4

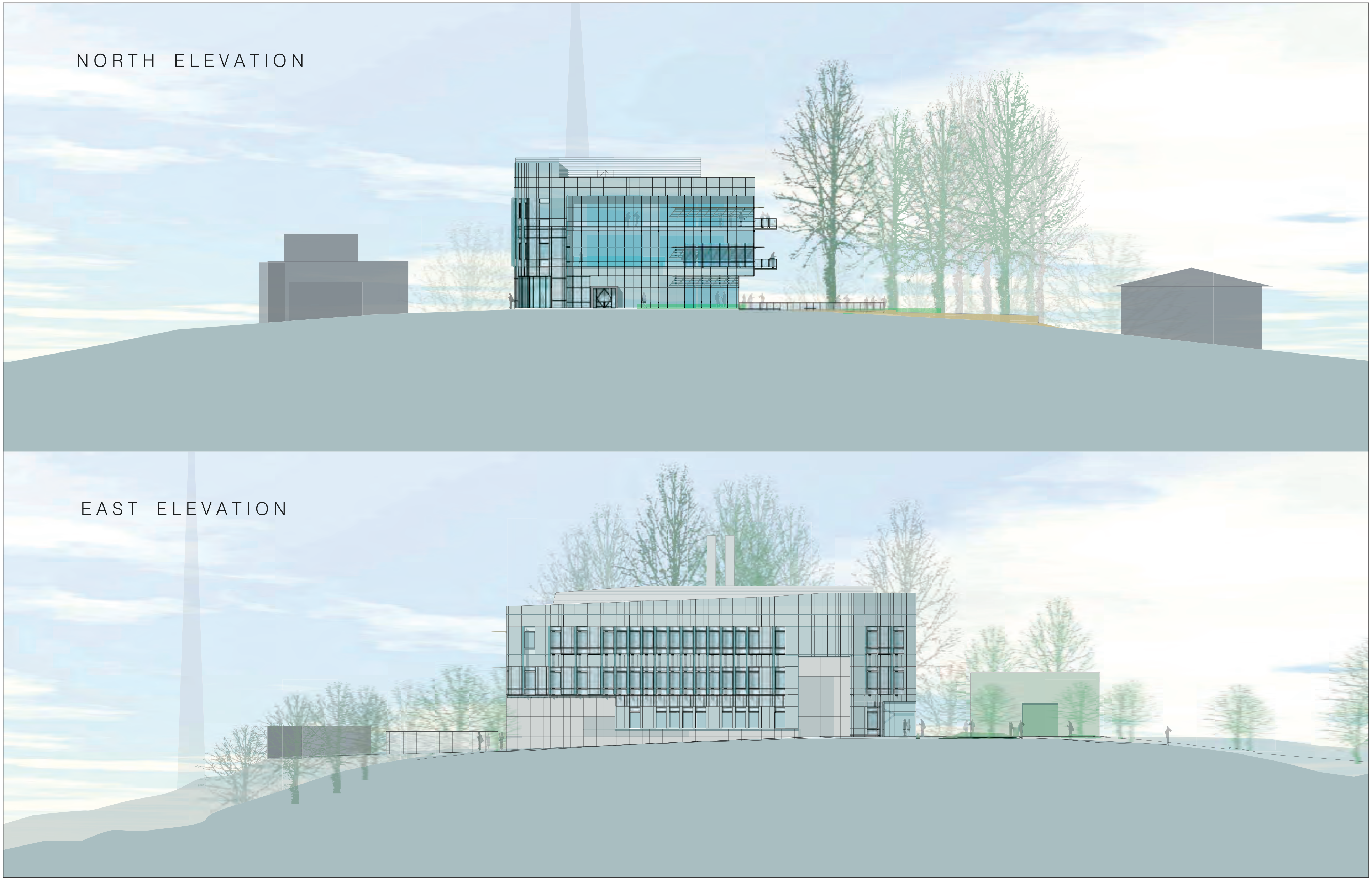
AERIAL VIEW OF BUILDING 25/25B COMPLEX



Source: RMW architecture & interiors

FIGURE III-5

PLAN OF GPL AT BUILDING 25/25B SITE



Source: RMW architecture & interiors

FIGURE III-6

NORTH AND EAST ELEVATIONS OF PROPOSED GPL

III.B.5.c. GPL at Building 25/25B Site: Utilities, HVAC, and Exhaust Systems

The GPL would use the existing electrical, water, and sewer utility systems that currently serve the Building 25 complex, with some minor additions. A new fire hydrant would be added to the southeastern side of the proposed building, where there is an existing 12-inch main. A new storm drain line about 125 feet in length would be installed to replace the existing line, which is partially blocked and undersized for the current drainage area around Building 25. The drain would probably run from the southeastern corner of the new building east through the neighboring hillside to a connection point on Segre Road.

A new sanitary sewer line would also be added for the GPL, in accordance with the UC LBNL Sanitary Sewer System Management Plan (SSSMP) of September 30, 2009. Preliminary design documents call for an approximately 6-inch diameter pipe with two routing options: either a run of approximately 500 feet west from the proposed GPL between existing buildings, or a run of approximately 650 feet north and then west from the GPL. Both routing options would pass entirely through previously developed land.

The exact points of utility connections and drain locations would be determined based on the development of the design. There would be some rerouting of utilities for building access. Additionally, a building utility plant would be located on grade to house chillers, a cooling tower, electrical transformer, and an emergency generator.

GPL interior building systems that would require exterior ventilation would include heating and air conditioning units and bathroom exhaust fans. Condensate drainage from heat pumps and air conditioners would be drained into the sanitary sewer system and would pass through the Hearst Monitoring Station before flowing into the City of Berkeley public sewer system and ultimately to the East Bay Municipal Utility District (EBMUD) regional wastewater treatment facility as described in Section IV.C.10. Sanitary sewer discharge would also be directed to the sanitary sewer system and monitoring performed at the Hearst Monitoring Station would ensure compliance with local and State regulations. HVAC, fume hoods, and bathroom exhaust fans would be vented to the outside at undetermined locations. Combustion air and flue exhaust vents for lab functions and heating and air conditioning units would be included on the exterior of the building roof as would laboratory exhaust air stacks. A mechanical equipment roof screen would be located on the roof of the GPL.

III.B.5.d. GPL at Building 25/25B Site: Access, Circulation, and Parking
The GPL would meet Architectural Barriers Act (ABA) and Americans with Disabilities Act (ADA) requirements including the provision of required disabled parking stalls. A shuttle bus stop is currently located along McMillan Road to the north of the GPL site.

Employees, guests, and vendors at LBNL would be provided access to the new facility under the existing UC LBNL entrance policies and procedures. No changes to existing UC LBNL security and safeguards are anticipated. LBNL has three secured entrances, one of which is staffed 24 hours a day, 365 days a year. The new GPL facility would be equipped with card key access controls.

Road access for emergency fire apparatus is required by the 2007 California Fire Code (California Code of Regulations, Title 24, Part 9). Emergency vehicles would access the GPL via a paved roadway on the east and south sides of the building, as shown in Figure III-4. The roadway would be redesigned from the current configuration to eliminate its sharp curve.

III.B.5.e. GPL at Building 25/25B Site: Landscaping and Tree Removal
The GPL facility would be landscaped in accordance with the following design requirements:

♦ Continue to use sustainable practices in selection of plant materials and maintenance procedures;

- Utilize native, drought-tolerant plant materials to reduce water consumption; and
- Focus shade trees and ornamental plantings at special outdoor use areas.

Trees to the southwest of Building 25 would probably be removed as part of the Proposed Action in order to realign the driveway. One is a 25-foot-high Coast live oak and the other a 30-foot Dawn redwood. A second Coast live oak on the east side of Building 25 might have to be removed to allow for the construction of a new 125-foot-long storm drain which would run from the southeast corner of the GPL east through the previously developed hillside to a connection point on Segre Road. The two Coast live oak trees have circumferences of 26 inches (tree southeast of B25) and 33 inches (tree southwest of B25) respectively. If the trees were removed, they would be replaced at a ratio of one to one, in keeping with UC LBNL policies.

III.B.5.f. GPL Operation at Building 25/25B Site
The GPL would be a safe, modern, energy efficient laboratory/office facility designed for multi-program use. The GPL would consist of approximately 60 percent office space and approximately 40 percent wet chemistry lab facilities.

The GPL is planned to house researchers from several LBNL Divisions, including but not limited to Life Sciences, Physical Biosciences, and Materials Sciences. The building includes general laboratory space for functions such as wet lab, measurement lab, spectroscopic equipment, optics, instrumentation, tissue culture, and media prep; and general office space including facilities for computational theory staff related to the Solar Energy Research Center (SERC). The researchers would work in a variety of scientific areas including but not limited to structural biology, macromolecular crystallography, and cell biology. Their research activities would benefit technologies designed to improve the conversion of biomass to fuels, materials for energy applications such as photovoltaics, fuel cells and thermoelectric. Research activities would also contribute knowledge relevant to human disease and biotechnology.

The GPL would house normal general purpose laboratory equipment, typical of current laboratories located on-site and off-site. There would be a number of lasers embedded in other instruments such as microscopes, mass spectrometers, or flow cytometry analyzers/sorters; and probably an x-ray machine. All workers would be trained to the specification of the UC LBNL Health and Safety Manual (Pub-3000) prior to commencing work in the GPL. Standard laboratory chemicals including organic solvents would be used and stored in the labs. A suite of laboratory chemicals would be used, including very low level (typically 1 mCurie – 5 mCurie) radioactive substances. Such low level radioactive substances would be stored and used in very small amounts and under highly controlled conditions. Compressed gases would also be used.

III.B.5.g. GPL Decommissioning

It is anticipated that the GPL would be decommissioned at some as yet undetermined point in the future, after it has exceeded its useful lifetime. It is anticipated that such decommissioning would likely involve safely tying off utility systems; removing and recycling or reusing its contents; and cleaning up and disposing of wastes and any potential sources of environmental contamination. Afterward, the building may or may not be demolished and removed pending a decision to be made at that time.

If the GPL were demolished, it is anticipated that there would be minimal environmental impacts. It is anticipated that there would be no hazardous or radioactive building waste material to dispose of, conventional demolition methods would be used, and controls would be required to protect the workers and the environment. Prior to demolition of the building, analysis would be conducted to verify whether environmental impacts would result from building demolition and to assess what level of further National Environmental Policy Act (NEPA) review would be appropriate.

III.B.6. Personnel and Equipment Relocations

III.B.6.a. Personnel

The GPL would provide space for a total of approximately 130 occupants, including UC LBNL life science researchers, personnel from the Physical Biosciences Division at the LBNL site, and approximately 30 graduate and post-graduate UC Berkeley researchers affiliated with the SERC program, some of whom currently work at or travel regularly to the LBNL site. Relocation of these personnel to the GPL would consolidate related research programs and personnel and foster the collaborative approach to science and the free exchange of ideas which is vital to achieving DOE scientific mission objectives. The addition of approximately 30 UC Berkeley researchers represents an increase of less than 1 percent over the 2006 average daily population (ADP) of about 3,650 personnel of the LBNL site. As such, the Proposed Action would be achieved with only a negligible increase in the ADP of the LBNL site.[11]

In addition to the relocations of the directly affected personnel (described above), it is expected that a number of secondary personnel moves (involving people already on the LBNL site) would likely result from the Proposed Action. Such personnel moves typically involve the transport of boxes and personal equipment (computers, phones, and files) from one work space to another by handcart and/or moving van. At times, they also involve minor renovations (partition and furniture adjustments, new carpeting, interior painting, etc.).

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[11] The Proposed Action identified and analyzed in this EA is a refinement of the project description presented earlier in the University of California's Seismic Phase 2 Draft Environmental Impact Report (EIR) and circulated for public review between January 29 and March 15, 2010. In the earlier project description, approximately 100 UC LBNL staff were to relocate to the proposed GPL building at the LBNL site from off-site locations such as the 717 Potter Street facility in Berkeley and the Donner Laboratory on the UC Berkeley Campus. UC LBNL has since made planning decisions on future space needs that have modified the move plans associated with this proposed project.

III.B.6.b. Equipment and Functions

The GPL would house newly created space specifically designed for receiving project related equipment and functions, transferred from other locations on the LBNL site and the UC Berkeley campus. Relocations would be necessary for equipment and functions currently housed in buildings to be demolished (Building 55 and Building 71 Trailers C, D, F, J, K, and P), as well as for any subsequently triggered moves. Such secondary relocations are expected to involve only office and laboratory functions.

In addition to some office equipment and laboratory supplies, the most notable equipment to be moved would be the Positron Emission Tomography (PET) scanners currently housed and operated in Building 55. These imaging devices are relatively large and sensitive and require special consideration in their placement and operation. At this time, it is anticipated that the Building 55 PET scanners would be relocated to Building 64, a nearby laboratory/office building that currently houses similar devices.

It is expected that no personnel, equipment, or functions would be moved off the site as a result of the Proposed Action. In addition, it is anticipated that all moves would involve the relocation of personnel, equipment, or functions into similarly used spaces. For example, office workers would move to other office space, and lab workers would move to other, appropriately outfitted laboratory space.

III.C. Alternatives to the Proposed Action

In accordance with the NEPA, Section 102 (2)(E), reasonable alternatives to the Proposed Action must be considered. These include a "No-Action Alternative," against which all other alternatives and their impacts are compared. The following alternatives to the Proposed Action are considered feasible and evaluated in this EA:

- Alternative A: GPL construction at Building 74 SE Parking Lot Site, demolition of Building 25/25B, Building 55, and six Building 71 trailers, and seismic strengthening of Building 85/85A;
- Alternative B: GPL construction at the Richmond Field Station (RFS), demolition of Building 25/25B, Building 55, and six Building 71 trailers, and seismic strengthening of Building 85/85A;
- Alternative C: No GPL Construction but Leased Space in Berkeley or Emeryville, demolition of Building 25/25B, Building 55, and six Building 71 trailers, and seismic strengthening of Building 85/85A;
- Alternative D: No demolition of buildings or trailers, no GPL construction, seismic strengthening of Building 85/85A; and
- No-Action Alternative: No demolition, seismic strengthening of Building 85/85A, or GPL construction.

III.C.1. Alternative A (GPL Construction at Building 74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Under this alternative, seismically deficient Building 25/25B and Building 55, and antiquated Building 71 Trailers C, D, F, J, K, and P would be demolished as under the Proposed Action. Seismic strengthening of Building 85/85A would also proceed as under the Proposed Action. This alternative differs from the Proposed Action in the on-site location proposed for construction of the GPL.

Under this on-site alternative, the new GPL would be constructed on the site of the existing Building 74 southeast (SE) parking lot at LBNL. A three-story GPL structure of approximately 43,000 gsf, and 29,500-square-foot footprint (including drive aisle) would be built. This would require development of approximately 8,000 square feet of previously developed area and approximately 20,000 square feet of undeveloped hillside adjacent to the building site (for a fire access lane), as well as the demolition of the shed, Building 74F, that currently occupies a corner of the parking lot. The site is located in close proximity to the UC Botanical Garden in the eastern section of the LBNL site, within Oakland City limits.

The GPL building would be terraced into the hillside, the northeastern face would be approximately 2½ stories and 25 to 30 feet in height. The average height of the building along its three-story southwest face would be approximately 48 feet with an additional approximately 11-foot wall on the top of the third story to screen mechanical equipment. On the roof, there would be ventilation stacks, centrally located on the building, projecting approximately 30 feet above the roof. The building would require the construction of permanent retaining walls along the eastern and western boundaries. The eastern boundary retaining wall would be approximately 450 feet long with a maximum height of about 25 feet from finished grade. The western wall would be approximately 300 feet long and a maximum of about 20 feet tall from finished grade.

III.C.1.a. GPL at Building 74 SE Lot: Site Preparation and Staging

Building 74F would be demolished and the asphalt parking lot would be removed. The hillside would be terraced to accommodate the proposed building.

Four areas have been identified for staging:

- Parking Lot U5 off Calvin Road to the west of Building 74;
- Parking Lot U1 in front of and to the southwest of Building 74;
- Parking Lot U3 to the southeast of Building 74; and
- An area of ornamental shrubs to the west of the GPL site.

III.C.1.b. GPL at Building 74 SE Lot: Excavation and Soil and Groundwater Sampling and Analysis

The Building 74 SE Parking Lot site is adjacent to a former plume of diesel-contaminated groundwater that originated from leaks in a diesel tank pipe around Building 74, but the plume has not reached the area that would be excavated for the GPL foundations according to the most recent monitoring reports. Excavation at this site would be to an approximate depth of 20 feet and would probably encounter groundwater. As required for all excavation at LBNL, a SMP and GMMP would be prepared and these would contain descriptions of the sampling and analysis required to evaluate potential risks and to comply with landfill screening criteria.

For GPL construction, approximately 7,000 cubic yards of cut would be required for the foundations. Of this, approximately 4,000 cubic yards would be used as backfill and approximately 3,000 cubic yards would be transported off-site. Sampling, removal, handling, and disposal would be done as described in detail in Section III.B.1.d.

III.C.1.c. GPL at Building 74 SE Lot: Utilities, HVAC, and Exhaust Systems
The GPL would require connections to existing utility lines serving Building 74 and Building 84 for potable water supply and sewer. These connections would occur within areas that have already been disturbed by existing building footprints, driveways, or roadways. Three new fire hydrants would be installed around the exterior of the GPL. Concrete stormwater detention vaults are proposed to the north of the eastern side of the building.[12]

III.C.1.d. GPL at Building 74 SE Lot: Access, Circulation and Parking
The GPL would meet ABA and ADA requirements. A drop-off area and ADA parking would be located near the entrance of the GPL using existing parking spaces. At a minimum, disabled access would be provided through the main entrance on the west side of the building. Depending on final design, disabled access may be provided on other sides of the building as well.

Emergency vehicles would access the GPL from Centennial Drive via the existing driveway located along the southwestern face of Building 74. An emergency fire access road would be incorporated into the project area along

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[12] Conceptual Design Report, 2008. Seismic Life-Safety, Modernization, +Replacement of General Purpose Buildings, Phase II. RMW Architecture and Interiors for LBNL.

the eastern portion of the site. The roadway would be about 20 feet wide and approximately 250 feet long.

III.C.1.e. GPL at Building 74 SE Lot: Landscaping and Tree Removal
A landscaping plan to provide screening for the GPL when viewed from the UC Botanical Garden would be prepared as part of Alternative A, should the GPL be built at this location.

Site preparation is expected to involve removal of approximately 50 trees; however, this number assumes a worst case scenario and might decrease based on the final grading plan and the proposed area of disturbance.[13] This includes about 24 Coast live oak trees, eight Coast redwoods, and five Monterey pines. Any trees removed would be replaced at a ratio of one-to-one, in keeping with UC LBNL policies. The trees have been surveyed by an arborist and the project would follow recommended measures for pruning and protection of the remaining trees.

III.C.1.f. GPL Operation at Building 74 SE Lot
Under this alternative, the GPL would be a modern, safe, energy efficient laboratory/office facility designed for multi-program use. Operation of the facility would be equivalent to the GPL under the Proposed Action in all respects.

III.C.1.g. GPL Decommissioning
The process for decommissioning would be as described above in III.B.5.g. If the GPL were to be demolished and removed after decommissioning, the process and the associated analysis of environmental impacts would also be as described above under III.B.5.g.

[13] Arborist Report, 2008. Proposed New Building, LBNL. The Professional Tree Care Company.

III.C.2. Alternative B (GPL Construction at RFS, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Under this alternative, seismically deficient Building 25/25B, Building 55, and antiquated Building 71 Trailers C, D, F, J, K, and P would be demolished as under the Proposed Action. Seismic strengthening of Building 85 would also proceed as under the Proposed Action. This alternative differs from the Proposed Action primarily in the location proposed for the GPL and in the construction of its foundation.

Under this alternative, the proposed GPL facility would be located at the UC Berkeley RFS. The RFS is located in Richmond off of Interstate 580 (I-580), approximately six miles northwest of the LBNL site. The 152-acre academic teaching and research facility consists of about 100 acres of uplands and about 52 acres of marsh and bay lands. The RFS was formerly used for industrial purposes and there is remnant contamination that has been the subject of environmental investigation and remediation over a number of years.[14] UC Berkeley is conducting additional investigations of groundwater and soil contamination to determine if more clean-up is required.

The proposed 3.2-acre GPL site at RFS would be bound by Seaver Avenue to the west, South 47th Street to the east, and two un-named streets to the north and south. Figure III-7 shows an aerial view of the RFS. This site is an existing storage area for California Partners for Advanced Transit and Highways research vehicles. Although a building (Building 167) is present on this site, this building would not be displaced by the GPL facility as adequate undeveloped land area is available to locate the GPL building on the site without removing this existing building. Under this alternative, the GPL would be a safe, modern, energy efficient laboratory/office facility designed for multi-program use. Operation of the facility would be equivalent to the GPL under the Proposed Action in all respects. If the GPL were to be constructed on

[14] A description of the Richmond Field Station including past industrial activities and ongoing clean-up can be found online at: http://rfs.berkeley.edu/about.html#thefacility.

FIGURE III-7

AERIAL VIEW OF THE RICHMOND FIELD STATION (RFS) SITE this site, an SMP and GMMP would be prepared in accordance with UC LBNL standard operating procedures and the SPF. Sampling, removal, handling, and disposal would be done as described in detail in Section III.B.1.d.

Unlike the Proposed Action, which involves the relocation of about 30 UC Berkeley researchers to the LBNL site, this alternative would involve the relocation of 130 UC LBNL personnel to the RFS site. Because the RFS is not well-served by public transit, this alternative would include the creation of parking spaces for researchers, visitors, and guests, unlike the Proposed Action which would not result in the creation of additional parking spaces.

Similar to the Proposed Action, the RFS site is secured around all sides by chain link fencing that is at least 6 feet tall. Access to the site is monitored at a guard booth by the main entrance. Construction of the new facility at this site would require minimal grading since the site is flat.

III.C.3. Alternative C (No GPL Construction but Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Under this alternative, seismically deficient Building 25/25B, Building 55, and antiquated Building 71 Trailers C, D, F, J, K, and P would be demolished as under the Proposed Action. Seismic strengthening of Building 85/85A would also proceed as under the Proposed Action. This alternative differs from the Proposed Action primarily in that no new GPL facility would be constructed. Instead, additional space would be leased in a facility in the City of Berkeley or Emeryville, and LBNL research personnel would be relocated.

III.C.4. Alternative D: Seismic Strengthening of Building 85/85A

Under Alternative D, only the seismic strengthening of Building 85/85A would still take place. Building 25/25B, deemed seismically deficient under the UC Seismic Rating System, would remain unoccupied, but would not be demolished. In the short term, UC LBNL employees and guests would continue to occupy Building 55, also deemed seismically deficient under the UC rating system, and the six antiquated Building 71 trailers. In the long term, an alternative solution would be required as it is UC policy to replace or upgrade space deemed seismically deficient.

III.C.5. No-Action Alternative

Under the No-Action Alternative, none of the proposed demolition or GPL construction would occur. Building 25/25B would remain unoccupied, but would not be demolished. In the short term, UC LBNL employees and guests would continue to occupy Building 55, deemed seismically deficient under the UC Seismic rating system, and the six antiquated Building 71 trailers. In the long term, an alternative solution would be required as it is UC policy to replace or upgrade space deemed seismically deficient. Under the No-Action Alternative the seismic strengthening of Building 85/85A would not occur.

III.D. Alternatives Considered But Eliminated

The Council on Environmental Quality (CEQ), established as part of NEPA, has published regulations that require agencies to rigorously explore and objectively evaluate all reasonable alternatives and, for alternatives eliminated from detailed study, briefly explain the reasons for elimination. The Purpose and Need statement serves as the basis for identifying alternatives to the proposed action. Reasonable alternatives are those that substantially meet the agency's Purpose and Need. The following do not:

III.D.1. Rehabilitation Alternative

Under this alternative, Building 25/25B, Building 55, and Building 71 Trailers C, D, F, J, K and P would not be demolished but would instead be rehabilitated to upgrade overall function, improve seismic safety ratings, and mitigate risk to occupant safety. Specifically, this alternative would involve the partial demolition and reconstruction of Building 25/25B and Building 55 at their existing locations; the periodic replacement of the Building 71 trailers; and the seismic strengthening of Building 85/85A. However, productivity gains realized from co-location of the program elements would not be achieved.

Moreover, Building 25/25B and Building 55 in particular are very old and have little remaining useful life. As described in the Statement of Mission Need on file with the DOE, the cost to rebuild these facilities would exceed the cost to build new facilities due to the extensive retrofit required. This alternative was determined to be unreasonable, and is not evaluated further.

III.D.2. Existing Buildings Alternative

Under this alternative, functions and programs housed in buildings identified for demolition would be relocated to existing, seismically stronger buildings at LBNL. Buildings would not be demolished, but would instead be left vacant. The new GPL facility would not be constructed under this alternative.

This alternative would not allow for the achievement of the identified Purpose and Need. Space at LBNL is currently 98 percent occupied and the functions to be relocated to a new GPL facility serve mission-critical needs. Failure to provide upgraded research facilities would continue occupancy of buildings with elevated life safety risks, and little useful life left. Moreover, failure to provide modern high accuracy research facilities suitable for coordinated research would seriously challenge scientists' ability to perform the high-level research necessary to successfully address the nationally and internationally critical issues posed by the current and emerging DOE missions. Additionally, the environmental benefits of a more energy efficient GPL building would not be realized, nor would the associated reduction in maintenance and operational costs. Consequently, this alternative was determined to be unreasonable and is not evaluated further.

III.D.3. Relocation of the HWHF

Relocation of the HWHF functions, currently in the Building 85/85A complex, to another location at LBNL was an alternative considered but rejected. HWHF operations could not be relocated to an existing building on site, as there is no space available at LBNL that would meet the requirements for this facility. Relocating the HWHF off-site would necessitate that UC LBNL operate multiple interim storage facilities around the LBNL site for storage of hazardous waste up to a maximum of 90 days before manifesting to a final destination.[15] This practice would not be possible, however, for mixed waste generated at LBNL. Currently, under an agreement with the Department of Toxic Substances Control (DTSC) entered pursuant to the Federal Facility Compliance Act of 1992, certain mixed waste streams are stored at LBNL for longer than the year limit normally allowed at permitted hazardous waste handling facilities such as the LBNL HWHF in order to allow for characterizing the waste and locating appropriate mixed waste treatment and disposal facilities. This option is, therefore, unreasonable and was rejected.

III.E. Controls

This section describes the procedures which would be followed and the permits and approvals which would be obtained for the Proposed Action and alternatives.

III.E.1. UC LBNL Standard Operating Procedures

There are standard operating procedures to which the Proposed Action and alternatives would be subject. Specific reference to these procedures is made in Chapter IV and they are quoted where applicable. The procedures are generally intended to ensure the safety of contractors and visitors and staff at LBNL during construction projects, and to reduce the overall impact that construction/demolition actions have at LBNL and on the surrounding community.

III.E.2. Standard Project Features

Standard Project Features (SPFs) were originally identified in the UC LBNL 2006 LRDP EIR as environmentally proactive measures that would be incorporated into all LBNL projects.[16] These measures have been adopted as part

[15] As much as 55 gallons of waste may also be stored in a satellite accumulation area for no greater than one year before being shipped off-site.

[16] LBNL, 2007. LBNL 2006 Long Range Development Plan Final Environmental Impact Report (SCH No. 2000102046).

of the LBNL 2006 LRDP EIR by the Regents of the University of California. These Standard Project Features are set forth in Appendix A. For clarity, Appendix A lists Standard Project Features as they were characterized in the LDRP EIR in Chapter 5, entitled *Mitigation Monitoring and Reporting Program*. The SPFs described herein are incorporated into and are a part of the project description of the Proposed Action and alternatives.

III.E.3. Plans Applicable to this Project

A variety of plans are applicable to cover the work carried out under the Proposed Action and alternatives. These are referenced in the issue sections in Chapter IV as appropriate, and are summarized here.

- *Soil Management Plan (SMP)* and *Groundwater Monitoring and Management Plan (GMMP)* must be prepared in accordance with the DTSC-administered CMI. A site-specific SMP is required by LBNL Pub-3000, Section 11.3.7 Contaminated Soil and Groundwater Management. This plan describes the requirements for soil and groundwater testing.
- *LBNL Radiological Work Permit Program*. The contractor must ensure that project construction complies with the LBNL Radiological Work Permit Program. At Building 25 and Building 55, where radiological materials have historically been used, whenever construction work exposes previously unexposed surfaces or opens up trenches, ventilation, plumbing, drains, or vacuum lines, the area must be surveyed by a Radiological Control Technician. Radiation testing would be conducted during removal of fume hoods, exhaust fans, ducting, vacuum systems, and flooring. Any contaminated material must be removed and disposed of prior to further demolition work.
- *Asbestos Compliance Work Plan, Lead Compliance Work Plan, and Silica Exposure Controls* must be implemented by the construction contractor to comply with relevant State and Federal regulations preventing worker exposure to these materials. The OSHA regulations also include extensive, detailed requirements for worker protection applicable to any activity that could disturb lead- or asbestos-containing materials, including maintenance, renovation, and demolition. For lead, these requirements

include respiratory protection, protective clothing, housekeeping, special high-efficiency filtered vacuums, hygiene facilities, medical surveillance, and training.

- *Site-Specific Injury and Illness Prevention Plan* including exposure prevention measures must be implemented by the construction contractor(s).
- *Site-Specific Storm Water Pollution Prevention Plan (SWPPP)* designed to specifically address potential discharges associated with construction must be prepared as the Proposed Action and alternatives would disturb more than 1-acre of land. A Notice of Intent must be submitted to the Regional Water Quality Control Board (RWQCB) to comply with the Construction General Permit requirements and conditions.
- *Communications Plan* to ensure that UC LBNL personnel and contractors are informed regarding hazards at the construction site would be developed by the UC LBNL Project Manager. Regular project site evaluations would be performed during project construction by a safety professional and project engineer to monitor the effectiveness of implemented measures.
- *Hazardous Materials Storage, Handling, Use, and Disposal Procedures* are maintained and overseen by LBNL EH&S Division. These procedures are compliant with State and Federal regulations and designed to minimize health and safety risks to individuals such as those who would occupy the GPL on an ongoing basis.
- *Hazardous Materials Business Plan*, which identifies appropriate procedures for emergency training and response procedures to address the accidental release of hazardous materials, is maintained by UC LBNL. The plan is updated on a regular basis to account for changes in the types, locations, and volumes of hazardous materials used and stored on the LBNL site.
- *Self-Assessment Summary Report* and a *Site Environmental Report* are prepared by UC LBNL on an annual basis to aid in compliance with environmental laws and regulations governing hazardous materials, and worker safety, emergency response, and environmental protection.

- *LBNL EH&S Manual, Publication 3000* governs procedures for handling laboratory chemicals, including hazardous and radioactive chemicals, compressed gases and cryogenics, and operation of potentially dangerous machinery, as well as construction safety requirements. The LBNL EH&S Division maintains and oversees procedures for storage, handling, use, and disposal of hazardous materials. These procedures are compliant with State and Federal regulations and designed to minimize health and safety risks to individuals such as those who would occupy the GPL on an ongoing basis.

III.E.4. Environmental Permits and Approvals

Several permits and approvals from regulatory agencies would be obtained for the project.

- LBNL is located on land owned by the University of California. The Board of Regents of the University of California (The Regents) is the University's decision-making body. The Regents have the authority to approve the project and to certify the EIR, however, the Proposed Action and alternatives are subject to and conditioned upon completion of the NEPA process. The Regents would approve the design of the GPL when the EIR is certified, subject to DOE completion of NEPA and approving the project as planned.
- State Water Resources Control Board (SWRCB), National Pollutant Discharge Elimination System (NPDES) California General Permit for Storm Water Discharges associated with Construction Site Discharges.
- Bay Area Air Quality Management District (BAAQMD) must be notified concerning asbestos demolition and possible asbestos renovation. However, no BAAQMD permit is required.
- The FTU at Building 25B is a permit by rule unit covered under the Tiered Permit Certified Unified Program Agency (CUPA) permit issued to LBNL by the City of Berkeley. Decommissioning of this unit would require approval of a decommissioning plan by the City of Berkeley Toxics Management Division.

- Alameda County Public Works Agency must issue a permit to close monitoring wells if the wells around Building 25/25B need to be decommissioned. The well decommissioning process, which involves overdrilling, removal of well casings and resurfacing with cement grout or sealant, would comply with California Well Standards.

IV AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter discusses the environmental effects for issues analyzed under National Environmental Policy Act (NEPA). The discussion is separated into two sections: those issues that are irrelevant, or only of minor relevance, with respect to the Proposed Action and alternatives and those that require more detailed consideration.

IV.A. Location and Existing Conditions at LBNL

The LBNL site is an approximately 200-acre site in the Berkeley Hills, straddling the border between the cities of Berkeley and Oakland, east of San Francisco Bay. The eight structures proposed for demolition are all located in the western portion of the site within Berkeley City limits, as is the site proposed for construction of the general-purpose laboratory (GPL). Building 85/85A, where seismic strengthening work would occur, is located in the City of Oakland. Locations of the components of the Proposed Action are shown on Figure III-1.

IV.B. Issues Determined Not to Warrant Further Consideration

Department of Energy (DOE) guidance recommends against addressing clearly insubstantial effects in detail, but rather advocates providing enough information to show why greater consideration is not needed.[1] The following environmental topics are either irrelevant to the area of the affected environment due to the nature and/or location of the Proposed Action and alternatives, or do not provide a basis for distinguishing between the Proposed Action and alternatives and therefore do not require further discussion. In the absence of effects, no cumulative effect is possible and therefore these issue areas are also not discussed in Chapter V.

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[1] U.S. Department of Energy (DOE), 2004, Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, page 3.

IV.B.1. Population and Housing

If the GPL is constructed at either of the on-site alternative locations at LBNL or at the Richmond Field Station (RFS), occupants would relocate from other locations on the site. Demolition of Building 55 and the Building 71 trailers would cause the additional relocation of approximately 110 UC LBNL staff to other LBNL site locations. In the case of Alternative C, if functions transferred to an off-site leased space facility in Berkeley or Emeryville, around 100 people could transfer from the LBNL hill site. There would be no relocations under Alternative D or the No-Action Alternative.

None of these relocations would be expected to affect population or housing as the distance between the LBNL site, the UC LBNL Potter Street facility, and the RFS is 6 miles or less and well within a reasonable commute from existing residences. Likewise, the seismic strengthening work would not affect population or housing needs.

IV.B.2. Socioeconomics and Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires agencies to identify and address disproportionately high and adverse human health or environmental effects its activities may have on minority and low-income populations.

The construction of the entire project is expected to last less than three years and all temporary contractors would likely be drawn from the local area at the discretion of subcontractors selected to perform the work. The subcontractors would be hired in compliance with UC and DOE guidelines. The residential areas surrounding the LBNL site do not qualify as minority neighborhoods, although the number of students living in the area means that some areas qualify as low-income areas, as they contain a higher percentage of low-income households than the Alameda County average. Nevertheless, the Proposed Action and alternatives would not result in environmental effects or human health risks which could affect the low-income populations near the site.

Census data indicate that the area around the RFS contains high concentrations of minority and low-income residents; however, the RFS is located in an area of light-industrial uses, and is largely isolated from the adjoining residential areas in Richmond by the freeway and railroad tracks.

Project operation under the Proposed Action and Alternatives A through C involves relocation of existing staff rather than hiring additional personnel.

IV.B.3. Public Services

The new GPL would be built to all currently applicable codes and would provide emergency access as required under applicable laws and regulations. The on-site fire station, which is located approximately 0.45-mile from the location of the GPL under the Proposed Action, would provide first response capabilities in the event of a fire or hazardous materials release. Police services are provided by the UC Police Department. As there would be only a negligible increase in the average daily population (ADP) of the site as a result of the Proposed Action or Alternative A, there would be no new effect on the provision of public services.

Alternative B would result in the transfer of about 130 staff to the RFS. Although this would be relatively large compared with the working population of around 500 at the RFS, it is small compared with the surrounding business and industrial community, and would place little new demand on Station 64 of the Richmond Fire Department, located less than 2 miles from the RFS. With Alternative C, approximately 100 additional UC LBNL personnel would be transferred to an off-site leased space facility in Berkeley or Emeryville. Neither Alternative D nor the No-Action Alternative would result in a change to the site ADP, and therefore neither alternative would affect provision of public services.

IV.B.4. Cultural Resources

The State Historic Preservation Office (SHPO) confirmed that Building 25/25B was not eligible for listing in the National Register of Historic Places based on the application of the Criteria for Evaluation identified in the National Historic Preservation Act (NHPA).[2] The DOE Berkeley Site Office (BSO) has determined that Building 55 and the Building 71 trailers are also not eligible for inclusion.[3,4] Building 85/85A, which would be modified internally and underground, was built in 1996 and is not considered a historic resource.

As the Proposed Action would take place on previously disturbed ground, the potential to encounter archaeological or paleontological resources is low. Alternative A would result in construction on a steep hillside, and it is very unlikely that archeological or paleontological resources would be uncovered. In the unlikely event that they were, Standard Project Features (SPF) CUL-3 from Appendix A would prevent their destruction prior to further investigation by halting activities within a 50-foot radius and summoning a qualified archaeologist. SPF CUL-3 would be adopted voluntarily at the RFS for Alternative B and would be used in the unlikely event that archaeological or paleontological remains are uncovered. Alternative C, D, and the No-Action Alternative would not involve ground disturbance from new construction.

IV.B.5. Land Use and Planning

The Seismic Phase 2B Project involves DOE facilities operated and managed by the University of California on land owned by the University. DOE facilities and the University of California, under Article IX, Section 9 of the California Constitution, are exempt from local land use regulation, including general plans and zoning. UC nevertheless seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts

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[2] Stephen D. Mikesell, Acting State Historic Preservation Officer. *Letter Re: Identification and Evaluation of Old Town Buildings, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, Alameda County.* April 27, 2004.

[3] Abbott, Kim, Environmental Programs Manager, DOE Berkeley Site Office. Determination of Ineligibility for Building 55 and Building 71 in the National Register of Historic Places. December 11, 2009.

[4] Trailer 71D was mistakenly omitted from the list of structures in the Determination of Ineligibility. However, as it is similar to Trailers 71C, F, J, K, and P that were included, the same conclusions also apply.

to the extent feasible. As such, only the UC LBNL plans and polices such as the SPFs listed and described in Appendix A are binding on the Proposed Action.

The construction of the GPL would take place either entirely at UC LBNL on lands designated by the University of California as Institutional Research and Academic, or at the RFS on lands designated for teaching and research, or in the case of Alternative C, the off-site leased space alternative, within an existing facility. The Proposed Action and alternatives would therefore not place incompatible land uses in proximity to one another or raise any other issues related to land use.

IV.B.6. Soils

The term "soil" refers to unconsolidated materials formed from bedrock or other parent material. The majority of soils on the LBNL site are characterized as Xerorthens-Millsholm complex, 30 to 50 percent slope. These are well-drained soils that are highly susceptible to erosion, although runoff is minimized on the LBNL site by heavy vegetation. Measures to prevent soil erosion that could result from the Proposed Action or alternatives are discussed in Section IV.C.3, Water Resources. The Building 74 SE Parking Lot site is in an area of relatively steep terrain against a hillside. Issues of possible landslides that might occur with heavy rain, and/or induced by earthquakes, are discussed in Section IV.C.1.

The southern portion of the LBNL site, including the Building 85/85A site, is underlain by Altamont Clay which is expansive and subject to shrink-swell potential, depending on variations in moisture levels.[5] Soil conditions have been factored into the design of all LBNL buildings, including Building 85/85A. However, only the seismic strengthening of those buildings and their attachment to underlying bedrock is relevant to this analysis.

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[5] LBNL, 2007, *Long-Range Development Plan Environmental Impact Report*, page IV.E-10.

The RFS is a relatively flat-lying bayside area. Any potential issues due to expansive soil would be factored into the building design.

IV.B.7. Intentional Destructive Acts

Intentional destructive acts such as sabotage and terrorism from internal or external sources are required to be considered in NEPA documents, according to interim guidance from the Office of NEPA Compliance Policy (part of the DOE Office of General Counsel).[6] The Proposed Action involves construction of a new GPL at LBNL that would take over functions currently being carried out in several other buildings at LBNL and this would not result in a change to the risk of intentional destructive acts. The Proposed Action is not expected to require additional security for the LBNL site. The entire LBNL site is fenced, and controlled access is available only at three entry gates. Card keys would be used for building access.

If the GPL were to be built at the RFS, the security configuration would be similar, in that the site is surrounded on all sides by chain link fencing at least 6 feet tall. On the southern side there is a marsh, an approximately 4-foot-tall wire mesh fence, and a section of the popular recreational trail, the Bay Trail. There is one public access point on the northeast corner, with a guard booth. Card keys would also be used for building access.

The building would have a guard on the door during normal business hours and card key access. These security precautions are considered appropriate given the type of work that is carried out, and would be carried out under Alternative C.

IV.B.8. Aviation Hazards

The RFS site is more than 12.5 miles north of the Oakland Metropolitan Airport, and is also not located within the vicinity of a private airstrip. There are no additional risks from overflying planes due to its location. As such,

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[6] Need to Consider Intentional Destructive Acts in NEPA Documents. Office of NEPA Policy and Compliance, Department of Energy, December 1, 2006.

implementation of Alternative B would not expose users of the GPL facility at the RFS to aviation hazards. The off-site facility is in existence and there would be no new hazards from greater LBNL occupation of this building as in Alternative C.

IV.C. Issues Determined to Warrant Further Consideration

This section includes comparative analyses of environmental issues that have been deemed relevant to the area of the affected environment, and that provide a basis for distinguishing between the Proposed Action and alternatives. Following a description of the relevant affected environment, the issues are evaluated for each alternative, and also compared to each other in order to establish a preferred alternative with respect to each issue. A summary table of these conclusions is presented in Chapter I, Executive Summary.

IV.C.1. Geological and Seismic Hazards

IV.C.1.a. Affected Environment

IV.C.1.a.i. Ground Shaking in Earthquakes

The San Francisco Bay Area contains active and potentially active faults and it is considered a region of high seismic activity. The Working Group on California Earthquake Probabilities has concluded that there is a 62 percent probability of at least one magnitude 6.7 or greater earthquake occurring in the Bay Area before 2032.

The northwest-trending Hayward Fault traverses the western edge of the LBNL site. The San Andreas Fault Zone, the longest in the State, is located approximately 19 miles west of the site. Both faults have experienced movement in the last 150 years. At the LBNL hill site, ground shaking resulting from an earthquake on the Hayward Fault is anticipated to be "violent" to "very violent."[7] In addition, strong ground shaking can be expected at the site as a result of moderate to major earthquakes on other faults in the region such as the Concord-Green Valley Fault (approximately 14 miles northeast of the

[7] As defined by the Modified Mercalli Scale. Definitions are available at www.abag.org.

site), the Calaveras Fault (about 18 miles southeast of the site), the Healdsburg-Rodgers Creek Fault (about 23 miles north of the site), as well as the San Andreas Fault.[8] Movement along these larger faults would generate substantial shaking that is factored into the design of new buildings built in California.

The intensity of shaking at the proposed site depends on the distance between the site and the earthquake epicenter, the magnitude of the earthquake, and the response of the underlying soil and bedrock. It is reasonable to assume that throughout the lifetime of the buildings, Building 85/85A and the GPL would be subjected to at least one moderate to severe earthquake that could produce potentially damaging ground shaking at the site.

Likely maximum ground accelerations during an earthquake at LBNL have been quantified for most types of subsurface conditions. For the UC Berkeley campus and LBNL, this information has been combined with the probability of earthquakes of a certain magnitude occurring within a certain number of years to make a set of probabilistic seismic hazard analyses.[9] These calculations are used to ensure that new buildings are designed, and existing ones strengthened, to withstand likely earthquakes.

In accordance with Section 1.3 (A) (Codes) of the LBNL Facilities Master Specifications, 010000 General Requirements, and with SPF GEO-2 from Appendix A, all improvements to existing buildings and all new construction would comply with the provisions of the most current version of the California Building Code (CBC). The CBC requires varying levels of geotechnical analysis and engineering provisions for grading, foundations, retaining walls, according to different seismic zones based on potential for seismic activity. The most stringent seismic design requirements contained in the code

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[8] LBNL 2006, *LRDP EIR*, Geology and Soils Chapter, page IV.E-5.

[9] URS Corporation, 2009, Updated Probabilistic Seismic Hazard Evaluation and Development of Seismic Design Ground Motions for the University of California, Berkeley and Lawrence Berkeley National Laboratory.

would apply to the LBNL geographic area.[10,11] In addition, UC probabilistic seismic hazard analyses describing the risk to construction in different locations on different substrates would be incorporated into the building design to ensure that the building is able to withstand likely earthquakes.

IV.C.1.a.ii. Active Faulting

The western edge of LBNL is located within an Alquist-Priolo Earthquake Fault Zone (Alquist-Priolo Zone) for the northern segment of the Hayward Fault (Figure IV-1). An Alquist-Priolo Zone is a zone of active faulting, with faults that have moved within the Holocene Era, or in the last 11,000 years. The eastern limit of the Alquist-Priolo Zone passes through LBNL near the Blackberry Canyon entrance. None of the Proposed Action components would be located within this zone.

IV.C.1.a.iii. Landslides

UC LBNL has undertaken studies to map unstable slopes within the site that are prone to sliding. Landslide hazard areas within the LBNL boundary have been assigned a high, medium, and low risk. In addition, UC LBNL has mapped areas where hillsides and historic landslides were repaired and stabilized. Most of the mapped landslides or potential landslides at the LBNL site are located within earthquake-induced landslide hazard zones.[12]

IV.C.1.a.iv. Liquefaction

According to the California Geologic Survey, no areas within the LBNL site have been identified as a Seismic Hazard Zone for liquefaction. Localized liquefaction hazards may be present at LBNL in areas underlain by shallow groundwater and poorly engineered fill or alluvial materials. However, the

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[10] LBNL 2006, *LRDP EIR*, Geology and Soils Chapter, page IV.E-16.

[11] Relevant LRDP Mitigation Measures are listed in Appendix A of this document.

[12] LBNL 2006, *LRDP EIR*, Geology and Soils Chapter, page IV.E-7.

thin soil profile on hillside areas and the existence of bedrock very close to the ground surface minimize potential liquefaction hazards at the site.[13]

IV.C.1.a.v. Tsunamis

The LBNL site is sufficiently far from the Bay, and at a relatively high elevation, so that tsunamis are not an issue. ABAG maps of tsunami danger show that the site proposed for GPL construction, is not in a tsunami evacuation zone.[14] Construction at this site would not therefore place personnel at undue risk from tsunamis. Portions of the Berkeley or Emeryville facility and portions of the RFS lie within ABAG designated Tsunami Evacuation Area.

IV.C.1.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.1.b.i. Demolition of Building 25/25B, Building 55, and Building 71 Trailers

Building 25/25B, Building 55, and Building 71 trailers would be demolished as part of the Proposed Action and these issues would not be relevant.

Demolition of Building 25/25B, Building 55, and Building 71 trailers would also be components of Alternatives A, B, and C but for the sake of brevity is not repeated below.

IV.C.1.b.ii. GPL Construction and Operation at Building 25/25B Site

Ground Shaking in Earthquakes

The Building 25/25B GPL site is located approximately 0.4-mile from the surface trace of the Hayward Fault on consolidated deposits of Tertiary age. All new construction is subject to the State standards of the CBC that have different requirements according to the precise construction location. UC probabilistic seismic hazard analyses also describe the risk to construction at

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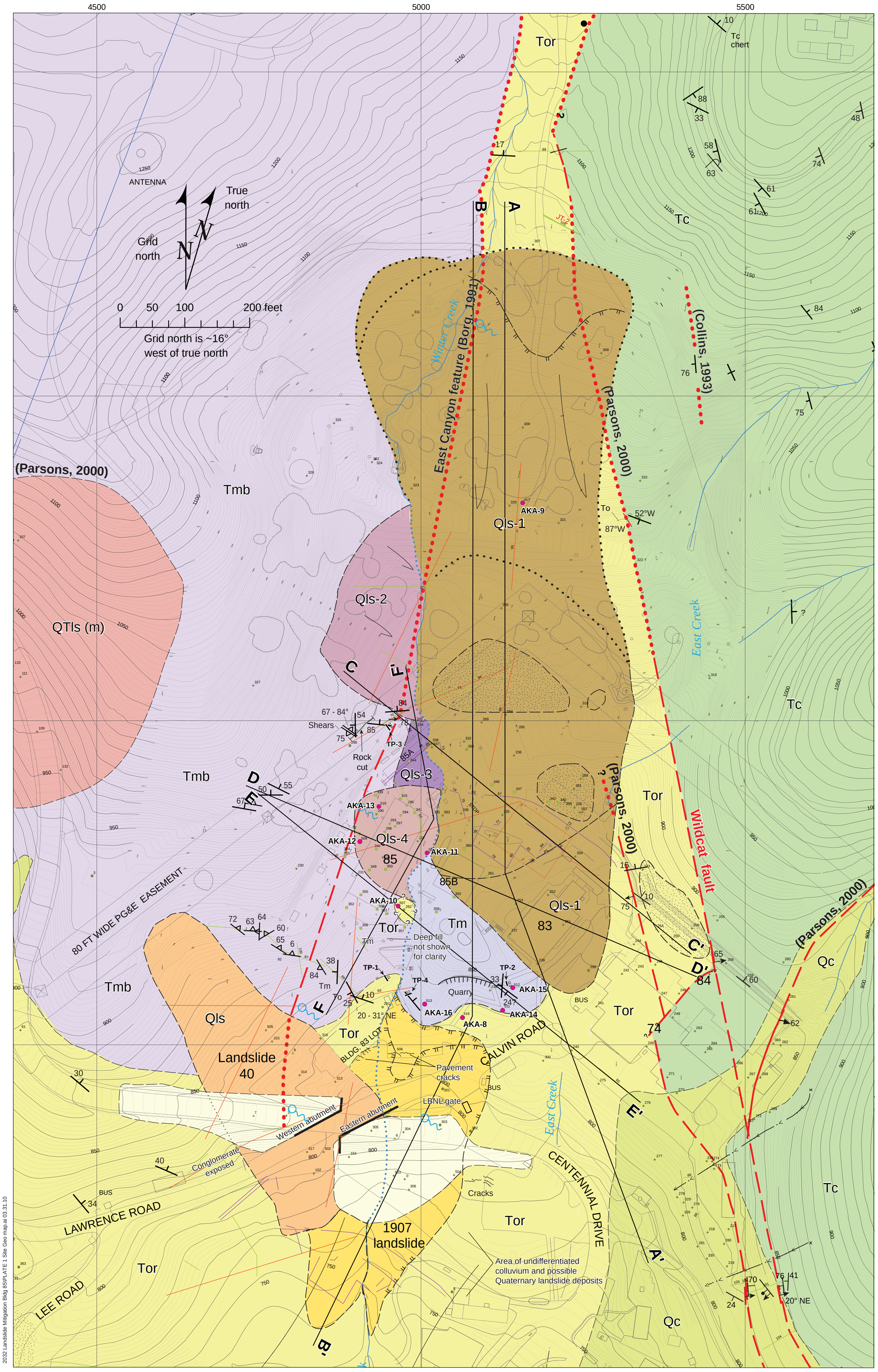
[13] LBNL 2006, *LRDP EIR*, Geology and Soils Chapter, page IV.E-14.

[14] Association of Bay Area Governments (ABAG). ABAG Tsunami Information, http://www.abag.ca.gov/bayarea/eqmaps/tsunami/tsunami.html. Accessed on April 6, 2010.



Fill
Qc — Quaternary colluvium/alluvium
QTls(m) — Moraga paleolandslide unit
Tmb — Miocene Moraga Formation (volcanics)
Tor — Miocene Orinda Formation (sandstone-siltstone conglomerate)
Tc — Miocene Claremont Formation (chert-shale)

Repaired landslide
1907 landslide
Landslide 40
Qls-1 - Quaternary landslide deposits
Qls-2- Quaternary landslide deposits
Qls-3- Quaternary landslide deposits
Qls-4- Quaternary landslide deposits

Contour, 10-foot interval (2003)
Contour, 2-foot interval (2003)
Contact; dashed where approximate dotted where concealed
Scarp morphology from 1907 photographs
? Fault projected verticle from depth, dashed where approximate, dotted where concealed and uncertain
84 Strike and dip of bedding
Overturned strike and dip
Fault strike and dip
24 Shear
Syncline
Anticline
Buildings, roads, vegetation (2003)
Spring (Parsons, 2000)
Stream (LBNL, 2003)

GIS Data Point ID
AKA-8 to AKA-16 — Boring (this study)
24 — Boring
294 — Pier hole
72 — Slope indicator boring
4 — Piezometer
283 — Monitoring well
164 — Well boring
352 — Test pit
103 — Borehole-hydrograph

GIS Data Line ID
60 — Hydrauger
34 — Seismic line
22 — Trench or test pit
72 — Cut wall

Notes: 1. Coordinate system is the University of California Grid system.
2. Mapping is based on field reconnaissance and compilation of previous studies.
3. The location accuracy of all data is only as good as the source location information. Georeferencing error can be as much as +/- 10 feet.

FIGURE IV-1

GEOLOGIC MAP OF THE EAST CANYON AREA

different UC locations and these risks are factored into the building design to ensure that the building is able to withstand likely earthquakes. This reduces the risks to personnel and buildings from ground shaking in earthquakes to a low level.

Seismically Induced Landslides

Building 25/25B is considered by several consultants to have been built on a paleolandslide[15] that separates a block of the Moraga Formation from the underlying Orinda Formation; other consultants have concluded that the contact between these two geologic units is depositional. The most recent and most detailed study of this issue by Lettis and Associates (2009) included new trenching.[16] It concluded that the evidence was equivocal as to whether a paleolandslide existed beneath Building 25 or not, but if the landslide did exist, it was geologically stable and had not moved in thousands of years. Lettis and Associates (2009) concluded that the Building 25/25B site was suitable for redevelopment and recommended the following should take place:

- Prior to the final design of new major structures, site-specific geotechnical and/or geologic investigations should be performed to assess the soil and bedrock conditions, minor slope instabilities, site grading and loading, strong ground shaking and surface fault rupture potential and recommendations presented in those reports should be followed.
- As the trenches were not backfilled to engineering design specifications, any proposed buildings or structures that intersect the trenches should include removal and re-compaction of the trench backfill.

Preparation of a site-specific geotechnical report is part of this project as required by SPF GEO-2. Geological investigations focused on the possibility of a landslide were carried out in 2009 and an additional supplemental geotechnical investigation was completed in April, 2010. The report made recom-

[15] Parsons, 2000, *RCRA Facility Investigation Report*.

[16] Lettis and Associates, 2009, *Palaeolandslide Investigation Building 25, Lawrence Berkeley National Laboratory, Berkeley, California*.

mendations pertaining to the design of the GPL which would be implemented if the Proposed Action goes forward at this location.[17] In addition, it would be standard engineering practice to remove and re-compact any encountered trench backfill.

In conclusion, construction of the GPL at the Building 25/25B demolition site would not place personnel or buildings at unacceptable levels of risk from groundshaking during earthquakes or other seismically-induced phenomena.

IV.C.1.b.iii. Building 85/85A Seismic Strengthening
The Building 85 complex was built in 1996 in conformance with the CBC. It is located approximately 0.7 miles from the Hayward Fault and would experience violent to very violent shaking due to an earthquake on that fault.

Ground Shaking in Earthquakes
Part of the seismic strengthening work will include additional bracing inside Building 85. This will further enhance the structure's integrity and ability to withstand earthquake-related ground shaking.

Active Faulting
A linear geologic feature, called the East Canyon Feature and shown on Figure IV-1 (taken from Lettis & Associates, 2008) runs through the Building 85 complex. The East Canyon Feature has been mapped as a branch of the Wildcat Fault that forms the western margin of the canyon and also runs through the Building 74 southeast (SE) parking lot. Figure IV-1 shows the linear feature overlain by two landslide deposits to the north.[18] The feature was evaluated prior to building construction by Geo/Resource Consultants (1994) when it was concluded that it was an inactive fault.

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[17] Alan Kropp & Associates, Inc., 2010, *Geotechnical Investigation Report, GPL at B25 Site, Lawrence Berkeley National Laboratory, Berkeley, California*.

[18] According to the Lettis & Associates 2008 figure, reproduced as Figure 4.5-2, the fault cross-cuts the older of the landslides to the east.

Seismically Induced Landslides

The landslides now considered to underlie part of Building 85 and all of Building 85A were not known when the Building 85 complex was built in 1996, and were not revealed by geotechnical surveys carried out in 1994 to determine the presence of active faults in the vicinity.[19] Landslides were first suspected in the Building 85 area in 2004 when they were discovered at the adjacent Building 86 (Animal Care Facility) site, during pre-construction geotechnical surveys, including analysis of historical photographs taken prior to the development of LBNL.[20] As their discovery had possible ramifications for Building 85, additional work was commissioned for the Building 85 area to investigate this in more detail.[21] This involved additional trenching in August 2005 to establish the western margins of the landslides. Two reports (Alan Kropp & Associates 2006a and 2006b) showed two landslides of Holocene age directly underlying Building 85 (Figure IV-1).[22,23]

The landslides in the Building 85/85A area are considered to be of Quaternary age (which is the most recent geological period, including about the last 1.6 million years) and it is not known if they have moved as coherent units with the Holocene Period (in the last 11,000 years). They were first recognized as landslides from their landslide-like topography shown in the photographs taken in 1885 and 1903 prior to development of the Canyon. Alan Kropp & Associates (2006b) found no evidence that the landslides have moved within historic times.

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[19] Geo/Resource Consultants, Inc., 1994, *Fault Investigation, Building 85 Hazardous Waste Handling Facility*.

[20] Alan Kropp and Associates, 2006a, *Geotechnical Investigation Report, Animal Care Facility, Lawrence Berkeley National Laboratory, Berkeley, California*.

[21] Alan Kropp and Associates, Inc., 2006b, *Summary Report. Initial Landslide Study, Building 85, Lawrence Berkeley National Laboratory, Berkeley California*.

[22] Alan Kropp and Associates, 2006a, *Geotechnical Investigation Report, Animal Care Facility, Lawrence Berkeley National Laboratory, Berkeley, California*.

[23] Alan Kropp and Associates, Inc., 2006b, *Summary Report. Initial Landslide Study, Building 85, Lawrence Berkeley National Laboratory, Berkeley California*.

A follow-up report[24] made recommendations to prevent the landslides from moving beneath Building 85 and Building 85A. These involved the installation of a system of drilled piers and tiebacks that would anchor the building and landslide into the bedrock and prevent the slide from moving during a seismic event.

The seismic strengthening of Building 85/85A would be carried out to resist the ground accelerations that could be expected in an earthquake of a magnitude such as could be expected to be encountered every 475 years. The calculations of accelerations and their probabilities are those now used for all UC Berkeley and LBNL buildings.[25] Design of the underground system and the internal building strengthening is subject to peer review by consultants appointed by UC LBNL. The UC seismic safety rating of Building 85 would be upgraded to "good" after completion of the improvements. The seismic strengthening would not affect everyday building operations and would enhance building safety.

The seismic strengthening at the Building 85 complex would also be a component of the project as described under Alternatives A, B, C, and D (but not the No-Action Alternative) but for the sake of brevity is not repeated below.

IV.C.1.c. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Ground Shaking in Earthquakes

The Building 74 SE Parking Lot site is located around 0.7 miles from the Hayward Fault and on consolidated, Tertiary deposits. As with the Proposed Action, building design would ensure that risks from ground shaking are

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[24] Alan Kropp & Associates, April 27, 2007, *Letter Report on Conceptual-Level Study of the Mitigation of a Landslide in the East Canyon Area of LBNL*.

[25] URS Corporation, 2009, *Updated Probabilistic Seismic Hazard Evaluation and Development of Seismic Design Ground Motions for the University of California, Berkeley and Lawrence Berkeley National Laboratory*.

minimized and upon completion of construction the GPL building would have a UC seismic rating of "good."

Active Faulting

The Building 74 SE Parking Lot site directly overlies a feature marked on geologic maps as the Wildcat Fault. This fault is not recognized by the California Division of Mines and Geology as an active fault.[26] However, in 2008 UC LBNL requested a geotechnical survey to verify the location of this fault and whether or not it is active.[27] These investigations showed that the fault was present at its mapped location. Trenching revealed that, along the western trace of the fault, sediments of early to middle Holocene age were undeformed, and east of the proposed GPL site, latest Pleistocene colluvium sediments were also unfaulted. The fault has therefore not been active since the oldest sediments (of Pleistocene age) were deposited and is therefore technically inactive.

Although the Wildcat Fault is inactive, it represents a structural weakness in the earth and zone of friable material that could damage the building's foundation. In conformance with Section 1.3 (A) Codes of the UC LBNL Facilities Master Specifications, building foundations and structural designs would be required to conform to the CBC design standards.

Landslides

Although Alternative A site is against a steep hillside, neither the elevated slope above this site to the northeast nor the lower slope to the southwest was identified as a landslide hazard in the LBNL 2006 LRDP.[28]

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[26] California Division of Mines and Geology (CDMG), 1982. Official map of Special Studies Zones, Richmond Quadrangle.

[27] Lettis and Associates, 2008, "Surface-fault Rupture Hazard Investigation of the Wildcat Fault." Proposed General Purpose Lab. Lawrence Berkeley National Laboratory, Berkeley, California.

[28] LBNL 2007, *LRDP EIR,* Geology and Soils Chapter, Figure IV.E-4, page IV.E-12.

In conclusion, construction of the GPL at the Building 74 SE Parking Lot site would not place personnel or buildings at unacceptable levels of risk from ground shaking during earthquakes or other seismically-induced phenomena. The presence of the Wildcat Fault and zone of structural weakness underneath the proposed building site at the Building 74 SE Parking Lot site is comparable to the risks of construction at the Building 25/25B site.

See also Sections IV.C.1.b.i and IV.C.1.b.iii.

IV.C.1.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Affected Environment at RFS

The RFS is located about 2.2 miles from the Hayward Fault and within a mile of the Bay and the underlying geology is Holocene alluvium. The alternative site is located in a topographically flat area and a portion of the site has been excavated and backfilled with imported soil. The Association of Bay Area Governments (ABAG) Liquefaction maps show the RFS is in an area of moderate liquefaction hazard following an earthquake of magnitude 7.1 along the entire Hayward Fault.[29] The site is not located in an area of landslide risk.

Construction and Operation of the GPL at RFS

As discussed above, the ABAG Liquefaction maps show the RFS is in an area of moderate liquefaction hazard following an earthquake of magnitude 7.1 along the entire Hayward Fault. Therefore, although this location is farther from the fault than if the GPL was built at the Building 25/25B site on the main LBNL hill site, the substrate presents greater risks to building stability. However, based on soil borings which show that sand layers occur at depths greater than 8 feet, UC concluded that the liquefaction potential for the upland area of the RFS is not high.[30] Additionally, adherence to the require-

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[29] Available online at: http://www.abag.ca.gov.

[30] UC Berkeley, 2008, Final Current Conditions Report, University of California, Richmond Field Station, California.

ments of the CBC would minimize the associated risks and construction of the GPL at the RFS would not involve a greater level of risk than construction at the LBNL site.

The site is not located in an area of landslide risk, and ABAG maps of tsunami danger show that only the marshland in the south of RFS is in tsunami evacuation zone.[31] Construction at this site would not therefore place personnel at undue risk from tsunamis.

See also Sections IV.C.1.b.i and IV.C.1.b.iii.

IV.C.1.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

This alternative would use an existing off-site facility in Berkeley or Emeryville which is around 3 miles from the Hayward Fault and located on Holocene alluvium.

See also Sections IV.C.1.b.i and IV.C.1.b.iii.

IV.C.1.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

This alternative involves only the seismic strengthening of Building 85/85A. In comparison to the Proposed Action, and to Alternatives B, C, and D, personnel would continue to use Building 55 that has been designated as seismically "poor" under the UC seismic rating system and the Building 71 trailers described as antiquated. (Personnel have already been moved from the "very poor" Building 25/25B and the building would remain vacant.) If these buildings were not demolished, the risk to personnel and to others who work in proximity to them would be greater in comparison to the Proposed Action

[31] Association of Bay Area Governments (ABAG). ABAG Tsunami Information, http://www.abag.ca.gov/bayarea/eqmaps/tsunami/tsunami.html. Accessed on April 6, 2010.

and key benefits of the project would not be achieved, including the co-location of similar research programs and the construction of modern, energy efficient research and office space fully suitable for DOE mission objectives. In the long term, personnel would still need to be moved from these buildings, given the age and structural integrity of the buildings. Additionally, Alternative D would not create the modern scientific research space in line with project objectives.

See also Section IV.C.1.b.iii.

IV.C.1.g. No-Action Alternative

None of the beneficial aspects of the project related to reduction of geological and seismic risks would be achieved under this alternative, as UC LBNL personnel would remain exposed to potential life safety hazards due to occupation of buildings that have a "poor" seismic rating or are described as antiquated. Building 85/85A is now known to be located on two ancient landslides. These landslides are considered stable except possibly in response to a severe earthquake, when they could move. Under the No-Action Alternative, Building 85/85A would continue to have risk of potential building damage in severe earthquakes.

Building 85/85A, built in 1996, is currently satisfactorily serving its function as a hazardous waste handling facility at LBNL. HWHF operations cannot be relocated to an existing building on site, as there is no space available that would meet the requirements for this facility, and the option of relocating the HWHF off-site was rejected as unreasonable for the reasons described above in Section III. Without installation of slope stabilization improvements and minor upgrades to the building structure, there would be a continued risk of potential damage to the building in response to a significant earthquake.

Under the No-Action Alternative, the current situation would continue and life- and building-safety benefits would be unrealized.

IV.C.2. Hazardous Substances and Human Health

IV.C.2.a. Affected Environment at LBNL

IV.C.2.a.i. Hazardous Substances in Older Buildings

Hazardous substances are commonly found in building materials, including those used in structures affected by the Proposed Action. Buildings constructed more than 30 years ago, such as those proposed for demolition as part of the Proposed Action, may contain several hazardous materials, including:

- ♦ *Asbestos*, a common component of older building materials. Inhalation of airborne fibers is the primary mode of asbestos entry into the body, making friable (easily crumbled) materials the greatest health threat.
- ♦ *Lead*, a hazardous neurotoxin that accumulates in soft tissue over time and may cause serious blood and brain disorders. It is present in lead-based paint that was commonly used in buildings prior to the 1970s.
- ♦ *Polychlorinated Biphenyls* (PCBs), organic oils that were formerly placed in many types of electrical equipment, including fluorescent lighting ballasts. Exposure to PCBs may cause various health effects, and PCBs are highly persistent in the environment.
- ♦ *Radioactive materials*, which have been used in several laboratory buildings at LBNL including Building 25 and Building 55. Material could be present as dust on exposed or hidden surfaces, in ventilation systems or drains.
- ♦ *Other hazardous chemicals*, including chemical residues on laboratory buildings that could be released to air, soil and groundwater during demolition.

IV.C.2.a.ii. Soil and Groundwater Contamination

Past chemical handling practices at LBNL were not as stringent as current practices and there were some releases of hazardous chemicals to soil and groundwater. In 1988, UC LBNL began a rigorous evaluation as part of an investigation under the Resource Conservation and Recovery Act (RCRA) for renewal of its Part B Hazardous Waste Facility Permit. This process revealed contamination in soil and groundwater due to past site activities. A total of 174 Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) were identified during the initial RCRA Facility Assessments, of which responsibility for 166 units was assigned to the California EPA DTSC, and responsibility for eight radiological units was assigned to DOE for regulatory oversight.

A number of targeted investigations and interim remedial cleanup actions were undertaken during the 1990s. The remaining contamination was addressed by a Corrective Measures Implementation (CMI) Work Plan, which was approved by DTSC in March 2006. Remedial activities continue at the site. All cleanup standards and methods are consistent with UC LBNL's *Environmental Assessment and Corrective Measures Study Report for Remediating Contamination at LBNL Regulated under the Resource Conservation and Recovery Act*[32] and applicable laws. In January 2007, DTSC determined that UC LBNL had implemented the approved remedies for the soil contamination and that the approved remedies for groundwater had been constructed and were operating successfully.[33]

Although all areas of soil contamination have been cleaned up to levels consistent with UC LBNL operations (designated as institutional land use) and acceptable to regulatory oversight agencies, residual contamination is present in soil at numerous locations. In addition, there may be undiscovered contamination that is encountered during building demolition and earthmoving activities.

VOC Contamination in the Building 71 Area

The primary contaminants of concern in project construction areas are volatile organic compounds (VOCs), including a number of compounds associated with degreasers and industrial solvents: tetrachloroethylene (PCE), tri-

[32] DOE/EA-1527.

[33] Department of Toxic Substances Control, Envirostor database, http://www.envirostor.dtsc.ca.gov/public/, accessed February 6, 2009.

chloroethylene (TCE), carbon tetrachloride, 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), and 1,1-dichloroethane (1,1-DCA). Freon-113, a coolant, is also a contaminant of concern in the Building 71 area.

Past Curium-244 Release in Building 71 Area

Radioactive curium-244 was released to the environment accidentally in 1959 as a result of research activities being conducted within Building 71 at that time. Curium-244, which has a half-life of approximately 19 years, was found at very low levels (maximum activity of 2.6 pCi/g) in soil around the building during investigations in 2003. Analysis of groundwater samples taken from around Building 71 in 2003 did not detect measurable levels of curium-244. As a result, the DOE approved a No Further Action (NFA) status for the radiation release.[34] Approval of NFA status provides that no additional environmental investigations are required for this event under the RCRA-related corrective action process.

Tritium from Building 75

The National Tritium Labeling Facility (NTLF) was located in Building 75, northeast of the Old Town Area, and approximately 750 to 1,500 feet from the various construction areas for the project. The NTLF conducted tritium labeling research and development between 1982 and 2001. During operation of the NTLF, small amounts of tritiated water, or steam, were released to the air from the Hillside Stack discharge location and have since been found in the soil and groundwater at the LBNL site. A comprehensive tritium sampling program revealed that the highest soil and groundwater concentrations are located near the NTLF. A tritium groundwater plume has been mapped showing a plume that has migrated to the south of the NTLF and well east of the Building 25/25A area. In addition, in the Building 71B area, some isolated measurements have detected tritium in groundwater at close to detection lim-

[34] Summary of Radionuclide Investigations for LBNL Environmental Restoration Program, http://www.lbl.gov/ehs/erp/assets/pdfs/RadionuclidePDFfinal.pdf, accessed September 2003.

its. The tritium is believed to be from surface runoff of material that condensed from releases to the air from the NTLF area.

Between 1997 and 2002, US EPA evaluated tritium levels in air, soil, sediment, and surface water and determined that there were no significant hazards and LBNL was not eligible for the National Priorities List (NPL, commonly referred to as Superfund). Concentrations of tritium have been below the Maximum Contaminant Level for drinking water (<20,000 pCi/L) in all wells at the LBNL site since February 2005 (shortly after closure of the NTLF). The maximum detected concentration in any single monitoring well was 16,000 pCi/L, as reported in the 2008 annual report.[35]

IV.C.2.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.2.b.i. Demolition of Building 25/25B, Building 55, and Building 71 Trailers

Pre-Demolition Removal of Hazardous Substances

A survey to identify hazardous materials was conducted during 2008 at Building 25/25B, Building 55, and Building 71 trailers.[36] The survey identified asbestos-containing materials in thermal pipe insulation, sheetrock, floor tile, transite interior and exterior panels, acoustical ceiling tile, sink undercoating material, and roofing materials at Building 25; in carpet and other flooring materials, ventilation systems, and roofing materials at Building 55; and floor tiles and window caulking at the Building 71 trailers. Lead-based paint was identified on interior surfaces in Building 25 and Building 55. Other hazardous materials noted during the survey included fluorescent light fixtures with presumed PCB ballasts and lighting tubes, coolant gases, mercury thermo-

[35] LBNL Environmental Restoration Program, 2009. Quarterly Progress Report and Annual Status Summary. Fourth Quarter Fiscal Year 2008, February, page10.

[36] Winzler & Kelly, 2008, Hazardous Materials Survey, Seismic Upgrade Phase II, Lawrence Berkeley National Laboratory.

stats, hydraulic fluid for elevators at Building 55, and an electrical trench with metal debris at Building 25.

Radioactive materials were historically used in Building 25 and Building 55. The demolition would be required to comply with the UC LBNL Radiological Work Permit Program. At Building 25 and Building 55, where radiological materials have historically been used, whenever construction work exposes previously unexposed surfaces or opens up trenches, ventilation, plumbing, drains, or vacuum lines, the area must be surveyed by a Radiological Control Technician. Radiation testing would also be conducted during removal of fume hoods, exhaust fans, ducting, vacuum systems, and flooring.

As described in Chapter III, project areas found to have building-related chemical or radiological hazards would be cleaned and decontaminated under oversight of UC LBNL industrial hygienists and health physicists prior to any further demolition work. Hazardous and radioactive materials would be disposed in accordance with UC LBNL procedures.

Emissions from demolition activities would be reduced by a series of measures outlined in Appendix A of this EA. Implementation of SPF AQ-1 (a), related to dust control, as discussed in Section IV.C.8, Air Quality, would minimize the airborne release of particles to non-hazardous levels.

Excavation and Remediation of Soil and Groundwater

Demolition at Building 55 and Building 25/25B would involve removal of soil to at least 3 feet below grade. The most recent investigations of subsurface contamination under Building 25, completed in February and March 2010, indicate no considerable subsurface contamination.[37] A more comprehensive evaluation of potential subsurface contamination would be completed as part

[37] Environment, Health and Safety Division, and Earth Sciences Division, LBNL, 2010. Initial Evaluation of Potential Subsurface Contamination Under Building 25, 2010.

of the building demolition process in order to confirm these results, after removal of the building and concrete floor slab.

Soil and groundwater contamination is known to be present in the Building 25/25B area as described in the UC LBNL Environmental Restoration Program's Quarterly Progress Reports.[38] No soil or groundwater contamination is known in the Building 55 area but, because the building was used as a chemical laboratory, contamination could be discovered during the excavation process.

If the soil under the buildings is found to be contaminated, it would be cleaned up as necessary as part of the Proposed Action. Sampling of soil and groundwater would be in accordance with the site-specific SMP and GMMP. Any newly discovered environmental releases of hazardous constituents would meet the notification and corrective action requirements in LBNL's Hazardous Waste Facility Permit (EPA ID. No. CA 4890008986), Section VI.B, "Newly Identified Releases." Cleanup standards and methods would be consistent with LBNL's *Environmental Assessment and Corrective Measures Study Report for Remediating Contamination at LBNL Regulated under the Resource Conservation and Recovery Act*.[39] Known or suspected contaminated soil would be placed in covered bins or other sealed containers, or stockpiled and covered with plastic sheeting held in place. Clean soil would be trucked to a Class III landfill, contaminated soil to a Class I or II landfill. In the unlikely event that any soil was found to have low-level radioactive contamination, it would be sent to the Nevada Test Site or equivalent facility.

Demolition of Building 25/25B may require relocation of several groundwater monitoring wells located adjacent to Building 25 by filling in existing wells and drilling new ones. The wells are used to monitor the effectiveness of a corrective measure approved by DTSC (*in-situ* soil flushing) designed to achieve the required groundwater cleanup levels for the groundwater con-

[38] Available online at: http://www.lbl.gov/ehs/erp/html/documents.shtml.
[39] DOE/EA-1527.

tamination at Building 25/25B. The well decommissioning process, which involves overdrilling, removal of well casings and resurfacing with cement grout or sealant, would comply with California Well Standards and require a well closure permit from the Alameda County Public Works Agency. As a result of this project, there would be an opportunity to conduct further investigation and improve the existing groundwater remediation system.

No soil contamination is known or suspected at the Building 71 trailers, which were used for offices. Although groundwater beneath the Building 71 trailers has been impacted by solvents, demolition of the trailers involves removal of the surface structure without penetrating the underlying asphalt.

In conclusion, the demolition of Building 25/25B, Building 55, and Building 71 trailers, if it proceeded, would implement SPF HAZ-3 (a) which calls for a Site Environmental Report, with soil and groundwater testing as described in the SMP and GMMP, and would result in a low risk of release of hazardous chemicals into the environment, or exacerbation of an existing contamination situation. Implementation of the health and safety plans discussed above would provide adequate protection of construction workers.

Demolition of Building 25/25B, Building 55, and Building 71 trailers is also part of Alternatives A, B, and C, but for brevity, this discussion is not repeated below.

IV.C.2.b.ii. Construction of GPL at Building 25/25B Site

If the GPL is constructed at the Building 25/25B site under the Proposed Action, soil would be excavated to greater depth than if the site were left vacant after demolition. Risks of encountering contamination and procedures to be followed if this occurs were described above under Section IV.C.2.b.i. Construction of the GPL would involve standard construction materials and would result in a low risk of release of hazardous substances to the environment.

IV.C.2.b.iii. GPL Laboratory Operations

The GPL would house normal general purpose laboratory equipment, typical of current laboratories located on site, including instruments such as lasers and an X-ray machine. Potential hazards associated with these pieces of equipment include eye injuries from laser use, fire and explosion, and radiation dangers. Precautionary measures for operation of these instruments are contained in the UC LBNL EH&S Manual, Pub 3000. A suite of laboratory chemicals would be used, including very low level (typically 1 milli-Curie - 5 mCurie) radioactive substances. Such low-level radioactive substances would be stored and used in very small amounts and under highly controlled conditions. Adequate radiation shielding would be incorporated into the building design. The GPL will also use compressed gases and cryogenics during operation. The use of compressed gases is subject to the requirements of Pub 3000, Chapter 7, Pressure Safety & Cryogenics, and Chapter 13, Gases. Plans and procedures to ensure safe operation of equipment and to prevent hazardous chemical releases to the environment are listed in Chapter III, Section III.E.3 and III.E.4. All radioactive wastes are handled, stored, and treated in accordance with DOE requirements. All hazardous wastes are handled, stored, and treated in accordance with the LBNL's RCRA Part B permit.

GPL laboratory operations would be similar for Alternatives A, B, and C, but for the sake of brevity, is not repeated below.

IV.C.2.b.iv. Building 85/85A Seismic Strengthening

Building 85/85A was constructed in 1996 in accordance with requirements in the Uniform Building Code, Uniform Fire Code, hazardous materials laws and regulations, and accepted industrial waste management practices. These include the use of curbs, trenches, and sumps for hazardous material containment, coated floors, backup emergency power supply, and pollution abatement equipment, monitors, and alarms to minimize the release of hazardous or radioactive substances to the environment. All radioactive wastes at Building 85 are handled, stored, and treated in accordance with DOE requirements. All hazardous wastes are handled, stored, and treated in accordance with the facility's RCRA Part B permit. Mixed wastes are handled, stored, and treated in accordance with both DOE requirements and the Part B permit.

The soil and groundwater around Building 85/85A have been analyzed for potential contaminants, primarily prior to building construction, and the level of contamination was within established regulatory thresholds. Since then, according to facility personnel, no spills have occurred.

During the construction work at Building 85/85A, sub-grade piers would be installed below the building overhang in the lower yard. Piles would also be installed on the southeast and northeast sides of Building 85A. Depth to groundwater ranges between approximately 37 to 40 feet below ground surface (bgs) at monitoring well MW 85-96-2, which is south of Building 85; approximately 14 to 16 feet bgs at MW 85-96-1, which is north of Building 85; and about 5 to 11 feet bgs at MW 85-95-2, which is east of Building 85A.
As described in the project description, borings for the piers would be approximately 4 to 5 feet wide and about 40 to 50 feet deep and are expected to contact groundwater. Sampling of soil and groundwater would be in accordance with the site-specific SMP and GMMP. The holes would be drilled in dry weather. The metal piers would be inserted and the holes would be filled with concrete, slowly, to prevent spaces within the structure. The holes would be filled as soon as feasible after drilling to prevent creating a path for rainwater to enter the subsurface.

In conclusion, the seismic strengthening of Building 85/85A is not likely to lead to any releases of hazardous or radioactive waste into the environment, exacerbate any existing contamination problem, or cause worker or public exposure. Procedures to be followed if this occurs were described above under Section IV.C.2.b.i. The building would continue to operate during the construction work (with temporary closure of some areas) and operations would return to normal when the work was completed.

The seismic strengthening at the Building 85 complex would also be a component of the project as described under Alternatives A, B, C, and D (but not the No-Action Alternative) but for the sake of brevity is not repeated below.

IV.C.2.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening

Construction of the GPL would result in excavation of an area of approximately 20,600 gsf that includes the existing parking lot and area occupied by Building 74F, which would be demolished. The excavation would be to a depth of approximately 20 feet and would be expected to intersect groundwater. The Building 74 SE Parking Lot site is adjacent to a former plume of diesel-contaminated groundwater that originated from leaks in a diesel tank pipe around Building 74, but the plume was determined not to have reached the GPL excavation area. In addition, monitoring wells in this area are sampled quarterly and tested for total petroleum hydrocarbons as diesel. Results were below the limit of detection in the third quarter of FY 2009[40] and no further cleanup is necessary.[41] It is therefore unlikely that any remnant diesel contamination would be spread due to the construction of the GPL. Building 74 and Building 84 have not been associated with other contamination issues. The chances of construction workers encountering contaminated soil and groundwater at this site are therefore very low.

See also Sections IV.C.2.b.i and IV.C.2.b.iv.

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[40] Environmental Restoration Program. Quarterly Progress Report. Third-Quarter Fiscal Year 2009 for the LBNL Hazardous Waste Facility Permit.

[41] City of Berkeley Toxics Management Division has notified UC LBNL that no further action is required for the investigation of the former underground storage tank.

IV.C.2.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Affected Environment at RFS

The southeast portion of the RFS site was used for explosive manufacturing between 1840 and 1945. Soils and sediments contain levels of metals, PCBs, and pesticides above the California hazardous waste Total Threshold Limit Concentration criteria. Most of the contamination within the proposed site at the RFS has been remediated; however, UC Berkeley is currently conducting an investigation of pyrite cinders contamination at the site and plans to remediate the site in compliance with DTSC requirements. Groundwater contamination is described below in section IV.C.3.d.

Construction and Operation of the GPL at RFS

As described above, a portion of the site proposed for the GPL at the RFS has been remediated for various metals that exceeded site-specific human and ecological target levels. Additionally, soil management and groundwater monitoring programs are in place to ensure ecological and human safety.[42] It is anticipated that UC Berkeley would remediate the site entirely, in compliance with DTSC requirements, prior to development. Therefore, locating the GPL facility at this site would not expose facility users to contamination.

See also Sections IV.C.2.b.i and IV.C.2.b.iv.

IV.C.2.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

See Sections IV.C.2.b.i and IV.C.2.b.iv.

[42] UC Berkeley, 2008, Final Current Conditions Report, University of California, Richmond Field Station, California.

IV.C.2.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

See Section IV.C.2.b.iv.

IV.C.2.g. No-Action Alternative

Under this alternative, there would be no new effects related to construction or demolition. Potential hazards from release of hazardous substances from the HWHF due to earthquake damage are avoided due to the secondary containment of all storage containers and by the tertiary containment that is a feature of the entire facility.[43] Therefore the environmental effects of hazardous materials release to the environment from demolition of older buildings would be avoided. There would be no new environmental effects from the No-Action Alternative.

IV.C.3. Water Resources and Soil Erosion

IV.C.3.a. Affected Environment at LBNL

Runoff and Drainage

LBNL is located within the Strawberry Creek watershed in an area characterized by three main canyons and related tributaries. A site-wide storm drain system, designed and installed beginning in the 1960s, discharges runoff from the northwestern portion of LBNL to the North Fork of Strawberry Creek and the remaining areas in the south and east to the main stem (sometimes referred to as the "South Fork") of Strawberry Creek. Strawberry Creek then flows through Berkeley to San Francisco Bay.

UC LBNL manages stormwater flows originating from sources upstream of the site and from within the site through engineering controls and management practices. Subsurface hydraugers[44] were installed at LBNL to facilitate

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[43] Nancy E. Rothermich, LBNL Waste Management Group Leader. Email to Jerry O'Hearn, LBNL FA Capital Projects Department Head, January 21, 2010.

[44] Hydraugers are in-hill drainage pipes installed at locations throughout the Lab to draw groundwater out of the hillside and prevent saturation of the soil that otherwise could lead to slumps and landslides.

hillside drainage and improve slope stability. Groundwater collected in these hydraugers is subsequently directed into the LBNL storm drain system, except in areas where groundwater quality has been affected by historic chemical releases.

Stormwater Runoff Water Quality
Stormwater runoff from portions of the site where industrial activities occur is monitored as required under the NPDES Industrial General Permit. In addition to NPDES-required stormwater sampling, the UC LBNL EH&S Division conducts sampling of creeks in and near the main LBNL hill site. Discussion of data related to contaminant releases and groundwater quality is included in Section IV.C.2, Hazardous Substances and Human Health.

Freshwater Supply to LBNL Buildings
Groundwater flow through bedrock beneath LBNL occurs as a typical fracture flow with a slow recharge and low yield and groundwater is currently not used, nor likely to be used in the future, as a supply of potable water. Drinking water is supplied to LBNL and the cities of Berkeley and Richmond by the East Bay Municipal Utility District (EBMUD).

IV.C.3.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.3.b.i. Demolition of Building 25/25B, Building 55, and Building 71 Trailers

The original topography and existing drainage pattern of the sites affected by demolition activities would be maintained under the Proposed Action. Following demolition, the Building 55 site, and the Building 25/25B site if not further developed, would be filled with ¾-inch drain rock and paved to prevent groundwater intrusion. The Building 71 trailers are already resting on asphalt. There would therefore be no change to the net pervious area at LBNL as a result of the demolition component of the Proposed Action. Although an ephemeral stream runs close to Building 55, the demolition would be at a sufficient distance from this so that it is unlikely to be affected. There are no stream or river courses close to Building 25/25B or Building 71 trailers.

As the area covered by the Proposed Action is more than one acre, a project-specific Stormwater Pollution Prevention Plan (SWPPP) would be prepared and implemented as required by NPDES permit so as to provide runoff control, prevent chemical release via stormwater, and ensure that erosion and siltation are minimized.

Demolition of Building 25/25B, Building 55, and Building 71 trailers is also part of Alternatives A, B, and C but for brevity this discussion is not repeated below.

IV.C.3.b.ii. GPL Construction at Building 25/25B Site

After construction of the GPL, the post-construction topography would differ very little from the pre-construction topography. Drainage plans are being prepared as part of the detailed design. There would not be any changes in drainage patterns, sediment runoff, or groundwater infiltration as a result of the GPL construction at the Building 25/25B site as part of the Proposed Action.

The possible effects of the operation of the GPL related to wastewater and water use, for the Proposed Action and each alternative, are discussed in Section IV.C.10, Utilities and Waste Management.

IV.C.3.b.iii. Building 85/85A Seismic Strengthening

There would be minor changes to the subsurface drainage patterns at Building 85/85A because of the presence of impermeable concrete plugs proposed as part of the pile borings. However, these would be largely underneath the impermeable building or yard surface, and would have minimal effects on surface drainage.

The seismic strengthening at the Building 85 complex would also be a component of the project as described under Alternatives A, B, C, and D (but not the No-Action Alternative) but for the sake of brevity is not repeated below.

IV.C.3.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

As would be the case under the Proposed Action, construction of the GPL at the Building 74 SE Parking Lot site would maintain existing drainage patterns and would not significantly alter the topography of the site. Development and implementation of the SWPPP would also result in runoff control and prevent chemical release via stormwater.

However, whereas the Proposed Action would not increase the total amount of paved surface, Alternative A would result in approximately 20,000 additional square feet of impervious surface at the LBNL site. In addition, construction under Alternative A would be located at the base of a steep slope. Additional stormwater runoff would be managed with three new stormwater drains and a new detention basin that would be designed in conformance with NPDES regulations. While this would ensure that there would be no net increase in stormwater volume from construction of the project, it means that development and stormwater management at the site would be more complex than under the Proposed Action.

See also Sections IV.C.3.b.i and IV.C.3.b.iii.

IV.C.3.d. Alternative B (GPL Construction and Operation at the RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening

Affected Environment

The RFS is located in a small un-named watershed that primarily drains the neighboring City of Richmond properties to the west and north. The watershed is almost completely urbanized and consists of housing, light industry, commercial and institutional facilities, and some small parks. On-site stormwater drainage is by overland flow that is conveyed from the upland area through a series of culverts and open swales. Two subcatchments on the RFS drain to two storm drain outlets at the edge of Western Stege Marsh, known as the Eastern Storm Drain and the Western Storm Drain. These storm drains discharge into a series of tidal salt marsh channels that drain to Meeker Slough.[45]

According to the Current Conditions Report prepared for the RFS site, at least three water-bearing zones are present at the RFS: a shallow groundwater zone, from approximately 10 to 20 feet bgs, an intermediate groundwater zone, from approximately 30 to 74 feet bgs, and a deeper-groundwater zone, from approximately 90 to 100 feet bgs. Based on groundwater monitoring well observations, groundwater flow is generally south toward San Francisco Bay (UC Berkeley 2008). The Current Conditions Report provides an evaluation of the groundwater contaminants present at the RFS site. Contamination, including metals, VOCs, and PCBs, has been identified within the shallow-zone groundwater, and fewer contaminants are identified in lower zones (UC Berkeley 2008).

Construction and Operation of the GPL at RFS

The GPL facility site at the RFS is currently undeveloped, and therefore the facility would add new impervious surfaces that would generate increased storm water. Due to the site's location very near the San Francisco Bay, hydromodification effects of this increased runoff are not a concern for this site. Water quality could be affected by the runoff generated by the parking lot that would be built to serve the GPL facility population. However, compliance with NPDES requirements would minimize water quality effects. Construction-phase water quality impacts would be addressed in a SWPPP that would be developed and implemented in compliance with NPDES requirements.

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[45] UC Berkeley, 2008, Final Current Conditions Report, University of California, Berkeley, Richmond Field Station, Richmond, California.

Additionally, the RFS is not located in an area at risk of inundation from sea level rise expected in the next century, as defined by the San Francisco Bay Conservation and Development Commission (BCDC).[46]

See also Sections IV.C.3.b.i and IV.C.3.b.iii.

IV.C.3.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Use of an existing building under this alternative would eliminate any environmental effects to water resources due to new construction.[47]

See also Sections IV.C.3.b.i and IV.C.3.b.iii.

IV.C.3.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

Only the minor environmental effects from seismic strengthening described above are relevant to this alternative.

See also Section IV.C.3.b.iii.

IV.C.3.g. No-Action Alternative

This alternative would not include any of the environmental effects from new construction, demolition, or Building 85/85A seismic strengthening.

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[46] San Francisco Bay Conservation and Development Commission. Climate Change, http://www.bcdc.ca.gov/planning/climate_change/climate_change.shtml. Accessed on April 7, 2010.

[47] San Francisco Bay Conservation and Development Commission. Climate Change, http://www.bcdc.ca.gov/planning/climate_change/climate_change.shtml. Accessed on April 7, 2010.

IV.C.4. Biological Resources

IV.C.4.a. Affected Environment at LBNL

Of the approximately 131 acres of undeveloped lands within the LBNL site, about 67 acres are comprised of grassland, including both annual grassland and mixed grassland. Mixed grassland is found in small patches along steep slopes throughout the LBNL site. Mixed grassland occurs on the south side of Building 25, on the north side of Building 55, and in undeveloped areas adjacent to Building 85/85A.

A total of approximately 12 acres of the LBNL site is comprised of non-native eucalyptus stands with sparse understory vegetation consisting primarily of non-native weedy species. A line of non-native blue gum (*Eucalyptus globulus*) trees is located southwest of Building 25/25B. Eucalyptus trees also occur on the north side of Building 55. Landscape trees of about 10 giant sequoias (*Sequoiadendron gigantea*) and one dawn redwood (*Metasequoia glyptostroboides*) with irrigated turf as an understory are located along the western side of the Building 25/25B site.

Coast live oak woodland comprises approximately 9 acres on the LBNL site. This vegetation type ranges in cover from sparse to dense canopy, with coast live oak (*Quercus agrifolia*) the only tree species present. Where oaks are widely spaced, annual or mixed grasslands occur in the understory. This community occurs adjacent to Building 55 on the hillside to the north and west and across the road on the south side; and adjacent to the Building 71 trailers on the south side.

IV.C.4.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.4.b.i. Demolition of Building 25/25B, Building 55, and Building 71 Trailers

Demolition of Building 25/25B, Building 55, and Building 71 trailers, including use of adjacent staging areas, is an activity restricted to land that is already developed and is therefore unlikely to affect biological resources. The demolition timeframes vary from a few months in length, in the case of the Building 71 trailers, to around a year for Building 25/25B. Noise and dust created by the construction, although disturbing to local wildlife, is a temporary phenomenon and it is expected that wildlife would return afterwards.

For the Building 25/25B demolition, one of the staging and laydown areas is immediately east of a grove of redwood *(Sequoia sempervirens)* trees planted as landscape elements, and north of an undeveloped area of mixed grasslands. The Alameda whipsnake, a State special-status and Federal threatened status reptile, could possibly use the adjacent grasslands for foraging or movement, and special-species nesting birds may inhabit the trees adjacent to the building. SPFs BIO-3, 4 and 5 (a) through (f), from Appendix A of this EA, would ensure that adequate precautions are taken during demolition and construction activities to protect special-status wildlife in the vicinity.

The dusky-footed woodrat (*Neotoma fuscipes*), a special status animal, is not expected to use the line of eucalyptus trees along the southwest portion of the proposed GPL site or the landscaped trees located to the west of the Building 25/25B site. The individual oak trees located at Building 71 trailers and Building 55 also do not provide the canopy cover necessary for this species. Therefore, the demolition, construction and seismic strengthening activities would not affect this species.[48]

Demolition of Building 25/25B, Building 55, and Building 71 trailers is also part of Alternatives A, B, and C but for brevity this discussion is not repeated below.

IV.C.4.b.ii. GPL Construction at Building 25/25B Site

Construction of the GPL is planned to take about three years, which is longer than any of the individual demolition components of the Seismic Phase 2B Project and, therefore, has a greater potential for wildlife disturbance. How-

[48] Wildlife Research Associates (WRA), 2009, Biological Assessment for the Seismic Phase 2B Project, Lawrence Berkeley National Laboratory.

ever, the Building 25/25B site is a developed site, and staging and laydown areas would be located exclusively on developed land.

GPL construction at the Building 25/25B site would also require the construction of a storm drain approximately 125 feet long, extending from the southeast corner of the new building to a connection point on Segre Road, east of the proposed site. This drain crosses a neighboring hillside, although the land has already been disturbed by the creation of Segre Road. The area is not designated as critical habitat by United States Fish and Wildlife Service (USFWS) for the Alameda whipsnake according to the LBNL 2006 LRDP EIR. In the unlikely event that whipsnakes are encountered, SPFs BIO-5 (a) to (f) would be implemented to prevent harm to the reptile.

The existing 4-inch sanitary sewer pipe would be replaced by an approximately 6-inch diameter pipe running along one of two routing options: either a run of approximately 500 feet west from the proposed GPL between existing buildings, or a run of approximately 650 feet north and then west from the GPL. Both routing options would pass entirely through previously developed land not recognized as habitat for the Alameda whipsnake. Again, in the unlikely event that whipsnakes are encountered, SPFs BIO-5 (a) to (f) would be implemented to prevent harm to the reptile.

GPL construction at the Building 25/25B site is expected to require removal of two Coast live oak trees west of Building 25 in order to realign the driveway, and a Dawn redwood tree on the hillside southeast of the building to allow for the addition of a new storm drain. The two Coast live oak trees have circumferences (as measured at a height of 4 feet above the ground) of 26 inches (tree southeast of Building 25) and 33 inches (tree southwest of Building 25), respectively. These trees would be considered protected under the City of Berkeley Tree Ordinance, which covers trees with single-stem diameters greater than 18 inches. However, LBNL is operated by the University of California, which is constitutionally exempt under Article IX, Section 9 from local land use regulation including general plans, zoning, and ordinances. Nevertheless, the University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. In the case of tree removal, UC LBNL voluntarily plants trees at a ratio of one to one to replace any that need to be removed.

In conclusion, the GPL would be built on an already developed site under the Proposed Action, and replacement planting would be provided for any necessary minor tree removal in keeping with UC LBNL policy.

IV.C.4.b.iii. GPL Operation

GPL operation would not affect surrounding biological resources.

IV.C.4.b.iv. Building 85/85A Seismic Strengthening

As seismic strengthening work on Building 85/85A would take place largely underground or inside the building, and as staging and laydown areas are on disturbed land, there would only be minor effects to wildlife. Tree pruning necessary for improvement work in close proximity to Building 85/85A could potentially disturb breeding and nesting passerines, raptors and bats that may occupy those trees. However, the inclusion of SPFs BIO-3 and BIO-4, from Appendix A of this EA, ensures that measures such as pre-construction surveys and prohibition of destruction of roosts would be in place to prevent major disturbance. In addition, the presence of Alameda whipsnakes in the vicinity of Building 85/85A is minimal due to the existing constant high level of human activity around the complex.

The seismic strengthening at Building 85/85A would also be a component of the project as described under Alternatives A, B, C, and D (but not the No-Action Alternative) but for the sake of brevity is not repeated below.

IV.C.4.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

The Building 74 SE Parking Lot site is currently occupied by a parking lot and small building that would be demolished under this alternative. However, construction and operation of the GPL at this location would encroach on approximately 20,000 square feet of undeveloped land, mainly for the construction of a fire access lane. The undeveloped portion of the proposed site supports non-native grasslands as well as oak woodlands, and likely provides foraging or movement habitat for the Alameda whipsnake, a threatened status species.[49]

To accommodate the new building, a total of approximately 46 trees would be removed from the eastern portion of the site, including 24 Coast live oak trees, eight Coast redwoods and five Monterey pines. As part of Alternative A in compliance with UC LBNL policies, UC LBNL would plant replacement trees at a ratio of one to one elsewhere on the LBNL site, in keeping with UC LBNL policy. The trees that would be removed provide potential nesting habitat for both passerine and raptor species of birds. SPF BIO-3 from Appendix A sets out a strategy for minimizing loss of nesting passerine and raptor birds which includes restricting grading and tree removal activities to months outside the breeding season.

Removal of these trees could also potentially disturb the Dusky-footed woodrat habitat or result in mortality of individuals. However, the inclusion of SPF BIO-5(f) from Appendix A, which calls for site vegetation management prior to tree removal, would prevent the take of individuals during tree removal or ground breaking activities.

The site proposed for the GPL under this alternative is adjacent to Unit 6 of Critical Habitat for the Alameda whipsnake, and there is a high likelihood that the reptile uses the undeveloped 20,000 square-foot portion of the site for foraging or movement. SPFs BIO-5 (a) to (f) from Appendix A were developed to minimize potential adverse effects on the Alameda whipsnake. In consultation with USFWS under Section 7 of FESA, UC LBNL would replace lost habitat, either through habitat conservation or in the form of a Conservation Easement, and appoint a USFWS-approved Biological Monitor

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[49] Wildlife Research Associates (WRA), 2009, Biological Assessment for the Seismic Phase 2B Project, Lawrence Berkeley National Laboratory.

to oversee actions implemented on-site for the preservation of the Alameda whipsnake during the construction phase.

In conclusion, project features built into Alternative A would cause effects to the environment such as disturbance to the Alameda whipsnake and loss of trees to be minor. Nonetheless, the potential for construction and operation of the GPL to affect sensitive species is greater under Alternative A than under the Proposed Action.

See also Sections IV.C.4.b.i and IV.C.4.b.iv.

IV.C.4.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Affected Environment

The proposed GPL site at the RFS is disturbed, and a portion of it is developed with Building 167 and a parking lot. The habitat on the site includes disturbed native and non-native grassland, ornamental trees, eucalyptus trees, and a drainage ditch that is potentially a jurisdictional feature. The grassland at the site provides potential habitat for western burrowing owl (*Athene cunicularia hypugaea*, a state species of concern) and foraging habitat for loggerhead shrike (*Lanius ludovicianus*, a state species of special concern). The eucalyptus grove provides nesting habitat for white tailed kite (*Elanus leucurus*, a state species of concern, fully protected).[50] Native grasslands that occur at the site include California Oatgrass Bunchgrass Grassland (*Danthonia californica*) and purple needlegrass (*Nassella pulchra*). Both grassland types are considered a sensitive natural community by the CDFG "List of California Terrestrial Communities Recognized by the California Natural Diversity Database".[51] No federally listed plant or wildlife species occur on the site.

[50] UC Berkeley, 2003, Richmond Field Station Remediation Project Initial Study and Mitigated Negative Declaration. SCH #2003052124.

[51] UC Berkeley, 2003, Richmond Field Station Remediation Project Initial Study and Mitigated Negative Declaration. SCH #2003052124.

Construction and Operation of the GPL at RFS

The drainage along the eastern side of the GPL site at RFS may potentially be under the jurisdiction of the U.S. Army Corps of Engineers (USACE) and/or California Department of Fish and Game (CDFG). If it is determined that the drainage feature qualifies as a jurisdictional feature, it would be avoided. If avoidance is not feasible, compliance with Federal and State policies would reduce the environmental effects related to the water feature. The potential for Alternative B to affect wetland habitat is greater than the potential under the Proposed Action, however the effects would be reduced by the implementation of SPFs from Appendix A of this EA, which would be voluntarily applied under this alternative.

It is anticipated that most of the trees on the site would remain under this alternative, and only a few trees would be removed. The removal of active nests and nest abandonment due to construction noise would be avoided through implementation of SPF BIO-3 from Appendix A, which involves pre-construction surveys and implementation of additional measures in case active nests are encountered. UC LBNL would also comply with the Migratory Bird Treaty Act.

In addition, construction of the GPL under this alternative could potentially affect the sensitive natural communities—California Oatgrass Bunchgrass Grassland (*Danthonia californica*), and purple needlegrass (*Nassella pulchra*)—that are present on the site. Although these species are not federally protected, implementation of SPFs BIO-5 (f) from Appendix A, involving vegetation management and floristic surveys for special-status plants, would minimize this effect.

See also Sections IV.C.4.b.i and IV.C.4.b.iv.

IV.C.4.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Instead of building a new GPL, UC LBNL personnel would occupy additional leased space in an existing facility located in an urban area.

See also Sections IV.C.4.b.i and IV.C.4.b.iv.

IV.C.4.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

This alternative also would not involve the construction of a new GPL or the demolition of seismically deficient buildings.

See also Section IV.C.4.b.iv.

IV.C.4.g. No-Action Alternative

This alternative would result in no change to the status quo and no effects on biological resources.

IV.C.5. Aesthetics

IV.C.5.a. Affected Environment at LBNL

The 200-acre LBNL site is located on a steep, rugged hillside with elevations that range from approximately 500 feet to approximately 1,100 feet. Wooded areas of eucalyptus, sequoias, redwoods, coast live oaks, and other trees cover 42 acres of the site. Due to areas of dense vegetation and the relatively steep topography, many LBNL buildings are hidden from view and the site cannot be seen in its entirety from any single viewpoint. The result is a semi-rural setting with pockets of clustered development.

LBNL's built environment is defined by an eclectic and diverse architectural style and building form, the result of development over many decades. Permanent buildings typically display a utilitarian, semi-industrial aesthetic defined by concrete facades and box-like massing. Temporary structures, such as the Building 71 trailers, are often indistinguishable from one another.

Many of the site's pathways and gathering areas encroach on service areas, loading zones, and parking lots, ultimately detracting from visual cohesion.

IV.C.5.b. Proposed Action (GPL Construction at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.5.b.i. Demolition of Building 25/25B, Building 55, and Building 71 Trailers

The demolition component of the Proposed Action would remove several functional structures that are aging and architecturally unremarkable. All of these buildings can be seen from on- and off-site viewpoints. Building 25/25B can be seen from residences to the north, from various places on the UC Berkeley campus and from hiking trails in the vicinity of LBNL. Building 55 is partially visible from streets in Berkeley. Building 55 and the six Building 71 trailers can be seen from Lawrence Hall of Science on the UC Berkeley campus. Demolition of these buildings would thus serve to marginally enhance views to and from the LBNL site, while the demolition of the Building 71 trailers and Building 55 would serve to increase the amount of undeveloped space on the LBNL site, an asset to the site's overall visual quality.

Demolition of Building 25/25B, Building 55, and Building 71 trailers is also part of Alternatives A, B, and C but for brevity this discussion is not repeated below.

IV.C.5.b.ii. GPL Construction at Building 25/25B Site

The Proposed Action would involve the construction of a modern GPL facility on the LBNL site at the site of the demolished Building 25/25B. As evident in Figure IV.2, which shows a simulation of the GPL from Centennial Road looking southwest toward the building, the GPL would be modern in appearance, thoughtfully designed and largely obscured by adjacent trees. Vegetated hillsides and undeveloped ridgelines would remain intact. As proposed, most viewers would consider it an improvement over the utilitarian aesthetic and lack of articulation that define Building 25/25B and surrounding buildings.

Source: DC&E, 2009

FIGURE IV-2

SIMULATION OF GPL AT B25/25B SITE (VIEW SOUTHWEST FROM CENTENNIAL DRIVE)

Simulations of the GPL from the Jordan Fire Trail across Strawberry Canyon show that it would be almost entirely hidden behind eucalyptus trees.[52] It is possible that the two exhaust stacks could be seen from some vantage points in the Panoramic Hills neighborhood, but the rest of the building would be heavily screened by existing vegetation and topography. Simulations made from viewpoints along residential areas of Campus drive also scarcely showed the building, although the two exhaust stacks are visible. In general, from medium-range and long-range viewpoints, the new building would scarcely be visible. Incorporation of SPF VIS-4 (a) through (c), from Appendix A of this EA, would minimize light and glare from the building through design standards that confine illumination to the site and through the prohibition of reflective exterior wall materials.

During the construction phase, some construction equipment would be more visually prominent than the completed building. However, the temporary appearance of the construction equipment would lack prominence when viewed against the scale and density of existing development.

IV.C.5.b.iii. Building 85/85A Seismic Strengthening

Work associated with the seismic strengthening of Building 85/85A would be performed either below-grade, inside the building or in the rear yard area, shielded from view by the structure. Improvements would consist mainly of underground retaining structures, pier foundations, tiebacks, and some internal work. Once completed, these generally would not be noticeable from off-site locations. Although the seismic strengthening work would involve construction equipment visible from a distance, it would be temporary, and lack prominence when viewed against the backdrop of the large, industrial building. The temporary presence of construction equipment would not be detrimental to the aesthetics of the Building 85/85A area.

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[52] As the GPL was scarcely noticeable in these additional simulations, they are not included in this EA.

The seismic strengthening at Building 85/85A would also be a component of the project as described under Alternatives A, B, C, and D (but not the No-Action Alternative), but for the sake of brevity is not repeated below.

IV.C.5.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Alternative A would also involve the construction of a modern GPL facility at LBNL, but at a site in Strawberry Canyon. At this location, the GPL would be adjacent to an area of open space and would be located, at its closest point, less than 50 feet from the edge of the UC Botanical Garden, a facility admired for its natural setting and high aesthetic quality. Under this alternative, the GPL would be highly visible from the UC Botanical Garden, some nearby residences in the Panoramic Hill neighborhood, and an adjacent hiking trail. A simulation of the GPL at the Building 74 SE Parking Lot site, as viewed from the walkway looking northeast across Centennial Drive towards the UC Botanical Garden, is shown in Figure IV-3.

The GPL would be approximately 30 feet high and terraced into the hillside, with stacks projecting an additional 30 feet or so higher than the surface of the building roof. While its position upslope from the Garden would accentuate its height, the building would not significantly increase the amount of shadow cast onto the gardens because it would be set against the hillsides. Preliminary shadow studies have indicated that the building would cast shadows on the edge of the Garden for a period of two morning hours during summer months. SPF VIS-4 (a) through (c) from Appendix A would minimize light and glare through design standards that confine illumination to the site and through the prohibition of reflective exterior wall materials. However, in conclusion, even with landscaping after building construction, it is unlikely that vegetative screening could grow tall enough in a reasonable length of time to screen the building.

See also Sections IV.C.5.b.i and IV.C.5.b.iii.

FIGURE IV-3

SIMULATION OF GPL AT BUILDING 74 SE PARKING LOT
(VIEW NORTHEAST TOWARD UC BOTANICAL GARDEN)

IV.C.5.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Affected Environment at RFS

The visual setting of the RFS consists of a flat, developed, bayside plain surrounded by industrial and residential land uses, and Interstate 580 to the northeast. Although this setting differs greatly from the setting at Building 25/25B on the main LBNL hill site, building form and design at both locations would be comparable. The site proposed for the GPL is located at the center of the RFS. Views of the proposed site are primarily available from two public viewpoints: the Bay Trail along the southern end of the RFS and the Marina Bay Residential Housing complex southwest of the property.

Construction and Operation of the GPL at RFS

Views of the proposed facility would be largely screened from the Bay Trail and nearby housing by intervening buildings and vegetation. The building would be adjacent to existing structures and would therefore appear as an incremental addition to the existing development at the RFS site. Voluntary inclusion of SPF VIS-4 (a) through (c), from Appendix A of this EA, would ensure that adverse effects from light and glare are minimized. Under this alternative the amount of development on the LBNL hill site would not increase, and thus have little effect on site aesthetics.

See also Sections IV.C.5.b.i and IV.C.5.b.iii.

IV.C.5.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Under this alternative, no new GPL facility would be constructed and there would be no aesthetic effects due to use of an existing facility. Rather, UC LBNL personnel would be relocated from the site to space leased in an existing facility in Berkeley or Emeryville. Therefore, there would be no new visual impact associated with this alternative.

See also Sections IV.C.5.b.i and IV.C.5.b.iii.

IV.C.5.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

Under this alternative there would be no demolition of existing structures or new construction. The Building 85/85A seismic strengthening component of this work would not result in any environmental effects related to aesthetics.

See also Section IV.C.5.b.iii.

IV.C.5.g. No-Action Alternative

The No-Action Alternative would not involve demolition of any structures on the LBNL site. Under this alternative, the GPL would not be constructed, thereby avoiding visual impact but the opportunity to slightly improve views from the surrounding area by eliminating unattractive structures would be lost.

IV.C.6. Transportation and Traffic

IV.C.6.a. Affected Environment at LBNL

The LBNL site is approximately 3 miles east of Interstate 80, the nearest major freeway and connection between the San Francisco Bay Area and Sacramento region. Regional access to LBNL is also provided by Interstate 580 and State Routes 24 and 13. Local vehicular access generally occurs along Hearst Avenue and Centennial Drive, while vehicular circulation within LBNL primarily occurs via Chamberlain Road and McMillan Road, which constitute LBNL's "upper" circulation system, and Lawrence Road and Alvarez Road, which constitute the "lower" circulation system. An extensive network of pedestrian paths crisscrosses the LBNL site and bike lanes are provided on the site where feasible.

Traffic counts conducted as part of the LBNL 2006 LRDP EIR indicated that roughly 5,700 vehicle trips are generated daily by the approximately 4,000 employees at the LBNL site. Approximately 40 percent of UC LBNL staff use alternative modes of transportation to the single occupancy vehicle, including LBNL shuttle, bicycling, Bay Area Rapid Transit (BART), and carpooling.[53] UC LBNL has developed and is implementing a Transportation Demand Management (TDM) program which seeks to reduce total vehicle trips to and from LBNL and minimize demand for additional parking spaces. The TDM program promotes increased use of the Laboratory Shuttle Service, the Guaranteed Ride Home program, Pretax Transportation Program Incentives, and carpooling/vanpooling as well as encouraging telecommuting and the use of flex time where feasible. In addition, potential alternative transportation measures being considered include: development of remote parking with shuttles for employees and construction personnel, as well as subsidizing public transit costs with vouchers, discounted BART tickets and participation in the Alameda County Transit Easy Pass program.

The City of Berkeley has established designated truck routes to manage the movement of construction vehicles on its streets. The designated truck routes that would be used by construction vehicles associated with UC LBNL projects, including the Proposed Action, are shown on Figure IV-4. In 2009, Fehr & Peers identified four key intersections along the designated truck routes for study (see Figure IV-4). Fehr & Peers found that all four intersections operate at acceptable levels of service (LOS) [54] (LOS D or better under City of Berkeley standards) during the AM peak hour. During the PM peak hour, however, three of the four intersections operate at unacceptable levels.

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[53] LBNL, 2006, *Long-Range Development Plan Environmental Impact Report*, page IV.L-19.

[54] Level of service (LOS) is a qualitative measure describing operational conditions within a traffic stream. Level of service assesses conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Six levels of service are defined by letter designations from LOS A to F, with LOS A representing the best operating conditions, and LOS F the worst. These LOS definitions are widely used in the field of traffic engineering and are defined in the Transportation research Board's Highway Capacity Manual.

Source: Fehr & Peers, 2009

FIGURE IV-4

CITY OF BERKELEY DESIGNATED TRUCK ROUTES

In August 2007 and May 2009, Fehr & Peers studied four intersections on local roads used by traffic accessing the LBNL site.[55] As shown in Table IV-1, two of the four study intersections (Hearst Avenue/Gayley Road/La Loma Avenue, and Durant Avenue/Piedmont Avenue) currently operate at acceptable LOS D or better in both the AM and PM peak hours. A third intersection (Stadium Rim Way/Gayley Road) currently operates at an acceptable level of service in the AM peak hour, but is at an unacceptable LOS E in the PM peak hour. The fourth intersection (Bancroft Way/Piedmont Avenue) operates at LOS F during both AM and PM peak hours when pedestrian crossings are factored into the analysis.

IV.C.6.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.6.b.i. Demolition, Construction/Seismic Strengthening

Given the location of the demolition, construction and seismic strengthening activities for the Proposed Action, the majority of trucks would enter and exit the site though the Blackberry Canyon Gate, traveling through Berkeley on Hearst and University Avenues. UC LBNL has a Site Construction Coordinator, responsible for administering best management practices and ensuring that UC LBNL construction vehicle traffic does not contribute to a substantial increase in volumes or degradation in LOS on surrounding roadways. In its 2009 report, Fehr & Peers recommended the following maximum allowable number of daily truck trips to and from LBNL so as to avoid exceeding the City of Berkeley established thresholds governing intersection operations, roadway segment operation, and pavement condition:

- An average of 98 one-way truck trips per day through the Hearst Avenue and University Avenue intersections.

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[55] Construction traffic would travel only on the City of Berkeley designated truck routes, whereas it is anticipated that operational traffic would access the main hill site from a variety of directions. Therefore, a different set of study intersections was selected for construction and operational traffic studies so as to reflect the differing conditions.

TABLE IV-1 **EXISTING TRAFFIC CONDITIONS AT INTERSECTIONS ON LOCAL ROADS IN THE VICINITY OF LBNL (LEVEL OF SERVICE SUMMARY)**

Intersection	Intersection Control	Peak Hour	Delay (seconds)	LOS
Stadium Rim Way/ Gayley Road	All-Way Stop-Controlled	AM	29.6	D
		PM	**41.1**	**E**
Hearst Avenue/ Gayley Road/ La Loma Avenue	Signalized	AM	22.7	C
		PM	24.1	C
Bancroft Way/ Piedmont Avenue	All-Way Stop-Controlled	AM	>60 (v/c =0.930)	**F**
		PM	>60 (v/c =0.825)	**F**
Durant Avenue/ Piedmont Avenue	All-Way Stop-Controlled	AM	17.4	C
		PM	17.6	C

Note: Results in **bold** represent unacceptable levels of service.
Source: Fehr & Peers Transportation Consultants. August 2007 and May 2009.

- An average of 50 one-way truck trips per day through the Stadium Rim Way/Gayley Road intersection.

By itself, the Proposed Action is not expected to generate more than a maximum daily average of 38 one-way truck trips at any time, and in combination with other projects at LBNL would not generate a daily average of more than 98 trips, even at the peak of construction activities in June-July 2011. In addition, as shown in Table IV-2, below, Fehr & Peers found that construction truck traffic from all UC LBNL construction projects controlled by the Site Construction Coordinator, including the Proposed Action, not to exceed 98 one-way truck trips per day, would not exceed the City's thresholds at any of the truck route study intersections. Regardless, the Site Construction Coordinator would oversee the development and implementation of a Construction Traffic Management Plan for the Proposed Action, as well as the

TABLE IV-2 **NEAR TERM LEVEL OF SERVICE CONDITIONS WITH AND WITHOUT LBNL CONSTRUCTION TRUCK TRAFFIC**

			Background Conditions		Conditions with LBNL Construction Traffic	
Intersection	**Intersection Control**	**Peak Hour**	**Delay (Seconds)**	**LOS**	**Delay (Seconds)**	**LOS**
University Ave./ Sixth St.	Signalized	AM	40.3	D	40.8	D
		PM	**69.5**	**E**	**71.1**	**E**
University Ave./ San Pablo Ave.	Signalized	AM	43.8	D	44.0	D
		PM	**93.1 (v/c=1.00)**	**F**	**95.3 (v/c=1.00)**	**F**
Stadium Rim Way/Gayley Rd.	All-Way Stop-Controlled	AM	30.5	D	32.3	D
		PM	**42.4**	**E**	**44.8**	**E**
Hearst Ave./ Gayley Road/ La Loma Ave.	Signalized	AM	25.8	C	27.1	C
		PM	24.8	C	25.7	C

Note: Results in **bold** represent unacceptable levels of service.
Source: Fehr & Peers Transportation Consultants, May 22, 2009.

management of concurrent project schedules so as to minimize overlap of construction activity that requires numerous truck trips for demolition and excavation.

Under the Proposed Action, parking lots around Building 25/25B, Building 55, and Building 71 trailers would be used as staging and laydown areas during the demolition and construction phase. This would result in an approximately 24-month loss of 113 surface parking spots that are normally available to UC LBNL staff. Priority for available spots would be given to construction vehicles during this phase, and the precise number and location of spots required by contractors would be identified in the relevant project-specific Construction Traffic Management Plan.

Despite this temporary reduction in parking supply due to the Proposed Action, there are nine parking lots in the area immediately surrounding the site of the Proposed Action that would still be available. Depending on the progress of various UC LBNL projects, these lots, which together form LBNL Parking Zone 5, would contain between 520 and 580 parking spaces between 2010 and 2018 (the timeframe of the Proposed Action). During that same timeframe, it is estimated the demand for parking in that same area would fluctuate between 466 and 544 spaces and the rate of occupancy for lots in Parking Zone 5 would range from 80 to 99 percent.[56] To further compensate for lost parking spots, UC LBNL is negotiating with UC Berkeley for temporary use of additional spaces in UC lots during the construction phase.[57]

IV.C.6.b.ii. Operation of the GPL

As discussed above, the future occupants of the GPL would be drawn primarily from other locations on-site at LBNL, with some additional researchers relocating from the adjacent UC Berkeley campus. No parking passes would be issued to UC Berkeley researchers, all of whom would use the shuttle service to travel to and from the site. Consequently, there would be no increase in the number of commute trips made to and from the site as a result of the Proposed Action. Additionally, continued implementation of the TDM program would encourage further use of alternatives to single-occupancy vehicle trips to and from the site. Therefore, operation traffic from the Proposed Action would not adversely affect LOS conditions at stressed intersections in the vicinity of LBNL.

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[56] Fehr and Peers Transportation Consultants, 2007, *LBNL On-Site Parking Management Study.*

[57] Les Dutton, Site Construction Coordinator, LBNL. Personal communication with DC&E, October 20, 2009.

When in operation, the new GPL is not expected to take any of the existing parking spaces from the surface parking lot adjacent to Building 25. In addition, 49 parking spots in Lots N4 and P, closest to the proposed GPL site, would be reserved for future GPL occupants.[58] Lots near the site proposed for the GPL under this alternative are currently 100 percent occupied at peak hour (11:00 a.m.),[59] and current plans add only a limited number of additional spaces on the LBNL site.

However, continued implementation of the TDM program developed as an SPF TRANS-1(d), from Appendix A of this EA, which seeks to reduce total vehicle trips to and from LBNL and minimize demand for additional parking spaces, would temper demand for parking.

IV.C.6.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

IV.C.6.c.i. Demolition, Construction/Seismic Strengthening

As would be the case under the Proposed Action, construction traffic and parking demand under this alternative would be managed to avoid unacceptable congestion. However, the management plan for parking would be more complex than that necessitated by the Proposed Action because construction of the GPL on the Building 74 SE Parking Lot would result in the loss of more parking stalls than under the Proposed Action.

IV.C.6.c.ii. Operation of the GPL

For the reasons described above in IV.C.6.b.ii, operation traffic from Alternative A would not adversely affect LOS conditions at stressed intersections in the vicinity of LBNL. Similarly, demand for parking under Alternative A

[58] Les Dutton, Site Construction Coordinator, LBNL. Personal communication with DC&E staff. January 25, 2010.

[59] Lawrence Berkeley National Laboratory, 2007. *Long-Range Development Plan, Draft Environmental Impact Report.*

would be tempered by the TDM program developed and implemented as a SPF TRANS-1 (d), from Appendix A of this EA.

IV.C.6.d. Alternative B (GPL Construction at RFS, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Affected Environment at RFS

The RFS site is accessible via Interstate 80 and Interstate 580. There are three interchanges on Interstate 580 that provide access to the RFS: Marina Bay Parkway interchange, Regatta Boulevard interchange, and Bay View Avenue interchange. Syndicate Street, Regatta Boulevard, and Frontage Road provide access to the RFS main entrance gate at 46th Street. The Regatta Boulevard interchange is 0.35 miles from the main entrance and provides the most direct access to and from the freeway.[60] The intersection of Syndicate Street and Meade Street is the only major intersection between the Regatta interchange and the RFS main gate. This intersection is signalized and currently operates at an acceptable level of service.

The RFS site is served by Alameda-Contra Costa Transit District (AC Transit) bus number 71, which links the RFS to Richmond BART station, and by the AC Transit RFS bus that provides service between RFS and the El Cerrito Del Norte BART station.

Construction and Operation of the GPL at RFS

The RFS is located about 6 miles northwest of the site, in the City of Richmond. The construction of the GPL facility at RFS would reduce the number and volume of construction vehicles on roads in the vicinity of the LBNL site in Berkeley. As the RFS is located in close proximity to Interstate 580 interchanges, construction vehicles traveling to and from the site would travel for less than 5 minutes on Richmond streets. The number of construction-related truck trips would be small as compared to regional traffic patterns and freeway traffic.

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[60] UC Berkeley, 2003, Richmond Field Station Remediation Project Initial Study and Mitigated Negative Declaration.

While the RFS can be reached by Alameda-Contra Costa Transit District (AC Transit) bus number 71 from Richmond BART station or by AC Transit RFS bus from El Cerrito Del Norte BART station, both routes require more than 30 minutes travel time, which would be a deterrent to use of public transit. Additionally, as UC LBNL personnel would not be consolidated in research clusters on the LBNL site, occupants of the GPL under this alternative would have to travel to the site for meetings. Consequently, this alternative would likely generate more vehicle traffic than on-site alternatives.

Vehicles traveling to and from the RFS site via the Regatta interchange travel through one major intersection at Syndicate Street and Meade Street, which currently operates at an acceptable level of service by Transportation Research Board Standards. Based on trip generation rates for Single Tenant Office uses in the Institute of Traffic Engineers (ITE) Trip Generation guide,[61] the additional traffic generated by the approximately 130 full-day GPL occupants and associated visitors would not adversely affect the Syndicate and Meade Street intersection. Furthermore, given the relatively small number of people who would be relocated to the proposed RFS site in comparison to the volume of traffic on freeways used to access the site, and the fact that most UC LBNL employees would be counter-commuting to and from the RFS, operation of Alternative B would not greatly affect transportation and traffic on the network adjoining the RFS.

IV.C.6.e. Alternative C (No GPL Construction but Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.6.e.i. Demolition, Construction/Seismic Strengthening

This alternative would not involve the construction of a new GPL facility, as additional space would be leased in an existing building such as the facility in Berkeley or Emeryville. Although demolition of seismically deficient buildings on the LBNL site and seismic strengthening of Building 85/85A would

[61] Institute of Transportation Engineers, 2008, Trip Generation, 8th Edition.

still occur, construction related-traffic at LBNL under Alternative C would be considerably less than that resulting from the Proposed Action.

IV.C.6.e.ii. Operation of the GPL

The off-site facility would be located in an urbanized area and is accessible by public transit. Given the ease of access to the site by public transit and the fact that many UC LBNL employees live within walking or biking distance of the off-site facility, the proportion of vehicle trips made to and from the site would be less than those made to and from the LBNL site. Using the LRDP trip generation rate of 1.42 vehicle trips per employee for a conservative estimate, an additional 100 employees located at an off-site facility would generate no more than 43 vehicle trips, approximately 14.8 additional trips in the AM peak period and about 16.8 additional trips in the PM peak period. Therefore, the effects on transportation and traffic would not be considered substantial and would be less than those of the Proposed Action.

IV.C.6.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

IV.C.6.f.i. Seismic Strengthening

Construction traffic under Alternative D would be limited to trucks from the Building 85/85A seismic strengthening component. As with the Proposed Action, the Site Construction Coordinator would manage construction traffic to stay within accepted daily limits.

IV.C.6.f.ii. Operation of the GPL

With no relocation of functions there would be reduced effects under this alternative compared to the Proposed Action.

IV.C.6.g. No-Action Alternative

The No-Action Alternative would not involve any demolition, new construction or seismic strengthening and there would be no change to the current situation with respect to transportation and traffic.

IV.C.7. Noise and Vibration

IV.C.7.a. Affected Environment at LBNL

Within the boundaries of LBNL, the majority of ambient noise is generated by automobile and shuttle bus traffic and stationary equipment such as heating, ventilation, and air-conditioning (HVAC) equipment and pumps, generators, cooling towers. Intermittent high-altitude jet aircraft overflights also contribute to ambient noise levels. Based on measurements taken at 13 sites within LBNL and at 299 Panoramic Way (0.4 miles from the site of the Proposed Action), daytime noise levels range from 45 dBA L_{90} to 71 dBA L_{max}.

The LBNL site is surrounded by numerous noise-sensitive land uses. These include City of Berkeley residential areas to the west and north; the UC Botanical Garden to the east of the LBNL site; the Lawrence Hall of Science, Space Sciences Laboratory and Mathematical Sciences Research Institute to the north; and nearby parks and student dormitories. There are also several vibration-sensitive laboratories and scientific instruments within other UC LBNL facilities.

The DOE and the University of California, under Article IX, Section 9 of the California Constitution, are exempt from local land use regulation, including general plans, zoning and noise ordinances. However, UC seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. Therefore, because the western part of the LBNL site is within the Berkeley city limits, and the eastern part is within the Oakland city limits, this section assesses the noise effects of the Proposed Action and alternatives with respect to both City of Berkeley and City of Oakland ordinances related to noise.

IV.C.7.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.7.b.i. Demolition, Construction/Seismic Strengthening

The two principal sources of noise generated during demolition and construction work would be construction vehicle traffic on local roads and construction equipment used on the project site. Under worst case scenario conditions, calculations suggest that construction truck traffic would cause noise levels at key local intersections to rise by less than 1 dBA over existing conditions. Noise from individual trucks would be distinguishable from regular traffic and limited to the demolition/construction phase of the project.

On-site construction activities would be subject to SPF NOISE-1 (a) from Appendix A, which limits the hours in which construction activities can take place, requires the use of quiet equipment, and prescribes the use of special controls such as noise attenuation barriers to reduce the effects of construction noise on the surrounding environment. Building 55 is approximately 550 feet from the nearest residences, but the aforementioned SPF would assure noise would not exceed the City of Berkeley single-family residential maximum noise standard of 60 dBA per the Noise Ordinance. Building 25/25B is located at the center of the LBNL site, approximately 1,500 feet from the nearest recreation area and 1,800 feet from the nearest residences. Given these distances, receiving noise levels at nearby recreational areas and residences would not exceed limits in the City of Berkeley Noise Ordinance. Building 71 trailers are smaller structures and their demolition would not measurably contribute to ambient noise levels.

The use of pneumatic impact drills on-site during seismic strengthening activities at Building 85/85A would generate a predicted maximum noise level of between 85 and 90 dBA at a distance of 50 feet. Building 85 is located approximately 750 feet from the UC Botanical Garden, and maximum noise from the pneumatic drills is predicted to be about 66 dBA at that location, which is below the 70 dBA maximum allowable receiving noise limits for commercial/industrial receptors[62] set out in the City of Oakland Noise Ordinance for weekday construction activity lasting longer than 10 days. Inclu-

[62] The Oakland Noise Ordinance has only two categories of receptors: commercial/industrial, and residential. It was considered more appropriate to use the commercial/industrial limit than the residential, because the UC Botanical Garden does not include permanent housing.

sion of SPFs NOISE-1 (a) to (b) and NOISE-4, as described in Appendix A of this EA, would further reduce noise in the vicinity by implementing comprehensive noise control specifications.

In general, UC LBNL employees are most likely to be affected by construction noise levels; however, as they work indoors, this effect is expected to be minimal and limited to the timeframe of the demolition and construction phase.

The demolition of Building 25/25B, Building 55, and Building 71 trailers would also be a component of Alternatives A, B, and C, and the seismic strengthening at Building 85/85A would also be a component of Alternatives A, B, C, and D (but not the No-Action Alternative), but for the sake of brevity are not repeated below.

IV.C.7.b.ii. Operation of the GPL

The primary source of operational noise from the Proposed Action would be the cooling towers on the GPL. For comparison, noise levels resulting from representative cooling towers at LBNL (monitored in January 2009) ranged from about 65 to 70 dBA at a distance of approximately 50 feet. As discussed above, the nearest residences to the proposed site for the GPL under the Proposed Action are located 1,800 feet away. At that distance, noise from the cooling towers would be 40 dBA (L_{eq}) or less. Noise from the building HVAC system at that distance would be less than 30 dBA, which is substantially lower than existing ambient noise levels and approximately equivalent to the lowest nighttime ambient noise level.

The Lawrence Hall of Science, located on the hillside above the proposed GPL site, has an outdoor activity area approximately 850 feet from the proposed location of the building. The noise level from the cooling towers and HVAC systems associated with the GPL, without accounting for reductions in the noise due to shielding from the GPL building itself, is calculated to be 45 to 50 dBA at the most affected location outside the Lawrence Hall of Science. Such levels would have no impact on speech or activities and would be indistinguishable from the noise of other equipment and distant traffic.

As described above, because the Proposed Action would only result in a negligible increase in the ADP of the site or an associated increase in the number of vehicle trips made to the site, there would be no measurable contribution to ambient noise levels from associated operational traffic.

IV.C.7.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

IV.C.7.c.i. Demolition, Construction/Seismic Strengthening

The site of the new GPL facility under this alternative would be in the City of Oakland portion of LBNL, less than 50 feet from the nearest point of the UC Botanical Garden. Construction traffic would be audible to members of the public and Botanical Garden employees (when outdoors). Given the short distance, noise from construction equipment is likely to exceed the maximum allowable receiving noise limits set out in the City of Oakland Noise Ordinance. The Ordinance specifies that, for residential and civic receptors, the maximum allowable receiving noise for weekday construction activity of greater than 10 days in duration is 65 dBA, while on weekends the maximum allowable receiving noise for long-term construction is 55 dBA. Even with implementation of noise SPFs included in Appendix A of this EA (refer to SPFs NOISE-1 (a) to (b) and NOISE-4 in Appendix A), which call for limiting construction to a schedule that minimizes disruption, etc., it is unlikely that the noise level from construction at this location would meet the standard at the UC Botanical Garden.

See also Section IV.C.7.b.i.

IV.C.7.c.ii. Operation of the GPL

The design of the GPL facility would be similar to that under the Proposed Action, and the operational noise would be principally attributable to the cooling towers, vehicular traffic generated by the facility and the building

HVAC system. As described above, there would be no increase in the number of vehicle trips and no measurable contribution to ambient noise levels from operational traffic.

The cooling towers and HVAC system of the GPL would be more than 0.5-miles from the nearest residences, sufficient distance for noise levels to be nearly inaudible. However, sensitive receptors in the UC Botanical Garden could be affected by operational noise from the GPL under this alternative. Cooling tower noise is somewhat directional and depends on the sloping topography and the orientation with respect to the receivers. Noise levels would range from 65 to 70 dBA at a distance of approximately 50 feet to the side of the towers. Noise from ventilation fans are typically at least 10 dBA lower. Given that the GPL would be less than 50 feet from the edge of the UC Botanical Garden at its nearest point, City of Oakland noise limits could be exceeded. Strategies such as location, insulation and shielding would be implemented to reduce GPL noise to levels in conformance with City standards.

IV.C.7.d. Alternative B (GPL Construction at RFS, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Affected Environment at RFS

Traffic noise from the surrounding street network and Interstate 580 freeway dominates the noise environment at the RFS. However, the site proposed for the GPL is located at the center of the RFS and ambient noise levels in this area are low given the distance from the roadways and adjacent industrial uses. Land uses surrounding the RFS are largely industrial. The residential Marina Bay neighborhood is located to the southwest of the RFS. However, this neighborhood is at least 1,509 feet from the proposed GPL site and there are several intervening buildings between the site and the homes so that a clear line of sight is not available.

Demolition, Construction/Seismic Strengthening

Noise levels generated during construction of the facility would be the same as described under the Proposed Action. Land uses surrounding the RFS are largely industrial. Although there is a residential neighborhood adjacent to the site at least 0.28 miles to the southwest, construction trucks would access the site from roads to the north and northeast, and would thus not pass near the homes. Intervening distance, existing buildings, and vegetation between the proposed GPL site and the residential neighborhood to the southwest would attenuate construction noise. In addition, voluntary inclusion of SPFs NOISE-1 (a) through (b) and NOISE-4 from Appendix A of this EA, in this alternative would further reduce noise levels by limiting construction to specific times, etc., such that City of Richmond Noise Ordinance standards would not be exceeded.

See also Section IV.C.7.b.i.

Operation of the GPL

The design of the GPL facility would be similar to that under the Proposed Action and operational noise would be principally attributed to the cooling towers of the new building, with additional contributions from vehicular traffic generated by the facility and the building HVAC system. The building would be situated between 0.28-miles from the Marina Bay residences to the southwest, a distance too far for operational noise from the cooling towers or the HVAC system to have a considerable effect. Traffic associated with the new GPL would access the site from roads to the north and northeast and would not pass near the residential area.

IV.C.7.e. Alternative C (No GPL Construction but Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.7.e.i. Demolition, Construction/Seismic Strengthening

Alternative C would see the lease of additional space in an existing facility in Berkeley or Emeryville instead of the construction of a new GPL facility. As such, construction noise would be avoided.

See also Section IV.C.7.b.i.

IV.C.7.e.ii. Operation of the GPL

The vicinity of the off-site facility would be in a highly developed, semi-industrial section of Berkeley or Emeryville. The increase in vehicular traffic that would be expected from this alternative would be minimal and is not likely to have a substantial effect on ambient noise levels in the vicinity. Additionally, operational noise from building HVAC maintenance equipment would not increase substantially as there would be no addition or expansion of the existing facilities. However, as Alternative C would not result in the construction of a new, energy-efficient laboratory building, there is no potential for realizing operational noise reductions attributable to newer, more up-to-date equipment.

IV.C.7.f. Alternative D (Reduced Project with only Building 85/85A Seismic Strengthening)

The two principal sources of noise generated during seismic strengthening work would be construction vehicle traffic on local roads and construction equipment used on the project site. As discussed above, even under worst case scenario conditions, there would be only a minimal rise in ambient noise levels on local roads due to construction truck traffic. However, as the Reduced Project Alternative would not result in the construction of a more energy efficient GPL building, there is no potential for realizing operational noise reductions attributable to newer, more up-to-date equipment.

See also Section IV.C.7.b.i.

IV.C.7.g. No-Action Alternative

This alternative would not produce noise effects from new construction, demolition, or Building 85/85A seismic strengthening. It would result in no new operational or construction noise. However, as the No-Action Alternative would not result in the construction of a more energy efficient GPL building, there is no potential for realizing operational noise reductions attributable to newer, more up-to-date equipment.

IV.C.8. Air Quality

The air quality impact assessment in this EA has been prepared in accordance with the applicable Federal law, including Council on Environmental Quality (CEQ's) directives and the Clean Air Act (CAA), administered by the U.S. Environmental Protection Agency (US EPA). Because the CEQ NEPA Regulations require NEPA documents to discuss possible conflicts with "State, and local . . . land use plans, policies, and controls for the area concerned," local air quality planning by the California Air Resources Board (CARB) and the Bay Area Air Quality Management District (BAAQMD) was also considered, and no violation of a state or local requirement was noted.

IV.C.8.a. Affected Environment and Regulatory Setting

The Proposed Action and alternatives would be situated in an area which is subject to air quality planning programs developed in response to both the federal CAA and the California Clean Air Act (CCAA). Within the San Francisco Bay Area, air quality is monitored, evaluated, and regulated by the US EPA, the CARB, and the BAAQMD. The LBNL site is located in Alameda County, which, along with eight other counties, is within the San Francisco Bay Area Air Basin (SFBAAB or Basin).

IV.C.8.a.i. Federal Air Quality Regulations

Criteria Pollutants

The US EPA is responsible for enforcing the CAA and the National Ambient Air Quality Standards (NAAQS). The NAAQS identify levels of air quality for seven criteria pollutants that are considered the maximum levels of ambient (background) air pollutants considered safe, with an adequate margin of safety, to protect the public health and welfare. The seven criteria pollutants are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter less than 10 microns in diameter (PM_{10}), fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb).

Based on monitoring data collected in the air basin, the SFBAAB is currently classified by the US EPA as a nonattainment/marginal area for the 8-hour standard for O_3. The SFBAAB was recently designated non-attainment for the new federal $PM_{2.5}$ standard. For all other federal standards, the SFBAAB is in attainment or unclassified.

In response to its enforcement responsibilities, the US EPA requires each state to prepare and submit a State Implementation Plan (SIP) describing how the state will achieve the federal standards by specified dates, depending on the severity of the air quality within the state or air basin. The SIP as it pertains to the SFBAAB is discussed below in Section IV.C.8.a.ii, State Air Quality Regulations.

Hazardous Air Pollutants

Federal law defines hazardous air pollutants (HAPs) as non-criteria air pollutants with short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects. The 1990 federal CAA Amendments offer a comprehensive plan for achieving significant reductions in both mobile and stationary source emissions of HAPs. Under the 1990 CAA Amendments, a total of 189 chemicals or chemical families were designated HAPs because of their adverse human health effects. Major stationary sources of HAPs are required to obtain an operating permit from the BAAQMD pursuant to Title V of the 1990 CAA Amendments. A major source is defined as one that emits at least 10 tons per year of any HAP or at least 25 tons per year of all HAPs. LBNL is not considered a major source.

IV.C.8.a.ii. State Air Quality Regulations

Criteria Pollutants

CARB, a branch of the California Environmental Protection Agency (Cal/EPA), oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the 1988 CCAA, for responding to the federal CAA requirements, and for regulating emissions from motor vehicles and consumer products within the state. The CCAA and other California air quality statutes designate local air districts, such as the BAAQMD, with the responsibility for regulating most stationary sources, and to a certain extent, area sources.

Like the US EPA, CARB has established ambient air quality standards for the state (i.e. CAAQS). These standards apply to the same seven criteria pollutants as the federal CAA and also address sulfates (SO_4), visibility-reducing particles, hydrogen sulfide (H_2S) and vinyl chloride (C2H3Cl). The CCAA standards are more stringent than the federal standards and, in the case of PM_{10} and SO_2, far more stringent. Based on pollutant concentrations measured at monitoring stations within the Basin, the SFBAAB is classified as nonattainment for the state O_3 8-hour and 1-hour standards, the state PM_{10} annual and 24-hour standards, and the state $PM_{2.5}$ standard. For all other state standards, the SFBAAB is in attainment or unclassified.

Toxic Air Contaminants

California law defines TACs as air pollutants having carcinogenic or other health effects. A total of 245 substances have been designated TACs under California law; they include the federal HAPs adopted as TACs in accordance with AB 2728. The Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources; AB 2588 does not regulate air toxics emissions directly. Under AB 2588, sources emitting more than 10 tons per year of any criteria air pollutant must estimate and report their toxic air emissions to the local air districts. Local air districts then prioritize facilities on the basis of emissions, and high priority facilities are required to submit a health risk assessment and communicate the results to the affected public. Depending on risk levels, emitting facilities are required to implement varying levels of risk reduction measures. The BAAQMD is responsible for implementing AB 2588 in the Basin. One of the TACs being controlled by the BAAQMD is diesel particulate matter (DPM) from diesel-fueled engines. Compared to other TACs, DPM emissions are estimated to be responsible for about 70 percent of the total ambient air toxics risk in the Basin. LBNL has not been identified by BAAQMD as a facility with risk levels that warrant risk reduction measures.

IV.C.8.a.iii. General Conformity

The US EPA adopted the General Conformity Rule in November 1993 to implement conformity provision of Title I, Section 176 (c)(1) of the federal

CAA. This provision requires that the federal government not engage, support, or provide financial assistance to licensing, permitting, or approving any activity not conforming to an approved SIP. To determine whether a federal action would conform or conflict with an approved SIP, a conformity review is performed. The review process comprises the following four steps:

1. Determine whether the proposed action causes emissions of criteria air pollutants.
2. Determine whether the emissions of a criteria pollutant or its precursor would occur in a non-attainment or maintenance area for that criteria air pollutant.
3. Determine whether the federal action is exempt from the conformity requirement as per 40 CFR 93.153 (c)(2)-(e).
4. Estimate emissions and compare to the threshold emissions rate and the nonattainment or maintenance area's emissions inventory.

The de minimis levels for a general conformity analysis vary based on the attainment status of each criteria pollutant in the air basin, as shown in Table IV-3, below. Because the SFBAAB is a nonattainment/marginal area for the 8-hour standard for O_3 and has been designated non-attainment for the new federal $PM_{2.5}$ standard, a general conformity analysis is required for the Proposed Action. As such, the estimated emissions of the Proposed Action and alternatives must be compared to the de minimis levels set forth in 40 CFR 93.153 (b)(1) and (2). The de minimis levels for a general conformity analysis vary based on the attainment status of each criteria pollutant in the air basin, as shown in Table IV-3, below.

If the emissions are greater than or equal to the de minimis levels, a conformity determination must be performed. The purpose of the conformity determination, if needed, is to show if a proposed action conforms to the applicable SIP. Any one of the following three options can be used to establish conformity:

- The applicable SIP can specifically include an allowance for emissions of the proposed project.

TABLE IV-3 **GENERAL CONFORMITY DE MINIMIS LEVELS**

Pollutant	Area Designation Type	De Minimis Levels (Tons/Year)
Ozone (ROG or NO_X)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	**100**
Ozone (NO_X)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (ROG)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
CO, SO_2, and NO_2	**All nonattainment and maintenance**	**100**
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$	**Nonattainment**	**
Lead (Pb)	All nonattainment and maintenance	25

Note: Bold indicates status of SFBAAB relative to attainment and relevant de minimis levels.
** The US EPA has not established a general conformity de minimis level for $PM_{2.5}$.
Source: US EPA, "De Minimis Levels," http://www.epa.gov/air/genconform/deminimis.html.

- The proposed project can purchase offset emission credits for the total direct and indirect emissions, which fully offset emissions within the same non-attainment or maintenance area so that there is no net increase in emissions.
- The SIP can be changed to include the emissions budget of the proposed project.

IV.C.8.b. Proposed Action (GPL Construction and Operation at B25/25B Site; B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

The environmental effects on regional air quality from the emissions of criteria pollutants from the construction and operation of the Proposed Action are evaluated below in terms of the Proposed Action's conformity with an approved SIP, as required under federal law. Because there are no well-defined federal thresholds for evaluating impacts from HAP or TAC emissions, the BAAQMD thresholds are used to evaluate those impacts.

IV.C.8.b.i. Demolition, Construction, and Seismic Strengthening Emissions of Criteria Pollutants

Construction activities associated with the Proposed Action would generate fugitive dust emissions from site grading, building construction, hauling of equipment, hauling soil to and from the site, and construction worker commuting. These emissions would be temporary and would be further reduced through the implementation of Appendix A of this EA and incorporated into and a part of the Proposed Action and alternatives. Specifically, SPF AQ-1a from Appendix A is included in the Proposed Action and would require minimizing the generation of fugitive dust.

In addition, construction activities under the Proposed Action would generate criteria pollutants (ROG, NO_X, PM_{10}, $PM_{2.5}$, CO, and SO_2). These pollutant emissions were calculated using the URBEMIS2007 Environmental Management Software, in accordance with emission factors and parameters appropriate for the Bay Area. Implementation of SPF AQ-1b from Appendix A would minimize the generation of exhaust emissions during the construction of the proposed facility. This would ensure that emissions of ozone precursors are minimized during construction. Construction activities would also comply with Regulation 8, Rules 3 and 15, related to architectural coatings and emulsified and liquid asphalt.[63]

Construction of the Proposed Action would emit criteria air pollutants and would not be exempt from general conformity, because the Proposed Action is located in the SFBAAB, which is designated as a "marginal" nonattainment area for the federal 8-hour ozone standard. The Basin is also designated as a nonattainment area for the federal $PM_{2.5}$ 24-hour standard, and is designated as a maintenance area for the federal CO standard. Table IV-4 below compares the Proposed Action's combined off-road and on-road construction emissions to the general conformity de minimis levels.

As shown in Table IV-4, the construction emissions do not exceed the general conformity de minimis levels for ROG, NO_X, and CO. The US EPA has not established a general conformity de minimis level for $PM_{2.5}$; however, for this analysis, the PM_{10} "moderate" nonattainment and maintenance threshold of 100 tons per year is used to evaluate $PM_{2.5}$ emissions. $PM_{2.5}$ construction emissions would not exceed the 100 tons per year. Therefore, the construction emissions are considered to conform to the General Conformity Rules and applicable SIP. Note that the Proposed Action's construction emissions would also not exceed the BAAQMD's construction CEQA significance thresholds of 54 lbs per day of ROG and NO_X, 82 lbs per day of PM_{10}, and 54 lbs per day of $PM_{2.5}$ emissions.

IV.C.8.b.ii. Demolition, Construction, and Seismic Strengthening Emissions of Toxic Air Contaminants

$PM_{2.5}$ concentrations, Lifetime Excess Cancer Risk (LECR), and chronic health hazard were calculated for both on-site, off-road construction/ demolition equipment, and off-site, on-road construction/demolition truck traffic. As shown in Tables IV-5, IV-6, and IV-7 below, concentrations of

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[63] Bay Area Air Quality Management District (BAAQMD), 2010. Regulation 8: Organic Compounds, http://www.baaqmd.gov/Divisions/Planning-and-Research/Rules-and-Regulations.aspx. Accessed June 28, 2010.

TABLE IV-4 **CONSTRUCTION EMISSION COMPARISON WITH GENERAL CONFORMITY DE MINIMIS LEVELS**

	Maximum Emissions in Tons Per Year					
Construction Year	**ROG**	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
2010						
On-Road Construction Emissions	0.0170	0.2520	0.0700	0.0003	0.0090	0.0080
Off-Road Construction Emissions	0.0705	0.5167	0.3501	0.0002	0.0357	0.0733
Total Construction Emissions:	**0.0875**	**0.7687**	**0.4201**	**0.0005**	**0.0447**	**0.0813**
General Conformity Threshold:	100	100	100	N/A	N/A	–
Exceeds Threshold?	NO	NO	NO	N/A	N/A	–
2011						
On-Road Construction Emissions	0.0170	0.2520	0.0700	0.0003	0.0090	0.0080
Off-Road Construction Emissions	0.1496	1.1201	0.8879	0.0003	0.1914	0.0881
Total Construction Emissions:	**0.1666**	**1.3721**	**0.9579**	**0.0006**	**0.2004**	**0.0961**
General Conformity Threshold:	100	100	100	N/A	N/A	–
Exceeds Threshold?	NO	NO	NO	N/A	N/A	–
2012						
On-Road Construction Emissions	0.0170	0.2520	0.0700	0.0003	0.0090	0.0080
Off-Road Construction Emissions	0.1955	1.4232	1.2331	0.0006	0.2170	0.1085
Total Construction Emissions:	**0.2125**	**1.6752**	**1.3031**	**0.0009**	**0.2260**	**0.1165**
General Conformity Threshold:	100	100	100	N/A	N/A	–
Exceeds Threshold?	NO	NO	NO	N/A	N/A	–
2013						
On-Road Construction Emissions	0.0170	0.2520	0.0700	0.0003	0.0090	0.0080
Off-Road Construction Emissions	0.1641	1.2057	0.9725	0.1237	0.4687	0.1516
Total Construction Emissions:	**0.1811**	**1.4577**	**1.0425**	**0.1240**	**0.4777**	**0.1596**
General Conformity Threshold:	100	100	100	N/A	N/A	–
Exceeds Threshold?	NO	NO	NO	N/A	N/A	–
2014						
On-Road Construction Emissions	0.0170	0.2520	0.0700	0.0003	0.0090	0.0080
Off-Road Construction Emissions	0.0390	0.2913	0.2292	0.0001	0.1648	0.0470
Total Construction Emissions:	**0.0560**	**0.5433**	**0.2992**	**0.0004**	**0.1738**	**0.0550**
General Conformity Threshold:	100	100	100	N/A	N/A	–
Exceeds Threshold?	NO	NO	NO	N/A	N/A	–

Note: N/A = Not Applicable.
Source: Impact Sciences, Inc., (2010).

TABLE IV-5 **MAXIMUM ESTIMATED ANNUAL $PM_{2.5}$ CONCENTRATIONS IN AMBIENT AIR FROM CONSTRUCTION/DEMOLITION EMISSIONS**

Pollutant	Assessment	Maximum Ambient Concentration	Significance Threshold
$PM_{2.5}$	On-Site, Off-Road Equipment Emissions	0.15 $\mu g/m^3$	0.3 $\mu g/m^3$
$PM_{2.5}$	Off-Site, On-Road Truck Emissions	0.005 $\mu g/m^3$	0.3 $\mu g/m^3$

Source: Golder Associates, January 2010.

TABLE IV-6 **MEI LECR AND CHRONIC HAZARD ESTIMATES FOR ON-SITE, OFF-ROAD CONSTRUCTION/DEMOLITION EQUIPMENT DPM EMISSIONS**

Assessment	MEI Result	Significance Threshold
On-Site LECR	7-in-a-million	10-in-a-million
On-Site Chronic Hazard	0.08	1.0
Off-Site LECR	8-in-a-million	10-in-a-million
Off-Site Chronic Hazard	0.01	1.0

Source: Golder Associates, January 2010.

TABLE IV-7 **MEI LECR AND CHRONIC HAZARD ESTIMATES FOR OFF-SITE, ON-ROAD CONSTRUCTION/DEMOLITION TRUCK TRAFFIC DPM EMISSIONS**

Assessment	MEI Result	Significance Threshold
Off-Site LECR	0.6-in-a-million	10-in-a-million
Off-Site Chronic Hazard	0.001	1.0

Source: Golder Associates, January 2010.

$PM_{2.5}$, the LECR, and chronic health hazard would be much lower than the BAAQMD thresholds.

The demolition of Building 25/25B, Building 55, and Building 71 trailers would also be a component of Alternatives A, B, and C, and the seismic strengthening at Building 85/85A would also be a component of Alternatives A, B, C, and D (but not the No-Action Alternative). To avoid unnecessary repetition, discussion of emissions related to demolition and seismic strengthening activities is not repeated below.

IV.C.8.b.iii. Operational Emissions of Criteria Pollutants
Emissions would be generated during GPL operations from the following sources: laboratory fume hood roof exhaust vents; natural gas-fueled building heaters/boilers; maintenance/testing operation of a backup diesel generator; and employee commuting. Natural gas combustion, diesel generator operation, and employee passenger vehicles would generate both criteria pollutants and TACs.[64]

Operation of the proposed GPL would emit criteria air pollutants and would not be exempt from conformity, because the Proposed Action, as described earlier, is located in the SFBAAB, which is designated as a "marginal" nonattainment area for the federal 8-hour ozone standard, a nonattainment area for the federal $PM_{2.5}$ 24-hour standard, and a maintenance area for the federal CO standard. Table IV-8 compares the Proposed Action's operational emissions to the general conformity de minimis levels.

As shown in Table IV-8, the operational emissions would not exceed the general conformity de minimis levels for ROG, NO_X and CO. The US EPA has not established a de minimis level for $PM_{2.5}$; however, for this analysis, the

[64] Air quality emissions from current activities at LBNL that would be moved to the GPL after its completion have not been subtracted from the figures for GPL operational emissions estimates. Data presented are therefore overestimates of the Proposed Action's emissions and provide for a conservative analysis.

TABLE IV-8 **OPERATIONAL EMISSION COMPARISON WITH GENERAL CONFORMITY DE MINIMIS LEVELS**

	Maximum Emissions in Tons Per Year					
Emission Source	**ROG**	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Laboratory	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Natural Gas Boiler	0.00160	0.02900	0.02500	0.00018	0.00220	0.00220
Diesel Generator	0.00118	0.09850	0.01560	0.01740	0.00136	0.00136
Employee Vehicles	0.27000	0.31000	2.77000	0.00000	0.45000	0.09000
Total Operational Emissions:	**0.27278**	**0.43750**	**2.81060**	**0.01758**	**0.45356**	**0.09356**
General Conformity Threshold:	**100**	**100**	**100**	**N/A**	**N/A**	**-**
Exceeds Threshold?	**NO**	**NO**	**NO**	**N/A**	**N/A**	**-**

N/A = Not Applicable.
Source: Impact Sciences, Inc., (2010).

PM_{10} "moderate" nonattainment and maintenance threshold of significance of 100 tons per year is used to evaluate $PM_{2.5}$ emissions. $PM_{2.5}$ operational emissions would not exceed the 100 tons per year, and would also be well below a much lower threshold of significance, were a lower threshold to be set. Therefore, the operational emissions are considered to conform to the general conformity rules and applicable SIP.

The Proposed Action's operational emissions, shown in Table IV-8, would also not exceed the BAAQMD's operational CEQA significance thresholds of 10 tons per year of ROG, NO_X, and $PM_{2.5}$ emissions, and 15 tons per year of PM_{10} emissions.

IV.C.8.b.iv. Operational Emissions of Toxic Air Contaminants

As shown in Tables IV-9, IV-10, and IV-11, concentrations of $PM_{2.5}$, the LECR, and chronic health hazard resulting from Proposed Action operations would be much lower than the applicable thresholds. The acute hazards from TACs were assessed only for emissions emanating from the laboratory fume

TABLE IV-9 **MAXIMUM ESTIMATED $PM_{2.5}$ CONCENTRATION IN AMBIENT AIR FROM PROJECT OPERATIONS**

Pollutant	Maximum Ambient Concentration	Significance Threshold
$PM_{2.5}$	0.0008 $\mu g/m^3$	0.3 $\mu g/m^3$

Source: Golder Associates, January 2010.

TABLE IV-10 **MEI LECR AND CHRONIC HAZARD ESTIMATES FOR GPL BUILDING OPERATIONS**

Assessment	MEI Result	Significance Threshold
On-Site LECR	0.5-in-a-million	10-in-a-million
On-Site Chronic Hazard	0.003	1.0
Off-Site LECR	0.2-in-a-million	10-in-a-million
Off-Site Chronic Hazard	0.001	1.0

Source: Golder Associates, January 2010.

hood exhaust vents, but not from combustion sources (such as the boilers/heaters and diesel generator). The rationale for this approach is that in general boilers, heaters and diesel generators produce TAC emissions that would exceed significance criteria for chronic effects and LECR at far lower levels than would cause them to exceed the significance criteria for acute effects. However, laboratory fume hood vents could emit a wider variety of individual chemicals where the acute health effects might dominate the chronic health effects. All values are below BAAQMD thresholds.

IV.C.8.c. Alternative A (GPL Construction at B74 SE Parking Lot; B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Construction emissions generated under this alternative would be equivalent to those generated under the Proposed Action. Therefore, the criteria pollut-

TABLE IV-11 **MAXIMUM ACUTE HAZARD QUOTIENT VALUES FOR GPL LABORATORY FUME HOOD TAC EMISSIONS**

Pollutant	Maximum Hazard Quotient	Significance Threshold
1,3-Butadiene	[a]	1.0
Acetaldehyde	0.0001	1.0
Acrolein	0.004	1.0
Acrylonitrile	[a]	1.0
Benzene	0.0001	1.0
Boron Trifluoride	[a]	1.0
Carbon Tetrachloride	0.0001	1.0
Chlorine	0.001	1.0
Chloroform	0.01	1.0
Crotonaldehyde	[a]	1.0
Ethylene Dichloride	[a]	1.0
Formaldehyde	0.002	1.0
HCl	0.001	1.0
Hydrazine	[a]	1.0
Vinyl Chloride	0.000001	1.0
Vinylidene Chloride	[a]	1.0

Note: Maximum annual average TAC emission rates for the laboratory fume hood exhaust stacks were multiplied by a ratio of hourly to annual average chemical usage for research laboratories determined from a previous study to obtain maximum hourly emission rates for dispersion modeling as per Central Campus Human Health Risk Assessment, prepared by URS Corporation for the University of California at Berkeley, June 28, 2000.

Using the US EPA AEROD dispersion model and meteorological data collected on-site, maximum ambient concentrations (over both on-site and off-site receptor grid locations) were estimated. These results were compared to acute reference concentrations published by OEHHA to determine hazard quotients for each TAC emitted (the hazard quotient is the ratio of the maximum estimated ambient concentration to the acute reference concentration).

[a] No hazard quotient calculated because OEHHA does not publish an acute reference concentration.

Source: Golder Associates, January 2010.

ant emissions would not exceed the de minimis levels and the alternative would conform to the SIP. Similarly the TAC emissions from Alternative A construction would be comparable to the Proposed Action. However, under Alternative A, construction emissions would be generated in closer proximity to sensitive receptors in the UC Botanical Garden. These receptors include both visitors and employees of the Garden who would be exposed to TACs from passing diesel-powered truck traffic and the operation of other construction equipment.

Operational emissions generated under this alternative would be equivalent to those generated under the Proposed Action. Therefore, the criteria pollutant emissions would not exceed the de minimis levels and the alternative would conform to the SIP.

IV.C.8.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Under Alternative B, construction of the GPL would occur at the RFS. Criteria pollutant emissions from construction would be comparable to the Proposed Action and would not exceed the general conformity de minimis levels and the alternative would conform to the SIP. The TAC emissions would also be comparable and the impact would be similar to the Proposed Action.

Operational emissions of criteria pollutants from employee commute vehicles, would account for a significant percentage of these criteria pollutant emissions (as well as CO_2 emissions, as discussed in Section IV.C.9). The RFS is located at a greater distance from the LBNL site, and were the GPL to be built at the RFS, it is likely that there would be an increase in vehicle miles travelled (VMT). Proportionately more employees live in the Berkeley/Albany/Kensington area than in El Cerrito/Richmond/San Pablo, and there are fewer opportunities for public transit commuting to the RFS. However, as calculations for operational emissions of criteria pollutants are sufficiently far below the de minimis levels for the Proposed Action, it is unlikely they would be exceeded under this alternative, even given the greater

VMT. On-site operational emissions would be equivalent to those generated under the Proposed Action and well below de minimis levels and the alternative would conform to the SIP. The TAC emissions would be comparable and the impact would be similar to the Proposed Action.

IV.C.8.e. Alternative C (No GPL Construction, but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

For Alternative C there would be no construction of the GPL. The offsite location would be more accessible to UC LBNL personnel by alternatives to the single occupancy vehicle, which could reduce VMT for commuting. Therefore, under this alternative, emissions of criteria pollutants from operations would be less than the Proposed Action.

See also Sections IV.C.8.b.i and IV.C.8.b.ii.

IV.C.8.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

This alternative would not generate the emissions associated with demolition and new construction, although there would still be emissions associated with the seismic strengthening. There would be no new operational emissions from the GPL, although there would still be operational emissions associated with activities and employees that would have otherwise occupied the GPL. Both construction and operational emissions of criteria pollutants would be well below de minimis levels and the alternative would conform to the SIP. The construction TAC emissions would be much lower and the impact less than that of the Proposed Action.

IV.C.8.g. No-Action Alternative

Without GPL construction, building demolition or Building 85/85A seismic strengthening, emission of construction-period pollutants would be entirely avoided. There would be no new operational emissions from the GPL, although there would still be operational emissions associated with activities and employees that would have otherwise occupied the GPL.

See also Sections IV.C.8.b.i and IV.C.8.b.ii.

IV.C.9. Greenhouse Gases

IV.C.9.a. Affected Environment and Regulatory Setting

Increased concentrations of greenhouse gases (GHGs) in the atmosphere due to human activities and the associated changes in global climate represent potential adverse environmental effects. The Proposed Action and alternatives are evaluated below for their potential to generate GHGs and contribute to global climate change.

The CEQ, the agency responsible for administering the National Environmental Policy Act (NEPA), has released *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions*. The guidance recommends a threshold of 25,000 MTCO2e of direct emissions as a "bright line" threshold for analysis within NEPA documents. In establishing this threshold, CEQ relied upon the final EPA regulations governing GHG monitoring and reporting. Emissions below this threshold would not be relevant to and would not need to be discussed within a NEPA analysis. The draft NEPA guidance focuses on direct emissions (those that would be generated on site by the project) only. It does not include off-site emissions such as those generated by vehicle trips to and from the project site or from the generation of electricity used by the proposed action. The 25,000 MTCO2e reporting threshold can be seen as a dividing line for major GHG emitters, which could have the potential to result in an adverse impact on the environment. This threshold has been used for the purpose of evaluation in this EA.

The BAAQMD has also, as of June 2010, issued guidance for evaluating the climate change impact of land development projects in the Bay Area and from stationary source projects subject to BAAQMD permitting authority. The guidance requires quantification of both direct and indirect emissions from operation of the project. The BAAQMD guidance includes quantitative thresholds of significance for operational impacts. The land use development project threshold is 1,100 metric tons of carbon dioxide equivalents

(MTCO2e) per year from both direct and indirect sources, while the stationary source threshold is 10,000 MTCO2e. These BAAQMD thresholds are not binding on a Federal project analyzed in a NEPA document. However, in the interest of a thorough discussion, they are referenced in this analysis.

GHGs and their effect on climate change is an environmental effect that is relevant only in the effect of its contribution to a global problem, and therefore cumulative condition. Despite that, for ease of comparison to the discussion above in Section IV.C.8, Air Quality, it is discussed below in this chapter. It is not discussed again in Chapter V, Cumulative Effects.

IV.C.9.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

IV.C.9.b.i. Demolition, Construction/Seismic Strengthening

GHG emissions from construction/demolition activities would occur from internal combustion engine exhaust associated with off-road construction equipment, exhaust from on-road trucks associated with the Proposed Action, and construction worker commute vehicle travel. Emissions of CO_2, the primary GHG emitted from these sources, were estimated using the same methods and models used to calculate criteria pollutant emissions presented in Section IV.C.8. Table IV-12 shows a summary of total estimated carbon dioxide emissions from the Proposed Action. Total annual CO_2 emissions from demolition, construction and seismic strengthening activities are relatively small and far below the CEQ “bright line” threshold of 25,000 MTCO2e of direct emissions. They are also below the BAAQMD thresholds.

The demolition of Building 25/25B, Building 55, and Building 71 trailers would also be a component of Alternatives A, B, and C, and the seismic strengthening at Building 85/85A would also be a component of Alternatives A, B, C, and D (but not the No-Action Alternative), but for the sake of brevity are not repeated below.

TABLE IV-12 **SUMMARY OF PROJECT AND BASELINE ESTIMATED GREENHOUSE GAS EMISSIONS (METRIC TONS OF CO_2)**

Source	2004	2008	Proposed Action	Net Increase over 2008
Construction/Demolition	N/A	N/A	214	214
Operation (Non-Stationary)	1,386[b]	1,195[b]	2,096[a]	901
Operation (Stationary)	N/A	57[c]	46	-11

[a] Includes off-site CO_2 emissions from electricity usage of 4,700 MW-hrs/year by the GPL.
[b] Estimated CO_2 emissions resulting from operation of Building 25/25B; Building 55; and Building 71 Trailers C, D, F, J, K, and P (to be demolished) based on natural gas and electricity usage. Energy usage includes operation of Building 26 and Building 71 Trailer G because these were not metered separately. Also includes historical electricity usage (2008 usage for 2004 and 2008 estimates) from Potter Street location operations at this site that would be transferring to the main LBNL Hill site.
[c] Estimated based on fiscal year 2009 data.
Source: Golder Associates, January 2010.

IV.C.9.b.ii. Operation of the GPL

GHG emissions from operation of the Proposed Action would occur from stationary and non-stationary sources.[65] Stationary source emissions would include emissions from natural gas combustion in the boilers/heaters, and internal combustion engine exhaust associated with the backup diesel generator. Non-stationary source emissions would include emissions from on-road employee passenger vehicles, electricity used in the proposed GPL, and emissions from energy used in water and wastewater conveyance.

[65] "Stationary" sources are defined as those sources that would be covered under the facility operating permit, and "non-stationary" sources are defined as all other sources of GHG emissions associated with the operation of the building being evaluated.

Emissions of CO_2, the primary GHG emitted from these sources, were estimated using the same methods and models used to calculate criteria pollutant emissions presented in Section IV.C.8.

Overall, the Proposed Action would, through demolition and new construction, replace a series of older buildings with a single modern, scientific laboratory with associated office space, of equivalent square footage. In addition, the proposed GPL would be designed for a high standard of energy efficiency and, consequently, more energy conserving than the facilities it would replace, thereby reducing GHG emissions. Traffic generated by the Proposed Action would be comparable to existing conditions since the occupants would relocate from other spaces on the site. Additionally, implementation of the TDM program discussed above in IV.C.6.b. would generally help reduce the number of vehicle trips made to and from the site. Therefore, the Proposed Action would not result in an increase in GHG emissions due to operational vehicle traffic.

An assessment of GHG emissions was performed based on the total CO_2 emissions associated with project sources from building energy use and transportation, as well as a comparison to the CO_2 emission reductions anticipated due to the demolition of existing buildings. Because usage of the buildings to be demolished has declined over the last several years, CO_2 emission estimates were performed for the buildings to be demolished as part of the project for calendar year 2004 (representative of operation of these buildings before partial shutdown) and for calendar year 2008 (the most recent full calendar year of reduced operations).

Emissions of CO_2 from project construction/demolition and project operations are summarized in Table IV-12, along with estimated emissions for 2004 and 2008 operation of the buildings to be demolished as part of this project. In order to evaluate the net increase in GHG emissions due to project operations, displaced GHG emissions were subtracted from project GHG emissions. The increase or decrease in emissions is shown in the last column in Table IV-12. For stationary sources, a net decrease in GHG emissions was estimated (versus a proposed significance threshold of 10,000 MT of CO_{2e}/yr).

IV.C.9.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Demolition, construction and seismic strengthening emissions under this alternative would be comparable to the Proposed Action and small relative to the non-stationary source significance threshold. As the GPL would be similar to that under the Proposed Action, operational emissions would also be comparable and well below CEQ "bright line" threshold of 25,000 MTCO2e of direct emissions. They would also be below the BAAQMD thresholds.

IV.C.9.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Affected Environment at RFS

The affected environment at the RFS would be as described above in IV.C.9.a.

Construction and Operation of the GPL at RFS

Under Alternative B, construction of the GPL would occur instead at the RFS. Emissions from construction traffic would be greater than if the GPL were built at the site, as would operational traffic emissions. This is because the RFS is located a greater distance from the site, and were the GPL to be built at the RFS, it is likely that there would be an increase in VMT, as discussed in Section IV.C.8. Although emissions associated with automobile traffic would be greater than under the Proposed Action, it is not likely that the CEQ threshold of direct emissions, nor the BAAQMD thresholds, would be exceeded under this alternative.

See also Section IV.C.9.b.i.

IV.C.9.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Use of an existing building would mean that there would not be the generation of additional GHGs from construction of the GPL. However, activity associated with demolition of several older buildings and seismically strengthening Building 85/85A would still generate GHGs.

See also Section IV.C.9.b.i.

The location of the off-site facility in Berkeley or Emeryville offers more opportunities to commute by alternatives to the single-occupancy vehicle, which could reduce VMT and related GHG emissions. However, locating programs and personnel at this site would not have the advantage of consolidating people and functions on the LBNL site. Overall, it is unlikely that operational emissions would be greater than the BAAQMD thresholds.

IV.C.9.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

Construction activity associated with the seismic strengthening work would generate GHGs. However, as demolition of seismically weak structures and construction of the GPL would not occur, GHG generation associated with construction activities would be less under this alternative than under the Proposed Action. The operational GHG emissions would occur over the lifetime of the building and are numerically more important than those from construction. Therefore, on balance, this alternative would probably generate slightly less GHGs than the Proposed Action.

IV.C.9.g. No-Action Alternative

In the absence of construction of the GPL and with no demolition activities, construction-period emissions would be entirely avoided and operational emissions would continue as at present.

IV.C.10. Utilities and Waste Management

IV.C.10.a. Affected Environment at LBNL

Stormwater at LBNL is managed via a gravity-fed system in which runoff from the northern portion of the site discharges into the north fork of Strawberry Creek, and runoff from the southern portion discharges into Strawberry Creek itself. Wastewater is conveyed via a gravity-fed system to the City of Berkeley's public sewer system and ultimately to the EBMUD regional wastewater treatment facility. UC LBNL maintains a Sanitary Sewer System Management Plan (SSSMP) which lays out guidelines for monitoring wastewater flows and cost-effectively minimizing infiltration and inflow (I/I) rates. Sanitary sewer discharge at LBNL is subject to both regulatory-based monitoring as mandated in the wastewater permits issued by EBMUD and to DOE-based monitoring,[66] which concentrates on radiological parameters and ensures compliance with radiological limits in the California Code of Regulations.

A recycling contractor collects all non-hazardous and non-recyclable solid waste generated at LBNL and transports it to a collection facility in Richmond, California. LBNL receives its water supply from the EBMUD system, and electrical power is purchased from the Western Area Power Administration (WAPA) and delivered via the Pacific Gas and Electric (PG&E) transmission system.

IV.C.10.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Wastewater from Building 25/25B currently flows into two City of Berkeley sanitary sewer sub-basins: sub-basin 17-013 and sub-basin 17-503. Sub-basin 17-013 has no capacity constraints, while sub-basin 17-503 is constrained during peak wet weather conditions. This constraint could be exacerbated by the increased volume of wastewater from the new, approximately 43,000-gsf GPL

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[66] Borglin, Ned. Environment, Health & Safety, LBNL. Personal communication with DC&E, January 11, 2010.

facility. Although the proposed facility would be designed to higher standards of energy and water efficiency, it would have a larger full-day occupant population and would be approximately 22,536 square feet larger than Building 25/25B, which totals about 20,644 gsf.

However, SPF UTILS-2, from Appendix A requires that UC LBNL implement programs to ensure that additional wastewater flows are directed into unconstrained sub-basins. Under the Proposed Action, detailed plans for the GPL indicate that wastewater from the new facility would be diverted to unconstrained sub-basin 17-013. Additionally, the existing 4-inch diameter sanitary sewer pipe would be replaced with a 6-inch diameter pipe designed in accordance with SSSMP guidelines and connected to unconstrained sub-basin 17-013. The Proposed Action would, therefore, not overburden the existing capacity of sanitary sewer systems.

Construction of the GPL on the site where Building 25/25B now stands would require a new storm drain line, as the existing line is partially blocked and undersized for the current drainage area around Building 25. The new line would be about 125 feet in length, running from the southeastern corner of the new building through a section of hillside. Although the new storm drain line would be a minor addition to LBNL's extensive, existing storm drainage infrastructure, it would alleviate an existing stormwater drainage constraint.

The GPL, with some modifications, would use existing electrical, water, and sanitary sewer utility systems that currently serve the Building 25 complex.

The demolition component of the Proposed Action would not affect utilities except in the removal or capping of utility lines during removal of the buildings. Seismic strengthening of Building 85/85A would involve some rerouting of utility lines around the new underground construction. Demolition is included in Alternatives A, B, and C below. Seismic strengthening is included in Alternatives A, B, C, and D but for the sake of brevity this discussion is not repeated below.

IV.C.10.c. Alternative A (GPL Construction and Operation at B74 SE Parking Lot Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

As explained above, SPF UTILS-2 requires that UC LBNL implement programs to ensure that additional wastewater flows are directed into unconstrained sub-basins. Accordingly, additional wastewater flows would be directed into sub-basin 17-013, sub-basin 17-304, unconstrained portions of sub-basin 17-503, or another sub-basin that has adequate capacity. However, redirection would be more complex than under the Proposed Action, as existing wastewater infrastructure in the vicinity of the Building 74 site currently drains into constrained sub-basin 17-503. Any redirection of wastewater would therefore demand substantial infrastructural improvements including off-site improvements.

Construction of the GPL at this location on the LBNL site would result in an increase of approximately 20,000 square feet of impervious surface, as discussed under Section IV.C.3.c, Water Resources and Soil Erosion. To accommodate additional stormwater runoff from this new impervious surface, construction of three new storm drains and a new detention basin would be required. Work on the storm drains would take place in previously disturbed areas of the site, and collectively the new stormwater infrastructure would effectively restrain the flow of runoff leaving the site and entering downstream water bodies.

See also Section IV.C.10.b. concerning demolition and seismic strengthening.

IV.C.10.d. Alternative B (GPL Construction at RFS, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Affected Environment at RFS

The RFS is connected to the City of Richmond and local utilities for water, sewer, electric power, and natural gas. EBMUD serves the RFS with one 8-inch domestic water line and two 12-inch fire main lines. These lines enter the RFS from the north, west, and east sides of the property (UC Berkeley 2008). The Richmond Municipal Sewer District provides wastewater treatment and disposal services to the RFS. Sewer discharge from the RFS flows to the City of Richmond publicly owned wastewater treatment plant, located approximately 3 miles west on Canal Boulevard.[67] Beyond the basic utilities provided at the time of purchase, UC Berkeley installed additional support at the RFS as needed, such as water and sanitary sewer service for restrooms, laboratories, and research projects.[68]

PG&E provides electricity to the RFS through an overhead 12-kilovolt electrical line service, with both underground and aerial power lines comprising the electrical service infrastructure. PG&E also provides natural gas service to the RFS through a high-pressure gas main on South 46th Street.[69]

Construction and Operation of the GPL at RFS

Construction of the GPL at the RFS would not exacerbate sanitary sewer constraints at the LBNL site, although utility, service system, and energy demand at the RFS would increase under this alternative. However, based on current usage levels and capacity, it is anticipated that sufficient utilities and service systems would be available for further development at the RFS.

See also Section IV.C.10.b concerning demolition and seismic strengthening.

IV.C.10.e. Alternative C (No GPL Construction but Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Use of additional space in an existing facility in Berkeley or Emeryville would not involve new construction of infrastructure and utility systems on the site.

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[67] UC Berkeley, 2008, Final Current Conditions Report, University of California, Richmond Field Station, California.

[68] UC Berkeley, 2008, Final Current Conditions Report, University of California, Richmond Field Station, California.

[69] UC Berkeley, 2008, Final Current Conditions Report, University of California, Richmond Field Station, California.

Additionally, the sanitary sewer capacity constraints associated with sub-basin 17-503 would not be exacerbated.

See also Section IV.C.10.b concerning seismic strengthening.

IV.C.10.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

The Reduced Project Alternative would not involve the construction of new utilities or services systems, and the seismic strengthening work on Building 85/85A would not alter operation of the building's existing systems. However, Alternative D would not result in the increased energy and water efficiency benefits of the Proposed Action, as it would not include a more energy efficient GPL facility.

IV.C.10.g. No-Action Alternative

The No-Action Alternative would not involve the construction of new utilities or services systems. As with the Reduced Project Alternative however, no energy efficient GPL facility would be constructed and consequently the opportunity for increased energy efficiency at LBNL would be missed.

IV.C.11. Wildland Fires

IV.C.11.a. Affected Environment at LBNL

According to the California Department of Forestry and Fire Protection (CDF) Natural Hazard Disclosure Map Images and Data for Alameda County, components of the Proposed Action are not located in an area that has a substantially high potential for wildland fires.[70] However, the LBNL site does contain various types of vegetation and mature trees that could burn during a wildland fire event.

[70] California Department of Forestry and Fire Protection, *Natural Hazard Disclosure Map Images and Data for Alameda County*. http://www.fire.ca.gov/ab6/nhd01.pdf. Accessed March 12, 2008.

Wildland fires are a potential concern at the LBNL site and resources have been devoted to fire protection strategies and infrastructure. In 1994, UC LBNL published a Wildland Fire Evacuation/Relocation Plan. The plan, which would apply to the Proposed Action, is based on a wildland fire scenario that would require rapid mobilization of resources, quick decision making and well–coordinated execution by emergency responders during a wildland fire.[71] Furthermore, fire management would be considered in the selection of plant stock for post-construction landscaping as per the LBNL vegetation management program.[72]

IV.C.11.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Demolition and construction activity, as well as regular operation of a building all have the potential to cause sparks and ignite adjacent areas of grassland and trees. However, the chances of uncontrolled wildland fires at LBNL have been reduced to a very low level by LBNL-wide measures listed in Section IV.C.11.a. Additionally, Building 25/25B is in the center of the LBNL site, surrounded mainly by other buildings and an irrigated grove of redwood trees. The location has a considerably lower fire risk than areas on the periphery of the site that are closer to vegetation.

The demolition of Building 25/25B, Building 55, and Building 71 trailers would also be a component of Alternatives A, B, and C, and the seismic strengthening at Building 85/85A would also be a component of Alternatives A, B, C, and D (but not the No-Action Alternative), but for the sake of brevity is not repeated below.

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[71] Supplemental EIR Addendum for the Proposed Extension of the Contract between the DOE and the UC Regents for Operation and Management of LBNL, http://rfplbnl.sc.doe.gov/docs/pdf/lbnl_1997_seir.pdf, page IV-H-1. Accessed April 3, 2008.

[72] LBNL 2006, *LRDP EIR,* Hazards and Hazardous Materials Chapter, page IV.F-8.

IV.C.11.c. Alternative A (GPL Construction at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

The Building 74 SE Parking Lot site that would be used under Alternative A is in an area that is surrounded by vegetation on most sides and in close proximity to trees and grassland. It is therefore at slightly greater risk of wildfires than at the Building 25/25B site as under the Proposed Action. However, the fire prevention and response measures described in the Wildland Fire Evacuation/Relocation Plan would also reduce the fire risk at this location.

See also Section IV.C.11.b concerning demolition and seismic strengthening.

IV.C.11.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

The RFS is close to San Francisco Bay, bordered by industrial and residential areas of Richmond and the freeway. It is not located in a California Fire Hazard Severity Zone.[73]

See also Section IV.C.11.b concerning demolition and seismic strengthening.

IV.C.11.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

The off-site facility is closer to San Francisco Bay, Interstate 80 freeway, the Berkeley aquatic park lagoon and industrial and residential areas of Berkeley. It is not located in a California Fire Hazard Severity Zone.[74]

See also Section IV.C.11.b concerning demolition and seismic strengthening.

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[73] CalFire, http://www.fire.ca.gov/fire_prevention/fire_prevention_wildland_zones_maps.php, accessed on November 2, 2009.

[74] CalFire, http://www.fire.ca.gov/fire_prevention/fire_prevention_wildland_zones_maps.php, accessed on November 2, 2009.

IV.C.11.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

There would be a reduced risk of wildland fires from this alternative as only the seismic strengthening construction work would contribute.

See also Section IV.C.11.b concerning seismic strengthening.

IV.C.11.g. No-Action Alternative

There would be no change to the existing fire risk under the No-Action Alternative.

IV.C.12. Accidents

Accidents are discussed in various different sections of this EA. For accidents due to earthquakes and landslides, see Section IV.C.1, Geological and Seismic Hazards. For accidents due to wildland fires, see Section IV.C.11. Traffic accidents are discussed below.

IV.C.12.a. Affected Environment at LBNL

Traffic accidents are considered for the Proposed Action and Alternative A sites for construction trucks travelling from the project sites to the freeway. These routes are described above in Section IV.C.6.

IV.C.12.b. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Accident data for collisions involving trucks along the designated truck route in Berkeley between 2002 and 2004 was obtained from the Department of California Highway Patrol (CHP) and analyzed. Table IV-13 shows roadway names, segment lengths, total number of collisions involving trucks over the three year period of analysis, average number of accidents per year, and the number of accidents where fault was attributed to the truck driver. As shown in the table, the total number of accidents involving trucks is low and the number of accidents where fault was attributed to the truck driver is even lower.

TABLE IV-13 **COLLISIONS INVOLVING TRUCKS ALONG THE DESIGNATED TRUCK ROUTE (2002-2004)**

Roadway	Length of Segment (Miles)	All Accidents		Truck Driver at Fault	
		Total	Per Year	Total	Per Year
University Avenue (Oxford St. to I-80)	2.19	17	5.7	10	3.3
Oxford Street (University Ave. to Hearst Ave.)	0.12	1	0.3	1	0.3
Hearst Avenue (Shattuck Ave. to Highland Pl.)	0.72	1	0.3	1	0.3

Source: CHP, 2004.

The Proposed Action would not change the physical characteristics of the street network on the site or along the designated truck route. Construction traffic generated by the Proposed Action would be controlled by the Site Construction Coordinator and would be maintained below the level required to avoid exceeding City of Berkeley thresholds governing intersection operations, roadway segment operation, and pavement conditions. In other words, there would be no considerable increase in construction truck traffic and therefore no corresponding increase in potential for traffic accidents compared to existing conditions. Therefore, there would be no reasonably foreseeable increase in risk to health and safety from transporting demolition or construction material associated with the Proposed Action.

The demolition of Building 25/25B, Building 55, and Building 71 trailers would also be a component of Alternatives A, B, and C, and the seismic strengthening at Building 85/85A would also be a component of Alternatives A, B, C, and D (but not the No-Action Alternative).

IV.C.12.c. Alternative A (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

As under the Proposed Action, there would be no considerable increase in construction truck traffic and therefore no corresponding increase in potential for traffic accidents compared to existing conditions.

IV.C.12.d. Alternative B (GPL Construction and Operation at RFS, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

Construction trucks have only a short distance to travel from the RFS site entrance to the freeway, thereby reducing the risk of accidents on Richmond Streets to a very low level.

IV.C.12.e. Alternative C (No GPL Construction but Use of Leased Space Off-Site, B25/25B, B55, B71 Trailer Demolition, and B85/85A Seismic Strengthening)

With the exception of a relatively small number of trucks removing debris for demolition-related components of this alternative, there would be no construction trucks associated with use of an existing building in Berkeley or Emeryville.

IV.C.12.f. Alternative D (Reduced Project with only B85/85A Seismic Strengthening)

As only the construction trucks associated with seismic strengthening work would contribute under Alternative D, the potential for accidents would be lower than under the Proposed Action.

IV.C.12.g. No-Action Alternative

There would be no construction trucks at risk of accidents from the No-Action Alternative.

V CUMULATIVE EFFECTS

Cumulative environmental effects consider the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions. In the area surrounding the LBNL site, planned, pending, and/or reasonably foreseeable actions proposed in the same timeframe as the Proposed Action include DOE projects at LBNL as well as UC projects at LBNL and on the adjacent UC Berkeley campus. These projects are listed and described below in Section V.A. Projects located at LBNL are shown in Figure V-1.

The University of California's Seismic Phase 2 Draft Environmental Impact Report (EIR), circulated for public review between January 29 and March 15, 2010, considers cumulative impacts out to 2025, which is the planning horizon for the 2006 LBNL LRDP. The LRDP provides guidance for any future development without the assurance that such development would occur. LRDP growth projections include projects that would only be executed if and when funding becomes available. Such funding has historically been very much open to question. Absent financing, the projections are not reasonably foreseeable. By contrast, this EA considers the cumulative effects of projects which have reached a "Critical Decision – 0" approval (or where funding is otherwise anticipated) and are therefore reasonably foreseeable. Accordingly, the timeline for cumulative effects has been set at 2018, which is the anticipated completion date of Seismic Phase 3, the latest project for which funding is anticipated. Any National Environmental Policy Act (NEPA) document prepared on Seismic Phase 3 would, of course, account for any projects which are reasonably foreseeable at that time.

The Next Generation Light Source (NGLS), as envisioned, would be a linear accelerator "light source" capable of producing extraordinarily bright, short, soft x-ray pulses at rates of hundreds of thousands of times per second. Soft x-rays are ideal for studying solar cells, fuel cells, advanced electronics, biological systems, cleaner catalysts, and high-temperature superconductors. If located at the LBNL site, the NGLS could be a national user facility available not only to scientists at LBNL and UC Berkeley but to re-searchers around the nation and the world. While the idea of locating the NGLS at the LBNL site is being actively studied by Laboratory management, UC LBNL has not formally proposed this to the DOE, nor has it entered into the required DOE "Critical Decision" process for the NGLS. Consequently, the NGLS is not considered a reasonably foreseeable project at LBNL at this time. Because the idea to locate the NGLS at LBNL is not a reasonably foreseeable project at this time, the NGLS is not considered further in this analysis.

Currently, there are no foreseeable development projects planned at the RFS[1] or in adjacent areas of the City of Richmond.[2] Therefore, the only cumulative issues facing Alternative B, the off-site GPL alternative at the RFS, are greenhouse gas emissions. Discussions of these cumulative issues are located in Chapter IV.

Cumulative effects are not identified for Alternative C, the off-site leased space alternative in Berkeley or Emeryville, because the building would be already constructed and in use. The off-site facility would be in a light-industrial area of Berkeley or Emeryville and the addition of approximately 100 UC LBNL personnel relocated to the area would have only a very minimal effect.

The No-Action Alternative serves as the baseline against which the effects of the Proposed Action and alternatives are measured. For each potentially affected resource category, the area of potential effect is defined by factors specific to the medium of propagation of effects and the relative time overlap of the projects. As such, the Area of Potential Effect (APE) for cumulative effects associated with geology and seismicity is not the same as for cumulative effects related to air quality.

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[1] A specific plan for development of the RFS is expected to be prepared in the coming months.

[2] Rese-Brown, Lori, Senior Planner, City of Richmond. Personal communication with DC&E, December 21, 2009.

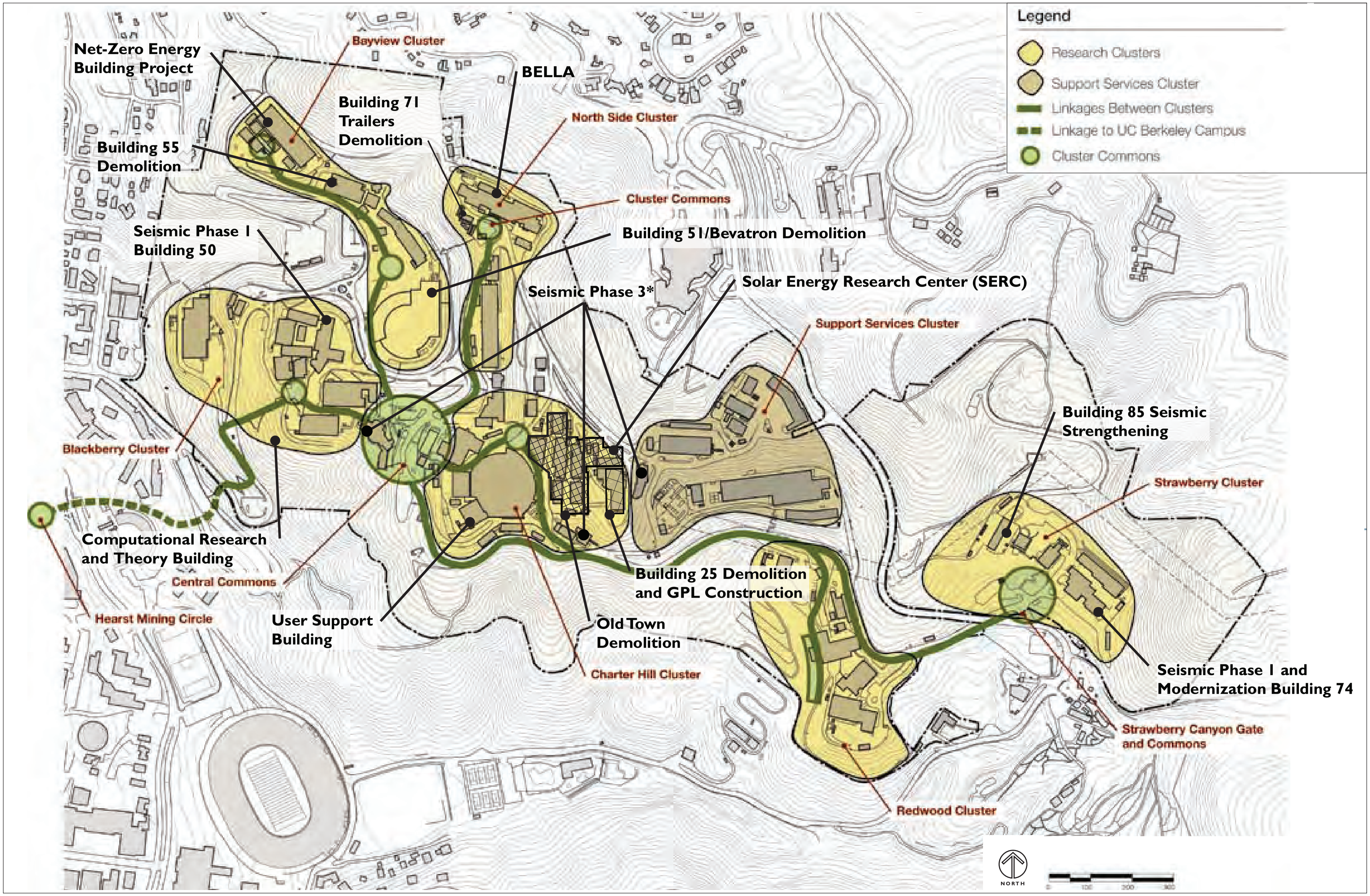
V.A. Construction Projects in the Vicinity of the Proposed Action

There are a number of projects either planned or under consideration for the LBNL site, adjacent UC campus, and City of Berkeley that would take place in the same approximate timeframe of the Proposed Action (allowing for project schedule changes). Project locations are shown in Figure V-1 and time frameworks in Table V-1.

V.A.1. DOE Projects at LBNL[3]

V.A.1.a. The User Support Building
Status: In Progress.
Anticipated Project End: Mid 2010
Project Size: 30,000 gsf
CEQA Documentation: Initial Study/Mitigated Negative Declaration was prepared and circulated in fall 2006 and adopted by The UC Regents in January 2007.
NEPA Documentation: Categorical Exclusion, December 2006.
Description: The three-story User Support Building (USB) will include assembly space, support laboratories, and offices. An existing 16,038 gsf structure, Building 10, which housed approximately 24 full-time LBNL staff, was demolished to create space for the USB.
Project Sponsor: DOE
Relevance: Geographic proximity to Building 25 demolition and GPL construction, although it is predicted to be finished before the start of the Proposed Action. Operational traffic from USB is included in cumulative traffic, air quality, and noise analyses.

[3] The projects are the same as those analyzed in the Seismic Phase 2 Draft EIR, January 29, 2010, although they were listed in that document according to the titles of the CEQA documents in which they were analyzed. Projects are listed in this EA using the titles assigned to them by UC LBNL personnel for calculations of truck trips associated with each project.



Source: Lawrence Berkeley National Laboratory

* Indicates structures proposed to be removed as part of the Seismic Phase 3 Project.
The GPL 2 building location has not been determined.

FIGURE V-1

CUMULATIVE PROJECTS

TABLE V-1 **PROJECTS AT LBNL AND UC CAMPUS DURING THE PROPOSED ACTION TIMEFRAME**

	2010	2011	2012	2013	2014	2015	2016	2017	2018
PROJECTS AT LBNL									
User Support Building									
Building 25 Demolition									
GPL at Building 25 Site									
Old Town Demolition									
SERC									
Seismic Phase 3									
Seismic Phase 1 Building 50									
CRT									
Building 55 Demolition									
Building 51 and Bevatron									
Building 71 BELLA									
Building 71 Trailer Demolition									
User Test Bed Facilities									
GPL at Building 74 SE (Alt A)									
Building 74 Modernization									
Building 85 Seismic Strengthening									
PROJECTS ON UCB CAMPUS AND IN ADJACENT CITY OF BERKELEY									
Student Athlete High Performance Center									
Stadium Seismic Upgrade									
UCB Law School Infill									

TABLE V-1 **PROJECTS AT LBNL AND UC CAMPUS DURING THE PROPOSED ACTION TIMEFRAME** (CONTINUED)

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Utilities/ROW in Piedmont Ave.									
Storm and Sewer in Gayley Rd.									
Chang-Lin Tien Center Phase 2									
Community Health Campus Phases 1 and 2									
Northeast Quadrant Science and Safety Project									
Campbell Hall Replacement									
Anna Head Housing									
Berkeley Art Museum/PFA									
DHS Demo/Helios, 2151 Berkeley Way									
Blum Center/Naval Architecture									
Warren Hall Replacement/Li Ka Shing Center Steps 1&3									
Various Construction Projects									
Tolman Hall Seismic Renovation									
Lewis Hall Seismic Renovation									
Mulford Hall Seismic Renovation									
Dwinelle Annex Renovation									
Hearst Gym Seismic and Program Renovation and Expansion									

Note: **Bold** = Proposed Action and Alternatives.
Construction Durations shown in calendar years.

V.A.1.b. Old Town Demolition

Status: Environmental review completed. Project approved December 2009.
Anticipated Project Start: Late 2010
Anticipated Project End: Mid 2013
Project Size: 55,000 gsf
CEQA Documentation: Covered by LBNL 2006 LRDP EIR
NEPA Documentation: Categorical Exclusion, December 2009
Description: This project covers the decontamination and demolition of certain buildings in the LBNL "Old Town" area in the center of the LBNL site, and associated environmental restoration. Depending on funding, up to 14 buildings would be decontaminated and demolished, including Buildings 4, 5, 7, 7C, 14, 16, 25A, 40, 41, 44, 44A, 44B, 52, and 52A. In addition, any contaminated soil under these structures would be remediated and groundwater treatment systems (if necessary) would be installed within the approximately three-acre project area.
Project Sponsor: DOE
Relevance: Geographic proximity to Building 25 demolition and GPL and concurrent nature of work. Construction vehicle traffic and equipment from Old Town Demolition is included in traffic, air quality, and noise analyses. Demolition activities are considered in discussions of hazardous substances and human health, water resources, biological resources, aesthetics, and air quality.

V.A.1.c. Seismic Phase 1 – Building 50

Status: In Progress. It is anticipated that the Building 50 work would be finished prior to start of Proposed Action.
Anticipated Project End: Early 2010
Project Size: 48,719 gsf
CEQA Documentation: Categorical Exemption
NEPA Documentation: Categorical Exclusion
Description: Seismic Phase 1 is intended to correct structural deficiencies in LBNL Buildings 50 and 74 in order to improve their performance in a seismic event and upgrade the seismic rating of the buildings from "Poor" to "Good." Seismic Phase 1 work for Building 74 was finished in late 2009.

Project Sponsor: DOE
Relevance: Project location at LBNL site. Although included for completeness, this project is not relevant to any of the issues discussed below due to lack of time overlap.

V.A.1.d. Seismic Upgrades, Modernization & Replacement of General Purpose Buildings, Phase 3 (Seismic Phase 3)
Status: Conceptual design studies expected in 2011
Anticipated Project End: 2018
Project Size: 40,000-46,000 gsf
CEQA Documentation: None as yet
NEPA Documentation: None as yet
Description: LBNL's Seismic Phase 3 project would involve modernization of Building 26, a critical medical emergency facility, and Building 54, which houses conference rooms and a Lab-wide cafeteria and dining facility, in order to upgrade the buildings' seismic ratings from "Poor" to "Good." Buildings 45 and 48, which are connected and comprise the Laboratory Fire Station, would also be upgraded to a seismic rating of "Good." Finally, a General Purpose Laboratory would be constructed at a location as yet undetermined under Seismic Phase 3, to replace 40,000-46,000 gross square feet of seismically unsafe and deficient space demolished as part of the project.
Project Sponsor: DOE
Relevance: Geographic proximity to Building 25 demolition and Seismic Phase 2B GPL construction. Operational traffic from Seismic Phase 3 is included in cumulative traffic and air quality analyses.

V.A.1.e. Building 51 and the Bevatron Demolition
Status: In Progress. Expected to be finished before Proposed Action starts.
Anticipated Project End: Late 2011
Project Size: 96,562 gsf
CEQA Documentation: EIR certified July 2007, tiered from LBNL 1987 LRDP EIR.
NEPA Documentation: EA/FONSI, April 2008

Description: The work involves demolition and removal of the Building 51 complex, including the Bevatron (a retired particle accelerator), and the concrete blocks and building shell surrounding it.
Project Sponsor: DOE
Relevance: Project located near Building 55 demolition, although no predicted time overlap.

V.A.1.f. Berkeley Lab Laser Accelerator (BELLA) Laser Acquisition, Installation and Use for Research and Development
Status: In design phase
Anticipated Project Start: Laser system purchased; construction start date Fall 2010
Anticipated Project End: 18-month long period. Expected ending in 2012
Project Size: N/A
CEQA Documentation: Categorical Exemption, October 2009
NEPA Documentation: NEPA EA/FONSI, September 2009
Description: BELLA will take place almost entirely within Building 71, involving modifications to the internal structure to support a shielded experimental cave and support functions. The cave will house a new laser accelerator system. An additional utility room and stairwell will be added to the roof.
Project Sponsor: DOE
Relevance: Project location near Building 71 trailer demolition. Construction vehicle traffic and equipment from BELLA construction is included in discussions of traffic, air quality, and noise analyses.

V.A.1.g. User Test Bed Facilities
Status: Awarded funding December 2009
Anticipated Project Start: Summer 2011
Anticipated Project End: Winter 2012
Project Size: Approximately 10,000 gsf, but could be less
CEQA Documentation: None as yet
NEPA Documentation: None as yet

Description: The User Test Bed Facilities project would consist of a series of energy-efficient building "testbeds" in new and/or existing buildings to allow researchers to conduct measurements of energy use with various prototype building systems such as windows, lights, heating, ventilation, and air conditioning (HVAC), roofs, and skylights. The project is in a very early stage of development at this time. Consideration is being given to renovating existing interior floor space in Building 90, with the possibility of adding a small support building next to Building 90 on a parking lot.
Project Sponsor: DOE
Relevance: Project location near Building 71 trailer demolition. Included for the sake of completeness, but due to the lack of information and the early stage in project planning, it is not included in the analysis below. However, due to its relatively small size, it would make a minimal difference in the quantitative cumulative impact analyses, and would not change the impact conclusions in this document.

V.A.1.h. Building 74 Modernization
Status: In Progress
Anticipated Project End: Mid 2012
Project Size: 45,383 gsf
CEQA Documentation: Covered by LBNL 2006 LRDP EIR
NEPA Documentation: Categorical Exclusion
Description: An additional phase of Building 74 modernization work involves interior renovation of the entire building, including new mechanical, electrical and plumbing systems, new interior partitions, finishes, and laboratory casework.
Project Sponsor: DOE
Relevance: Project location near Building 85 seismic strengthening, and Alternative A location for GPL. Construction vehicle traffic and equipment from Building 74 modernization is included in traffic, air quality, and noise analyses.

V.A.2. UC Projects at LBNL

V.A.2.a. Solar Energy Research Center (SERC)

Status: Anticipated, foreseeable.

Anticipated Project Start: Mid 2011

Anticipated Project End: Late 2013

Project Size: 38,000 gsf

CEQA Documentation: Underway

NEPA Documentation: None as yet

Description: The goal of the Solar Energy Research Center (SERC) project is to accelerate the development of sustainable solar energy sources through various initiatives, such as the development of new materials for use in collectors, efficient processing steps, and energy handling. SERC at LBNL would be an approximately 38,000 gsf building devoted to new photovoltaic and electrochemical solar-energy systems. Various sites on the LBNL site, including the Building 25A demolition site, are currently being evaluated for this project. All are served by existing roadways and utilities.

Project Sponsor: UC

Relevance: Although not yet approved, this project is included due to its proximity to Building 25 demolition and GPL construction and its overlapping schedule. Only this location for SERC is examined. Construction vehicle traffic and equipment from SERC construction is included in traffic, air quality, and noise analyses. Construction activities are considered in discussions of hazardous substances and human health, water resources, biological resources, aesthetics, and air quality. Operational traffic from SERC is included in cumulative traffic, air quality, and noise analyses.

V.A.2.b. The Computational Research and Theory Building (CRT)

Status: Anticipated; foreseeable

Anticipated Project Start: Late 2010

Anticipated Project End: Late 2013

Project Size: 126,000 gsf

CEQA Documentation: EIR certified by The UC Regents in May 2008

NEPA Documentation: Underway

Description: As currently proposed by UC, the Computational Research and Theory (CRT) Building would be constructed near the Blackberry Gate entrance to the LBNL site. The project would provide high-end computing floor space and accompanying office space.
Project Sponsor: UC
Relevance: Project location at LBNL site and timeframe would overlap with Proposed Action. Construction vehicle traffic and equipment from CRT construction is included in cumulative traffic, air quality, and noise analyses. Operational traffic from CRT included in cumulative traffic, air quality, and noise analyses.

V.A.3. UC Projects on UC Campus and in Adjacent City of Berkeley
These are included due to their relevance in the traffic, air quality, and noise analyses from construction activity. Timeframes are included in Table V-1.

<u>Southeast Campus Integrated Projects</u>

- Student Athlete High Performance Center (158,000 gsf)
- Stadium Seismic Upgrade (120,000 gsf)
- UC Berkeley Law School Infill (52,100 gsf)
- Utilities/ROW in Piedmont Avenue (N/A)
- Storm and Sewer in Gayley Road (N/A)
- Chang-Lin Tien Center Phase 2 (43,500 gsf)
- Community Health Campus Phases 1 and 2 (300,000gsf)
- Northeast Quadrant Science and Safety Project (demolition of 100,000 gsf of existing buildings, and construction of 430,000 gsf of laboratory and classroom space)
- Campbell Hall Replacement (81,600 gsf)
- Anna Head Housing (143,000 gsf)
- Berkeley Art Museum and Pacific Film Archive (142,000 gsf)
- DHS Demolition/Helios Construction, 2151 Berkeley Way (120,000 gsf)
- Blum Center/Naval Architecture (23,918 gsf)
- Warren Hall Replacement/Li Ka Shing Center Steps 1 &3 (200,000 gsf)
- Various Construction Projects

- Tolman Hall Seismic Renovation: (247,000-gsf) demolition/ construction, 2012 through 2013.
- Lewis Hall Seismic Renovation: (68,100-gsf) demolition/construction, 2015 through 2016.
- Mulford Hall Seismic Renovation: (93,500-gsf) demolition/ construction, 2012 through 2013.
- Dwinelle Annex Renovation: 817-square-meter (8,800-gsf) demolition/ construction, 2016 through 2017.
- Hearst Gym Seismic and Program Renovation and Expansion: 11,520-square-meter (124,000-gsf) demolition/construction, 2017 through 2018.

Vegetation Management Projects

The University has applied, through the State of California Governor's Office of Emergency Services, to the Federal Emergency Management Agency (FEMA) for funding under the Pre-Disaster Mitigation (PDM) Program to conduct vegetation management activities in Strawberry Canyon, Claremont Canyon, and Frowning Ridge. The vegetation management activities would involve removal of non-native trees, including approximately 10,000 stems of eucalyptus trees from Strawberry Canyon, approximately 12,000 stems of eucalyptus trees from the Claremont Canyon area, and approximately 24,000 stems of eucalyptus and pine trees from the Frowning Ridge location. Environmental review of the projects has not been completed. After approval, each project is expected to take place over a three-year period.

V.B. Issues Determined Not to Warrant Further Discussion

As discussed in Chapter IV, the following environmental issues are scarcely affected by the Proposed Action and are not discussed further at the cumulative level: Population and Housing, Socioeconomic and Environmental Justice, Intentional Destructive Acts, Public Services, Cultural Resources, Land Use and Planning, Utilities and Waste Management, and Hazards from Wildfires.

V.B.1. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

The Proposed Action was determined not to affect the topical areas of Population and Housing, Socioeconomic and Environmental Justice, Intentional Destructive Acts, Public Services, Cultural Resources, Land Use and Planning, Utilities and Waste Management, and Hazards from Wildfires. Because there are no identified impacts at the project level, construction of the Proposed Action would not contribute to cumulative effects in these areas.

V.B.2. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Alternative A was determined not to affect the topical areas of Population and Housing, Socioeconomic and Environmental Justice, Intentional Destructive Acts, Public Services, Cultural Resources, Land Use and Planning, Utilities and Waste Management, and Hazards from Wildfires. Because there are no identified impacts at the project level, construction of this alternative would not contribute to cumulative effects in these areas.

V.B.3. Alternative D (B85/85A Seismic Strengthening Only)

There would not be cumulative impacts resulting from construction of Alternative D in these topical areas.

V.B.4. No-Action Alternative

No cumulative impacts in these topical areas would occur under the No-Action Alternative.

V.C. Issues Determined to Warrant Further Discussion

V.C.1. Geological and Seismic Hazards

The APE for geological and seismic hazards is taken as the locations where LBNL personnel work and are exposed to geological and seismic hazards during their working day, on the site.

V.C.1.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

UC LBNL plans to continue its program of correcting seismic deficiencies in existing buildings by upgrading or replacing them, and the Proposed Action would only result in a negligible increase in the ADP of the LBNL site. In addition, adherence to State requirements such as the California Building Code with its strict provisions for structural design in seismically active areas such as Berkeley would ensure that the associated risks would be reduced to acceptable levels.

V.C.1.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Cumulative effects under this alternative would be the same as the Proposed Action for Geological and Seismic Hazards.

V.C.1.c. Alternative D (B85/85A Seismic Strengthening Only)

As with the proposed project, no cumulative effects would occur under this alternative.

V.C.1.d. No-Action Alternative

The No-Action Alternative would prolong the existing situation, leaving Building 85 without additional protection from the underlying landslides that could move during a severe seismic event, but would not introduce new effects.

V.C.2. Hazardous Substances and Human Health

The APE for consideration of the cumulative effects of hazardous substances and the risks to human health is taken as the area immediately surrounding the locations of the Proposed Action components, or the GPL location under Alternative A. These are the locations where LBNL personnel work and are exposed to hazards during their working day, as well as the land around the buildings that could be affected by the release of contamination into soil and groundwater.

V.C.2.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

The demolition component of the Proposed Action could potentially release chemicals used in Building 25/25B and Building 55 (both of which have been used as chemical laboratories) to the air, soil, or groundwater in the vicinity of those structures. The Old Town area of LBNL is contiguous to Building 25/25B, and the period of demolition of the Old Town buildings overlaps the Building 25/25B demolition. In addition, excavation and construction of the GPL under the Proposed Action could overlap construction of the SERC if this location is selected. Reinstallation of groundwater monitoring wells that are part of the ongoing Building 25/25A remediation system will take place with consideration for the effects of the combined project work.

Potential project-specific effects would be reduced through implementation of the SPF HAZ-3(a) as described in Appendix A of this EA, and also through compliance with local, regional, State, and Federal regulations. Releases of dust would be minimized by the incorporation of standard dust control measures as part of SPF AQ-1 (a) from Appendix A, which calls for dust abatement control measures.

Construction of the GPL at the Building 25/25B site, under the Proposed Action, would involve excavation to a depth of over 10 feet (compared to at least 3 feet if the GPL is not located here) in an area previously contaminated with VOCs. Soil and groundwater sampling performed in compliance with the SMP and GWMP would ensure that any new, as yet undiscovered, sources would be remediated prior to construction of the building. Adherence to health and safety plans would ensure protection of construction workers.

Building 55 demolition work would take place more than several hundred feet from the Bevatron and Building 51 and is scheduled to take place one to two years afterwards, so one project would not likely affect the other.

Seismic strengthening of Building 85/85A, although it involves borings up to approximately 50 feet deep and about 4 to 5 feet wide, takes place in an area of no known contamination. Additionally, it is unlikely to provide any pathways for spreading contamination should any be released in a future event.

V.C.2.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Alternative A would involve construction at the Building 74 SE Parking Lot site, located relatively near Building 85/85A, where the seismic strengthening component of the Proposed Action would take place. However, as previously indicated, Building 85/85A strengthening would not involve contaminated soil. Besides the Alternative A location for the GPL, there is no other foreseeable development planned for the Strawberry Canyon area.

V.C.2.c. Alternative D (B85/85A Seismic Strengthening Only)

As previously indicated, Building 85/85A strengthening would not involve contaminated soil.

V.C.2.d. No-Action Alternative

The No-Action Alternative would not introduce any new environmental effects. However, with the projected growth of LBNL as outlined under the LBNL 2006 LRDP, there would be an increase in the number of personnel and activities at the LBNL site and the number of hazardous-waste generating activities. Under an agreement with the Department of Toxic Substances Control (DTSC) entered pursuant to the Federal Facility Compliance Act of 1992, certain mixed waste streams are stored at LBNL for longer than the year limit normally allowed at permitted hazardous waste handling facilities such as the HWHF in order to allow for characterizing the waste and locating appropriate mixed waste treatment and disposal facilities. Therefore, it would not be possible to operate multiple interim storage facilities around the site for short-term stockpiling before manifesting to a final destination, and it would be necessary to have a functioning waste treatment facility on-site.

V.C.3. Water Resources

The APE for consideration of the cumulative effects of risks to Water Resources is taken as the Strawberry Creek watershed that is affected by the components of the Proposed Action, Alternative A, and Alternative D. For potential cumulative impacts on hydrology and water quality, only those projects that would include grading, excavation, new exterior construction, and/or intensified land use that are in the same watershed would be expected to be capable of contributing to cumulative hydrology and water quality impacts. This includes the USB, SERC, CRT, Seismic Phase 3, and Old Town Demolition. Potential water quality issues from groundwater contamination are described under Section V.C.2, above.

V.C.3.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

At the project level, it was found that the Proposed Action would not cause any changes in drainage patterns, sediment runoff, or groundwater infiltration as a result of the demolition or seismic strengthening components. In addition, a new GPL constructed at the LBNL site would use water supplied by EBMUD and would not draw on groundwater.

Concurrent projects listed in Section V.A. located in the APE for cumulative analysis of Water Resources would occur largely on previously developed land. Consequently, they would result in a loss of approximately 3.14 acres of pervious surface in the Strawberry Creek watershed. This represents approximately 0.26 percent of the 1,163 acre watershed. The shallow soils located on steep slopes that exist across the majority of the site permit rapid runoff and likely do not allow for substantial levels of groundwater recharge to occur. Therefore, in general, impacts to groundwater recharge area from present and future development in the APE would be minimal. This represents the background situation under the No-Action Alternative.

The Proposed Action would take place entirely on previously developed land and therefore would not contribute to loss of pervious surface on the site or affect groundwater recharge. In addition, surface water resources would not increase due to compliance with SPFs from Appendix A which maintain current flows through retention techniques, thus avoiding erosion of the creek system.

V.C.3.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Under Alternative A, construction of the GPL at the Building 74 SE Parking Lot site would result in the loss of about 20,000 square feet (0.46 acres) of undeveloped land and would thus contribute to the foreseeable loss of pervious surface in the APE. However, 20,000 square feet represents only eight percent of the total foreseeable area that could be converted to impervious surface and only 0.04 percent of the total area of the Strawberry Creek watershed.

Additional stormwater runoff that would result from development of an additional 20,000 square feet under Alternative A would be managed by three new stormwater drains and a new stormwater detention basin, all designed in conformance with NPDES regulations to ensure no net increase in runoff flowing into the storm sewer system from the GPL.

V.C.3.c. Alternative D (B85/85A Seismic Strengthening Only)

Seismic strengthening activities would result in no increases in impervious surfaces or stormwater runoff at the Building 85/85A site, and therefore no change to baseline conditions.

V.C.3.d. No-Action Alternative

No increases in stormwater runoff would occur under the No-Action Alternative.

V.C.4. Biological Resources

For the Proposed Action, Alternative A, Alternative D, and the No-Action Alternative, the APE for consideration of the cumulative effects on biological resources is taken as the East Bay hills.

V.C.4.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

The Proposed Action takes place entirely on land that is already developed or otherwise disturbed. Minor and temporary effects on the adjacent biota could be caused by demolition/construction noise and dust. The possible removal of three trees would be compensated by planting replacement trees elsewhere on the LBNL hill site. The schedule for construction of the GPL at the Building 25/25B demolition site, under the Proposed Action, would overlap with projects such as Old Town demolition and construction of SERC, if that were to take place at the Building 25A Site. This would exacerbate the disturbance, but overall would not contribute to a cumulatively adverse effect on biological resources because of the highly developed nature of LBNL in the Old Town area.

V.C.4.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Although a large percentage of the GPL site under Alternative A is a parking lot, construction would involve excavation and development of an undeveloped hillside in an area that is critical habitat for a threatened species, the Alameda whipsnake, as well as habitat for other wildlife and plants. It could also involve removal of approximately 46 trees, including native species such as Coast live oaks. The SPFs listed in Appendix A are part of the Proposed Action and would reduce the effects on the whipsnake and other wildlife. (See SPFs BIO-3, BIO-4, BIO-5 (a) through (f), which include pre-construction surveys and vegetation management).

Nonetheless, Alternative A would see the development of about 20,000 square feet (approximately 0.46-acre) of as yet undeveloped land in the East Bay hills. This would be in addition to the removal of about 9.5 acres of habitat and open space from the LBNL site and the removal of approximately 5 acres removed by other potential development from the UC campus.[4] The Oakland and Berkeley general plans do not foresee development of undeveloped land in the East Bay hills under their respective jurisdictions, nor does the East Bay Regional Park District that controls Tilden and other ridgeline parks. There are more than 10,000 acres of undeveloped land in the East Bay hills,[5] and therefore, the potential loss from Alternative A would be less than 1.5 percent of the total undeveloped area in the East Bay hills.

Development of about 20,000 square feet under Alternative A would represent an increase of approximately three percent over other planned development. UC LBNL and UC Berkeley both have numerous policies and procedures in place to protect threatened species from development in general. With these in place, it is not anticipated that there would be adverse effects to biological resources from planned and foreseeable development, to which Alternative A would contribute only 0.46 acres of a total of 14.5 acres.

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[4] LBNL, 2007, *Long-Range Development Plan Environmental Impact Report*, page IV.C-57.

[5] East Bay Regional Park District, http://www.ebparks.org/parks, accessed on February 24, 2010.

V.C.4.c. Alternative D (B85/85A Seismic Strengthening Only)

No effects to biological resources would occur under this alternative.

V.C.4.d. No-Action Alternative

No effects to biological resources would occur under this alternative.

V.C.5. Aesthetics

The APE for consideration of the cumulative effects to aesthetics is taken as the LBNL site, including lower elevation viewsheds of the site. The APE applies to the Proposed Action, Alternative A, Alternative D, and the No-Action Alternative.

V.C.5.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

The Proposed Action would decrease the density of development at the LBNL hill site by removing Building 55 and Building 71 trailers from the viewshed, and removing Building 25/25B, but replacing it with a new building. The new building would be taller and slightly more prominent than the existing building, but would be located in the center of the LBNL site, the portion of the site that is historically the most developed. As it is behind the cusp of a hill, the location could only be viewed from selected viewpoints. It is anticipated that this part of the LBNL hill site would undergo several changes that could affect its aesthetic qualities, including the demolition of the Old Town and possible construction of SERC at the Building 25A site. SERC is likely to be similar in height to the proposed GPL and not highly visible from off-site. Overall, changes in the Old Town area would reduce the amount of developed space and the density of development in the center of LBNL and would add two new aesthetically pleasing buildings (GPL and SERC) in their place. To most eyes, the cumulative effect would be an improvement in the visual character of the area.

V.C.5.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Construction of the GPL at the Building 74 SE Parking Lot under Alternative A would increase the amount of developed land in the Strawberry Canyon area. The addition of the GPL to the Strawberry Cluster (Figure V-1) would increase the amount of development in Strawberry Canyon that is visible from natural areas, including hiking trails to the southeast. However, there are currently no plans for further development of the Strawberry Canyon area either by LBNL or other parties, and a large portion of Strawberry Canyon is designated as Perimeter Open Space under the LBNL 2006 LRDP land use classification system. Overall, Alternative A would not contribute to a cumulative aesthetic effect in the APE.

V.C.5.c. Alternative D (B85/85A Seismic Strengthening Only)

No effects to aesthetic resources would occur under this alternative.

V.C.5.d. No-Action Alternative

No effects to aesthetic resources would occur under this alternative.

V.C.6. Transportation and Traffic

The APE for consideration of the cumulative effects to transportation and traffic for the Proposed Action is taken as the designated truck routes from the LBNL construction sites to the freeway (for construction truck traffic) and the streets in Berkeley around the UC Berkeley Campus (for operational traffic).

V.C.6.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

The cumulative effects of the Proposed Action on traffic and transportation are identified and analyzed in Chapter IV, Section IV.C.6. As discussed, construction traffic at LBNL would be controlled so as not to cause an intersection level of service threshold to be exceeded. Also as discussed, because there would be no increase in the number of vehicle commute trips associated with the Proposed Action, with any of Alternatives A, D, or the No-Action Alternative, conditions on stressed intersections in the vicinity of the site would not be exacerbated.

V.C.6.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Cumulative effects would be the same as the Proposed Action.

V.C.6.c. Alternative D (B85/85A Seismic Strengthening Only)

Construction traffic under Alternative D would be limited to trucks from the Building 85/85A seismic strengthening component. As with the Proposed Action, the Site Construction Coordinator would manage construction traffic to stay within accepted daily limits.

V.C.6.d. No-Action Alternative

The No-Action Alternative would not involve any demolition, new construction or seismic strengthening and there would be no change to the current situation with respect to transportation and traffic.

V.C.7. Noise

The APE for consideration of the cumulative effects of noise is taken as the areas immediately surrounding the components of the Proposed Action, Alternative A, or Alternative D sites that would be affected by noise from project activities.

V.C.7.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

V.C.7.a.i. Cumulative Construction Noise

If the Proposed Action were to go ahead as planned, it would be one of several construction projects underway at approximately the same time in the Old Town area in the center of the LBNL site. The USB is a construction project underway and anticipated to last at least until late 2010. Old Town demolition would follow on a similar schedule, starting in mid 2010. Construction of SERC at the Building 25A demolition site (if the project goes ahead at that location) is anticipated to start in early 2011. However, these projects would all take place near the center of the LBNL site, well away from the LBNL perimeter fence and (as measured from the GPL site at Building 25/25B) approximately 1,800 feet from the nearest residences. With the incorporation of SPFs NOISE-1 (a) to (b), and NOISE-4, from Appendix A, which call for comprehensive noise control specifications, cumulative construction noise would not exceed City of Berkeley noise standards at the nearest off-site receptors.

Building 55 demolition would take place in the Bayview Cluster area in the northwest of the site in 2013. Demolition of the Bevatron and Building 51, located in relatively close proximity, is expected to be finished by early 2011 so there would not be cumulative effects on neighboring residences resulting from this component of the Proposed Action. Similarly Building 71 trailer demolition, although in close proximity to the Berkeley Lab Laser Accelerator (BELLA) site, is not expected to have much, if any, overlap in time and would be completed within a relatively short period.

The seismic strengthening at Building 85/85A would take place at the same time as the Building 74 modernization work. However, both activities would take place mostly inside the buildings, or underground and out of view. Therefore no cumulative noise effects would result.

V.C.7.a.ii. Cumulative Construction Traffic Noise

Cumulative construction truck traffic from all LBNL and UC projects concurrent with the Proposed Action was analyzed to determine whether or not it would cause a substantial temporary increase in noise along the major arterials (Hearst Avenue, Oxford Street, and University Avenue) used by the construction trucks. To demonstrate a worst-case scenario, assuming all projects were under construction concurrently and all construction truck traffic traveled along the same arterials, on an average day calculations indicate the noise level would increase by less than 1 dBA L_{dn}. On a peak day the noise level is calculated to increase from about 1 to 2 dBA L_{dn}. The second scenario represents the upper estimate of possible noise effects because peak construction truck traffic for all projects would be controlled so as not to overlap. As a rule of thumb, an increase of less than 3 dBA L_{dn} is not substantial and there would be no cumulative noise impacts from construction truck traffic to, from, or within the LBNL site under the Proposed Action.[6]

V.C.7.a.iii. Cumulative Operational Noise

Operational noise from the proposed GPL at the Building 25/25B site would not make a considerable contribution to community noise levels. Even if SERC were constructed on an adjacent site, both buildings would be sufficiently far from off-site sensitive receptors that no effects at the cumulative level would result.

V.C.7.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

V.C.7.b.i. Cumulative Construction Noise

As discussed in Section IV.C.7, it is unlikely that the noise level from construction at this location would meet the standard at the UC Botanical Garden. The seismic strengthening at Building 85/85A would take place at the same time as the Building 74 modernization work. However, both activities would take place mostly inside the buildings, or underground and out of view. Therefore no cumulative noise effects would result.

V.C.7.b.ii. Cumulative Construction Traffic Noise

Under Alternative A, a similar volume of construction traffic would travel along the same designated truck routes as under the Proposed Action, and consequently no cumulative effect on noise would result from this alternative either.

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[6] Rich Rodkin, Principal, Illingworth & Rodkin, Inc. Personal communication with DC&E, January 25, 2010.

V.C.7.b.iii. Cumulative Operational Noise

As discussed above in IV.C.7.c.ii, operational noise from the GPL at the Building 74 SE site could result in noise levels above City of Oakland regulatory thresholds. This is due to the proximity of sensitive receptors in the UC Botanical Garden, located less than 50 feet away from the GPL at its nearest point. Combined with background noise from existing development at Buildings 85, 83, and 84, the situation would be compounded. Consequently, Alternative A would result in both project-specific and cumulative effects on surrounding sensitive receptors due to operational noise.

V.C.7.c. Alternative D (B85/85A Seismic Strengthening Only)

V.C.7.c.i. Cumulative Construction Noise

The seismic strengthening at Building 85/85A would take place at the same time as the Building 74 modernization work. However, both activities would take place mostly inside the buildings, or underground and out of view. Therefore no cumulative noise effects would result.

V.C.7.c.ii. Cumulative Construction Traffic Noise

Construction traffic under Alternative D would be limited to trucks from the Building 85/85A seismic strengthening component, resulting in no cumulative noise effects.

V.C.7.c.iii. Cumulative Operational Noise

There would be no change in operational noise from existing conditions.

V.C.7.d. No-Action Alternative

The No-Action Alternative would not involve any demolition, new construction or seismic strengthening and there would be no change to the current situation with respect to noise.

V.C.8. Air Quality

The APE for consideration of the cumulative effects on air quality is, in general terms, the San Francisco Bay Area Air Basin. However, the various pollutants of concern have different areas of spatial effect depending on their nature and sources. BAAQMD guidelines have taken these factors into account in the criteria used as cumulative thresholds. Air quality emissions from the Proposed Action in combination with other concurrent projects were calculated by Golder Associates, 2010.

The BAAQMD recently approved new guidance for use in evaluating cumulative impacts from toxic air contaminant emissions under CEQA. By its own terms, that guidance does not apply to the evaluation of this proposed Federal action under NEPA. However, because there is no well-defined set of Federal standards for TACs or HAPs, cumulative air quality impacts from HAPs/TACs associated with the Proposed Action in conjunction with projects occurring over the same time period are evaluated below using the BAAQMD thresholds.

V.C.8.a. Proposed Action (GPL Construction and Operation at B25/25B Site, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

V.C.8.a.i. Construction, Demolition and Seismic Strengthening

For this assessment, cumulative DPM and $PM_{2.5}$ emissions from trucks and off-road equipment associated with all identified construction and demolition projects (including the Proposed Action) occurring over the Proposed Action time period were estimated, using methods and models identical to those used to estimate DPM and $PM_{2.5}$ emissions from trucks and off-road equipment associated with the Proposed Action alone, as described in Chapter IV, Section IV.C.8.a. Identical dispersion modeling methods were then used to estimate maximum average DPM concentrations at potential sensitive receptor locations on- and off-site, and maximum average $PM_{2.5}$ concentrations in ambient air (defined as any off-site location).

Next, LECR and chronic hazard for the hypothetical MEI were calculated using the same methods used to estimate these impacts resulting from on-road truck and off-road equipment emissions in Chapter IV, from the Proposed Action alone. These results are provided in Tables V-2 and V-3.

TABLE V-2 **CUMULATIVE MEI LECR AND CHRONIC HAZARD ESTIMATES FOR ON-SITE, OFF-ROAD CONSTRUCTION/DEMOLITION EQUIPMENT DPM EMISSIONS**

Assessment	MEI Result	Significance Threshold
Cumulative On-Site LECR	15-in-a-million	100-in-a-million
Cumulative On-Site Chronic Hazard	0.3	1.0
Cumulative Off-Site LECR	25-in-a-million	100-in-a-million
Cumulative Off-Site Chronic Hazard	0.06	1.0

Source: Golder Associates, January 2010.

TABLE V-3 **CUMULATIVE MEI LECR AND CHRONIC HAZARD ESTIMATES FOR CONSTRUCTION/DEMOLITION TRUCK TRAFFIC**

Assessment	MEI Result	Significance Threshold
Cumulative Off-Site LECR	9-in-a-million	100-in-a-million
Cumulative Off-Site Chronic Hazard	0.02	1.0

Source: Golder Associates, January 2010.

Maximum cumulative $PM_{2.5}$ concentrations in ambient air (i.e. any off-site location) were also determined using dispersion modeling methods identical to those used to determine $PM_{2.5}$ impacts from the proposed project. These results are provided in Table V-4. Based on these estimates, the cumulative LECR, chronic hazard, and $PM_{2.5}$ impacts would not exceed the proposed BAAQMD thresholds.

V.C.8.a.ii. Operations Impact

As described in Chapter IV, Section IV.C.8.b, the maximum LECR impacts from Proposed Action operation would be relatively small: 0.5-in-a-million within the LBNL facility property boundary (5 percent of the BAAQMD recommended threshold of significance) and 0.2-in-a-million outside of the boundary (2 percent of the BAAQMD recommended threshold of significance). The LBNL 2006 LRDP EIR estimated maximum LECR impacts from all projects occurring over the LRDP period out to 2025 to be 22-in-a-million. Although the proposed project is part of the growth projected under the 2006 LRDP and is therefore already accounted for in the LBNL site-wide LECR assessment, conservatively adding the maximum LECR for the proposed project (0.5-in-a-million) to the maximum cumulative LECR from the LRDP analysis (22-in-a-million) would provide a result of no more than 23-in-a-million. This is less than the BAAQMD proposed threshold of 100-in-a-million (for either construction or operation) for assessing cumulative LECR, and adopted for use in this EA.

V.C.8.b. Alternative A (GPL Construction and Operation at B74 SE Parking Lot, B25/25B, B55, B71 Trailer Demolition and B85/85A Seismic Strengthening)

Alternative A would be very similar to the Proposed Action at the cumulative level for emissions from construction truck travel and construction equipment use. Operational emissions, although similar, would be produced from a location approximately 0.45 miles farther east. According to the analysis in the LBNL 2006 LRDP EIR, air emissions that affect areas north of LBNL are a greater concern than those to the east, because the pollutant load from existing and reasonably foreseeable development in the vicinity is greater in that area. From the perspective of residents living north of the LBNL, site emissions would therefore be less. On the other hand, as described under Section IV.C.8.c, the Alternative A site would be less desirable because emissions would be closer to sensitive receptors in the UC Botanical Garden and the residences nearby. However, as there is no other development planned for the Strawberry Canyon area, there would not be an effect at the cumulative level.

V.C.8.c. Alternative D (B85/85A Seismic Strengthening Only)

This alternative would not generate the emissions associated with demolition and new construction, although there would still be emissions associated with

TABLE V-4 **CUMULATIVE MAXIMUM ESTIMATED ANNUAL $PM_{2.5}$ CONCENTRATION IN AMBIENT AIR FROM CONSTRUCTION/DEMOLITION EMISSIONS**

Pollutant	Assessment	Maximum Ambient Concentration	Significance Threshold
$PM_{2.5}$	On-Site, Off-Road Equipment Emissions	0.31 $\mu g/m^3$	0.8 $\mu g/m^3$
$PM_{2.5}$	Off-Site, On-Road Truck Emissions	0.07 $\mu g/m^3$	0.8 $\mu g/m^3$

Source: Golder Associates, January 2010.

the seismic strengthening. There would be no new operational emissions from the GPL, although there would still be operational emissions associated with activities and employees that would have otherwise occupied the GPL. Given the results of the cumulative analysis discussed above, and the fact that emissions from this alternative would be substantially lower, this alternative would not result in cumulative air quality effects.

V.C.8.d. No-Action Alternative

The No-Action Alternative would not involve any demolition, new construction, or seismic strengthening and there would be no change to the current situation with respect to air quality.

V.C.9. Greenhouse Gases

The effect of GHG emissions upon climate change is a global phenomenon. The discussion presented in Chapter IV is already a cumulative-level discussion because project-related emissions are considered in relation to other existing emissions. The analysis in this EA follows the *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions*, recently issued by CEQ, the federal agency charged with overseeing NEPA's implementation. As discussed above, the contribution to the balance of GHG emissions would be well below the CEQ threshold under the Proposed

Action and each of the alternatives. Additionally, implementation of the Proposed Action or the alternatives would not greatly affect the overall GHG balance and climate change worldwide.

The BAAQMD recently approved new GHG guidance for use in evaluating climate change impacts under CEQA. As noted in Chapter IV, that guidance does not apply to the evaluation of this proposed federal action under NEPA. For informational purposes, however, it is also worth noting that the proposed action (and each of the alternatives thereto) falls below the BAAQMD's screening levels for climate change analysis, and therefore would not be subject to the District's significance criteria for operational GHG emissions in any event.

VI Glossary of Terms and Acronyms

A. Glossary

California Environmental Quality Act (CEQA): California State legislation that requires a written analysis of the potential environmental impacts of a development Proposed Action, including an assessment of alternative Proposed Action designs and a disclosure to the public about why the Proposed Action was approved.

Cumulative Impact: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Environmental Assessment (EA): A concise public document for which a Federal agency is responsible that serves to a) briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or a finding of no significant impact; b) aid in an agency's compliance with NEPA when no Environmental Impact Statement is necessary; and c) facilitate preparation of a statement when one is necessary.

Environmental Impact Report (EIR): A report required of general plans by the California Environmental Quality Act and which assesses all the environmental characteristics of an area and determines what effects or impacts will result if the area is altered or disturbed by a Proposed Action. (See "California Environmental Quality Act.")

National Environmental Policy Act (NEPA): A federal law very similar to CEQA which requires its own environmental review process.

Purpose and Need: Explanation of why the federal agency and project proponent are undertaking the proposed action and what objectives they intend to achieve. Basis may include: capacity and transportation demand, safety, legislative directive, economic development/planned growth, modal interrelationships, system linkage and roadway deficiencies. The statement of purpose and need provides the basis for developing a range of reasonable alternatives and, ultimately, the identification of the preferred alternative.

B. Acronyms

1,1,-DCA: 1,1-dichloroethane
1,1-DCE: 1-1-dichloroethene
1,1,1-TCA: 1,1,1-trichloroethane

ABA: Architectural Barriers Act
ABAG: Association of Bay Area Governments
AC Transit: Alameda-Contra Costa Transit District
ADA: Americans with Disabilities Act
ADP: average daily population
AERL: Alternative Energy Research Laboratory
AOCs: Areas of Concern
APE: Area of Potential Effect
AST: above-ground storage tanks

BAAQMD: Bay Area Air Quality Management District
BART: Bay Area Rapid Transit
BCDC: San Francisco Bay Conservation and Development Commission
BELLA: Berkeley Lab Laser Accelerator
Bgs: below ground surface
BSO: DOE Berkeley Site Office

C2H3Cl: vinyl chloride
CAA: Clean Air Act (federal)
CAAQS: California Ambient Air Quality Standards
Cal/EPA: California Environmental Protection Agency
CARB: California Air Resources Board
CBC: California Building Code

CCAA: California Clean Air Act
CDF: California Department of Forestry and Fire Protection
CDFG: California Department of Fish and Game
CEQ: Council on Environmental Quality
CEQA: California Environmental Quality Act
CFR: Code of Federal Regulations
CHP: Department of California Highway Patrol
cis-1,2-DCE: cis-1,2-dichloroethene
CMI: Corrective Measures Implementation
CO: carbon monoxide
CO_2: carbon dioxide
CRT: Computational Research and Theory Building
CUPA: Certified Unified Program Agency

dBA: Decibels-A-weighted scale
DOE: United States Department of Energy
DPM: diesel particulate matter
DTSC: Department of Toxic Substances Control

EA: Environmental Assessment
EBI: Energy Biosciences Institute
EBMUD: East Bay Municipal Utility District
EH&S: Environment, Health & Safety Department
EIR: Environmental Impact Report
EPA: United States Environmental Protection Agency

FESA: Federal Endangered Species Act
FTE: Full-time equivalent
FTU: Fixed Treatment Unit

GHG: greenhouse gas
GMMP: Groundwater Monitoring and Management Plan
GPL: General Purpose Laboratory
gsf: gross square feet

H_2S: hydrogen sulfide
HAPs: hazardous air pollutants
HAR: Hazard Analysis Report
HILAC: Heavy Ion Linear Accelerator
HVAC: heating, ventilation, and air-conditioning
HWHF: Hazardous Waste Handling Facility

I/I: infiltration and inflow
ITE: Institute of Traffic Engineers

LBNL: Lawrence Berkeley National Laboratory
LECR: Lifetime Excess Cancer Risk
LEED: Leadership in Energy and Environmental Design
LEQ: equivalent sound level
LOS: Level of Service
LRDP: Long Range Development Plan

M&O: Management and Operating
MCE: Maximum Credible Earthquake
MCLs: Maximum Contaminant Limits
MEI: maximally exposed individual
MTCO2e: metric tons of carbon dioxide equivalents

NAAQS: National Ambient Air Quality Standards
NEPA: The National Environmental Policy Act
NEQSS: Northeast Quadrant Science and Safety Project
NESHAP: National Emissions Standards for Hazardous Air Pollutants
NFA: No Further Action status
NHPA: National Historic Preservation Act
NO_x: nitrogen oxide
NO_2: nitrogen dioxide
NPDES: National Pollutant Discharge Elimination System
NPL: National Priorities List
NTLF: National Tritium Labeling Facility

O_3: ozone
OSHA: Occupational Safety and Health Administration

Pb: lead
PCBs: Polychlorinated Biphenyls
PCE: tetrochloroethylene
PELs: permissible exposure limits
PET: Positron Emission Tomography
PG&E: Pacific Gas and Electric
PM_{10}: Particulate matter 10 microns or less in diameter
$PM_{2.5}$: Particulate matter 2.5 microns or less in diameter

RCRA: Resource Conservation and Recovery Act
RFS: Richmond Field Station
ROG: reactive organic gas
RWQCB: Regional Water Quality Control Board

SCIP: Southeast Campus Integrated Proposed Actions
SERC: Solar Energy Research Center
sf: square feet
SFBAAB: San Francisco Bay Area Air Basin
SHPO: State Historic Preservation Officer
SIP: State Implementation Plan
SMP: Soil Management Plan
SO_2: sulfur dioxide
SO_4: sulfates
SPF: Standard Project Feature
SSSMP: Sanitary Sewer System Management Plan
SVOCs: semi volatile organic compounds
SWMUs: Solid Waste Management Units
SWPPP: Stormwater Pollution Prevention Plan
SWRCB: State Water Resources Control Board

TAC: Toxic air contaminant
TCE: trichloroethylene
TDM: Transportation Demand Management

UC: University of California
USACE: U.S. Army Corps of Engineers
USB: User Support Building
US EPA: United States Environmental Protection Agency
USFWS: U.S. Fish and Wildlife Service
UST: Underground Storage Tank

VMT: vehicle miles traveled
VOC: volatile organic compound

WAPA: Western Area Power Administration
WM: LBNL Waste Management

APPENDIX A

STANDARD PROJECT FEATURES

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INTRODUCTION TO THE STANDARD PROJECT FEATURES

Standard Project Features (SPFs) were originally identified in the UC LBNL 2006 LRDP EIR as environmentally proactive measures that would be incorporated into all LBNL projects. These measures have been adopted as part of the LBNL 2006 LRDP EIR by the Regents of the University of California. For clarity this Appendix lists Standard Project Features as they were characterized in the LDRP EIR in Chapter 5, entitled *Mitigation Monitoring and Reporting Program*. The SPFs described herein are incorporated into and are a part of the project description of the Proposed Action and alternatives. These measures are pertinent to such environmental resource areas as aesthetics; air quality; biological resources; cultural resources; geology and soils; hazards and hazardous materials; hydrology and water quality; noise; traffic and transportation; and utilities and service systems. Included among these environmentally proactive measures are the following:

A. AESTHETICS

- (Standard Project Feature (SPF) VIS-4a) All new buildings on the LBNL hill site constructed pursuant to the LBNL 2006 LRDP shall incorporate design standards that ensure lighting would be designed to confine illumination to its specific site, in order to minimize light spillage to adjacent LBNL buildings and open space areas. Consistent with safety considerations, LBNL project buildings shall shield and orient light sources so that they are not directly visible from outside their immediate surroundings.
- (SPF VIS-4b) New exterior lighting fixtures shall be compatible with existing lighting fixtures and installations in the vicinity of the new building, and will have an individual photocell. In general, and consistent with safety considerations, exterior lighting at building

entrances, along walkways and streets, and at parking lots shall maintain an illumination level of not more than 20 Lux (approximately two foot-candles).

- (SPF VIS-4c) All new buildings on the LBNL hill site constructed pursuant to the LBNL 2006 LRDP shall incorporate design standards that preclude or limit the use of reflective exterior wall materials or reflective glass, or the use of white surfaces for roofs, roads, and parking lots, except in specific instances when required for energy conservation.

B. AIR QUALITY

- (SPF AQ-1a) The BAAQMD's approach to dust abatement calls for "basic" control measures that should be implemented at all construction sites, "enhanced" control measures that should be implemented at construction sites greater than four acres in area, and "optional" control measures that should be implemented on a case-by-case basis at construction sites that are large in area or are located near sensitive receptors, or that, for any other reason, may warrant additional emissions reductions (BAAQMD, 1999).

  During construction of individual projects proposed under the LRDP, LBNL shall require construction contractors to implement the appropriate level of mitigation (as detailed below), based on the size of the construction area, to maintain project construction-related impacts at acceptable levels; this would reduce the potential impact to a less-than-significant level.

  Elements of the "basic" dust control program for project components that disturb less than one acre shall include the following at a minimum:

- Water all active construction areas at least twice daily. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer).
- Pave, apply water three times daily (or as sufficient to prevent dust from leaving the site), or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily or as appropriate (with water sweepers using reclaimed water if possible) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily or as appropriate (with water sweepers using reclaimed water if possible) if visible soil material is carried onto adjacent public streets.

Elements of the "enhanced" dust abatement program for project components that disturb four or more acres shall include all of the "basic" measures in addition to the following measures:

- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).
- Enclose, cover, water twice daily (or as sufficient to prevent dust from leaving the site), or apply (non-toxic) soil stabilizers to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 miles per hour.

- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.

Elements of the "optional" control measures are strongly encouraged at construction sites that are large in area or located near sensitive receptors, or that for any other reason may warrant additional emissions reductions:

- Install wheel washers for all exiting trucks, or wash off tires or tracks of all trucks and equipment leaving the site.
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 miles per hour.
- Limit the area subject to excavation, grading, and other construction activity at any one time.
- Pave all roadways, driveways, sidewalks, etc. as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
- Designate a person or persons to monitor the dust control program and to order increased watering, as necessary, to prevent transport of dust off-site. Their duties shall include holidays and weekend periods when work may not be in progress. The names and telephone numbers of such persons shall be provided to the BAAQMD prior to the start of construction.

♦ (SPF AQ-1b) To mitigate equipment exhaust emissions, LBNL shall require its construction contractors to comply with the following measures:

- Construction equipment shall be properly tuned and maintained in accordance with manufacturers' specifications.
- Best management construction practices shall be used to avoid unnecessary emissions (e.g., trucks and vehicles in loading and unloading queues would turn their engines off when not in use).
- Any stationary motor sources such as generators and compressors located within 100 feet of a sensitive receptor shall be equipped with a supplementary exhaust pollution control system as required by the BAAQMD and the California Air Resources Board.
- Incorporate use of low-NOx emitting, low-particulate emitting, or alternatively fueled construction equipment into the construction equipment fleet where feasible, especially when operating near sensitive receptors.
- Reduce construction-worker trips with ride-sharing or alternative modes of transportation.

C. BIOLOGICAL RESOURCES

♦ (SPF BIO-3) Direct disturbance, including tree and shrub removal or nest destruction by any other means, or indirect disturbance (e.g. noise, increased human activity in area) of active nests of raptors and other special-status bird species (as listed in Table IV.C-1) within or in the vicinity of the proposed footprint of a future development project shall be avoided in accordance with the following procedures for Pre-Construction Special-Status Avian Surveys and Subsequent Actions. No more than two weeks in advance of any tree or shrub removal or demolition or construction activity involving particularly noisy or intrusive activities (such as concrete breaking) that will commence during the breeding season (February 1 through July 31), a qualified wildlife biologist shall conduct pre-construction surveys of all potential special-status bird nesting habitat in the vicinity of the planned activity and, depending on the survey findings, the following actions shall be taken to avoid potential adverse effects on special-status nesting birds:

1. Pre-construction surveys are not required for demolition or construction activities scheduled to occur during the non-breeding season (August 1 through January 31).

2. If pre-construction surveys indicate that no nests of special-status birds are present or that nests are inactive or potential habitat is unoccupied, no further mitigation is required.

3. If active nests of special-status birds are found during the surveys, a no-disturbance buffer zone will be created around active nests during the breeding season or until a qualified biologist determines that all young have fledged. The size of the buffer zones and types of construction activities restricted within them will be determined through consultation with the CDFG, taking into account factors such as the following:

   - Noise and human disturbance levels at the project site and the nesting site at the time of the survey and the noise and disturbance expected during the construction activity;

   - Distance and amount of vegetation or other screening between the project site and the nest; and

   - Sensitivity of individual nesting species and behaviors of the nesting birds.

4. Noisy demolition or construction activities as described above (or activities producing similar substantial increases in noise and activity levels in the vicinity) commencing during the non-breeding season and continuing into the breeding season do not require surveys (as it is assumed that any breeding birds taking up nests would be

acclimated to project-related activities already under way). However, if trees and shrubs are to be removed during the breeding season, the trees and shrubs will be surveyed for nests prior to their removal, according to the survey and protective action guidelines 3a through 3c, above.

5. Nests initiated during demolition or construction activities would be presumed to be unaffected by the activity, and a buffer zone around such nests would not be necessary.
6. Destruction of active nests of special-status birds and overt interference with nesting activities of special-status birds shall be prohibited.
7. The noise control procedures for maximum noise, equipment, and operations identified in Section IV.I, Noise, of this EIR shall be implemented.

♦ (SPF BIO-4) Project implementation under the LBNL 2006 LRDP shall avoid disturbance to the maternity roosts of special-status bats during the breeding season in accordance with the following procedures for Pre-Construction Special-Status Bat Surveys and Subsequent Actions. No more than two weeks in advance of any demolition or construction activity involving concrete breaking or similarly noisy or intrusive activities, that would commence during the pup-rearing season (April 15 through August 31), or winter hibernacula season (October 15 through March 1, depending on weather conditions) a qualified bat biologist, acceptable to the CDFG, shall conduct pre-demolition surveys of all potential special-status bat breeding habitat in the vicinity of the planned activity. Depending on the survey findings, the following actions shall be taken to avoid potential adverse effects on breeding special-status bats:

1. If active roosts are identified during pre-construction surveys, a no disturbance buffer will be created by the qualified bat biologist, in

consultation with the CDFG, around active roosts during the breeding season. The size of the buffer will take into account factors such as the following:

- Noise and human disturbance levels at the project site and the roost site at the time of the survey and the noise and disturbance expected during the construction activity;
- Distance and amount of vegetation or other screening between the project site and the roost; and
- Sensitivity of individual nesting species and the behaviors of the bats.

2. If pre-construction surveys indicate that no roosts of special-status bats are present, or that roosts are inactive or potential habitat is unoccupied, no further mitigation is required.
3. Pre-construction surveys are not required for demolition or construction activities scheduled to occur during the non-breeding and winter hibernacula season (September 1 through October 15, and March 1 through April 15).
4. Noisy demolition or construction activities as described above (or activities producing similar substantial increases in noise and activity levels in the vicinity) commencing during the non-breeding season and continuing into the breeding season do not require surveys (as it is assumed that any bats taking up roosts would be acclimated to project-related activities already under way). However, if trees are to be removed during the breeding season, the trees would be surveyed for roosts prior to their removal, according to the survey and protective action guidelines 1a through 1c, above.
5. Bat roosts initiated during demolition or construction activities are presumed to be unaffected by the activity, and a buffer is not necessary.

6. Destruction of roosts of special-status bats and overt interference with roosting activities of special-status bats shall be prohibited.
7. The noise control procedures for maximum noise, equipment, and operations identified in Section IV.I, Noise, of this EIR shall be implemented.

- (SPF BIO-5a) With the approval of the USFWS on a case-by-case basis, relocate any snake encountered during construction that is at risk of harassment; cease construction activity until the snake is moved to suitable refugium. Alternatively, submit a general protocol for relocation to the USFWS for approval prior to project implementation.

- (SPF BIO-5b) Conduct focused pre-construction surveys for the Alameda whipsnake at all project sites within or directly adjacent to areas mapped as having high potential for whipsnake occurrence. Project sites within high potential areas shall be fenced to exclude snakes prior to project implementation. This would not include ongoing and non-site specific activities such as fuel management.

  Methods for pre-construction surveys, burrow excavation, and site fencing shall be developed prior to implementation of any project located within or adjacent to areas mapped as having high potential for whipsnake occurrence. Such methods would be developed in consultation or with approval of USFWS for any development taking place in USFWS officially designated Alameda whipsnake critical habitat. Pre-construction surveys of such project sites shall be carried out by a permitted biologist familiar with whipsnake identification and ecology.[1] These are not intended to be protocol-level surveys but designed to clear an area so that individual whipsnakes are not present within a given area

[1] Swaim, 2002.

prior to initiation of construction. At sites where the project footprint would not be contained entirely within an existing developed area footprint and natural vegetated areas would be disturbed any existing animal burrows shall be carefully hand-excavated to ensure that there are no whipsnakes within the project footprint. Any whipsnakes found during these surveys shall be relocated according to the Alameda Whipsnake Relocation Plan. Snakes of any other species found during these surveys shall also be relocated out of the project area. Once the site is cleared it shall then be fenced in such a way as to exclude snakes for the duration of the project. Fencing shall be maintained intact throughout the duration of the project.

- (SPF BIO-5c) (1) A full-time designated monitor shall be employed at project sites that are within or directly adjacent to areas designated as having high potential for whipsnake occurrence, or (2) Daily site surveys for Alameda whipsnake shall be carried out by a designated monitor at construction sites within or adjacent to areas designated as having moderate potential for whipsnake occurrence.

  Each morning, prior to initiating excavation, construction, or vehicle operation at sites identified as having moderate potential for whipsnake occurrence, the project area of applicable construction sites shall be surveyed by a designated monitor trained in Alameda whipsnake identification to ensure that no Alameda whipsnakes are present. This survey is not intended to be a protocol-level survey. All laydown and deposition areas, as well as other areas that might conceal or shelter snakes or other animals, shall be inspected each morning by the designated monitor to ensure that Alameda whipsnakes are not present. At sites in high potential areas the monitor shall remain on-site during construction hours. At sites in moderate potential areas the monitor shall remain on-call during construction hours in the event that a snake is found on-site. The designated monitor shall have the authority to halt construction activities in the event that a whipsnake is found within the construction footprint until such time as threatening activities can be eliminated in the vicinity of the snake and it can be removed from the site by a biologist permitted to handle Alameda whipsnakes. The USFWS shall be notified within 24 hours of any such event.

- (SPF BIO-5d) Alameda whipsnake awareness and relevant environmental sensitivity training for each worker shall be conducted by the designated monitor prior to commencement of on-site activities. All on-site workers at applicable construction sites shall attend an Alameda whipsnake information session conducted by the designated monitor prior to beginning work. This session shall cover identification of the species and procedures to be followed if an individual is found onsite, as well as basic site rules meant to protect biological resources, such as speed limits and daily trash pickup.

- (SPF BIO-5e) Hours of operation and speed limits shall be instituted and posted.

  All construction activities that take place on the ground (as opposed to within buildings) at applicable construction sites shall be performed during daylight hours, or with suitable lighting so that snakes can be seen. Vehicle speed on the construction site shall not exceed 5 miles per hour.

- (SPF BIO-5f) Site vegetation management shall take place prior to tree removal, grading, excavation, or other construction activities. Construction materials, soil, construction debris, or other material shall be deposited only on areas where vegetation has been mowed.

Areas where development is proposed under the LBNL 2006 LRDP are subject to annual vegetation management involving the close-cropping of all grasses and ground covers; this management activity would be performed prior to initiating project-specific construction. Areas would be re-mowed if grass or other vegetation on the project site becomes high enough to conceal whipsnakes during the construction period. In areas not subject to annual vegetation management, dense vegetation would be removed prior to the onset of grading or the use of any heavy machinery, using goats, manual brush cutters, or a combination thereof.

D. CULTURAL RESOURCES

♦ (SPF CUL-3) If an archaeological artifact is discovered on-site during construction under the proposed LRDP, all activities within a 50-foot radius shall be halted and a qualified archaeologist shall be summoned within 24 hours to inspect the site. If the find is determined to be significant and to merit formal recording or data collection, adequate time and funding shall be devoted to salvage the material. Any archaeologically important data recovered during monitoring shall be cleaned, catalogued, and analyzed, with the results presented in a report of finding that meets professional standards.

♦ (SPF CUL-4) In the event that human skeletal remains are uncovered during construction or ground-breaking activities resulting from implementation of the LBNL 2006 LRDP at the LBNL site, CEQA Guidelines Section 15064.5(e)(1) shall be followed:

- In the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery, the following steps should be taken:

(1) There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

  (A) The coroner of the county in which the remains are discovered must be contacted to determine that no investigation of the cause of death is required, and

  (B) If the coroner determines the remains to be Native American: (1) The coroner shall contact the Native American Heritage Commission within 24 hours. (2) The Native American Heritage Commission shall identify the person or persons it believes to be the most likely descended from the deceased Native American. (3) The most likely descendent may make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98, or

(2) Where the following conditions occur, the landowner or his authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance.

  (A) The Native American Heritage Commission is unable to identify a most likely descendent or the most likely descendent failed to make a recommendation within 24 hours after being notified by the commission;

  (B) The descendant identified fails to make a recommendation; or

  (C) The landowner or his authorized representative rejects the recommendation of the descendant, and the mediation by the Native American Heritage Commission fails to provide measures acceptable to the landowner.

E. GEOLOGY AND SOILS

- (SPF GEO-1) Seismic emergency response and evacuation plans shall be prepared for each new project at LBNL that is developed pursuant to the 2006 LRDP. These plans shall incorporate potential inaccessibility of the Blackberry Canyon entrance and identify alternative ingress and egress routes for emergency vehicles and facility employees in the event of roadway failure from surface fault rupture.

- (SPF GEO-2) A site-specific, design-level geotechnical investigation shall occur during the design phase of each LBNL building project, and prior to approval of new building construction within the LBNL hill site. This investigation shall be conducted by a licensed geotechnical engineer and include a seismic evaluation of potential maximum ground motion at the site. Geotechnical investigations for sites within either a Seismic Hazard Zone for landslides or an area of historic landslide activity at LBNL, as depicted on EIR Figures IV.E-2 and IV.E-3, or newly recognized areas of slope instability at the inception of project planning, shall incorporate a landslide analysis in accordance with CGS Publication 117. Geotechnical recommendations shall subsequently be incorporated into building design.

- (SPF GEO-3a) Construction under the LRDP shall be required to use construction best management practices and standards to control and reduce erosion. These measures could include, but are not limited to, restricting grading to the dry season, protecting all finished graded slopes from erosion using such techniques as erosion control matting and hydroseeding, or other suitable measures.

- (SPF GEO-3b) Revegetation of areas disturbed by construction activities, including slope stabilization sites, using native shrubs, trees, and grasses, shall be included as part of all new projects.

F. GHG EMISSIONS

The LBNL 2006 LRDP EIR has no mitigation measures related to greenhouse gases.

G. HAZARDS

- (SPF HAZ-3a) LBNL shall continue to prepare an annual self-assessment summary report and a Site Environmental Report that summarize environment, health, and safety program performance and identify any areas where LBNL is not in compliance with environmental laws and regulations governing hazardous materials, and worker safety, emergency response, and environmental protection.

  An EH&S assessment of LBNL activities is performed annually, and these results are reported annually in the LBNL Self-Assessment Report.

  In addition, LBNL prepares an annual Site Environmental Report that describes the environmental activities noted above. Implementation of this measure would ensure that the information in the LBNL Self-Assessment and Site Environmental Reports continues to be collected, reviewed, and provided.

- (SPF HAZ-3b) Prior to shipping hazardous materials to a hazardous waste treatment, storage, or disposal facility, LBNL shall confirm that the facility is licensed to receive the type of waste LBNL is proposing to ship.

  LBNL is required by DOE Order 435.1 to verify that the receiving facility has all appropriate licenses and that the waste meets all waste acceptance criteria of the receiving facility.

- (SPF HAZ-3c) LBNL shall require hazardous waste haulers to provide evidence that they are appropriately licensed to transport the type of wastes being shipped from LBNL.

  Shipping procedures at LBNL require all transporters of hazardous, radioactive, and mixed waste to provide evidence that they are appropriately licensed.

- (SPF HAZ-3d) LBNL shall continue its waste minimization programs and strive to identify new and innovative methods to minimize hazardous waste generated by LBNL activities.

  Each LBNL Division is required to identify and implement new waste minimization activities each year. The waste minimization program at LBNL reduced hazardous waste by 72% during the period 1993-2004.

- (SPF HAZ-3e) In addition to implementing the numerous employee communication and training requirements included in regulatory programs, LBNL shall undertake the following additional measures as ongoing reminders to workers of health and safety requirements:
  - Continue to post phone numbers of LBNL EH&S subject matter experts on the EH&S website.

- Continue to post Emergency Response and Evacuation Plans in all LBNL buildings.
- Continue to post sinks, in areas where hazardous materials are handled, with signs reminding users that hazardous materials and wastes cannot be poured down the drain.
- Continue to post dumpsters and central trash collection areas where hazardous materials are handled with signs reminding users that hazardous wastes cannot be disposed of as trash.

♦ (SPF HAZ-3f) LBNL shall update its emergency preparedness and response program on an annual basis and shall provide copies of this program to local emergency response agencies and to members of the public upon request.

H. HYDROLOGY

There were no mitigation measures recommended by the LBNL 2006 LRDP EIR.

I. LAND USE

The LBNL 2006 LRDP EIR has no mitigation measures for land use.

J. NOISE

♦ (SPF NOISE-1a) To reduce daytime noise impacts due to construction/demolition, LBNL shall require construction/demolition contractors to implement noise reduction measures appropriate for the project being undertaken. Measures that might be implemented could include, but not be limited to, the following:

- Construction/demolition activities would be limited to a schedule that minimizes disruption to uses surrounding the project site as much as possible. Such activities would be limited to the hours designated in the Berkeley and/or Oakland noise ordinance(s), as applicable to the location of the project. This would eliminate or substantially reduce noise impacts during the more noise-sensitive nighttime hours and on days when construction noise might be more disturbing.
- To the maximum extent feasible, equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g. improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible). Stationary noise sources shall be located as far from adjacent receptors as possible.
- At locations where noise may affect neighboring residential uses, LBNL would develop a comprehensive construction noise control specification to implement construction/demolition noise controls, such as noise attenuation barriers, siting of construction laydown and vehicle staging areas, and community outreach, as appropriate to specific projects. The specification would include such information as general provisions, definitions, submittal requirements, construction limitations, requirements for noise and vibration monitoring and control plans, noise control materials and methods. This document will be modified as appropriate for a particular construction project and included within the construction specification.

♦ (SPF NOISE-1b) LBNL shall engage a qualified noise consultant to determine whether, based on the location of the site and the activities proposed, construction/demolition noise levels could approach the property line receiving noise standards of the cities of Berkeley or Oakland (as applicable). If the consultant determines that the standards would not be exceeded, no further mitigation is required. If the standards would be reached or exceeded absent further mitigation, one or more of the following additional measures would be required, as determined necessary by the noise consultant:

- Stationary noise sources shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.
- Impact tools (e.g. jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.
- Noise from idling trucks shall be kept to a minimum. No trucks shall be permitted to idle for more than 10 minutes if waiting within 100 feet of a residential area.
- If determined necessary by the noise consultant, a set of site specific noise attenuation measures shall be developed before construction begins; possible measures might include erection of temporary noise barriers around the construction site, use of noise control blankets on structures being erected to reduce noise emission from the site, evaluation of the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings, and monitoring the effectiveness of noise attenuation measures by taking noise measurements.

- If determined necessary by the noise consultant, at least two weeks prior to the start of excavation, LBNL or its contractor shall provide written notification to all neighbors within 500 feet of the construction site. The notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of party responsible for construction). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. The name and phone number of the contact person also shall be posted outside the LBNL boundaries.

♦ (SPF NOISE-4) Mechanical equipment shall be selected and building designs prepared pursuant to the 2006 LRDP so that noise levels would not exceed the Noise Ordinance limits of the cities of Berkeley or Oakland for commercial areas or residential zones as measured on any commercial or residential property in the area surrounding the project. Controls that would typically be incorporated to attain adequate noise reduction would include selection of quiet equipment, sound attenuators on fans, sound attenuator packages for cooling towers and emergency generators, acoustical screen walls, and equipment enclosures.

K. PUBLIC SERVICES

The LBNL 2006 LRDP EIR has no mitigation measures related to public services.

L. TRANSPORTATION AND TRAFFIC

♦ (SPF TRANS-1d) LBNL shall develop and implement a new Transportation Demand Management (TDM) Program to replace its existing TDM program. This enhanced TDM Program has been drafted in consultation with the City of Berkeley, and is proposed to be adopted by LBNL following The Regents' consideration of the 2006 LRDP.[2]

- (SPF TRANS-3) LBNL shall develop and maintain a transportation plan designed to ensure that the current balance of transportation modes is maintained. This plan shall include 1) maintaining the same (or lesser) ratio of parking permits and parking spaces to average daily population (ADP), and 2) ensuring that levels of shuttle bus service and provision of bike racks on shuttle buses are sufficient to accommodate projected demand.

M. UTILITIES AND SERVICE SYSTEMS

- (SPF UTILS-2) LBNL shall implement programs to ensure that additional wastewater flows from the Lab are directed into unconstrained sub-basins, as necessary and appropriate. Final design and implementation of these improvements shall be negotiated between the appropriate parties and shall undergo appropriate environmental review and approval. LBNL shall closely coordinate the planning, approval, and implementation of this mitigation with the City of Berkeley and the UC Berkeley, as appropriate.

- (SPF UTILS-4) LBNL shall develop a plan for maximizing diversion of construction and demolition materials associated with the construction of the proposed project from landfill disposal.

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[2] The LRDP has been officially adopted by the UC-Regents, but the original language was maintained for accuracy.

APPENDIX B

DETERMINATION REGARDING ELIGIBILITY FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES

The following letters, cited in Chapter 4 of the Final EA, are included here in support of the determination that the structures that would be demolished under the Proposed Action are not eligible for inclusion on the National Register of Historic Places:

- Stephen D. Mikesell, Acting State Historic Preservation Officer. *Letter Re: Identification and Evaluation of Old Town Buildings, Ernest Orlando Lawrence Berkeley National Laboratory*, Berkeley, Alameda County. April 27, 2004.
- Abbott, Kim, Environmental Programs Manager, DOE Berkeley Site Office. Determination of Ineligibility for Building 55 and Building 71 in the National Register of Historic Places. December 11, 2009.

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, *Governor*

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
P.O. BOX 942896
SACRAMENTO, CA 94296-0001
(916) 653-6624 Fax: (916) 653-9824
calshpo@ohp.parks.ca.gov
www.ohp.parks.ca.gov

April 27, 2004

REPLY TO: DOE040301A

Janet M. Neville, Historic Preservation Officer
Department of Energy
National Nuclear Security Administration Service Center
1301 Clay Street, Suite N-700
OAKLAND CA 94612

Re: Identification and Evaluation of Old Town Buildings, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, Alameda County.

Dear Ms. Neville:

Thank you for submitting to our office your February 26, 2004 letter and Identification and Evaluation (IE) report regarding the Old Town Buildings on the Ernest Orlando Lawrence Berkeley National Laboratory (LBNL) in Berkeley, Alameda County. The enclosed report consists of an inventory and evaluation of fifteen (15) buildings located with the area of LBNL known as "Old Town". The report is the first in a series of reports being prepared to provide LBNL with information to support the Department of Energy's (DOE) compliance efforts under Section 110 of the National Historic Preservation Act. The 15 buildings discussed in the report are Buildings 4, 5, 14, 16, 17, 25/25A, 27, 40, 41, 44, 44A, 44B, 52, 52A, and 53. The structures were among the first built at the LBNL and were, for the most part, built to support the important scientific work undertaken at Lawrence's 184-inch cyclotron during and after World War II.

DOE is seeking my comments on its determination of the eligibility of the aforementioned structures for inclusion on the National Register of Historic Places (NRHP) in accordance with 36 CFR 800, regulations implementing Section 106 of the National Historic Preservation Act. A review of the submitted IE report leads me to concur with DOE's determination that none of the aforementioned structures is eligible, either individually or collectively, for inclusion on the NRHP under any of the criteria established by 36 CFR 60.4. The buildings (with the exception of 44A, 44B, and 52A) have associations with World War II-era and early Cold War-era research and development activities involving nuclear chemistry, particle acceleration, and isotope production, but lack integrity of those features that would represent the activities associated with their historic period of significance (1943 -1956). Most or all of the equipment associated with the experiments that took place during this period has long since been removed from the buildings and many of the historic functions the structures have served have been eliminated, changed, or moved to other structures on LBNL or the Lawrence Livermore National Laboratory.

Thank you again for seeking my comments. If you have any questions, please contact staff historian Clarence Caesar by phone at (916) 653-8902, or by e-mail at ccaes@ohp.parks.ca.gov.

Sincerely,

Stephen D. Mikesell
Acting State Historic Preservation Officer

Lawrence Berkeley National Laboratory
Seismic Life-Safety Phase 2 Project
Project Summary

PROPOSED ACTION:

This undertaking would include decontamination, demolition, and disposal of several seismically unfit buildings at Lawrence Berkeley National Laboratory (LBNL) under the proposed "Seismic Life-Safety Phase 2" project. Included among these buildings are: Building 55 and Buildings 71C, 71F, 71J, 71K, and 71P. Other buildings to be demolished under this proposed project are not the subject of this summary, as they have been fully analyzed for historical significance in previous investigations.

LOCATION OF ACTION:

Building 55 is located in the northwestern area of the Lab ("Bayview Cluster"), flanked by the Building 90 complex and Buildings 55A, 56, 60, 63, and 64.

The Building 71 Complex Trailers (Buildings 71C, 71F, 71J, 71K, and 71P) are located in the northern area of the Lab ("North Side Cluster"). They are situated between Building 71 to the north and Building 46 to the south.

Both locations are within the Lab's heavily developed "Research and Academic" zone as identified in the LBNL 2006 Long Range Development Plan.

DISCUSSION:

The DOE Berkeley Site Office (BSO) has determined that the subject buildings are not eligible for inclusion in the National Register of Historic Places based on application of the Criteria for Evaluation identified in the National Historic Preservation Act (NHPA). These Criteria help to establish whether a particular resource is associated with an important historic context and/or whether it retains historic integrity of those physical features necessary to convey its significance. The Criteria are as follows:

> A facility under consideration must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
>
> A) be associated with events significant to broad patterns of our history; or
> B) be associated with the lives of people significant to our past; or
> C) embody distinctive physical characteristics associated with history or architecture; or
> D) yield (or be likely to yield) information important to history or pre-history.

Building 55 was constructed and continually modified in phases starting in 1950 and ending in the mid 1980s. The original building was unremarkable from an architectural standpoint, and it does not retain architectural integrity of its earlier design due to continual modifications over the decades. It has been predominantly used by the Life Sciences Division, and it is not directly associated with significant scientists or scientific discoveries. Accordingly, it does not meet Criteria A, B, C, or D.

The Building 71 trailers are temporary, portable trailer buildings that were emplaced to provide ancillary office and administrative space for the Accelerator & Fusion Research Division (AFRD). They housed mainly support personnel and are all less than 50 years old. Accordingly, they do not meet Criteria A, B, C, or D.

DETERMINATION:

The DOE Berkeley Site Office (BSO) has determined that the subject buildings that comprise this proposed undertaking are not eligible for inclusion in the National Register of Historic Places. Further, and in accordance with 36 CFR Part 800.3(a)(1), BSO determines that the proposed undertaking does not have the potential to cause effects on historic properties; therefore, the DOE has no further obligations under section 106 or 36 CFR Part 800.3.

K. Abbott 12/11/09
BSO
Environmental
Programs Manager

DOE/EA - #1634

FINAL ENVIRONMENTAL ASSESSMENT FOR

THE LAWRENCE BERKELEY NATIONAL LABORATORY SEISMIC LIFE-SAFETY, MODERNIZATION AND REPLACEMENT OF GENERAL PURPOSE BUILDINGS, PHASE 2B

U.S. DEPARTMENT OF ENERGY

Volume 2

August 2010

DOE/EA - #1634

FINAL ENVIRONMENTAL ASSESSMENT FOR

THE LAWRENCE BERKELEY NATIONAL LABORATORY SEISMIC LIFE-SAFETY, MODERNIZATION AND REPLACEMENT OF GENERAL PURPOSE BUILDINGS, PHASE 2B

U.S. DEPARTMENT OF ENERGY

Volume 2

August 2010

Appendix C
Public and Agency Comments on the Draft EA

APPENDIX C

PUBLIC AND AGENCY COMMENTS ON THE DRAFT EA

This Appendix includes a list of agencies, persons, and organizations commenting in writing and a reproduction of each comment letter received during the 30-day public review period. Letters are reproduced in the order shown on the list of commentors below:

A. List of Persons and Organizations Commenting in Writing

- George Leitmann, July 19, 2010.
- Terri Compost, July 19, 2010.
- William Kirkpatrick, Manager of Water Distribution Planning Division, East Bay Municipal Utilities District, July 19, 2010.
- Wanda C. Bronson, July 20, 2010.
- Emilie Strauss, July 24, 2010.
- Georgia Wright, July 26, 2010.
- Laurie Sarachan, July 25, 2010.
- Carole Schemmerling, July 27, 2010.
- Jennifer Mary Pearson, July 28, 2010.
- Stephanie Thomas, July 28, 2010.
- Charlene M. Woodcock, July 28, 2010.
- Mary Lee Noonan, July 29, 2010.
- Gale Garcia, July 28, 2010.
- Gene Bernardi, July 14, 2010.
- Barbara Robben, undated.
- Georgia Wright, Save Strawberry Canyon, July 27, 2010.
- Pamela Sihvola, Committee to Minimize Toxic Waste, July 26, 2010.

LETTER #GL

-----Original Message-----
> From: gleit@berkeley.edu [mailto:gleit@berkeley.edu]
> Sent: Monday, July 19, 2010 10:52 AM
> To: Abbott, Kim
> Subject: General Purpose Bldgs. Phase 2B
>
>
> Dear Mr. Kim,
> I write to you, after reading the proposal "Seismic Life-Safety,
> Modernization and Replacement of General Purpose Buildings, Pase 2B",
> to urge EPA to undertake an EIS rather just an EA. The proposal
raises
> serious concerns, in the events of earthquake and fire, and these
need
> serious consideration.
>
> George Leitmann
> Professor in the Graduate School
> College of Engineering
> Universty of California, Berkeley
>

GL-1

LETTER #TC

From: t compost [mailto:terricompost@yahoo.com]
Sent: Monday, July 19, 2010 11:15 AM
To: Abbott, Kim
Subject: Concerns about labs in Strawberry Canyon!

Mr. Kim Abbott, DOE Office of Science
NEPA Document Manager, LBNL
One Cyclotron Road
Berkeley, California 94720

Dear Mr. Kim Abbott,

I am very concerned about the future building plans and safety of current and future projects in the environmentally sensitive Strawberry Canyon. It seems essential that at the least, the DOE does a full Environmental Impact Study (EIS), not an Environmental Assessment (EA). TC-1

Frankly I find it disturbing that hazards such as radioactive and other hazardous wastes, are being created and stored on land that is highly vulnerable to landslides, fires and earthquakes. TC-2 I am deeply disappointed that the canyon has already been contaminated with tritium and toxic underground plumes, TC-3 (not to mention extensive invasion of the experimental erharta grass) a sign of the inability or lack of concern that prevents these labs from operating safely. TC-4

Planning these labs in a precious ecosystem in the watershed above Berkeley and the San Francisco Bay is pure folly. Please don't allow these irreparable mistakes continue. TC-5

Sincerely,
Terri Compost

LETTER #EBMUD

EAST BAY
MUNICIPAL UTILITY DISTRICT

REC'D JUL 20 2010

July 19, 2010

Kim Abbott, NEPA Document Manager
Department of Energy, Berkeley Site Office
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 90-1023
Berkeley, CA 94720

Re: Notice of Availability – Draft Environmental Assessment for the Lawrence Berkeley National Laboratory Seismic, Life Safety, Modernization and Replacement of General Purpose Buildings, Phase 2B Project, Oakland/Berkeley Hills

Dear Mr. Abbott:

East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Draft Environmental Assessment (EA) for the Lawrence Berkeley National Laboratory Seismic, Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2B Project. EBMUD provided written comments on the Draft Environmental Impact Report (EIR) to the Lawrence Berkeley National Laboratory in March 2010 which were subsequently incorporated into the Final EIR issued in June 2010. EBMUD has no additional comments on the Federal EA for this project.

If you have any questions concerning this response, please contact David J. Rehnstrom, Senior Civil Engineer, at (510) 287-1365.

EBMUD-1

Sincerely,

W.R. Kirkpatrick

William R. Kirkpatrick
Manager of Water Distribution Planning Division

WRK:AMW:djr
sb10_150.doc

cc: Jeff Philliber, Environmental Planner
Lawrence Berkeley National Laboratory
Environmental Planning Group
One Cyclotron Road, MS 76-234A
Berkeley, CA 94720

LETTER #WB

-----Original Message-----
From: Gordon/Wanda Bronson [mailto:gwbronson@comcast.net]
Sent: Tuesday, July 20, 2010 4:20 PM
To: kim.abbott@bso.science.doe.gov
Subject: Proposed developments in Strawberry Canyon

Dear Sir;

I strongly urge you have a full EIS performed on the site of the building being proposed to be erected in Strawberry Canyon. A number of potential environmental hazards have been identified by citizen groups such as the Save Strawberry Canyon organization; being a long- lived member of the neighborhood I share their concerns and believe we have the right to ask for proper and fact-based reassurance. WB-1

Sincerely,

Wanda C. Bronson
3456 Dwight Way
Berkeley, CA 94704

LETTER #ES

ES-1

JULY 24, 2010

RE: SEISMIC LIFE SAFETY,
MOD, REPLACEMENT OF
GENERAL PURPOSE BLDGS, PH 2B

DEAR MR. ABBOTT –

AS A LONG-TIME BERKELEY RESIDENT AND USER OF STRAWBERRY CANYON, I AM CONCERNED ABOUT PROPOSED CONSTRUCTION OF A GENERAL PURPOSE LAB IN BLACKBERRY CANYON AND A RETROFIT OF BUILDINGS 85/85A.

ES-2

THERE ARE A NUMBER OF POTENTIALLY SIGNIFICANT IMPACTS THAT TRIGGERS PREPARATION OF AN EIS.

- ADDITIONAL ANALYSIS NEEDED TO DETERMINE IF BLACKBERRY CANYON ~~HE~~ IS ESPECIALLY PRONE TO SOIL MOVEMENT DURING EARTHQUAKES

ES-3

- CONTAMINANTS MAY BE RELEASED BY GRADING THAT COULD DAMAGE THE WATERSHED/ENTER STRAWBERRY CREEK.

ES-4

- PROPOSED PIER DESIGN WILL NOT PREVENT ~~TH~~ OR PROTECT THE (85/85A) STRUCTURES FROM SLIDES GENERATED BY MUDSTONE.

ES-5

- WILDFIRES COULD RELEASE MANY TOXIC COMPOUNDS INTO THE AIR. IF THE FIRE WAS DRIVEN BY ~~A [illegible]~~ EAST WINDS (AS WAS TRUE IN THE OAKLAND FIRE) IT WOULD AFFECT WHERE I RESIDE ON HEARST AVE.

• ALL ACTIVITIES OCCUR IN OR NEAR HABITAT FOR THE FEDERALLY-THREATENED ALAMEDA WHIPSNAKE. ②

ES-6

IN SUMMARY, DUE TO A NUMBER OF SIGNIFICANT POTENTIAL IMPACTS, THE ENVIRONMENTAL ANALYSIS FOR THESE TWO PROJECTS NECESSITATES PREPARATION OF AN EIS, NOT EA, AS MANDATED BY NEPA.

THANK YOU FOR CONSIDERATION OF MY COMMENTS.

SINCERELY,

Emilie Strauss

EMILIE STRAUSS
1606 HEARST AVE
BERKELEY, CA 94703

ES-7

LETTER #GW

105 Vicente Rd.
Berkeley, CA 94705
July 26, 2010

To Kim Abbott
NEPA Document Manager
US DOE
One Cyclotron Road
Berkeley, CA 94720

Re: EA for NEPA, General Purpose Lab, 85 and 85A strengthening

Alan Kropp and Associates (AKA) reports for Building 25 or the General Purpose Laboratory, cited in the Final EIR on disc and on the web, were only added to the web after their absence was reported to LBNL. As they were used in the " matrix" of the FEIR to contest points made by several individuals, they would appear to be important. **GW-1**

AKA, May 29, 2009, a preliminary report, made in two weeks "to meet LBNL's objectives," lays out the problems and what additional work will be necessary to help solve them.

1) AKA's preliminary investigation of old boring logs are consistent with the presence of a paleolandslide under B25.

2) Orinda Formation under the Lawrence Road (south and downhill from 25), is potentially part of a palealandslide rather than in-place bedrock.

3) Offsets in the curbs are not sufficient to evaluate historic slides. [Evidently AKA was not given access to the files on historic landslides.]

4) The borings suggest very low factors of safety, although these may be based upon conservative measures.

5) **Additional trenching is needed** (to establish whether the paleolandslide has moved recently.)

AKA, April 2, 2010.
Trenches 1 and 2 are mentioned but only T-1 (southwest of 25, 8' deep) appears on the map. There are no photos of the trench nor is it discussed. The "general sketch" at the end of the report is indeed too general. Were there slickensides, indicative of movement? **GW-2**

Historical borings around B25 indicate Moraga volcanics which "break into rubble during drilling." Gravity has moved colluvium downslope. Moraga Formation is highly permeable (although is it called "bedrock," which in common or dictionary definition means hard rock. Neither Moraga Formation nor Orinda Formation fit that definition. **GW-3**

AKA, May 29, 2010 , supplemental report

Boring log #1 (north of 25) has 8' of fill. Clay to 11.5', and silty clay below that. **GW-4**

Boring 2 (south of 25) Moraga volcanics with weak rhyolite, then andesite down to 90' where Orinda claystone and siltstone are found. (Muds and mudstones give rise to manyu problems in civil engineering because they are weak and shrink or swell on being dried or wetted." Mudstones are siltstone, mud-shale, or claystone. "Muds are very reactive to physical disturbances or differential loading, and they slump and flow easily when subjected to stress." (*Oxford Companion to the Earth*, 2000, p. 715) A three-story General Purpose Laboratory would indeed exert differential loaking and stress. **GW-4 cont.**

Boring 3 (south of 2) Orinda Formation
Boring 5 & 6 "southern side of proposed central plant site" (not on map):
Atterberg Limits;
Boring 5, (4-4.5' deep)Plasticity Index 56,;
Boring 6,(6 – 6/5' deep), Plasticity Index 46.
"Onsite soils having a PI of 15 or less are generally considered to have a sufficiently low expansion potential to be used as non-expansive fill." 5 and 6 are marked "Fat Clay" and not to be used for fill. AKA says these must be removed. **GW-5**

In effect after all these reports AKA has not come to a comclusion that the Moraga volcanics are a paleolandslide or in-place "bedrock". AKA did not examine the trench for slickensides, nor did it dig a second trench. Moving or not, should you build on "weak volcanics that break into rubble during drilling"? Will spread footings do the trick when the earthquake strikes? What about the contact with Orinda mudstones? **GW-6 GW-7 GW-8 GW-9 GW-10**

Both **Buildings 85 and 85A** are shown in the FEIR for CEQA to straddle two paleolandslides, characterized in several earlier consulting reports as potentially liable to move in a major seismic event and at different rates. Slickensides were prevalent throughout the area. In earlier reports 60% of the HWHF buildings (the southwestern parts) overlie the Orinda Formation clays. In the EA, however, AKA's plans show only QLS2 (or QLS4 on the colored map) crossing all but a small part of 85 and no characterization of the leftover area. AKA had declared in an earlier report that 10 feet of Moraga Formation lies under the northeast corner of the buildings, and below that 25 feet of Orinda Formation. What is under this area? **GW-11**

AKA proposes drilling 21 piers around two sides of B85 and 9 piers around two sides of B85A, these to be 5 feet in diameter and 40 to 50 feet deep, TO STOP THE LANDSLIDE, evidently the top one of Moraga Formation (hard but fractured volcanics.) What will stop the building from being torn apart? Has anyone ever used piers to stop a landlside? Into what will those piers be drilled that is less expansionary and stronger than mudstones? (AKA 2006, a propos the Animal Care Facility nearby, suggested a mat under the building so that it might move integrally, a proposal AKA could not make, evidently, for 85, as it would entail rebuilding.) **GW-12**

Missing from the reports are 9 boring logs, AKA 7 – 16. Where are these and their interpretations? They will be needed to determine the quality of the Moraga volcanics, the Orinda mudstones, and whatever lies beneath. **GW-13**

What does lie not far below the surface is water! In the EIR are tables recording water heights, taken from monitoring wells. The EA refers to them on p. 22. North of 85 the water measured from 16 to 12 feet below surface while south of 85 the range was from 40 to 35 feet.. Accounting for the difference in elevations the water table seems to be level there. But east of 85A at the same elevation as the well south of 85, the difference is huge—the level according to AKA ranges between 24 and 0.3 feet. This means that there is a "perched water table" or reservoir and that the other two wells may have penetrated a separate reservoir. GW-14

This is just what one expects in the caldera of the volcano upon which the Lab has constructed its buildings. When such a reservoir breaks during a seismic event (the breaks in 1973 may have been caused by a series of small events), the landslides may be devastating as they were in 1973. The unpredictable reservoirs, springs, and aquifers mean that conatminants spread all over. Monitorying wells are seldom left open for long. See the report *Contaminant Plumes of the Lawrence Berkeley National Laboratory…* (2007)http://berkeleycitizen.org/lbnl/cmtw1.html

Fire What are the plans in case of a wildlands firestorm? The East Canyon site is heavily wooded, with pines and eucalyptus, grasses and scotch broom, all flammable. The HWHF contains radioactive waste on the first floor and mixed solvents and volatile organic compounds on the second floor of 85. There are a number of storage sheds for liquid and dry combustible compounds. How are these protected from a fire like that of 1991 (2000 degrees, destroying concrete, "fireproof" safes, metals, etc.)? GW-15

During the 1991 fire, which reached the south wall of the next, Claremont canyon, Director Shank ordered all personnel to leave. Is this the plan today? How will people, air, water, and earth be protected when the fire reaches the East Canyon buildings or those generating the wastes? We are about due for another wildland fire, which come at 20 year intervals.

There is a brief paragraph dealing with fire in the EA. In essence it says "trust us!" It says LBNL has been declared a site with "not a high potential for wildland fires." But FEMA was willing to grant a huge amount of money to ridding the Canyon of trees above the site, a project now on hold. . On EA p. 141, "In 1994, UC LBNL published a Wildland Fire Evacuation/Relocation Plan. The plan, which would apply to the Proposed Action, is based on a wildland fire scenario that would require rapid mobilization of resources, quick decision making and well-coordinated execution by emergency responders during a wildland fire." The footnote sends one to a website that is no longer operating. Have the plans also been abandoned? The 1994 plan was evidently motivated by the lack of a plan GW-16
in 1991. At a "Community Advisory Group" meeting in June, someone asked about emergency plans. Evidently there were none! GW-17

There is no other building on Lab property which would fill the requirements for the HWHF, so this very dangerous site must remain exposed to fire and landslide with little GW-18

reinforcing of the building itself. The interim storage of hazardous materials is impossible because they would need more than the 90 days permitted, while the HWHF has a special dispensation, over one year, to sort them out and to find permanent disposal sitse. GW-18 cont.
Which buildings produce all of these radioactive wastes, volatile organic compounds, solvents, etc. that accummulate in 85 and the sheds? How are they protected? How does LBNL rationalize the LRDP in an area so dangerously unstable, so close to the Hayward Fault, and so close to wildlands? GW-19

The best **alternative** for the LRDP is UC's Richmond Field Station, where there is plenty of room for both buildings and parking, construction would be much cheaper on the flat land, and the site is farther from the Hayward Fault. GW-20 The only negative that LBNL is willing to mention is invalid. The hill site is NOT served by public transit but by Lab shuttle buses, just like Richmond! As bus and BART are to the present site, so BART is to Richmond with a stop one mile away. The RFS is 6 miles or 20 minutes from UC campus. GW-21
Evidently the problem lies elsewhere—"scientific adjacencies." This argument has never been explained. The scientists at LBNL, like those everywhere, find their natural colleagues all over the globe! One need only search LBNL personnel's publications! We suspect there is not all that much lab equipment sharing or conversations after work, The reasons for holding so tightly to this dangerous site appear to be that the view of the Bay plus the name "Berkeley" would attract more visiting scientists than "Richmond," although the latter has tremendous views and a sylvan setting! GW-22

We hope that the Department of Energy will be more wary of approving dangerous projects after the miserable performance of the Minerals Management Services. The least the Department can do is to perform an EIS with many more logs of trenches and borings and fewer desperate "solutions" for building over landslides!

Cordially, GW-23

Georgia Wright, Board Member
Save Strawberry Canyon

LETTER #LS

REC'D JUL 2 7 2010

1

1000 Rispin
Berkeley, California 94705

July 25, 2010

Mr. Kim Abbott, Office of Science
Department of Energy
Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley, California 94720

Re: **Environmental Impact Statement Needed** for Proposed Seismic Life-Safety, Modernization and Replacement of General Purpose Buildings, Phase 2B

Dear Mr. Abbott:

Several years ago I participated in submitting comments re: the Draft Environmental Impact Report for the LBNL Computational Research and Theory Facility building proposed to be built on the ridge above Cyclotron Road. This was before the court established that the CRT merited federal environmental review. I believe it is fortunate for everyone concerned that the CRT facility, planned to intrude upon a natural and precarious landscape, has not been built at that site. In the instance of the "Seismic Life-Safety, Modernization and Replacement of General Purpose Buildings, Phase 2B" it seems obligatory that a full EIS be prepared. LS-1

I have reviewed the EA for the Phase 2B project. I discovered immediately that the title of the project is misleading. Both "seismic" and "life-safety" appear to be misnomers for a project that cannot actually "fix" existing unfavorable conditions for large industrial type buildings on the slopes of Strawberry and Blackberry Canyons. LS-2 In addition to the existing environmental risks, this project has the potential to increase future environmental risks and to cause further degradation of significant natural resources. LS-3

First, it is incredible that there is a Hazardous Waste Handling Facility located in Strawberry Canyon. Because I live in the adjacent Claremont Canyon to the south, I know that Strawberry Canyon is an irresponsible site to place any industrial building, but especially a building that houses contaminated, toxic, and/or radioactive materials. Information regarding the operations and reason for the Hazardous Facility needs to be more complete. What exact materials and quantities are taken there? From where? From which other facility? How are the materials taken there? What is meant by "storage?" How long is each material stored there? What physical barrier is constructed in the facilities that gives the public assurance that the hazardous/radioactive waste "would not LS-4 be released to the environment?" Why is this the *best* site for handling, placement, and/or storage? Would it not be more financially prudent to take or store all waste materials in a non-seismically challenged site? If, in fact, certain waste materials are required to stay on the LBNL site for a required amount of time, then is this not one of the most compelling reasons to *move all of LBNL's research out of the Canyons*? I urge that it is essential to discuss fully in an EIS the whys and wherefores of an appropiate alternative site other than the current LBNL location. **LS-4 cont.**

The EA also ignores, by definition, a respectful discussion of the Hazardous Facility presence within a significant natural park resource. How does the Hazardous Facility affect the aesthetic and cultural value of Strawberry Canyon? Re-establishing high-tech, waste management buildings and the associated diesel truck traffic into a valued landscape corridor seems contrary to NEPA Section 101(b) which makes it the responsibility of the federal government to:

> *assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings... attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences... [and] preserve important historic, cultural, and natural aspects our national heritage...* **LS-5**

How the Hazardous Facility will further impact the irreplaceable physical assets of the Canyon and its social benefits to the adjacent university and urban community must not be overlooked. Any overriding reason to justify seismically strengthening the Hazardous Facility at this site, rather than removing it to an alternative site for the purpose of protecting a beneficial natural environment, merits comprehensive information and discussion.

Due diligence in compliance with NEPA would seem to indicate that the Hazardous Waste Handling Facility merits a stand alone EIS, independent of the other proposed actions in the Phase 2B proposal. **LS-6**

The LBNL objective to establish the General Purpose Laboratory as a modern research and office space within the Blackberry Canyon area also raises many questions that should determine an EIS is in order. The GPL design, its footprint and height, 43,000 sq. ft., with 3 stories and two exhaust stacks, is inappropriate for the hillsides of Berkeley. **LS-7** It seems obvious that LBNL's Long Range Development Plan to develop a 21st Century research "park" within what was once a clean watershed source, defined by oaks, bays and buckeyes, is short-sighted and a risk. No "seismic" bracing or concrete footing can secure such a building, as well as additional buildings, in this unstable location. The **LS-8** building design itself (might be termed in this location as "green wash") and the planting of a non-native industrial park landscape (after removing 2 coast live oak trees) with surrounding parking spaces belongs elsewhere. Please refer to NEPA Section 101 (b), as quoted above, to reassess the wisdom of building any laboratory and office facility such as the GPL in Blackberry Canyon. LS-9

The description of the GPL project and proposed alternatives raises more questions. How would private/corporate participation be defined at such a laboratory? How would the LBNL staff be linked to any private/corporate investment or research? Should there be a disclosure of private investment in regards to conflict of interest (BP comes to mind)? Is the financing of the facility only from federal sources? What federal sources? Is there a time-frame that is mandatory in relationship to the availability of federal financing? What is meant by offices? If the 3-story GPL is designed to provide 60% office use, then why is an urban setting, such as Richmond accessible to Highway 80, not more suitable? LS-10

How will the office and wet-lab research address the Congressional initiative to stimulate economic recovery? Why would not a location such as Richmond be a location that would comprehensively stimulate economic recovery, involving broad community needs, create a new center for research with a civic profile, while also being linked to a University research center? LS-11

I am concerned especially that the EA lacks detailed information regarding what will take place in the proposed wet-lab multi-program of the GPL. The EA description of the kinds of research seems to leave nothing out in the form of a general listing, but gives no specifics about potential environmental impacts of any of the kinds of research. The EA is too vague about the kinds of waste. LS-12

In particular, it is unclear how extensive the scientific research will be to create and use man-made nanoparticles. The Molecular Foundry, dedicated to state of the art nanosceince was built by LBNL and DOE without the benefit of environmental review. Now it would be irresponsible not to ask about the potential for the cumulative presence of man-made nanoparticles in the atmosphere due to LBNL activities. There is increasing concern about man-made nanoparticles in the atmosphere. This subject deserves serious detailed discussion in an EIS. What is the volume of man-made nanoparticles at LBNL? Has there been any location-site testing of man-made nanoparticles at LBNL surrounding the Molecular Foundry? Could there be a release of nanoparticles through a cooling system? The exhaust stacks? Into the water and waste system? What about potential release into the Strawberry Creek watershed and, thus, into the Bay? What about the wind patterns extending across the Bay to Marin? LS-13

I lived through the terror of the Oakland Firestorm of 1991. We had to evacuate our home and for a time we believed that Claremont Canyon had been consumed. It was only a miracle that it was not. A historic fire in 1923 beginning along the ridge of the East Bay Hills consumed all of North Berkeley, stopping just north of Blackberry Canyon. Urban wildland fires are devastating and promise to return to the Oakland-Berkeley Hills. The EA fails to reflect the reality of the dangers. How can the EA minimizes the threat of urban wildland fires? It is a stated danger for all of California. How can there be a serious discussion of the issue when Alameda County map in the EA rationalizes the non-threat of urban wildfires by portraying non-incorporated areas. What about the East Bay Park ridgelands? The Canyons? What about the urban and residential areas adjacent to the wildlands? The potential for urban-wildland fires alone is reason to move all of LBNL elsewhere. **LS-14**

Finally, if a fire occurred, possibly due to a seismic event, how would fire and life-safety be managed at LBNL? The potential for disaster is reason enough to reconsider the LBNL LRDP, in particular the Hazardous Waste Handling Facility and the General Purpose Laboratory. **LS-15**

Sincerely,

Laurie Sarachan

Laurie Sarachan

LETTER #CS

From: carole schemmerling [mailto:caroleschem@hotmail.com]
Sent: Tuesday, July 27, 2010 11:00 AM
To: kvabbott@lbl.gov; Jeff Philliber
Subject: EA phase 2

Dear Kim Abbott and Jeff;

Thanks for letting us use email to respond......it saves me going down the hill in my cranky car. CS-1

Cheers.....
Carole Schemmerling

The New Busy think 9 to 5 is a cute idea. Combine multiple calendars with Hotmail. Get busy.

STRAWBERRY CREEK WATERSHED COUNCIL

The Strawberry Creek Watershed Council wishes to comment on the EA for the Seismic Safety projects Phase 2B. We approve the plans for the removal of buildings 25/25B, 55 and the trailers at building 71. This plan is welcome, up to a point.....but there are serious issues being overlooked. **CS-1 cont.**

The plans to "strengthen" building 85/85A are so ill-conceived that it is hard to believe that this is a serious proposal.You claim that your upgrades "would prevent movement of the underlying slide in an earthquake" is a **CS-2** perfect example of Wishful Thinking! Therefore we insist that a separate EIS be done for this facility. **CS-3** Buildings 85/85A are on an old landslide, there is No bedrock and it has so much water below, that this project stands alone as one that should be removed all together ASAP. **CS-4**

Your plans for the 25/25B site, are also of great concern. According to the "Bedrock" geological map of LBNL which you sent to us, has No indication of where this Bedrock might be, shows that the 25/25B site is an area of landslide deposits. **CS-5** And that this is an area that is an active ground water remediation site. Where is the logic in paving over a site when you don't know how much contamination is there? How do you prevent detected contamination **CS-6** from migrating through the ground water? Have you ever accomplished that at LBNL? You certainly have not done so with the tritium plume. **CS-6 cont.** **CS-7**

To construct the GPL on the 25/25B site is another very bad idea. All of the issues mentioned above are rational obstructions to the development of this site. There are other sites than LBNL available for new construction. It is totally irrational to construct any new buildings on a hill that is contaminated with huge amounts of toxins, on the Hayward Fault, on the headwaters of 12 tributaries of Strawberry Creek, in the fire zone and believe it or not, the northern end of the Sibley Volcanic Caldera Complex. Maybe LBNL thinks there is no limit to the funds available for this very costly project, but if public funds are going to be used, we
believe it that it is incumbent on the lab to construct on a site that is cost effective! **CS-8**

The nearly 20 million gallon a year Gorilla missing from the plans is the WATER. Without acknowledging the huge amount of water that is there, the Lab will never understand how irrational their plans are. If their magical thinking allows them to continue to ignore the natural hazards of the site, as well as those they have placed there, then just as has happened in the Gulf, we will all pay dearly. **CS-9**

Carole Schemmerling
861 Regal Rd.
Berkeley, CA 94708

510.524-4005

CS-9
cont.

S

LETTER #JMP

-----Original Message-----
From: Jennifer Pearson [mailto:jennifer.maryphd@gmail.com]
Sent: Wednesday, July 28, 2010 4:50 PM
To: Abbott, Kim
Cc: jennifer mary
Subject: COMMENTS RE: THE LAWRENCE BERKELEY NATIONAL LABORATORY SEISMIC LIFE-SAFETY, MODERNIZATION AND REPLACEMENT OF GENERAL PURPOSE BUILDINGS, PHASE 2B

July 28, 2010

Mr. Kim Abbott
NEPA Document Manager
Department of Energy, Berkeley Site Office One Cyclotron Road, MS 90-1023 Berkeley, CA 94720

JMP-1

COMMENTS RE: THE LAWRENCE BERKELEY NATIONAL LABORATORY SEISMIC LIFE-SAFETY, MODERNIZATION AND REPLACEMENT OF GENERAL PURPOSE BUILDINGS, PHASE 2B

While the Seismic Life Safety Modernisation and Replacement of General Purpose Buildings Phase 2B lumps together disparate projects, all involve disturbing once again the hilly terrain at LBNL, and a brings to the fore a host of interconnected leftover situations. Thus, this commentary is underlain with concern for our scarce public water asset value, our most precious resource that is stored beneath the LBNL and East Bay Regional Parks--at times referred to as the pure geologic water of the Lennert Aquifer, discovered over 30 years.

JMP-2

I SUSTAINABLE DEVELOPMENT at LBNL-- HYDROGRAPH - WATER ASSETS

The Brundtland Commission Report of 1987 stated we must " meet the needs of the present without compromising the ability of future generations to meet their own needs".

Simply stated, rather than building by building demolition and construction at LBNL, the entire hydrograph of LBNL campus and beyond requires a full study. With respect to embracing the principles of sustainable development aren't we compelled to preserve our scarce public trust water for future generations?

Thus, a full Environmental Analysis is called for; the alternative site of Richmond Field Station may be far more sustainable, more secure and have less impacts on sustainable water assets, not threatening downstream, downhill residents as it fronts on marshlands.

One can argue that this planned construction can hinder progress toward sustainable development. The narrative justifies that safety of human life from seismic threats can be met by developing a General Purpose Lab, retrofitting the Waste Facility and building out 10 more facilities for a complex research campus on the Hill. The GPL building and the concepts of the research projects that it will house may narrowly work towards meeting the needs of the present goal of sustainability--a safer work environment and good research on sustainable energy innovations. However the siting of this building perched on hilly terrain up hill and upstream from where we live and work does not address the needs of the future for the larger community who share the hydrograph beneath us--in short our future drinking water resources asset will be threatened.

Again, those of us who live and work close-by in the same bioregion as LBNL share the local hydrograph--in the global hydrological cycle that is a significant and inseparable component of the water cycle, of the climate, of the basis of life forms. In short the local water footprint is significant for the needs of the present and for our future. Water that sheds from rainfall permeating the ground along with seeps of upsurges of geologic water abound in the Berkeley Oakland Hills --some flows downhill 900 feet to the SF Bay in open creeks following the basins carved by seismic and water movement; most flows beneath the ground (groundwater in hidden creeks) and permeates into perched water retained below us in the water table, in larger bodies of water as aquifers, which will soon be explored for our drinking water recharge opportunities, These future water sources for human sustainability--for our children and grandchildren deserve fierce consideration. We are facing water scarcity now.

JMP-2 cont.

Although the present Phase 2B Project has stimulated some progress in selected borings for geologic engineering or goeengineering design, it has not met the goal of the Bruntland Commission.

JMP-3

II THE DEPARTMENT OF ENERGY THEMES; and LBNL LEADERSHIP VALUES

On current DOE web-pages, the post Cold-War mission of the Department of Energy for Federal Scientific Laboratories sets forth three themes: the stockpiling of weapons of mass destruction; environmental cleanup; and, technical development and research.

In late 2009, after 20 years at the Lab, Dr. A. Paul Alivisatos took over steering a new course as Director of the Berkeley Lab. The new imagery of the lab describes research across a wide range of scientific disciplines with a strong commitment to sustainable energy innovations and cites:

BERKELEY LAB VALUES are:

Overarching commitment to pioneering science

Highest integrity/impeccable ethics

Uncompromising safety

Diversity in people and thought

Sense of urgency

It is most significant that in 2010 the Director has elevated the Lab's community outreach efforts, hiring staff who listen and inviting community partners to meet with himself and the major decision makers in a friendly Community Advisory Group.

Given the above, we encourage the Director to put out a call in confidence to past employees and long time community members to work up an All Hazards Vulnerability List for the goal of uncompromising safety. Such could enable his management to address the 'dark secrets'

JMP-4

that remain underground from past years of classified research using radionucleides, volatile organic chemicals, biological organisms and much that we do not yet know about that were 'stealthily buried' in the softer soils. **JMP-4 cont.**

Further reading on DOE pages, states that there are scattered patches of radionucleides or toxic chemicals embedded in the land and buildings on national laboratory sites that can serve as TESTBEDS for pioneering cleanup techniques.

III LBNL HAS TESTBEDS: The challenge of pioneering environmental waste cleanup technologies for identified underground contaminant plumes:

JMP-5a

The LBNL was once listed to be designated as a Superfund Site to receive funding for environmental cleanup under CERCLA (Comprehensive Environmental Response and Liability Act (1980). Unfortunately, LBNL was de-listed administratively/politically with no explanation while Lawrence Livermore Laboratory which had military base legacy contaminants receives robust funding to the present day. Following the first six years, the Federal Government enacted SARA, Superfund Amendments Research Act (1986) to add a focus on innovative research for hazardous waste cleanup.

JMP-5b

We learned recently, that UC Berkeley Engineering Professor Lisa Alvarez-Cohen received a SARA, Superfund Research Program grant. Her team leads in the discovery and application of novel micro-organisms and biochemical pathways for microbial degradation of environmental contaminants to improve bioremediation of superfund contaminants.

Perhaps, there are other researchers working on cleaning water, cleaning soils of hot and cold contaminants who receive SARA funding?

JMP-6

If such funded research projects allow experimental work on testbed sites that are not designated Superfund sites, then it begs the obvious question:

Is anyone at LBNL researching improved cleanup methods for the celebrity, Tritium and other radionucleides, and the synergized toxic chemicals that have been identified in the 'hot zones' of ground, soils, rock layers, creeks, perched water pockets or vaults, and underground waterways,identified in LBNL documents?

Is any effort underway to interest scientists to work pioneering cleanup techniques at any of these plume testbed? Given that Tritium has such a long life, and we hear of traces of tritium found all over the country, it would be consistent with the DOE mission of technical development and research for safe methods of environmental cleanup. These hot zones provide an opportunity! And we learned from previous employees that there are the 'cold zones' of decomposing biological waste.

JMP-7a

1V SEISMIC LIFE SAFETY; THE GENERAL PURPOSE LAB AND SAFE WASTE HANDLING BUILDINGS --SAFETY FIRST!

There is so much that we don't yet know of what lies beneath the LBNL, and what has flowed downhill beneath the UCB Campus, and further downhill deep beneath our homes and businesses in Berkeley.

And we don't know how and where the earth will open up when the Hayward Fault faults.

We don't know what will happen to contaminated plumes; we don't know if the splays that lace the Berkeley hills between the many identified faults will zig zag open, that plentiful geologic water from the Lennert Aquifer beneath the Lab will surge up, or contaminated waste water wil spring up in old traces of springs and seeps in our gardens downhill at our homes.

JMP-7b

While geotechnical engineers can assure us that sample borings and soil studies indicate what they assert IS beneath the LBNL, their studies are shallow nor do they apply to every square foot beneath existing buildings. Thus, an expert engineer in 2010 can design a geoenginered foundation for a new facility where he believes can be safely anchored over earthquake fault splays, underground streams, perched water ponds and layers of rock which sometimes is referred to as 'solid ground'. In earthquake country solid ground is questionable.

Ten years hence, in 2020, another geotechnical engineer may throw out that analysis and design and provide a stricter set of standards of construction, Or, he may recommend no construction whatsoever at that site as he has subsequently learned of a Pandora's Box of warning alerts that cumulatively strike him as an unsustainable site for future generations of humans.

JMP-8

The forces of nature elude forecasters who presume stationarity when using risk analyses.. Climate changes of excessive rainstorms, droughts, killer heatwaves, volcanic ash clouds, earth fault movements, firestorms, impact landslides, sinkholes, underground aquifers depletions or floods, dissolved rock, landslides--all manner of dynamic changes from largely natural forces are risks.

The cumulative risks of more and more disturbances of the steep hills at the LBNL site when more and more construction begins, have yet to be discovered and established for NEPA staff to review. The standards of development set by DOE Facility Safety Office Of Health, Safety, and Security to protect Lab personnel to work in a safe, healthy, and environmentally sound manner will change as future scientists pioneer research.

V ERNEST LAWRENCE CHOSE AN ALTERNATIVE SITE FOR THE SAFETY OF COLLEAGUES AND TEAM

Ernest Lawrence never imagined the Lab he founded would move soil, build, demolish, and rebuild filling out the land he choose as an alternative site to protect the health and safety of his academic colleagues. Ernest Lawrence moved his high energy physics research unit from the UCB Campus to the alternative hill site creating the Radiation Laboratory and in two canyons east of UCB. The land was empty, quite inaccessible for the public; he theorised that the slopes could absorb radioactivity from the accelerator experiments.

VI WOULD LAWRENCE TODAY CONTRIBUTE TO AN ALL HAZARDS VULNERABILITY INDEX COMMUNITY PROCESS?

JMP-9

Lawrence never imagined the range of classified research that took place in the "hot" zones and the problems of "hot" waste which for years were buried in pits in the ground--some forgotten-- and now ly beneath buildings that may soon be demolished or retrofitted. Had he lived until today, he likely would have learned of the high seismic risk and perhaps, even have contributed to an All Hazards Vulnerability Index.

People following the new course of values for the LBNL say it is time now to stop and follow the legacy of Lawrence to not compromise safety. Embrace the Bruntland sustainability: to not comprise the needs of the future generations by present use of resources.

VII A SATELLITE CAMPUS? Let LBNL revered and feared! become LBNL revered!

We request all readers to commit to a smart satellite campus for upcoming facilities development where no humans lives downhill, downstream.

JMP-9 cont.

Compare costs of changing the construction of the General Purpose Lab site to Richmond Field Station. A new GPL at a safe, modern, high accuracy research facility suitable for co-located and co-ordinated research at Richmond Field Station Add a lounge and indoor/outdoor cafe space for teams of individuals with different expertise to share knowledges. Scientists from UCSF who presently research at RSF could join in conversations.Clean Bay air, a beautiful view and ample parking with a a10 minute shuttle ride to the UCB main Campus.

JMP-10

Just imagine Physicist Steven Hawkings coming to visit in his wheelchair and the lack of American Disabilities Act access at the current Lab as opposed to a lovely scenic new laboratory campus on flat Richmond Field Station?

JMP-11

VIII ALTERNATIVE WASTE HANDLING FACILITY AT RFS

Entertain constructing a new state of the art Waste Handling Facility at RFS and then abandoning the current facility. If the building as planned and a satellite campus starting with the GPL is developed at RSF, another waste handling facility will be needed. Templates abound on DOE websites for safe waste facilities; indeed the nearby State Department of Health secure facility or Bayer Labs can provide tours that may assist in realising that the site of the present WHF is far too vulnerable.

JMP-12

IX CURRENT SHODDY PERIMETER SECURITY AT LBNL

The responses on page 54 Section IV.B.7. Intentional Destructive Acts states an UNTRUTH. We can easily see a rusty falling down fence with holes that we could crawl through in many steep slopes or follow the creeks uphill from the roadway by the Strawberry Canyon Recreation Facility or the creek in Blackberry Canyon. These old rusty fences are not secure. The hills above the lab are accessible by car and foot. Homes are within a few hundred feet of the weak fencing. We do not see any walls, lighting, cameras, etc...

JMP-13

"The Proposed Action is not expected to require additional security for the LBNL site The entire LBNL site is fenced, and controlled access is available only at three entry gates. Card Keys would be used for building access." And, "The building would have a guard on the door during normal business hours and card key access."

" If the GPL were to be built at the RFS, the security configuration would be similar..."

This last statement is doubtful. Would DOE permit a skimpy security design for a new asset, a laboratory worth millions of dollars with research projects that are priceless?

JMP-13 cont.

Aside from Lawrence Berkeley and classified Livermore, that lack a perimeter buffer zone to insulate surrounding civilian communities--is there any other Federal Lab that lacks a state of the art secure perimeter?

JMP-14

X WHAT ARE DOE SECURITY STANDARDS?

A 200 feet no private vehicle perimeter?
A blast standoff area?
Perimeter lighting of complex?
An access control center and security plan that can override key controls to all doors and gates?
loading docks outside footprint of main building?

(There is much more available on the internet.)

We continue to request that staff look at asset values and geographic range of threats related to this ICONIC government facility in concert with local law enforcement leadership who know the terrain.

JMP-15

XI FEARED 'COLD' BIOHAZARD LEGACY WASTE ?

An in confidence call to the larger community to partner with the management at LBNL to produce an ALL HAZARDS VULNERABILITY INDEX would allow recognition and future pioneering research on not only the 'hot' waste, but could flesh out the legacy of biological organisms waste that was secretly dumped and buried--the 'cold' biohazard waste of decomposing bodies of experiments with animals.

Years and years ago, when the Lab was still the Rad Lab and highly secretive it was called the "Stealth Lab". We recall the caged hyenas (from above Strawberry Canyon that were screaming when we took our children to swim at the University's pool--i.,e., until their vocal chords were severed); the frightened beagle dogs that barked all night long that we could hear for miles--other animals used in classified research including the radioactive chickens we saw in the poultry facility adjacent to Chicken Creek just up the road from the pool. Much is still there that we don't see or know about. Some organic bio-agents may still be alive. Metaphorically, one can imagine a 15th Century nightmare illustration of evil sinister chimeras lurking below ground awaiting a time to arise and plague the living with 'the sins of our fathers.'. This may not be likely; however it could serve for another testbed research project for SARA funding.

JMP-16

XII HOPE FOR FUTURE GENERATIONS
If we could work together towards an open transparent knowledge process, commit to the best possible clean-up, protect our reserve drinking water bank, and support a beautiful modern secure satellite campus at more stable land of Richmond Field Station perhaps the LAB will no longer be feared, it will be highly revered and attract even more of the best scientists for pioneering research for sustainable practices for all peoples worldwide.

Thank you for your attention to this lengthy essay.

Sincerely, Jennifer Mary Pearson, Ph.D. 1546 Milvia Street, Berkeley, CA 94709

please confirm receipt.

JMP-17

LETTER #ST

Subject: need for full environmental review for GPL
From: Stephanie Thomas <skthomas@flash.net>
Date: Wed, 28 Jul 2010 23:55:54 -0700
To: <kim.abbott@bso.science.doe.gov>
To: <kim.abbott@bso.science.doe.gov>

Mr. Kim Abbott, DOE Office of Science
NEPA Document manager
LBNL
One Cyclotron RD
Berkeley, CA 94720 **ST-1**

Dear Mr. Abbott,

I am writing to strongly request that this project, Seismic Life-safety, Modernization and Replacement of general Purpose buildings-Phase 2B undergo a full environmental review. Because of the many hazards and dangers of the area an Environmental Impact Study (EIS), not an Environmental Assessment (EA) is needed so that all of these risks can be discussed as well as how to protect the watershed lands and the cultural heritage of this area.

I have attended lectures and seen films of the area and the problems and dangers of
putting buildings in that area. These dangers include the unstable earth below which is **ST-2**
made up of mudstone and other material that will move in when the expected major
quake occurs on the Hayward Fault. Also The committee to Minimize Toxic wastes has
shown that the site is full of contaminants that will be disturbed when graded during
construction.. This is a volatile area and too dangerous to disturb near the UC Campus **ST-3**
and the neighborhoods nearby as well as the entire area.

In addition Building 85 and 85A have radioactive waste and VOCs. They straddle 2 old **ST-4**
landslides, The solution of the piers will not be sufficient. I have learned that there is a
new issue of what will happen if fire in that area should come down into these proposed
facilities, potentially burning and dispersing radioactive and VOCs into the air and **ST-5**
watershed into the bay.

As I am sure you are aware these are serious issues to consider and they require the
fullest study and chance for all experts to testify. It would be a serious mistake to allow
this to proceed and possibly have this community suffer an inevitable calamity of several
sorts. If you had a son or daughter who attends school there or if you or a family member **ST-6**
lived near by, i am sure you would want this to have a full assessment.

I have lived in Berkeley over 40 years, have walked the hills in Strawberry Canyon enjoying the views and the wildlife. I have attended walking lectures about this special watershed area and it's importance to the wildlife and the culture of the area. It has quite a history. This is not the place for such buildings- too much risk- too much disruption to what we should preserve. there are alternatives- in Richmond and in Oakland and elsewhere. ST-6 cont. ST-7

This is why this drastic proposal need an EIS.

Thank you

Stephanie Thomas
1824 San Loerenzo Ave
Berkeley, CA 94707

LETTER #CMW

Subject: GPL proposal
From: Charlene Woodcock <charlene@woodynet.net>
Date: Wed, 28 Jul 2010 20:41:26 -0700
To: <kim.abbott@bso.science.doe.gov>
To: <kim.abbott@bso.science.doe.gov>

28 July 2010

Mr. Kim Abbott, DOE Office of Science
NEPA Document Manager
LBNL
One Cyclotron Road
Berkeley, California 94720

Dear Mr. Abbott,

I write to express my strong objection to LBL's building plans for the very sensitive areas in Strawberry and Blackberry Canyons above Berkeley in an area of earthquake faults, fire danger, mudslides, and generally unstable terrain. In addition, the proposed site around Building 25 is proven to be contaminated with toxic wastes, Buildings 85 and 85A have radioactive waste contamination and are also on unstable ground. **CMW-1**

This area is obviously very inappropriate for the existing Hazardous Waste Facility above the botanical garden and the campus. How can a serious plan be put forth to add to the dangers already existing by planning another building in such an unstable area, with so much potential for disaster? **CMW-2**

At the very least, an objective, scientifically sound Environmental Impact Study is essential. Citizens of Berkeley should not have the watershed above our city threatened by these ambitious LBNL building projects without a very thorough examination of the risks and safer alternatives, that would not require extraordinary efforts and costs to ensure safety. **CMW-3**

Sincerely,

Charlene M. Woodcock

From: mleenoonan@comcast.net [mailto:mleenoonan@comcast.net]
Sent: Thursday, July 29, 2010 10:40 AM
To: Abbott, Kim
Subject: LBNL Building Plan

I trust that the Department of Energy will insist that a full federal environmental review be conducted for the projects currently in the planning stages at the Lawrence Berkeley National Laboratory. The risks of soil instability and the potential dispersal of contaminants are significant at the sites, for example, of both the proposed General Purpose Laboratory and the Hazardous Waste Facility. The legacy of the ancient caldera cannot be ignored. **MLN-1**

Even my cleaning lady has spoken up on the hazards. Many years ago she was the university's gardener at the Lawrence Hall of Science. She can remember vividly conversations with a seismologist who had been brought in from Texas as a consultant on various ground water problems which they had been experiencing. "When the Hayward Fault goes," he told her, " this will all be down at Center and Shattuck." LBNL minimizes these perils at its own risk - and at ours as residents of Berkeley. **MLN-2**

Mary Lee Noonan
2599 Buena Vista Way
Berkeley, CA 94708

REC'D JUL 2 9 2010

LETTER #GG

July 28, 2010

Mr. Kim Abbott
DOE Office of Science
NEPA Document Manager
LBNL
One Cyclotron Road
Berkeley, CA 94720

Re: Inadequate EA Review for Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project

Dear Mr. Abbott:

GG-1

Full compliance with the National Environmental Protection Act (NEPA) is necessary for the LBNL Plan to build new research facilities in the hills above the University. The area is an earthquake zone and a landslide zone, and is difficult to access. The "Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project", includes a major bioresearch building and a toxic waste building. It therefore needs full disclosure and discussion in a Environmental Impact Statement.

GG-2

I believe that the Environmental Assessment (EA) is very superficial. It is not persuasive that the natural setting of the Berkeley-Oakland hillsides is worth sacrificing for large glass and steel research and waste buildings. The EA has no serious discussion of the importance of the Strawberry Creek watershed or the connection of the hills to Tilden Park and the East Bay Regional Parks.

GG-3

It is significant that the EA ignores discussion of disaster preparedness and safety issues. Also, the burden upon our residential population on a daily basis or in the event of a disaster is ignored. Here are some quotes from City and University officials that can be found in a June, 2005 article on the California Planning & Development Report website: http://www.cp-dr.com/node/415.

1.) "'It's a built-out environment. Every piece of land has a use of some kind on it,' O'Banion said. For new buildings and facilities, campus planners are eyeing places that are underused, obsolete or **seismically questionable** . . ." (Emphasis added).

GG-4a

2.) "The third issue is money, specifically fees for municipal services that the city provides. City officials say the city provides $13.5 million worth of services to UC every year, a tab that will increase by $2 million annually under the LRDP. The city's lawsuit argues, 'The university does not commit under the LRDP to pay for the impacts on city services used by the university or to lessen those impacts through effective mitigation.'"

GG-4b

3.) "'For example,' added DeVries, 'we provide the entirety of the university's fire protection and ambulance services. We essentially provide a fire department for a community of 50,000 people at no charge.'" (Mr. DeVries was employed at that time in the City of Berkeley Mayor's office).

Also, I am attaching two pages from the City of Berkeley General Plan about disaster preparedness and safety issues. They can be found at: http://www.ci.berkeley.ca.us/ContentPrint.aspx?id=496. GG-5

The Department of Energy must take full responsibility for all impacts & liabilities at the LBNL site. I believe that a full EIS is mandatory under NEPA for this project because it will "significantly affect the quality of the human environment" and cause cumulative risk in the event of a disaster. GG-6

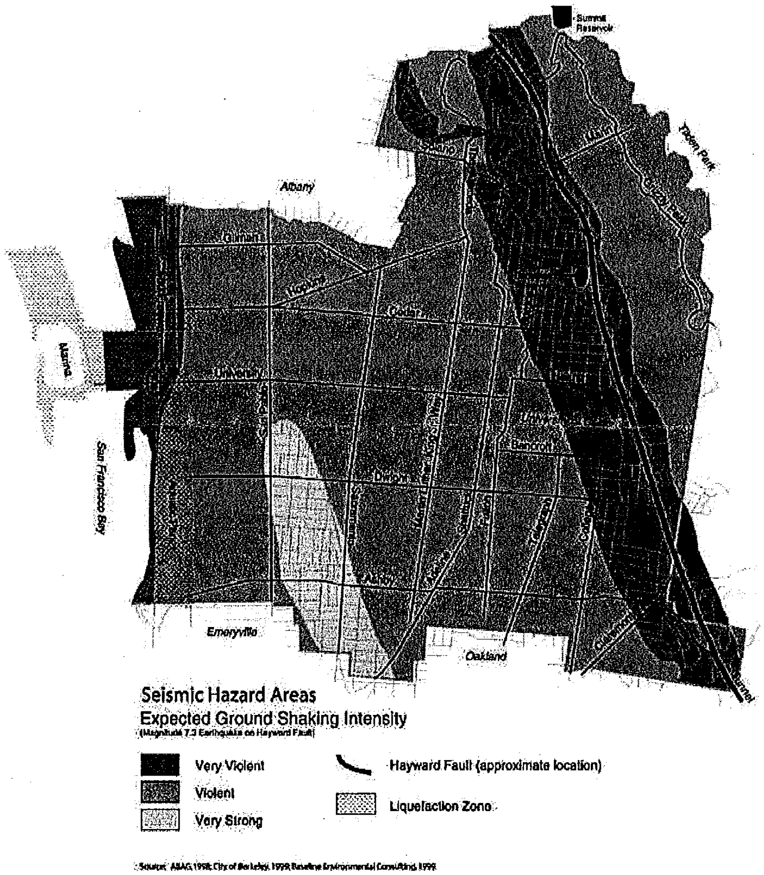
Sincerely,

Gale Garcia

Gale E. Garcia
2538 Fulton Street
Berkeley, CA 94704

Attachment

Figure 12. Ground Shaking Intensity



GG-7

These numbers are similar to the 1990 numbers, which yielded 23% for the Southern Hayward, 28% for the Northern Hayward, and 22% for the Rodgers Creek fault. However, many people will be surprised that these are lower estimates. Several changes in the 1999 methodology explain the difference. First, the new report accounted for more variations in fault rupture. For example, the 1990 report estimated probabilities for the rupture of the Rodgers Creek fault, the Northern Hayward and the southern Hayward as individual segments. The 1999 report accounts for the possibility that these individual segments may rupture together and cause larger earthquakes. By allowing for the occurrence of larger earthquakes, the computed probabilities decrease since the larger events are less frequent. Second, the new report includes the effects of the "stress shadow" of the 1906 earthquake. That is, it accounts for interactions between the faults. In the case of the 1906 earthquake, the movement of the San Andreas acted to reduce the stress on the Hayward fault. Third, the new models account for the fact that the Hayward fault "creeps". Through this seismic movement, some of the strain accumulation is released. Finally, new studies have shown that the 1868 earthquake was larger than previously thought, both in terms of the length of the rupture and the amount of slip. A larger rupture results in a larger strain release and contributes to lowering the probability.

The most significant physical characteristics of a major earthquake in Berkeley will be earthquake-induced ground shaking, which can lead to surface fault rupture, ground failure, and fire. Ground shaking is the vibration that radiates from the earthquake fault. Because it can damage or collapse buildings and other structures, it is the most serious and direct hazard produced by an earthquake. The impact of ground shaking on a building or structure is a function of the nature of the underlying soil; the structural characteristics of the building and the quality of workmanship and materials; the location and magnitude of the event; and the duration and character of the ground motion. Figure 12 shows the approximate location and intensity of ground shaking that might be expected in a magnitude 7.3 earthquake on the Hayward fault.

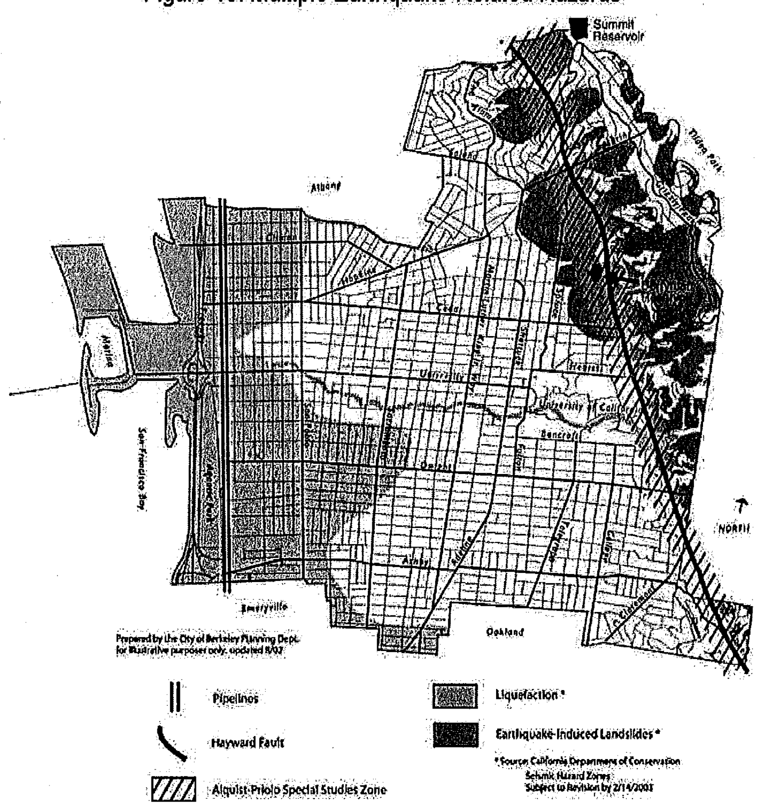
Earthquake-induced ground failure includes liquefaction, settlement, fault rupture, lateral spreading, and landslides. Liquefaction is the loss of soil strength due to shaking on water-saturated granular soils. The potential for liquefaction in Berkeley exists primarily to the west of the railroad tracks in low-lying areas adjacent to San Francisco Bay. Settlement is the vertical consolidation of loose soils and alluvium caused by ground shaking or liquefaction. The ground surface can range from a drop of a few inches to several feet, and may occur many miles from the epicenter. Along the Berkeley waterfront the potential for settlement exists due to underlying weak bay mud fill typical of the area. Lateral spreading is the horizontal movement or spreading of soil toward an open face such as a stream bank or the open sides of fill embankments. In Berkeley, locations most likely to be affected are areas with improperly engineered fill; steep, unstable banks; and areas near the waterfront underlain by soft bay mud soil deposits. In a major earthquake, Berkeley can expect lurch cracking to result in extensive rippling and fracturing of pavement and curbs, and damage to sewer, gas, and water lines. Seismic activity can also trigger landslides, primarily in the hill areas, which can result in significant property damage, injury, and loss of life.

Fire often accompanies earthquake damage. Fire following an earthquake is a particular concern because of the likelihood of numerous simultaneous ignitions, broken mains, and demands on fire personnel. Ruptured or disrupted gas service lines and mains, power lines, water heaters, wood, gas or electric stoves, and other gas or electrical appliances and equipment cause most earthquake-induced fires. As demonstrated in the San Francisco Marina District in 1989 and in the 1995 Kobe earthquake, modern cities are vulnerable to devastation from multiple fires, which, coupled with road blockages and damage to the water delivery system, can greatly exacerbate the initial damage from the seismic forces.

Figure 13 shows the approximate location of areas vulnerable to a combination of hazards caused by a major earthquake.

The combination of earthquake-induced ground shaking, potential lateral spreading, fault rupture and fire is of particular concern in the residential hill areas of Berkeley east of the Hayward Fault line. In these areas, many homes are on steep slopes, and access to many of these areas is difficult for emergency vehicles due to narrow, winding roads, some of which are cul-de-sacs. The eastern edge of the city is heavily wooded, which provides fuel for earthquake-induced fire. These areas are entirely residential and do not have easy access to any City emergency services. If the northern Hayward Fault were to rupture, many of the roads leading from the City's emergency service facilities (police and fire stations) to these residential areas could be made impassible and the areas would then be isolated. There is currently only one fire station east of the Hayward Fault and it is not capable of servicing this whole area without assistance in the event of a major disaster. Other hazards initiated by ground shaking include hazardous material releases and inundation due to reservoir failure. Problems can be exacerbated further and emergency response hindered due to the loss of critical facilities, and disruption of transportation and communication links.

Figure 13. Multiple Earthquake-Related Hazards



GG-7 cont.

LETTER #GB

REC'D JUL 2 9 2010

Kim Abbott, NEPA Document manager.
Department of Energy, Berkeley Office.
One Cyclotron Rd, MS 90-1023.
Berkeley, CA 94720.

July 14, 2010

Re: DEIR for Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project.

Dear Kim Abbott,

GB-1

My comments are directed to the Seismic strenghtening of the Hazardous Waste Handling Facility (HWHF) consisting of buildings 85, 85A, 85B, a yard and prefabricated units. To be be brief, the Seismic Life Safety of the HWHF is likely also brief. In 1989 it was predicted "The Big One" will occur on the Hayward Fault within 30 years; that's just 9 years to go!

The replacement HWHF should never have been built in its present location, situated behind Lawrence Berkeley Lab's Strawberry Canyon gate in Oakland on the East Canyon "Feature", a branch of the Wildcat Fault. In order to build the Non-Nuclear Facility, for the storage and treatment of radioactive and hazardous waste, it was necessary to do at least 4 things:

1. Ignore the Wildcat and East Canyon Faults and any branch "Features" upon which the Hazardous Waste Handling Facility now sits.

2. Ignore the safety implications of slope stability problems.
   The Lab ignored slope stability problems despite:

   a) its own revelation in "Response to Public Comments" IS-7 (LBNL, April 1997) which indicated that a slide 50 feet long by 100 feet wide occurred along the access road to the site of the replacement HWHF in the winter of 1994/95. (Not an ancient slide !)

   b) the knowledge, provided in Public Comment, of a UC Berkeley press release which reported that Centennial Drive, which connects to the access road to the HWHF, was closed for 8 months in 1983/84 due to a huge slide. (Press release enclosed).

GB-2

3. Fail . to do a Supplementary EIR when 2 major changes were made to the original EIR:

   a) First; building a Non-Nuclear Facility for storage and treatment of radioactive waste and hazardous waste because Department of Energy's (DOE) Western Division "determined that the benefits of constructing a Nuclear Facility do not justify the additional costs," (April 5, 1994 memo to Joe Boda from Alex Dong - enclosed). Surely a Nuclear Facility has more safety features thaa Non-Nuclear Facility. Is safety not worth the cost?

   In order to fall below the threshold for a Category 3 Non-Reactor Nuclear Facility, the one the original EIR indicated was to be built, the Tritium Focus Group was actually able to get the DOE to change the threshold from 1000 curies (Cl) to 16,600 Cil (U.S. Dept. of Energy, DOE Standard "Hazard Categorization and Accident Analysis...", DOE STD-1027-92, Dec. 1992, Change Notice no.1, September 1997 - See Attach. I pp A-10, for Isotope H3, and A 12 footnote * - enclosed)

GB-3

   b) Second: moving the fence-line a considerable distance from the then existing fence-line around the HWHF in order to declare they are not exceeding the allowable radiation dose to the public. This would not be possible without a public hearing and eminent domain proceedings if private property, rather than UC Regents' property were located outside the existing fence-line. (See enclosed: 7/21/99 letter to Watson Gin, DTSC from G. Bernardi CMTW: 2/20/98 memo from G, Weinstein to D.Balgobin, LBNL : 7/14/94 letter to G. Bernardi from T. Powell, LBNL; 3/28/96 memo to H. Mitchell, UC and K. Berkner, LBNL from L. Bean, UC and R. Camper, LBNL)

GB-4

I don't find it strange that the safety of the public and employees was not the paramount concern, and that CEQA was violated and radiation thresholds were changed to fulfill the headstrong plans and cost saving motives of the HWHF decision makers as this was done under the tutelage of the University of California, the manager of the Lab. One can see parallels to UC's actions regarding the Memorial Stadium, wherein UC claimed it could dispense with the supporting concrete pier footing tied into the stadium, when the Judge ruled it violated the Alquist-Priolo law. Next, UC saw to it that the Stadium and other State buildings be totally exempted from Alquist-Priolo through the Omnibus Bill (2009). Such amendments are required to be non-controversial!

LBNL has expressed concern (DEIR Vol. I. 1/29/10 - p. 3-17) that the HWHF (Bldg 85/85A and 85B) is in the area of the official State of California Earthquake Induced Landslide Hazard Zone and that presents a hazard to the HWHF in case a landslide was mobilized in the event of a major earthquake.

A sincere concern would mean compliance with the Alquist-Priolo Act. Do the cost and specifications of the system of concrete pier foundations and tiebacks to stabilize Bldgs. 85/85A comply with Alquist-Priolo? If not, does this mean safety conscious members of the public and potential employees need to avoid both State and Federal government buildings in California? GB-5

Sincerely,

Gene Bernardi

Gene Bernardi
9 Arden Road
Berkeley, CA 94704

Enclosures: 15 pages

KENNETH R. SCHMITZ
Associate Director — Grounds Services
Physical Plant Operations

NIVERSITY OF CALIFORNIA
ffice of Physical Resources
00 Carleton Street
rkeley, California 94720
(415) 642-6338
FAX (415) 643-7264

OFFICE OF PUBLIC INFORMATION
101 SPROUL HALL, BERKELEY, CA 9472
(415) 642-3734

5/9/84--McClendon--File #9070

FOR IMMEDIATE RELEASE

Berkeley--Centennial Drive, connecting the "main" University of California-Berkeley campus to hilltop facilities, will reopen tomorrow (Thurs., May 10) after an eight-month closing.

The reopening restores convenient access to U.C.'s Lawrence Hall of Science in plenty of time for the public to take advantage of its summer programs.

The road has been closed from just beyond the U.C. Botanical Garden in Strawberry Canyon since last September 19 to repair damage caused by two years of heavy rains and run-off.

Officials had expected the closure to last only 12 to 15 weeks, but wet weather caused many delays in the work, which included rebuilding a section of the road that had become unsafe.

At the Lawrence Hall of Science, five sessions of summer courses will be offered in computers, biology, chemistry, physics and astronomy for various age levels, ranging from age two through adulthood.

Other activities, such as film series and exhibits, will also be offered.

For information on Lawrence Hall of Science summer activities, call 642-5133.

GB-6

LBL : 3-31-97 : 2:37PM :EH&S DIVISION OFFICE→ LABORATORY COUNSEL...

United States Government APR 1 2 1994 Department of Energy

memorandum

DATE: April 5, 1994 cc: T. WAN

REPLY TO ATTN OF: Oakland Operations Office (WM)

SUBJECT: Classification of the LBL Hazardous Waste Handling Facility

TO: Joe Boda, Director of Western Operations Division, EM-322

We are writing to inform you of the Oakland Operations Office decision to classify the new Hazardous Waste Handling Facility at Lawrence Berkeley Laboratory as a Non-Nuclear Facility. This decision has been concurred upon by LBL and the DOE-LBL Energy Research Site Office.

LBL has completed a review of current inventories and proposed generation rates of radioactive and mixed waste and concluded that this facility will operate below Category 3 Non-Reactor Nuclear Facility thresholds as prescribed in DOE STD-1027-92. In addition, we have reviewed the additional incremental costs involved in constructing and operating a Category 3 Non-Reactor Nuclear Facility and have determined that the benefits of constructing a Nuclear Facility do not justify these additional costs.

We have received assurance from the DOE-LBL Site Office that they will closely monitor the waste generators to keep quantities within acceptable limits. In addition, we will establish waste acceptance criteria for the HWHF and monitor the inventory against these criteria. We are now proceeding with construction of the HWHF as designed under the general criteria of DOE Order 6430.1A, incorporating special features for areas where radioactivity is handled.

Should you have any questions concerning this matter, please contact Dan Nakahara at (510) 637-1640.

Sincerely,

Alex E. Dong

Alex E. Dong, Acting Director
Waste Management Division

Post-it® Fax Note 7671

To Nancy Shepard		Date 4/1/97	# of pages ▸
Co./Dept.		From J Bartley	
Phone #		Co.	
Fax #		Phone #	
		Fax #	

GB-6 cont.

TS

NOT MEASUREMENT
SENSITIVE

DOE-STD-1027-92
December 1992

CHANGE NOTICE NO.1
September 1997

DOE STANDARD

HAZARD CATEGORIZATION AND ACCIDENT ANALYSIS TECHNIQUES FOR COMPLIANCE WITH DOE ORDER 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS

GB-6
cont.

U.S. Department of Energy
Washington, D.C. 20585

AREA SAFT

Table A.1 Thresholds for Radionuclides

Isotope	Category 2 [1] Curies	Threshold Grams	Category 3 [2] Curies[3]	Threshold Grams
H-3	3.0E+05	3.0E+01	1.6E+04*	1.6E+00*
C-14	1.4E+06	3.1E+05	4.2E+02	9.4E+01
Na-22	6.3E+03	1.0E+00	2.4E+02	3.8E-02
P-32	4.4E+03	1.5E-04	1.2E+01	4.2E-05
P-33	3.0E+04	1.9E-01	9.4E+01	6.0E-04
P-32, acid**	2.2E+06	7.7E-02	1.2E+01	4.2E-05
P-33, acid**	1.5E+07	9.6E+01	9.4E+01	6.0E-04
S-35	2.5E+04	5.8E-01	7.8E+01	1.8E-03
Cl-36	1.4E+03	4.3E+04	3.4E+02	1.0E+04
K-40	4.7E+03	6.8E+08	1.7E+02	2.4E+07
Ca-45	4.7E+06	2.6E+02	1.1E+03	6.2E-02
Ca-47	4.8E+06	7.8E+00	7.0E+02	1.1E-03
Sc-46	1.4E+06	4.0E+01	3.6E+02	1.1E-02
Ti-44	3.2E+04	1.9E+02	6.2E+01	3.6E-01
V-48	3.0E+06	1.8E+01	6.4E+02	3.8E-03
Cr-51	1.0E+08	1.1E+03	2.2E+04	2.4E-01
Mn-52	4.0E+06	8.8E+00	3.4E+02	7.6E-04
Fe-55	1.1E+07	4.6E+03	5.4E+03	2.2E+00
Fe-59	1.8E+06	3.7E+01	6.0E+02	1.2E+02
Co-60	1.9E+05	1.7E+02	2.8E+02	2.5E-01
Ni-63	4.5E+06	8.0E+04	5.4E+03	9.5E+01
Zn-65	1.6E+06	1.9E+02	2.4E+02	2.9E-02
Ge-68	5.8E+05	8.8E+01	1.0E+03	1.5E-01
Se-75	3.4E+05	2.4E+01	3.2E+02	2.2E-02
Kr-85	2.8E+07	7.2E+04	2.0E+04	5.1E+01
Sr-89	7.7E+05	2.7E+01	3.4E+02	1.2E-02
Sr-90	2.2E+04	1.6E+02	1.6E+01	1.2E-01
Y-91	6.5E+05	2.7E+01	3.6E+02	1.5E-02
Zr-93	8.9E+04	3.6E+07	6.2E+01	2.5E+04
Zr-95	1.5E+06	6.9E+01	7.0E+02	3.3E-02
Nb-94	8.6E+04	4.6E+05	2.0E+02	1.1E+03
Mo-99	7.8E+06	1.6E+01	3.4E+03	7.1E-03
Tc-99	3.8E+06	2.3E+08	1.7E+03	1.0E+05
Ru-106	6.5E+03	1.9E+00	1.0E+02	3.0E-02
Ag-110m	5.3E+05	1.1E+02	2.6E+02	5.5E-02
Cd-109	2.9E+05	1.1E+02	1.8E+02	7.0E-02
Cd-113	1.8E+04	5.3E+16	1.1E+01	3.2E+13
In-114m	3.7E+05	1.6E+01	2.2E+02	9.5E-03
Sn-113	3.2E+06	3.2E+02	1.3E+03	1.3E-01

GB-6 cont.

Isotope	Category 2 Curies	Threshold Grams	Category 3 Curies	Threshold Grams
U-233	2.2E+02***	2.3E+04***	4.2E+00	4.4E+02
U-234	2.2E+02	3.5E+04	4.2E+00	6.7E+02
U-235	2.4E+02***	1.1E+08***	4.2E+00	1.9E+06
U-238	2.4E+02	7.1E+08	4.2E+00	1.3E+07
Np-237	5.8E+01	8.3E+04	4.2E-01	6.0E+02
Np-238	9.1E+05	3.5E+00	1.3E+03	5.0E-03
Pu-238	6.2E+01	3.6E+00	6.2E-01	3.6E-02
Pu-239	5.6E+01***	9.0E+02***	5.2E-01	8.4E+00
Pu-241	2.9E+03	2.8E+01	3.2E+01	3.1E-01
Am-241	5.5E+01	1.6E+01	5.2E-01	1.5E-01
Am-242m	5.6E+01	5.8E+00	5.2E-01	5.3E-02
Am-243	5.5E+01	2.8E+02	5.2E-01	2.6E+00
Cm-242	1.7E+03	5.1E-01	3.2E+01	9.7E-03
Cm-245	5.3E+01	3.1E+02	5.2E-01	3.0E+00
Cf-252	2.2E+02	4.1E-01	3.2E+00	5.9E-03

1 For isotopes not listed below, users may refer to LA-12846-MS, Specific Activities and DOE-STD-1027-92 Hazard Category 2 Thresholds, LANL Fact Sheet or to 10 CFR 30.72, Schedule C and adjust the values consistent with the X/Q value described in Attachment 1 of this Standard. (Note that although LA-12846-MS misstates the Category 2 threshold criterion, its use of the proper X/Q negates any effect of the misstatement. See "Radiological Criteria, p A-3 and Meteorological Conditions, p A-7 for clarification)

Any other beta-gamma emitter - 4.3E+05 Ci
Mixed fission products - 1.0E+03 Ci
Any other alpha emitter - 5.5E+01 Ci

2 For isotopes not listed below, users may refer to LA-12981-MS, Table of DOE-STD-1027-92 Hazard Category 3 Threshold Quantities for the ICRP-30 List of 757 Radionuclides, LANL Fact Sheet for threshold quantities of any isotopes of interest.

* At the recommendation of the Tritium Focus Group, the Category 3 tritium threshold value has been increased from 1.0E+03 Ci and 1.0E-01 grams to 1.6E+04 Ci and 1.6E+00 grams, consistent with the methodology of EPA used for the other nuclides.

** Provided as an example to indicate that when a substance such as P_{32} is used in a solution (i.e., phosphoric acid) for experimentation, medical treatment, etc., it should no longer be considered as highly volatile/combustible.

*** To be used only if segmentation or nature of process precludes potential for criticality. Otherwise, use the criticality lists for U_{233}, U_{235} and Pu_{239} of 500, 700, and 450 grams, respectively.

GB-6 cont.

- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
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Com

3. Article Addressed to:
Mr. Watson Gin Actng D Dir
Hazardous Waste Mngmnt
Dept of Toxic Substances
P.O. Box 801
Sacramento, CA. 95812-0806

4a. Article Number
P 843 026 399

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PS Form 3811, December 1994 102595-98-B-0229 Domestic Return Receipt

7/21/99

Mr. Watson Gin
Acting Deputy Director
Hazardous Waste Managem
Dept. of Toxic Substances C
POB 801
Sacramento, CA 95812-080

Re: **EPA ID # CA 4890008986-Lawrence Berkeley National Laboratory (LBNL) Permit Modification Request re: Hazardous Waste Handling Facility (HWHF) Operations**

Dear Mr. Gin,

Per our telephone conversation of July 19, 1999 in which you agreed to forward documentation, which I would provide, to the DTSC independent group reviewing the Committee to Minimize Toxic Waste's (CMTW's) appeal of your decision on LBNL's permit modification request, enclosed find the following documents which support CMTW's position that substantial changes have occurred with respect to the circumstances under which the project was undertaken. Under CEQA guidelines such changes require a subsequent or supplemental EIR for the project.

1. Feb 20, 1996 memo to David Balgobin, LBNL, from Gerald Weinstein, M.H. Chew and Associates, indicating that only if the HWHF fence boundary is changed will exceedances (opf regulatory standards for radiation exposure) not occur at the replacement HWHF.

2. July 14, 1999 letter to Gene Bernardi, CMTW, from Terry Powell with attached Joint Memorandum, signed in concurrence April 11, 1996, extending boundary of LBNL such that exceedances of regulatory standards would no longer occur for an offsite member of the public due to the fence line being moved a considerable distance from the former fence line around the replacement HWHF.

3. Sept. 1997 Change Notice #1 of ***DOE Standard**, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports,* (US DOE Attachment 1, p A-12) increasing the Category 3 Non-Reactor Nuclear Facility tritium threshold value from 1000 Ci to 16,600 Ci.

The need for a permit modification to increase storage of "mixed" waste and its treatments would not exist if it were not for the tritium "mixed" waste generated by the National Tritium Labeling Facility.

GB-6 cont.

The DOE is not only the enforcer of the regulations governing radionuclides at its facilities, but it conveniently changed a regulation by a magnitude of 16 in order to retroactively legitimize the construction of a non-nuclear HWHF! Furthermore, by virtue of the land (both within and outside of the LBNL) being U.C. Regents' property, the Lab has been able, outside of public knowledge, to merely move its boundaries outward in order to declare that they are not exceeding radiation dose regulations, and to declare the groundwater tritium contamination plume is within LBNL boundaries. If the Lab were surrounded by private property, public notification and ;public hearings regarding these boundary changes would be impossible to avoid.

While the DTSC claims its jurisdiction covers only the hazardous portion of mixed waste, its decision approving the permit modification allows the exposure to radiation of children at the Lawrence Hall of Science, workers (including pregnant women), students and persons visiting Strawberry Canyon for recreation.

We again ask that the DTSC take seriously its mandate to make permit decisions protective of human health and the environment.

The actions of LBNL/DOE, to bring itself into apparent compliance, after the fact, regarding the construction of a non-nuclear HWHF facility definitely merit a subsequent or supplemental EIR as these actions are inextricably related to the permit modification under consideration.

GB-6 cont.

In Health,

Gene Bernardi

Gene Bernardi, Cochair CMTW
9 Arden Road, Berkeley, CA 94704
510-843-2152

cc: Governor Gray Davis
Director Winston Hickox, CA EPA
Senator Don Perata
Assemblywoman Dion Aroner
US Congresswoman Barbara Lee
US Senator Barbara Boxer
US Senator Dianne Feinstein
Federal Facilities Coordinator Philip Armstrong, US EPA
Mayor Shirley Dean and Berkeley Councilmembers
Mayor Jerry Brown and Oakland Councilmembers

M.H. Chew & Associates, Inc.
Safety Professionals

1424 Concannon Blvd., Livermore, CA 94550-6006
510-443-507: Fax: 510-373-0624

Memorandum

Date: February 20, 1996

Subject: Basis for Differences Between Criteria Hierarchy In the First and Subsequent Drafts of the Final Safety Analysis Document (FSAD) for the Hazardous Waste Handling Facility (HWHF).

From: Gerald Weinstein, M.H. Chew & Associates, Inc. Gerald Weinstein

To: David Balgobin, Lawrence Berkeley National Laboratory (LBNL).

cc: Carol Kielusiak, LBNL.
Robin Wendt, LBNL.
Charles Guenther, CAI.
Steve Velen, CAI.

Per your request, I am hereby providing the basis for the change to the chemical criteria selection hierarchy used in the first draft of the FSAD for the evaluation of potential health impacts due to hypothetical accidental releases of chemicals at the replacement HWHF. The initial analysis of this facility was based upon a conservative set of screening criteria that were to be used in the absence of published values for the primary chemical accidental release criterion, the Emergency Response Program Guides Level 2 (ERPG-2). For this conservative screening analysis, the order of hierarchical substitution from highest to lowest criterion was as follows: Threshold limit values–short-term exposure levels (TLV–STEL) or TLV–ceiling (TLV–C) values, EPA Levels of Concern (LOCs), and TLV–time weighted averages (TLV–TWA). As discussed below, this original hierarchy was conservative because it did not take into account that TLV–STELs and TLV–Cs are tightly linked to and used in conjunction with TLV–TWAs. As such, the values were derived assuming an already continuous chronic exposure that will not occur for the offsite public. Thus, LOCs, which were developed strictly for accidental release exposures, should be applied, where available, in lieu of the TLV–STELs and TLV–Cs. GB-6 cont.

The purpose of a screening analysis is to analyze the potential consequences of realistic bounding chemical release scenarios. A conservative set of toxicological criteria or chemical modeling techniques were initially employed in the first stage of analysis. If no exceedances of the bounding concentrations were found using conservative screening toxicological criteria, then no further resources would be expended to re-evaluate the criteria or assumptions used in the analysis. As noted below, the initial screening analysis that was used to evaluate the replacement HWHF in the first draft of the FSAD indicated exceedances. In the reanalysis for the FSAD, given the pending relocation of the HWHF fence boundary, no exceedances occurred due to the physical distance between the hypothetical accidental sources and the location of the nearest hypothetical offsite member of the public.

Subsequent to completion of the first draft of the FSAD, we were independently contracted to evaluate, using similar methodology, the potential offsite exposures due to accidents at the existing HWHF. Our initial analysis indicated there would be exceedances at the existing facility under the assumptions and methodology used in the screening analysis of the replacement facility. Therefore, following the general approach to screening analyses, the basic assumptions of the analysis for the replacement facility were re-evaluated to determine whether any changes were warranted in order to reach a more realistic conclusion as to the potential risk of public exposure at the existing facility. It should be noted that a re-evaluation of the replacement HWHF was already being conducted independent of the analysis of the existing facility because, as noted above, using initial information on the site boundary, exceedances were indicated at the replacement facility. The re-evaluation of the replacement HWHF had stopped once it was discovered that no exceedances would occur at the replacement facility if the move of the fence boundary (that LBNL facilities engineering was planning for the purposes of land management) were taken into account.

Among the assumptions we scrutinized during the re-evaluation of the existing HWHF was the hierarchy placing TLV–STELs and TLV–Cs above LOCs. The American Conference of Governmental Industrial Hygienists (ACGIH, 1995) defines TLV–STELs and TLV–Cs as follows:

> Threshold Limit Value–Short-Term Exposure Limit (TLV–STEL)—The concentration to which workers can be exposed continuously for a short period of time without suffering from: (1) irritation, (2) chronic or irreversible tissue damage, or (3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially impair work efficiency, and provided that the daily TLV–TWA is not exceeded. It is not a separate independent exposure limit; rather it supplements the time-weighted average (TWA) limit where there are recognized acute effects from a substance whose toxic effects are primarily of a chronic nature. STELs are recommended only where toxic effects have been reported from high short-term exposures in either humans or animals.
>
> A STEL is defined as a 15-minute TWA exposure, which could not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV–TWA. Exposures above the TLV–TWA up to the STEL should not be longer than 15 minutes and should not occur more than four times per day.
>
> Threshold Limit Value–Ceiling (TLV–C): the concentration should not be exceeded during any part of the working exposure.

EPA (1987) defines LOCs as follows:

> Levels of concern (LOCs), for the purpose of this document, are defined as the concentrations of an extremely hazardous substance in air above which there may be serious irreversible health effects or death as a result of a single exposure for a relatively short period of time.

In reviewing the above criteria, it became clear that TLV–STELs and TLV–Cs are designed to cover work exposures that could occur repeatedly over an entire working lifetime, unlike an accident situation in which the members of the exposed public would not have had any significant prior exposure. The TLV–STELs and TLV–Cs presuppose an already continuous exposure to chemical substances for up to an entire working lifetime. On the other hand, LOCs are developed for the instances in which the public could be exposed to chemical substances for a short time period due to a rare accident and subsequently receive no prolonged additional exposure. In the instance of the current analysis, the concentrations modeled due to accidents represent peak concentrations (i.e., represent maximum short-term concentrations without considering the depletion of the amount of chemicals over time at the source).

GB-6
cont.

The US EPA (1987) has developed guidance for evaluation of such accidental releases. In the guidance document, EPA derived and recommended the primary use of LOCs (see Appendix C and Table C–2 of the document in particular) for chemicals without published ERPG–2 values. Such LOCs were derived by dividing the immediately dangerous to life and health (IDLH) values by a factor of 10 (EPA, 1987). Only in those instances where no ERPG-2s or IDLHs existed for chemicals being analyzed would the TLV–STELs, TLV–Cs, or TLV–TWAs be considered. In light of the fact that such events should be rare and the fact that no such accidents have occurred during the entire lifetime of the existing facility, we determined that LOCs represented the most appropriate criteria among those considered in the absence of ERPG-2s for evaluating the consequences of such a hypothetical release at the existing and the replacement HWHFs. Consequently, following the approach employed by EPA (1987) to assign criteria for accident analysis, the hierarchy was revised so that LOCs took precedence over TLV–STELs and TLV–Cs both for the analysis of the existing facility you asked us to do and the FSAD DOE is requiring for the replacement facility. GB-6 cont.

References:

ACGIH 1995, American Conference of Governmental Industrial Hygienists, 1995-1996 "Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)," Cincinnati, Ohio.

EPA 1987, U.S. Environmental Protection Agency, Federal Emergency Management Agency, and U.S. Department of Transportation, "Technical Guidance for Hazards Analysis, Emergency Planning for Extremely Hazardous Substances," Washington, DC.

BERKELEY LAB

July 14, 1999

Ms. Gene Bernardi, Co-Chair
Committee to Minimize Toxic Waste
9 Arden Road
Berkeley, CA 94704

Dear Ms. Bernardi:

In response to you request for the date on which Lawrence Berkeley National Laboratory's boundary was extended, please see the attached Joint Memorandum issued on March 28, 1996, and signed in concurrence on April 11, 1996, by the University of California at Berkeley and Ernest Orlando Lawrence Berkeley National Laboratory.

Sincerely,

Terry Powell

Terry Powell
Community Relations Coordinator

Enclosures

GB-6 cont.

Ernest Orlando Lawrence Berkeley National Laboratory
One Cyclotron Road | Berkeley, California 94720 | Tel: 510.486.4387

attachment 2

March 28, 1996

Joint Memorandum

To: Horace Mitchell, Vice Chancellor for Business and Administrative Services
University of California at Berkeley

Klaus Berkner, Deputy Director for Operations
Ernest Orlando Lawrence Berkeley National Laboratory

From: Leroy Bean, Associate Vice Chancellor of Business and Administrative Services
University of California at Berkeley

Robert Camper, Facilities Manager
Ernest Orlando Lawrence Berkeley National Laboratory

Subject: Management of Hill Area Lands

GB-6 cont.

As was stated in the Letter of Cooperation between Chancellor Tien and Director Shank, the University of California, Berkeley (Campus) and the Ernest Orlando Lawrence Berkeley National Laboratory (Berkeley Lab) share a common interest in cooperating to manage the risk of wild land fire and to ensure safe and orderly use of Regents property in the east bay hills. To further these objectives, Chancellor Tien and Director Shank have requested that the staff of each organization work closely to support common concerns and interests and have agreed that Berkeley Lab assume management responsibility for particular lands. This memorandum affirms our intent to cooperate and outlines specific implementation guidance relating to the transition of management responsibilities for the specific lands. We ask for your concurrence on this implementation guidance.

A fence and/or other markers, will be installed by Berkeley Lab to clearly delimit boundaries of the management area illustrated (with a crosshatch pattern) on the map attached to the Letter of Cooperation. A licensed surveyor/engineer will survey and document the Regents property line between Cyclotron Road and Campus Drive in 1997. Cost of this survey will be shared equally by the Campus and Berkeley Lab. Following this survey, the Lab and the Campus will work with the President's Office to resolve any disputes with owners of adjacent property regarding ownership rights prior to placement of a fence in the area by Berkeley Lab in 1998/9. To ensure free access from campus to the Big "C", no fence will be installed in the Big "C" draw.

Berkeley Lab will manage the area consistent with the Campus Long Range Development Plan (LRDP). When the Berkeley Lab completes an updated LRDP, this area will be addressed in the preparation of the Berkeley Lab LRDP. After adoption of the revised Berkeley Lab LRDP by the Regents, the Berkeley Lab LRDP shall be the guiding document. Berkeley Lab commits to manage the area such as to ensure that:

Access to natural areas is assured to Campus researchers as needed. Access will be accommodated consistent with Berkeley Lab site access and maintenance policies.

Management of the Chicken Creek riparian area will be accomplished in a manner which recognizes the fragile nature of this environment.

Erosion and sedimentation controls will be guided by best management practices including those described in the Bay Area Association of Governments "Manual of Standards for Erosion and Sediment Control Measures" (May 1995). Techniques which minimize erosion shall be preferred to those which reduce siltation where the former are practical. Use of mulching and vegetative soil stabilization (Chapter 8), soil stabilization fabrics (Chapt. 7 Measure D) and similar measures will be given preference.

Sustainable landscape management treatments will be guided by watershed biodiversity principles and be generally consistent with the East Bay Hills Vegetation Management Consortium's "Fire Hazard Mitigation Program and Fuel Management Plan for the East Bay Hills " (May 1995)

GB-6 cont.

In addition, Berkeley Lab and the Campus will work to achieve the following objectives and activities:

In order to allow for fuel management as well as the visual and functional integration of lands into Berkeley Lab, Campus will relocate materials from the Poultry Husbandry/Chicken Creek area to be managed by Berkeley Lab prior to September 1996. Berkeley Lab may demolish the wooden shed located immediately below Building 31.

Access to Campus-maintained hydraugers and fire trails is assured to Campus facilities staff. Maintenance of utilities and roads will be unchanged with the exception of those portions of fire roads which will be located within Berkeley Lab, which will now be maintained by Berkeley Lab. It is acknowledged that Berkeley Lab and its vegetation management contractors may use the Upper Jordan Fire trail to access the area above Building 74 and to remove debris and plant material from this portion of the site.

Campus staff and contractors shall continue to have access to lands adjacent to Centennial Drive and all other Campus-managed roads outside of Berkeley Lab in order to repair drainage, roadbed, soils or bedrock conditions which make the roadway less safe or usable.

Should historic contaminated soil or ground water be identified in the management area, remediation will remain the responsibility of its source.

Berkeley Lab will continue to explore options which may allow it to bring two small contiguous parcels of Campus-managed Regents property, at the western base of Blackberry Canyon and immediately north of lower Cyclotron Road, under its management. During this time, Campus will develop an access system in these areas.

Berkeley Lab and the Campus will update the Campus Hill Area Fire Prevention Committee annually on the progress in wildland fuel management made under this joint memorandum.

We look forward to working with you to implement the Letter of Cooperation. In the event a dispute or disagreement should arise, it is our intent that it be amicably resolved by the staff with our guidance. We will, of course, inform you if any dispute or disagreement should one arise.

We appreciate the opportunity to work together in order to reduce the risk of wild land fire and to ensure safe and orderly use of Regent property in the east bay hills.

Respectfully submitted,

Leroy Bean
Assoc. Vice Chancellor of Business and Administrative Services
UC Berkeley

3/28/96
Date

J. Robert Camper
Facilities Manager
Berkleley Lab

3-28-96
Date

Signed in Concurrence:

Horace Mitchell
Vice Chancellor for Business and Administrative Services
UC Berkeley

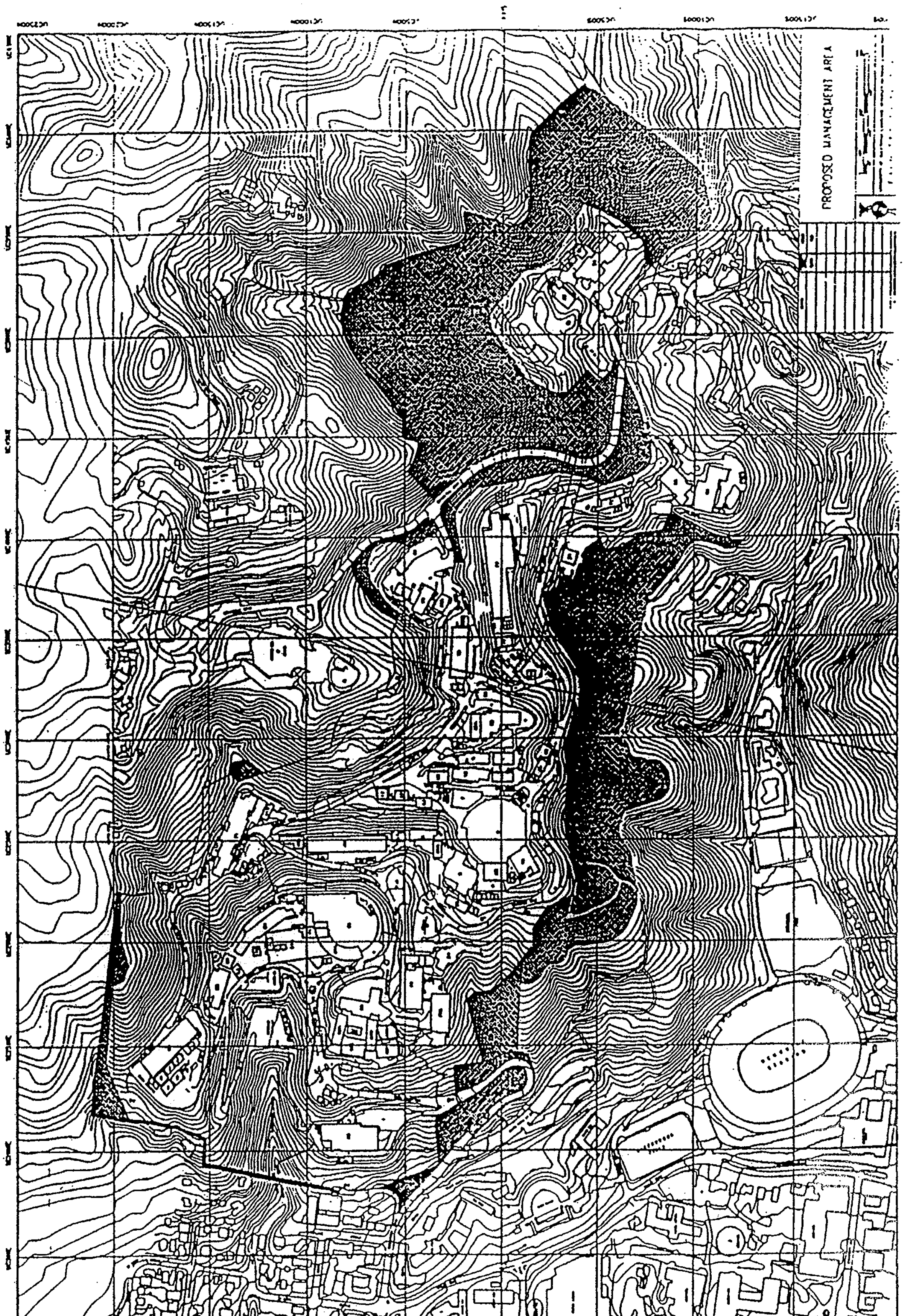
4/2/96
Date

K Berkner
Klaus Berkner
Deputy Director for Operations
Berkeley Lab

4-11-96
Date

cc: Chancellor Tien
Director Shank
Senior Vice President Kennedy
Site Office Manager Nolan
Director Dobbins

GB-6 cont.



GB-6
cont.

REC'D JUL 2 9 2010

LETTER #BR

COMMENTS ON LAWRENCE BERKELEY NATIONAL LABORATORY SEISMIC LIFE-SAFETY MODERNIZATION AND REPLACEMENT OF GENERAL PURPOSE BUILDINGS PHASE 2 B.

PRESENTED TO
KIM ABBOTT
NEPA DOCUMENT MANAGER
UNITED STATES DEPARTMENT OF ENERGY
BERKELEY SITE OFFICE
ONE CYCLOTRON ROAD
M/S 90 - R1023
BERKELEY CA 94720

BR-1

SUBMITTED BY
BARBARA ROBBEN
1964 EL DORADO
BERKELEY CA 94707
510-524-2383

COMMENTS ON LBNL SEISMIC LIFE-SAFETY, MODERNIZATION AND REPLACEMENT OF GPL BUILDING, PHASE 2B.

FIRST I WANT TO THANK YOU FOR MAILING ME A COPY OF THE DRAFT ENVIRONMENTAL ASSESSMENT DOCUMENT. IT IS ESSENTIAL TO HAVE THE DOCUMENT IN HAND, IN ORDER TO BE ABLE TO READ IT AND TO COMMENT ON IT. WHEN THE FINAL ENVIRONMENTAL ASSESSMENT IS PUBLISHED, I WILL NEED TO HAVE A COPY OF THAT, AS WELL. THANK YOU IN ADVANCE FOR SENDING IT.

APOLOGIES IF I HAVE INADVERTENTLY MIS-NAMED ANY OF THE AGENCIES INVOLVED. I KNOW THAT THE UNIVERSITY OF CALIFORNIA, THE LAWRENCE BERKELEY NATIONAL LABORATORY, THE DEPARTMENT OF ENERGY AND PERHAPS OTHERS INTERACT IN THEIR FUNCTIONS AND RESPONSIBILITIES THERE ON THE HILL.

I HAVE INCLUDED COMMENTS THAT I MADE FOR THE DRAFT ENVIRONMENTAL IMPACT REPORT, GENERAL PURPOSE BUILDINGS, PHASE 2 PROJECT, SUBMITTED ON MARCH 15, 2010.

BR-1 cont.

GROUND WATER.

IN THE FINAL EIR OF THIS PROJECT, DATED JUNE 21, 2010, I HAD MADE SOME COMMENTS ON THE TOXIC CONTAMINATION OF THE GROUNDWATER BY LBNL, NOTING THAT THE U.C. SITE ORIGINALLY WAS SELECTED BECAUSE OF ITS ABUNDANT FRESH WATER SPRINGS SUITABLE FOR DRINKING WATER. (5-280)

YOUR RESPONSE TO MY COMMENT (BR-26) IS:
"AS FOR GROUNDWATER CONTAMINATION, UC LBNL IS CLEANING UP THE GROUNDWATER UNDER THE REGULATORY AUTHORITY OF CALIFORNIA DEPT. OF TOXIC SUBSTANCES CONTROL. THE LONG TERM GOAL IS TO RESTORE ALL GROUNDWATER AT THE SITE TO DRINKING WATER STANDARDS, IF PRACTICABLE, EVEN THOUGH THE GROUNDWATER IS NOT USED AS A SOURCE OF DRINKING WATER".

BR-2

THERE ARE SEVERAL THINGS WRONG HERE. THERE IS THE ADMISSION THAT TOXIC CONTAMINATION HAS TAKEN PLACE, AND THAT THE SITE IS UNDER THE SUPERVISION OF THE CALIFORNIA DEPT. OF TOXIC SUBSTANCES. THIS SUGGESTS THAT DAMAGE HAS BEEN DONE AT THE SITE IN THE PAST. LOGIC SUGGESTS THAT THE SITE BE CLEANED UP. THIS SHOULD BE ACCOMPLISHED BEFORE ANY THOUGHTS OF FUTURE BUILDING AT THE SITE. STEP #1 SHOULD ALWAYS BE TO REMEDY ONES MISTAKES BEFORE CONSIDERING ANY OTHER DESIRED OUTCOMES. "IF PRACTICABLE" IS SUCH A HEDGE. ONCE THE LAB GETS ITS DESIRED BUILDINGS, WHAT INCENTIVE DOES IT HAVE TO REMEMBER ITS PROMISE TO "RESTORE GROUND WATER AT THE SITE TO DRINKING WATER STANDARDS"?

AND THEN THE SITE WOULD BE COVERED WITH THE BUILDING(S). LET'S EXAMINE YOUR SISTER LAB AT LAWRENCE LIVERMORE NATIONAL LABORATORY. MY UNDERSTANDING OF THIS SITE IS THAT IT IS A "SUPER-FUND" SITE. REMEDIAL WORK DONE AT THIS SITE IS NOT DONE "IF PRACTICABLE". IT IS A NATIONAL PRIORITY TO CLEAN UP THIS SITE. HUNDREDS OF WELLS AND OVER A THOUSAND BORE-HOLES HAVE BEEN DRILLED TO MONITOR THE CONTAMINATION. NOW THAT IT'S KNOWN WHERE THE CONTAMINATES ARE THE PROBLEMS ARE TO CLEAN UP, CAPTURE THE WATER, PREVENT MIGRATION. 37 TREATMENT FACILITIES ARE ON SITE. THERE ARE CONSTANT NEW PROBLEMS AND UNEXPECTED COSTS. THERE IS REGULATORY OVERSIGHT AT ALL TIMES. BR-2 cont.

MY QUESTION IS: WAS LBNL EVER CONSIDERED FOR A "SUPERFUND" SITE DESIGNATION? WHEN WAS THIS AND WHAT WAS THE OUTCOME? COMMUNITY MEM-BERS COULD BE RIGHTLY NERVOUS ABOUT THE TOXIC LEGACY OF THE LAB EVEN IF IT WAS NOT A DESIGN-ATED SITE. IS LBNL A 'SECOND-TIER TOXIC SITE,' AND WHAT WENT INTO THE DECISION? BR-3

IN ANY CASE, IT IS AWKWARD TO IMAGINE THE BASEMENT OF A NEW GENERAL PURPOSE LAB BEING DRILLED FOR BORE-HOLES AND WELLS TO MONITOR THE CONTAMINATION. THE COMMON SENSE CONCLUSION IS INESCAPABLE: CLEAN UP THE TOXICS AT THE LAB BE-FORE ANY CONSIDERATION OF FUTURE BUILDING. THIS SHOULD NOT BE A "LONG-TERM GOAL". IT SHOULD BE AN <u>IMMEDIATE</u> GOAL. THE LONG TERM GOAL SHOULD BE TO KEEP IT FREE OF TOXICS EVER AFTER. BR-4

IF THE LAB IS UNDER THE REGULATORY AUTHORITY OF THE CALIFORNIA DEPT. OF TOXIC SUBSTANCES, HOW DOES THIS CONFORM WITH REGULATORY AGENCIES AT NATIONAL LEVEL? BR-5

THE PUBLIC WAS INVITED TO COMMENT ON LBNL'S DRAFT EIR, AND WE RECEIVED THE OUTCOME OF THAT IN A DOCUMENT DATED JUNE 21, 2010, THE FINAL EIR, A STATE OF CALIFORNIA DOCUMENT: CEQA: CALIFORNIA ENVIRONMENTAL QUALITY ACT.

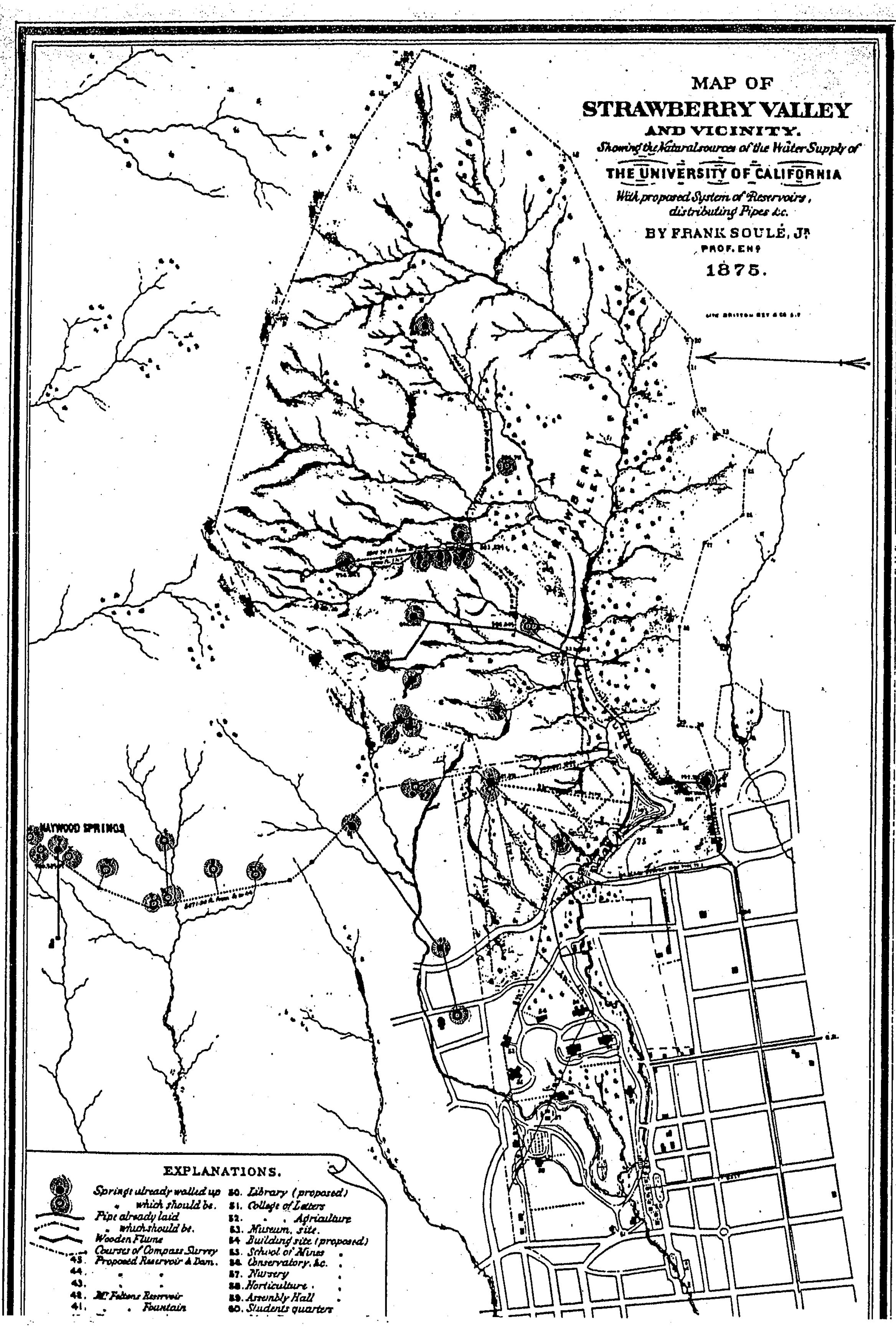
ONE WEEK LATER, HOWEVER, ON JUNE 28, 2010, A SECOND OPPORTUNITY APPEARED FOR CITIZEN COMMENT: A DRAFT ENVIRONMENTAL ASSESSMENT FROM THE DEPT. OF ENERGY, A NATIONAL DOCUMENT: NEPA: NATIONAL ENVIRONMENTAL POLICY ACT. BR-6

WILL THE TOXIC SUBSTANCES REGULATION BECOME MORE STRICT AT THE NATIONAL LEVEL? WHAT AGENCY WILL BE SUPERVISING THE FUTURE CLEAN-UP? BR-7

AND FINALLY I WOULD LIKE TO COMMENT ON LBNL'S RESPONSE, " EVEN THOUGH THE GROUNDWATER IS NOT USED AS A SOURCE OF DRINKING WATER".
GROUNDWATER BY ITS NATURE IS A SHARED RESOURCE. LBNL MAY POSSIBLY CHOOSE NOT TO DRINK THE GROUNDWATER FROM A WELL ON ITS PROPERTY, BUT THE NEIGHBORS OF THE LAB MAY DRILL A WELL INTO THAT SAME AQUIFER WITH THE EXPECTATION OF BEING ABLE TO DRINK IT.
THE UNDERGROUND RESERVOIR OF WATER DOES NOT STOP AT THE LBNL FENCE-LINE. THE SAME APPLIES TO STRAWBERRY CREEK. IT IS A SHARED RESOURCE WITH THOSE DOWN- BR-8

STREAM. STRAWBERRY CREEK FLOWS THROUGH THE CITY OF BERKELEY. PEOPLE – AND ANIMALS – SHOULD BE FREE TO USE THE CREEK WITHOUT THREAT OF CONTAMINATION IN THE WATER. WHEN THE WATER REACHES THE BAY, AND SUBSEQUENTLY THE OCEAN, IT MUST BE FREE OF LBNL CONTAMINATION.

BR-8 cont.



MAP OF
STRAWBERRY VALLEY
AND VICINITY.
Showing the Natural sources of the Water Supply of
THE UNIVERSITY OF CALIFORNIA
With proposed System of Reservoirs, distributing Pipes &c.
BY FRANK SOULÉ, Jr.
PROF. ENG
1875.
HAYWOOD SPRINGS
EXPLANATIONS.
Springs already walled up
which should be.
Pipe already laid
which should be.
Wooden Flume
Courses of Compass Survey
45. Proposed Reservoir & Dam.
44.
43.
42. Mr. Feltons Reservoir
41. Fountain
50. Library (proposed)
51. College of Letters
52. Agriculture
53. Museum, site.
54 Building site (proposed)
55. School of Mines
56. Conservatory, &c.
57. Nursery
58. Horticulture
59. Assembly Hall
60. Students quarters

BR-9

INCLUDED IS A MAP OF STRAWBERRY VALLEY, 1875, "SHOWING THE NATURAL SOURCES OF THE WATER SUPPLY OF THE UNIVERSITY OF CALIFORNIA" PREPARED BY FRANK SOULÉ, JR., PROF. ENG.

THIS MAP HAS BEEN PHOTOCOPIED, PROBABLY MANY TIMES, SO THAT IT IS SOMEWHAT DIFFICULT TO PIN-POINT EACH OF THE SPRINGS SHOWN ON THE MAP, SO I HAVE MARKED AS MANY AS I COULD FIND IN RED. NO DOUBT THE ORIGINAL MAY BE FOUND IN U.C. ARCHIVES. UNFORTUNATELY THE U.C. BERKELEY "WATER RESOURCES CENTER ARCHIVES" SEEMS TO BE IN THE PROCESS OF BEING DISPERSED TO VARIOUS LOCATIONS STATEWIDE, TO ITS DETRIMENT.

BR-9 cont.

MY POINT IS THAT IT HAS BEEN KNOWN FOR A LONG TIME THAT THERE EXISTS PLENTIFUL AMOUNTS OF FRESH WATER IN THE AQUIFERS, SPRINGS AND CREEKS OF STRAWBERRY CANYON, AND IT SHOULD COME AS NO SURPRISE THAT BUILDINGS PLACED THERE WOULD HAVE HYDROLOGIC ISSUES.

UNDERGROUND WATER WILL BE AFFECTING THE STABILITY OF BUILDINGS; ADD COSTS TO CONSTRUCTION; CONTRIBUTE TO LANDSLIDES, SOIL CREEP, EROSION; AND THRU FISSURES IN THE BEDROCK, ALLOW TOXIC SUBSTANCES KNOWN TO BE PRESENT AT LBNL, AND IN THE SOIL, TO ENTER INTO THE AQUIFER AND THE SURFACE DRAINAGE SYSTEM AS WELL.

PLEASE INCLUDE EITHER MY COPY OF SOULÉ'S MAP IN YOUR ENVIRONMENTAL ASSESSMENT REPORT, OR A MORE SUPERIOR VERSION FROM YOUR ARCHIVES. I AM ALSO INCLUDING TWO RECENT NEWSPAPER ARTICLES ABOUT THE WATER ARCHIVES AND THE UNIVERSITY'S ATTEMPTS TO CONSERVE WATER BY INSTALLING AERATORS AND SHOWER TIMERS ON CAMPUS. THESE ARTICLES POINT UP THE FACT THAT THERE ARE GAPS IN THE WAY THAT THE UNIVERSITY OF CALIFORNIA IS MANAGING ITS WATER RESOURCES AND ITS USAGE. YOU MAY ELIMINATE THESE TWO NEWSPAPER ARTICLES FROM YOUR E.A., SINCE THEY PERTAIN TO THE CAMPUS. YET, AS IS STATED IN THE D.O.E. DOCUMENT: "LBNL IS OPERATED BY THE UNIVERSITY OF CALIFORNIA..." AND, "DRINKING WATER IS SUPPLIED TO LBNL AND THE CITIES OF BERKELEY AND RICHMOND BY THE EAST BAY MUNICIPAL UTILITY DISTRICT (EBMUD)." THE SURVIVAL OF HUMANS ON THIS PLANET MAY HINGE ON WHETHER WE <u>ARE ABLE TO UNDERSTAND EARTH'S NATURAL SYSTEMS</u> AND NOT ABUSE THEM. ALL OF EARTH'S SYSTEMS - PLANTS ANIMALS, HUMANS, WEATHER, OCEANS, MARINE LIFE - WE ALL RELY ON WATER. WE MUST BE GOOD STEWARDS OF WATER IF WE ARE TO SURVIVE. BR-10

I WOULD LIKE TO SEE A MORE THOROUGH DISCUSSION OF THE HYDRAUGERS AND STORM WATER MENTIONED IN IV.C.3. PLEASE INCLUDE FACTS ABOUT THE LANDSLIDES THAT TRIGGERED THE NEED FOR THE HYDRAUGERS. DID THE HYDRAUGERS SOLVE THE IMMINENT LANDSLIDE PROBLEM? BR-11

I WOULD ALSO LIKE YOU TO INCLUDE INFORMATION ON THE WELL OR WELLS THAT WERE SUBSEQUENTLY DRILLED. WHAT IS THE FLOW FROM DRILLED WELL(S)? WHAT USE IS MADE OF THAT WATER? PLEASE INCLUDE RESULTS OF WATER QUALITY TESTS. BR-12

IT IS IMPORTANT THAT A MAP OF THE HYDROLOGY OF THE CANYON BE INCLUDED. IT SHOULD INCLUDE THE LOCATION OF HYDRAUGERS, WELLS, STORAGE TANKS, PIPES, CULVERTS, STORM DRAINS, SANITARY SEWERS, INLETS ETC.; ALL OF THE INFRASTRUCTURE THAT HAS BEEN INSTALLED SINCE THE TIME OF SOULÉ, IN FACT.

THIS IS PARTICULARLY IMPORTANT IN THE LIGHT OF THE FACT THAT WATER RUNS DOWNHILL. AT THE BASE OF LBNL LIES THE HAYWARD FAULT... AND OF COURSE, MOST OF THE CITY OF BERKELEY. ANY OF LBNL'S PIPES, CULVERTS, STORM DRAINS, AND SANITARY SEWERS THAT CROSS THE FAULT WILL LIKELY BE SEVERED AND RENDERED INOPERATIVE BY A MAJOR RUPTURE OF THE FAULT. BR-13

WHAT ARE LBNL'S EMERGENCY PLANS IN THIS REGARD? PLEASE BE SPECIFIC.

THE USE, HAZARDS, AND DEMOLITION OF TRAILERS.

III. B. 3

WHAT WAS THE JUSTIFICATION OF BRINGING TRAILERS TO THE LAB?

WAS THERE A PLAN TO UTILIZE TRAILERS ON THE HILL OR WAS IT MORE OF AN EXPEDIENT MEASURE TO HOUSE A PARTICULAR EXPERIMENT, OR TO ACCOMMODATE A PRESTIGEOUS PROFESSOR, OR BECAUSE FUNDING SUDDENLY BECAME AVAILABLE.

MY POINT HERE IS THAT IF THE TRAILERS APPEARED SUDDENLY AND RANDOMLY, AND IF THEIR ARRIVAL WAS NOT WELL THOUGHT OUT, THEN WHEN LBNL IS THINKING OF DEMOLISHING THEM AND REPLACING THEM WITH LARGE, MODERN AND EXPENSIVE BUILDINGS, IT MIGHT BE AT LEAST WISE TO EXAMINE THE ORIGIN OF THE INITIAL TRAILERS. IF THE REASONS FOR BRINGING IN THE TRAILERS WAS SOMEHOW FLAWED, THE IDEA OF REPLACING THE TRAILERS WITH PERMANENT BUILDINGS WOULD BE LIKE BUILDING ON A FLAWED FOUNDATION.

HAVE YOU A HISTORICAL SUMMARY OF THE DATES AND USES OF THE VARIOUS TRAILERS? LIKELY THERE WERE NO PERMITS INVOLVED BUT LBNL COULD AT LEAST DISCUSS THIS IN THE ENVIRONMENTAL ASSESSMENT.

BR-14

REGARDING THE USE OF TRAILERS AT LBNL:
IN SOME RESPECTS TRAILERS MIGHT BE THE IDEAL 'BUILDING' ON THE HILL. THEY ARE LOW-LYING, A SINGLE STORY, WITH ESCAPE EXITS NEAR AT HAND. IF THE TRAILER SHOULD HAPPEN TO SLIDE DOWN HILL IN A LANDSLIDE, THE WHOLE TRAILER WOULD PROBABLY SLIDE AS A UNIT.

ARE YOU ABLE TO FIND DOCUMENTATION OF THIS TYPE OF THINKING IN YOUR ARCHIVES? THE REASON FOR TRAILERS?

BR-14 cont.

A LARGE, GLASSY, MODERN BUILDING SUCH AS THE PROPOSED GENERAL PURPOSE LAB SEEMS SO OUT-OF-CHARACTER WITH THE ENVIRONMENT OF THE CANYON.

THIS IS NOT TO SAY THAT EXPERIMENTS OF THE 2000's MUST BE HOUSED IN TRAILERS BUT ONLY THAT IT WOULD BE WISE TO CONSIDER ALTERNATIVES TO THE TRADITIONAL GENERIC LARGE GLASSY BUILDING: IF LBNL PREFERS THIS TYPE OF CONSTRUCTION, THEN IT WOULD BE PRUDENT TO LOOK AT OTHER BUILDING SITES. (YOUR ALTERNATIVES III.C.2 and 3.)

BR-15

SINCE THE INCEPTION OF THE LAB ON THE HILL IN THE 1940s, HAD ONLY A FEW SMALL EXPERIMENTS BEEN DONE IN A FEW SMALL TRAILER-LIKE FACILITIES, THERE WOULD LIKELY NOT BE THE COMMUNITY OBJECTIONS THAT ARE THE RESULT OF LBNL's ENORMOUS EVER-INCREASING ACTIVITIES AND BUILDING PROJECTS IN A HIGHLY UN-SUITABLE LOCATION. IT IS THE LOCATION, THE SCALE, AND IN SOME CASES THE NATURE OF THE EXPERIMENTS BEING DONE, THAT WORRIES THE CITIZENS AND NEIGHBORS.

BR-16

IV.B.6 SOILS

THIS SECTION SHOULD BE REMOVED FROM IV.B, "ISSUES DETERMINED NOT TO WARRANT FURTHER CONSIDERATION", AND MOVED TO IV.C, "ISSUES DETERMINED TO WARRANT FURTHER CONSIDERATION", WHERE THERE IS AN OPPORTUNITY TO CONSIDER EROSION, RUN-OFF, SLOPE, LANDSLIDES, etc. WITH CLAY SOIL THERE WILL BE SHRINKAGE AND SWELLING. THE "ATTACHMENT TO BEDROCK" THAT YOU MENTION SOUNDS SUBSTANTIAL, BUT THAT BEDROCK IS ACTUALLY WEAK. BR-17

IV.B.7 INTENTIONAL DESTRUCTIVE ACTS

THIS SECTION SHOULD SIMILARLY BE MOVED TO IV.C TO ALLOW FOR FURTHER CONSIDERATION. SINCE LBNL ACTIVITIES SEEM TO REQUIRE CONSTANT SURVEILLANCE AND GUARDED PERIMETERS THESE ACTIVITIES ALSO EXPOSE RESIDENTS OUTSIDE OF THE FENCE TO DANGER SHOULD SOMETHING UNTOWARD HAPPEN. YOUR DOCUMENT CLAIMS THAT PHASE 2B PROJECTS "WOULD NOT RESULT IN A CHANGE TO THE RISK OF INTENTIONAL DESTRUCTIVE ACTS". BUT BY SUBSTITUTING A LARGE MODERN BUILDING FOR TRAILERS COMMITS LBNL FAR INTO THE FUTURE...AND TERRORISM SEEMS TO BE ON THE RISE. BR-18

V.C.3. WATER RESOURCES. Comments also applicable to other sections

LBNL SEEMS TO PUT GREAT EMPHASIS IN ITS ENVIRONMENTAL ASSESSMENT DOCUMENT ON THE SUPPOSITION THAT THE NEW G.P.L. PROJECT WILL NOT FURTHER DAMAGE THE ENVIRONMENT: "PREVIOUSLY DEVELOPED LAND... NO CHANGES IN RUN-OFF OR GROUNDWATER INFILTRATION... WOULD NOT CONTRIBUTE TO LOSS... NO INCREASES....". A LARGE PART OF WHAT THE COMMUNITY IS OBJECTING TO IS THE DAMAGE THAT HAS ALREADY BEEN DONE! TO SAY THAT ANY NEW PROJECT WON'T MAKE IT WORSE IS TO MISS THE POINT ENTIRELY. THE ACTUALITY IS THAT BUILDING A LARGE STATE-OF-THE ART STRUCTURE AS A 'REPLACEMENT' FOR SOME SMALL FALLING-APART STRUCTURES ESCALATES THE PROBLEMS, AND COMMITS EVERYONE INVOLVED TO A CERTAIN COURSE OF ACTION FOR A LONG, LONG TIME. BR-19

"MINIMAL IMPACT... ONLY 8% ADDED IMPERVIOUS SURFACE .... REMOVAL OF 9.5 ACRES OF HABITAT... REMOVAL OF 5 ACRES... LOSS OF 3.14 ACRES..."

THESE ARE <u>CUMULATIVE IMPACTS</u>, PAGE 158 LISTS ADDITIONAL PROJECTS, HUGE PROJECTS, QUITE NEARBY. ALL OF THE MANY PROJECTS THAT HAVE BEEN ADDED TO THE HILL SINCE 1940 TO THE PRESENT ARE ACCEPTED AS "BASELINE". AS IN "OH, ALL THOSE OTHER BUILDINGS AND PROJECTS, WELL, WE WONT MAKE IT ANY WORSE, SO ITS OK." BR-20

V. C. and Alternatives.

THIS REPORT STATES THAT TRITIUM, RADIO-ACTIVE MATERIALS, V.O.C.s etc. HAVE BEEN RELEASED IN THE AREA IN THE PAST, AND YET ASKS US TO BELIEVE THAT THERE IS NOTHING TO WORRY ABOUT AT PRESENT. IT BASICALLY ASKS CONCERNED CITIZENS TO TRUST THE AGENCIES THAT CAUSED THE CONTAMINATION TO BE THE AGENCIES THAT WILL DETERMINE OUR SAFETY NOW. THIS IS INADEQUATE. THE ALTERNATIVE CHOSEN MUST THUS BE A "NO PROJECT" ALTERNATIVE, OR ELSE, A FULL ENVIRONMENTAL IMPACT STUDY: E.I.S. **BR-21**

AS TO THE "REDUCED PROJECT" ALTERNATIVES, IT HAS BEEN STATED IN THE E.A. THAT THOSE ALTERNATIVES DO NOT MEET MODERN RESEARCH PROGRAM NEEDS.

THE POINT IS EXACTLY THAT.

HAPHAZARD BUILDING WAS ALLOWED ON THE HILLSIDE FOR OVER 60 YEARS, AND NOW, BECAUSE IT WAS DONE, LBNL BELIEVES THAT WE AS A NATION, AS A STATE, OR AS A UNIVERSITY, MUST REBUILD THE MESS TO A HIGHER STANDARD. I WOULD ARGUE FOR THE OPPOSITE CONCLUSION: THE LAB AS IT IS, HAS BEEN BUILT IN HELTER-SKELTER FASHION AS OPPORTUNITIES PRESENTED THEMSELVES, AND THAT IF IT DOES NOT MEET MODERN NEEDS, IT SHOULD BE GRADUALLY PHASED OUT, AND REMOVED FROM ITS BASICALLY UNSUITABLE HILLSIDE LOCATION. **BR-22**

AT THE VERY LEAST, A FULL ENVIRONMENTAL IMPACT STUDY IS CALLED FOR.

Universities to obtain UC Berkeley water archive

Officials say move of documents to UC Riverside, Cal State San Bernardino will help cut costs

By Mike Taugher
mtaugher@bayareanewsgroup.com

The West's premier archive of historical materials about water development is being moved from UC Berkeley to two universities in Southern California.

The Water Resources Center Archives, a unique collection of technical reports, speeches, photographs and other historical materials, has been housed at the Berkeley campus for more than a half-century.

However, budget worries and concerns that the Agriculture and Natural Resources Division of the UC president's office lacked the expertise to maintain the archive led university officials to seek proposals from other schools interested in housing the collection.

Late last week, UC Senior Vice President Dan Dooley announced

See **ARCHIVES,** *Page 7*

SUPPLEMENTARY MATERIAL

BR-23

Archives

From page 1

that the archive would be moved to libraries at UC Riverside and Cal State San Bernardino.

In making the announcement, UC officials said that UC Riverside has a record of expanding digital access to materials about agriculture and the environment.

The materials, including 200,000 technical reports and thousands of photographs, maps, newsletters speeches and other documents, are scheduled to be moved beginning this fall.

"We have a strong interest in preserving and digitizing the collection for the future ... to ensure the widest research access to all of the archive's contents," UC Riverside librarian Ruth Jackson said.

The school plans to charge for Internet access to the materials, which now are available for free.

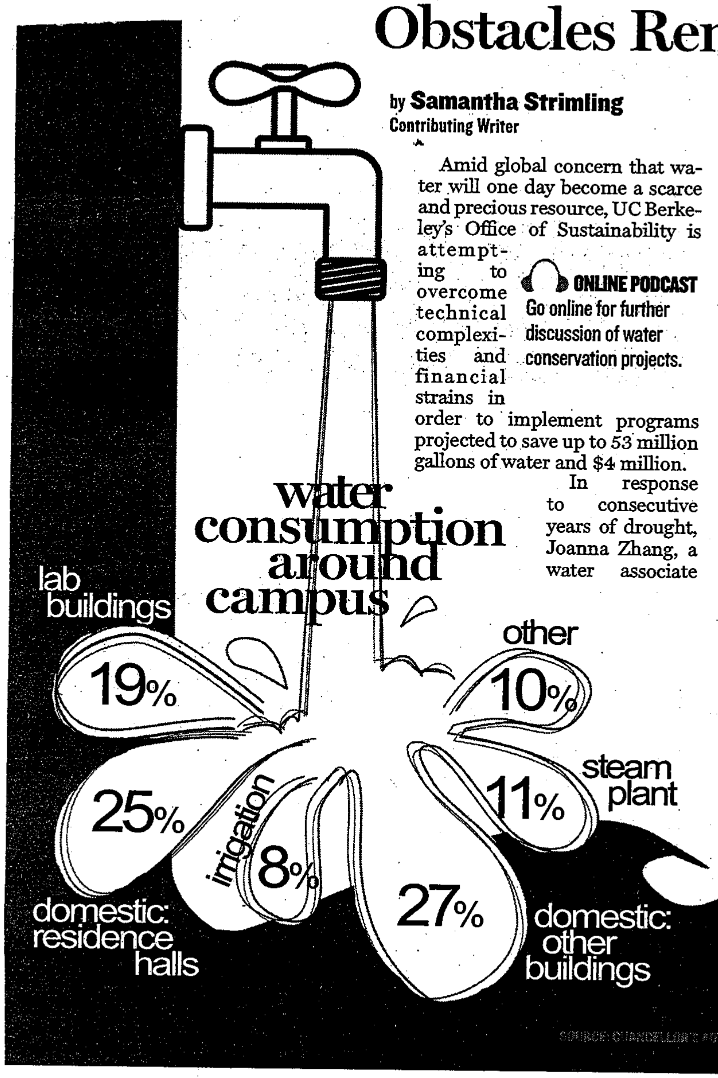
"I think it's sad that we're going to be leaving Berkeley after 51 years, but I look forward to the water archive continuing to serve UC and the California water community from the Riverside campus," said Linda Vida, librarian and archive director for more than 17 years. She is one of four employees at the archive.

The collection is open Monday through Friday from 10 a.m. to 5 p.m., but Vida said it was unknown whether it would remain open on the Berkeley campus after July.

Contact Mike Taugher at 925-943-8257.

Obstacles Remain in Campus Efforts to Conserve Water

by **Samantha Strimling**
Contributing Writer



Amid global concern that water will one day become a scarce and precious resource, UC Berkeley's Office of Sustainability is attempting to overcome technical complexities and financial strains in order to implement programs projected to save up to 53 million gallons of water and $4 million.

ONLINE PODCAST Go online for further discussion of water conservation projects.

In response to consecutive years of drought, Joanna Zhang, a water associate for the Chancellor's Advisory Committee on Sustainability, published a report in March detailing the campus's current water conservation plans and goals. The report used and expanded upon data from UC Berkeley alumna Jubilee Daniels' 2005 master's thesis, which has inspired some campus water conservation initiatives.

One large-scale project is the replacement of faucet aerators to reduce the rate of water flow — an inexpensive way to reduce water use because aerators are donated by East Bay Municipal Utilities District (EBMUD), leaving only the cost of labor, said Lisa McNeilly, director of the Office of Sustainability.

During 2008 and 2009, student group Building Sustainability at Cal discovered that more than 300 aerators could be replaced to save water, said Claire Evans, the group's lead program coordinator, in an e-mail. They worked with Physical Plant-Campus Services to install the new aerators, which reduce water flow from about two gallons per minute to 0.5 gallons per minute.

The chancellor's advisory committee has since uncovered about 700 more aerators to be replaced, McNeilly said, amounting to water savings of approximately 6.5 million gallons annually. The campus will begin installing these aerators in the coming months.

According to McNeilly, progress is already observable in the campus irrigation system, which currently makes up 8 percent of water use.

"Ninety percent of irrigation systems are now connected to a weather system that regulates how much water is released," she said. "This is an area where we have definitely seen success."

Such successes have inspired the Office of Sustainability to do more to conserve water. They are considering launching pilot programs in the future, such as installing shower timers with red lights to encourage students to reduce the length of their showers.

"Sometimes you need to do something, see the success, and that gives you the momentum to do something else," McNeilly said.

However, other projects inspired by the 2005 thesis are riddled with complications, making them expensive to implement. The challenge of maintenance has inhibited the installation of more waterless urinals beyond the ones installed in 2008 in the Martin Luther King Jr. Student Union.

"There is a different kind of cleaner and filter, and we must train the (maintenance) staff," said Christine Shaff, communications director for the campus Department of Facilities Services. "All of our pipes are installed to have a certain volume of liquid go through them, (which is) done by installing them at a certain angle. If there is more liquid, we put the pipes at an angle not as steep. If we don't replace all the pipes, there will not be as much water, so urine will just sit in the pipes and corrode them."

Such complications mean toilet and urinal renovations are only done during whole-bathroom renovations.

According to McNeilly, similar technical complexities involved in renovating single-pass cooling systems in laboratories as well as the variations among laboratories have prohibited substantial reduction of water use in laboratories, which constitute about 19 percent of campus water use.

Making campus water data available has also been complicated by technical issues. In addition to the four meters EBMUD uses for billing, Physical Plant-Campus Services monitors meters on almost every building on campus. Over 23 meters are "state of the art," McNeilly said, showing the water used in 15-minute increments. However, the software used to read the data is "not very user-friendly," and there are no definite plans to install better software.

According to McNeilly, another inhibitory cost is that involved in buying water-efficient parts for domestic water use systems, especially because EBMUD does not always give rebates for necessary parts.

"There was a gym that wanted to buy a low-flow showerhead," McNeilly said. "EBMUD only offered a residential one meant to (be used) two to three times a day, so the gym had to buy (the showerheads) at full cost."

Despite the complications and costs of water conservation, Daniels said continuing efforts are necessary.

"It is important to not just teach about sustainability but to show through how we operate the school that sustainability can be put into practice," she said.

Contact Samantha Strimling at sstrimling@dailycal.org.

Monday, July 26, 2010

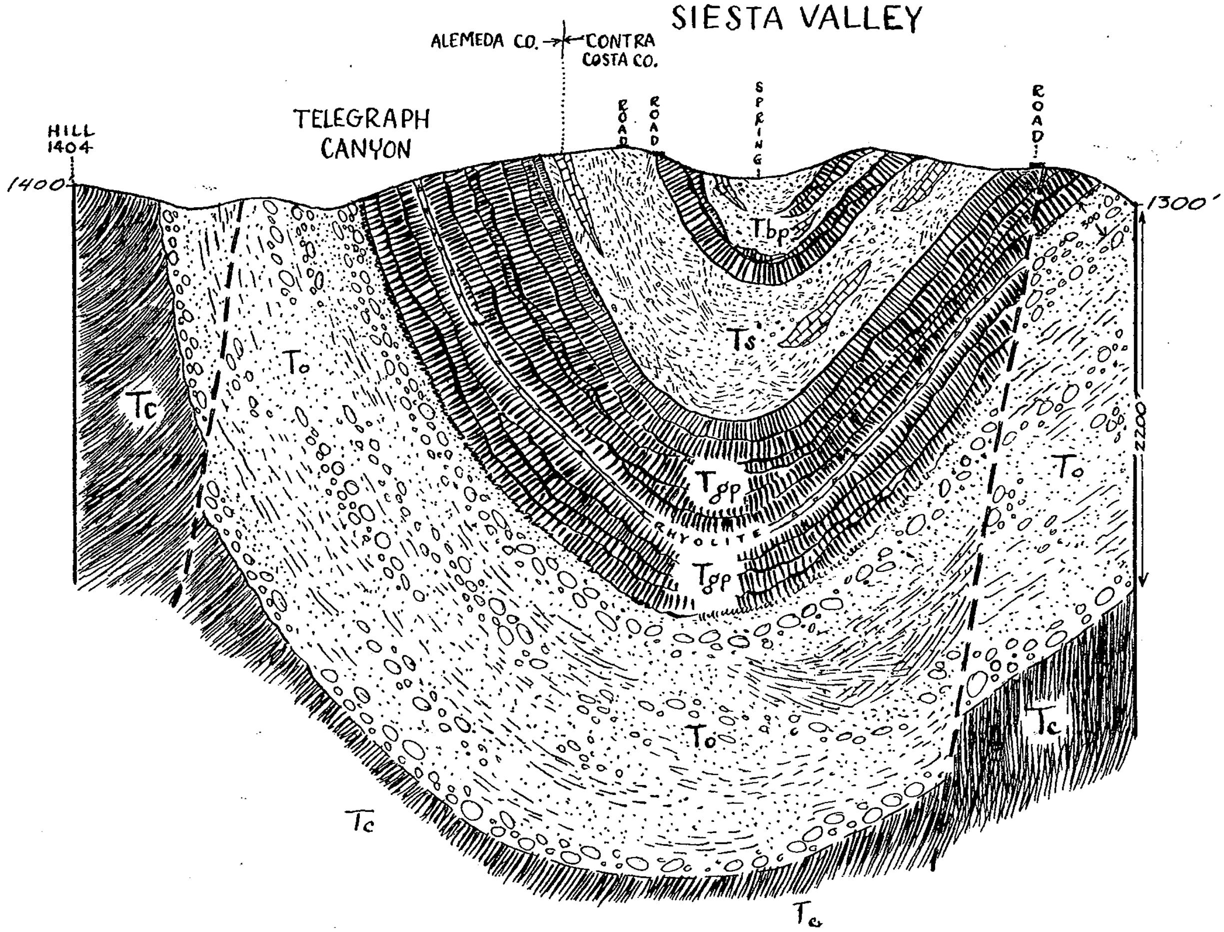
BR-24

A COMMENT ON THE ERRATA OF JUNE 29, 2010 FINAL ENVIRONMENTAL IMPACT REPORT:

I HAD REQUESTED A GEOLOGIC CROSS-SECTION FOR THE AREA IN QUESTION. IT WAS ADDED AS A NOTICE OF ERRATA.

I MUCH PREFER MY OWN DRAWINGS (ENCLOSED) MADE WHEN A STUDENT AT U.C. BERKELEY IN GEOLOGY AND SOIL SCIENCE. I BELIEVE THE INFORMATION IS PRESENTED IN A MORE HELPFUL AND VISUAL WAY. PERHAPS YOU COULD DO SOMETHING SIMILAR TO HELP READERS UNDERSTAND THE UNDERLYING ROCK FORMATIONS OF THE AREA. TO MANY PEOPLE, "BEDROCK" MEANS "SOLID". THAT IS NOT THE CASE IN MUCH OF THE MATERIAL THAT UNDERLIES THE LAB BUILDINGS.

BR-25



BR-25 cont.

CROSS-SECTION (A-A')

1 inch = 1000 feet

Tbp	Bald Peak fm.
Ts	Siesta fm.
Tgp	Grizzly Peak fm.
To	Orinda fm.
Tc	Claremont fm.

Bald Peak fm.
olivine basalt, limestone
clay, sandstone, cgs.

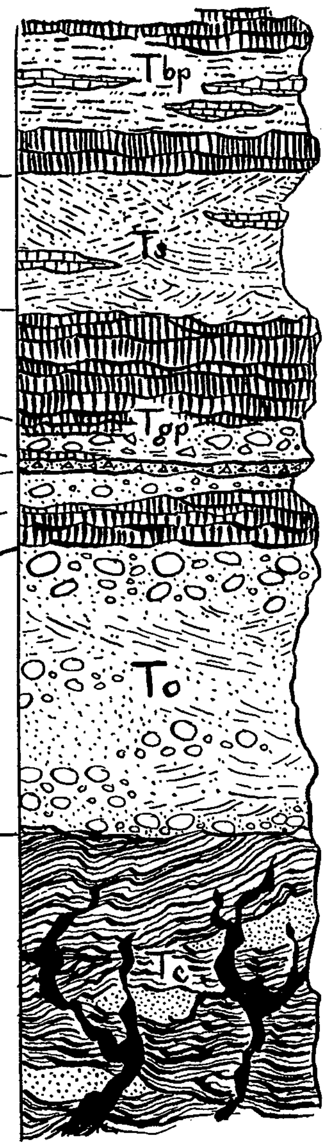
Siesta fm.
clay, mudstone, sandstone

Grizzly Peak fm.

upper flow - basalt	"e"
sediment	"d"
rhyolite tuff	"c"
sediment	"b"
lower flow - basalt	"a"

Orinda fm.
conglomerates, sandstones
mudstones, siltstones.

Claremont fm.
interbedded chert-shale
sandstone lenses, diabase
dikes



BR-25
cont.

Stratigraphic Column
Berkeley Hills

1 inch = 1000 feet

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT REPORT, GENERAL PURPOSE BUILDINGS, PHASE 2 PROJECT, FOR UNIVERSITY OF CALIFORNIA, LAWRENCE BERKELEY NATIONAL LABORATORY, BERKELEY, CALIFORNIA.

SUBMITTED TO
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UC-LBNL ENVIRONMENTAL PLANNER
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BY
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15 MARCH 2010

BR-26

COMMENTS ON D.E.I.R., SEISMIC LIFE SAFETY, MODERNIZATION, AND REPLACEMENT OF GENERAL PURPOSE BUILDINGS, PHASE 2.

THANK YOU FOR SENDING ME A COPY OF THE REPORT. IT IS A LARGE THICK DOCUMENT, BUT NICELY DONE. IT WOULD BE AN IMPOSSIBILITY TO COMMENT ON THE DOCUMENT WITHOUT HAVING IT IN HAND, SO I DO THANK YOU FOR THAT. IN THE FUTURE I THINK THAT IT IS IMPERATIVE THAT YOU ORDER COPIES ENOUGH FOR ALL INTERESTED AND AFFECTED CITIZENS. ALSO, I PERSONALLY RECEIVED A LETTER INFORMING ME OF BOTH THE DOCUMENT AND THE PUBLIC COMMENT SESSION, AND THAT WAS HELPFUL. I DO WONDER HOW MANY OF THESE LETTERS WERE SENT OUT, AND WHETHER THIS INFORMATION WAS AVAILABLE WIDELY, OR ONLY TO A FEW OF US WHO HAD PREVIOUSLY COMMENTED ON OTHER LBNL PROJECTS.

ALSO: IF THIS DOCUMENT IS ONLY A CEQA DOCUMENT, HOW WILL CITIZENS BE ABLE TO COMMENT ON THE NEPA DOCUMENT? PLEASE FORWARD TO ME THE NEPA DOCUMENT AS IT BECOMES AVAILABLE. p. 1-2

I ALSO REQUEST A COPY OF THE FINAL EIR FOR THIS PROJECT. p. 1-4

BR-26 cont.

PERHAPS WHAT IS CALLED FOR IN THE WAY OF DRAFT E.I.R. COMMENTS ARE SPECIFIC QUESTIONS SUCH AS:

> THE MAP ON p. 3-4 SHOWS THE BUILDINGS OF THE LBNL BUT IT FAILS TO SHOW ANY PART OF BERKELEY THAT CITIZENS MAY BE FAMILIAR WITH, BECAUSE ALL OF THE AREA SHOWN IS OFF-LIMITS TO US. IS BLACKBERRY GATE THE ONE AT THE TOP OF HEARST AVENUE? COULD HEARST AVENUE AND CENTENNIAL DRIVE PLEASE BE LABELLED? "OLD TOWN" IS MENTIONED IN THE TEXT, BUT IT IS NOT LABELLED ON THE MAP.

INSTEAD, AGAIN AND AGAIN AS I READ YOUR DRAFT E.I.R., I AM COMPELLED TO SAY ONLY THAT:

> NO FURTHER CONSTRUCTION SHOULD TAKE PLACE UPON THE HILL.

THE REGENTS ARE SCHEDULED TO CONSIDER THE FINAL E.I.R. AND THEY WILL HAVE THE DOCUMENT IN HAND FOR 10 DAYS PRIOR TO THEIR DECISION. THIS IS HARD FOR ME TO UNDERSTAND. WILL THE FINAL E.I.R. BE AVAILABLE TO ME BY THAT TIME? WILL OUR PUBLIC COMMENTS BE INCLUDED IN THE FINAL E.I.R OR WILL THEY JUST BE SUMMARIZED AS THEY WERE ON p. 2-2.C, "AREAS OF CONTROVERSY".

THIS PRESENT DRAFT E.I.R. IS AN INTERESTING DOCUMENT, AN IMPROVEMENT OVER SEVERAL PREVIOUS LBNL E.I.R.s. THE PHOTOGRAPHS AND MAPS ARE CLEAR, AND THE WRITING IS WELL DONE. THAT LEADS TO THE QUESTION OF THE TOTAL COST OF PREPARING THE DOCUMENT.

BR-26 cont.

IT HAS BEEN SAID TO ME THAT COPIES OF THE REPORT ARE TOO COSTLY FOR DISTRIBUTION TO THE PUBLIC. BUT THAT IS THE PURPOSE OF IT!
SURELY THE COST TO PREPARE THE DOCUMENT FAR OUT-WEIGHS THE COST OF THE COPIES. THE LAB NEEDS TO PROVIDE COPIES IN RESPONSE TO HONEST REQUESTS. IT IS MUCH TOO LARGE AND COMPREHENSIVE A DOCUMENT TO BE ABLE TO BE REVIEWED IN A LIMITED LIBRARY SETTING. LOOK AT THE EXPENSE OF PROVIDING COPIES THIS WAY: THE AVERAGE WORKER PREPARING THE DOCUMENT EARNS X DOLLARS PER HOUR. WE WHO ARE REVIEWING THE DOCUMENT AND WRITING COMMENTS ARE SIMILARLY PUTTING IN AN EQUAL EFFORT. YOU DO NOT PAY US. BUT YOU SHOULD AT LEAST CONTRIBUTE ENOUGH DOLLARS TO OUR EFFORTS SO THAT WE CAN BE PROVIDED WITH THE DOCUMENT NECESSARY FOR OUR WORK ON IT.

BR-26
cont.

COMMENTS

"THE PROJECT AIMS TO PROVIDE SEISMICALLY SAFE FACILITIES ... REPLACING THE DEMOLISHED SPACE.... BUILT TO HIGHER SEISMIC SAFETY STANDARDS" p1-1.A.

The problem here is that the site chosen is basically NOT seismically safe. It is wishful thinking to believe that a structure, however new and wanted, will ever be actually 'seismically safe' when the Hayward fault ruptures. Your employees there will be given a false sense of security, but because of the location of the project, will actually still be in danger. The other problem is that, in order to strive for seismic safety in a basically un-safe location, larger amounts of money will be required - and that is our money, our taxes that are being spent to engineer this building; more money than if the buildings were located in a safer area.

"CONSTRUCTION OF THE EFFICIENT NEW BUILDING WILL ALLOW LBNL TO VACATE 36,000 g.s.f. OF OFF-SITE LEASED SPACE". p.1-5.

The problem is that instead of moving lab activities away from this unstable and unsuitable area, plans are being made to move yet more people and activities in. This should not be done, in my opinion. If an un-safe building needs to be demolished, then do so in a safe way, but do not build additional buildings, whether you consider them to be "replacement" buildings or not.

BR-26 cont.

CUMULATIVE IMPACTS p.2-9. F.

the combination of projects listed for the LBNL site along with those listed for the U.C. Campus is staggering in both number and size.
As a citizen of Berkeley with some hope of being able to continue living here, it is clear after reading these lists of projects that either quality of life will be seriously compromised, or that in a matter of time these two agencies will continue to encroach on previously privately owned property like a huge tsunami until there is nothing else left: just a gigantic monolithic U.C./LBNL Complex from one end of the city to the other, and no one left to pay the sewage and infrastructure bills.
To say that "an additional number of vehicles may possibly create need for a traffic signal" is to completely miss the impacts of this enormous building frenzy. I'm thinking that nowadays U.C. might better stand for the "University of Construction" or the "University of Cranes".
Everywhere one goes, one is likely to find a construction fence along with a sign "No Pedestrian Access".
this is a great inconvenience to pedestrians, who then have to cross two additional streets to continue on their way. These barricades seems to be erected in a quite off-hand manner. Had the barrier been across a vehicle route, I'm sure arrangements would be made to accomodate the vehicles: not so with pedestrians. the most egregious example of this is on Hearst Avenue, where a barrier to pedestrian access has been in place for years. It also blocks

BR-26 cont.

one lane of street traffic, and my observation has been that the blocked off area is used only to accomodate the personal vehicles of construction workers, in other words, a parking lot. Yet it is Hearst Avenue which is always designated as the route of choice for demolition and construction materials for LBNL.

I would like to see this matter of the blocked-off lanes and side walk on Hearst Avenue specifically addressed in your E.I.R.

BR-26 cont.

4.5 GEOLOGY AND SOILS.
POTENTIAL PROJECT IMPACTS 4.5 - 16
I HAVE TO DISAGREE WITH YOUR DECISION TO LABEL THESE PROJECTS AS "LESS THAN SIGNIFICCANT" AS REGARDING THE RISKS INVOLVED.
SECTION 4.5-15 DISCUSSES THE SOIL TYPES (unstable), THE SLOPE OF THE LAND (30, 50, 75% slopes), AND THE EROSION (by which I suppose you mean 'landslide') POTENTIAL (highly susceptible).
FROM READING THE SOILS ANALYSIS SECTION I WOULD THINK THAT THE IMPACT OF BUILDINGS ON THIS SITE WOULD POSE 'EXTREMELY HIGH SIGNIFICANCE' RISKS. I KNOW THIS ALSO FROM MY OWN KNOWLEDGE OF THE AREA SURROUNDING THE LBNL FENCE-LINE.
IT ALMOST SEEMS LIKE LBNL HAS NOT READ ITS OWN REPORT AT ALL. PERHAPS THERE IS A HOPE THAT NO ONE NOTICES THAT SOME CRUCIAL ITEMS HAVE BEEN DEEMED TO BE "UNIMPORTANT". THE MANNER IN WHICH SECTION 4.5-16 SO CASUALLY DISMISSES VERY IMPORTANT MATTERS, CASTS DOUBT ON THE VERITY OF THE ENTIRE DRAFT E.I.R. BR-26 cont.

THIS OPENS UP SEVERAL POSSIBILITIES FOR THE INQUIRING CITIZEN TO PONDER:

1. IF THE LAB RECEIVES A MAJOR PART OF ITS FUNDING FROM THE TAX-PAYERS IN ONE FORM OR ANOTHER, LBNL's CAVALIER ASSESSMENT OF THE RISKS MAY STEM FROM THE BELIEF THAT, SHOULD ANYTHING HAPPEN TO THE LAB FROM SOIL-CREEP, LANDSLIDES, EARTHQUAKES AND SO ON, THAT THE TAX-PAYERS WOULD PAY FOR A REBUILD, OR THAT THE TAX-PAYING CITIZENS ASSUME THE RISK FOR THE LBNL MANAGEMENT.

2. THE RESPONSIBLE ADMINISTRATORS NEED TO LOOK AT THE FACT THAT ANY NEW BUILDINGS, AND ANY OLDER BUILDINGS ALREADY ON THE SITE, MIGHT BE DESTROYED AND THAT IT COULD MEAN THE END OF LBNL.
BECAUSE INDIVIDUAL ADMINISTRATORS WOULD APPARENTLY NOT BEAR THE RISKS OF THEIR UNFORTUNATE DECISIONS TO BUILD ON UNSUITABLE LOCATIONS, THEY ARE EXPOSING TAX-PAYERS AND THE NEIGHBORING COMMUNITY TO THE RISKS, INCLUDING THE ENVIRONMENTAL HAZARDS LBNL WOULD LEAVE BEHIND, SHOULD THE FACILITY COLLAPSE OR SLIDE AWAY DOWNHILL. THE ADMINISTRATORS WHO MADE THE BAD DECISIONS COULD WALK AWAY FREE AND MOVE ON TO JOBS ELSEWHERE.

BR-26 cont.

SEC 4.5 - 16. D.   4.5 - 9.

THERE ARE KNOWN FAULTS IN OUR AREA. WE CAN CERTAINLY ALL EXPECT SOME FUTURE SHAKING FROM MORE THAN ONE OF THEM, BUT TO CONTINUE TO PLACE MAJOR BUILDING PROJECTS SO NEAR TO THE HAYWARD FAULT IS COMPLETELY IRRESPONSIBLE. THE LIKELY-HOOD OF EXTREME SHAKING, LIQUIFACTION, LAND-SLIDING AND RUPTURE IS SO GREAT THAT THE WELL-INFORMED PRUDENT PERSON WOULD DESIGNATE THE WHOLE OF STEEP STRAWBERRY CANYON AS A NATURE PRESERVE. THIS WOULD ALSO BENEFIT THE TENS OF THOUSANDS OF STUDENTS AND FACULTY OF THE U.C.B. CAMPUS.

IT SEEMS THAT SELF-INTEREST, ALONG WITH LACK OF PLANNING, HAS ALLOWED INDIVIDUALS OR GROUPS TO PARCEL OFF SELECTED SITES IN STRAWBERRY CANYON ... BECAUSE IT IS "CLOSE TO THE UNIVERSITY CAMPUS AND FOLKS LIKE TO GO BACK AND FORTH EASILY". THIS ARGUMENT DOES NOT HOLD SWAY WITH THE PUBLIC AT ALL.

SEC. 4.5-8 ADDRESSES THE ISSUES OF ALTERNATIVE PRACTICES VERY WELL:

1. "AVOID CONSTRUCTION ON KNOWN FAULTS OR LANDSLIDES"...
2. "DISCOURAGE DEVELOPMENT ON SLOPES..."
3. "UTILIZE LANDS SUBJECT TO SEVERE SEISMIC AND GEOLOGIC HAZARDS FOR LOW INTENSITY PARK AND RECREATIONAL ACTIVITIES OR OPEN SPACE."
4. "NOT LOCATE PUBLIC FACILITIES FOR HUMAN OCCUPANCY IN FAULT ZONE AREAS ..."

BR-26
cont.

3-17.6 "OFFICIAL STATE OF CALIFORNIA EARTH-QUAKE INDUCED LANDSLIDE HAZARD ZONE:"

"A SYSTEM OF BELOW-GRADE PIER FOUNDATIONS AND TIE-BACKS, AND ADDITIONAL BRACING AND GIRDERS, METAL CASINGS AND CONCRETE..."
IS THE ENGINEERING SOLUTION TO THE PROBLEM, BUT IT OVERLOOKS THE COMMON-SENSE SOLUTION, WHICH IS NOT TO BUILD THERE.

'MODERN NEW BUILDINGS' AND 'SEISMIC STRENGTHENING' AND 'VISTA CORRIDORS' AND 'FOOD SERVICES' JUST MAKE THE SITUATION WORSE. NO MORE BUILDING SHOULD BE DONE ON THE HILL.
BUILDINGS, AS THEY BECOME OBSOLETE OR HAZARDOUS SHOULD BE REMOVED OR ENCASED IN PLACE, WORKING TOWARD THE GOAL OF EVENTUALLY RESTORING THE HILLSIDE TO ITS NATURAL STATE. A NEW TYPE OF THINKING WILL BE REQUIRED.

THERE IS AN HONESTY IN THIS E.I.R. THAT WAS NOT PRESENT IN SOME PREVIOUS LBNL DOCUMENTS:
SEC. 4.1-5 STATES: "LBNL IS LOCATED ON A STEEP HILLSIDE.."
"THE BUILT ENVIRONMENT IS A RESULT OF 'AS-NEEDED' CONSTRUCTION ... PATHWAYS ENCROACH ON SERVICE AREAS ... BOX-LIKE GREY METALLIC STRUCTURES..."
THESE DESCRIPTIONS SHOULD GIVE LBNL ITSELF PAUSE.

1. THE FIRST BUILDING WAS BUILT TO ACCOMODATE SECRET WW II PROJECT...
2. ADDITIONAL PROJECTS IN EVER-INCREASING AMOUNTS...
3. BUILDINGS ERECTED IN HAPHAZARD FASHION...

BR-26 cont.

4. THE REAL REASON BUILDINGS ARE ADDED IS THAT IT IS CLOSE TO CAMPUS.
5. THE LAND IS OWNED BY U.C.
6. SCIENCE CAN ATTRACT FUNDS
7. A COMBINATION OF PROFESSORS AND THEIR EXPERIMENTS; GRADUATE STUDENTS LOOKING FOR EXPERIENCE WITH PAY AND LEADING TO ADVANCED DEGREES

BUT THE WHOLE THING IS BASED ON A HOUSE OF CARDS - THE LOCATION IS NOT SUITABLE!

BR-26 cont.

FIG. 3-5, AN AERIAL VIEW OF BUILDING 25 COMPLEX, THOUGH A LOVELY PHOTO GRAPH, IS SCARY IN THE EXTREME WHEN IT IS THEN POSSIBLE FOR AN ORDINARY CITIZEN TO VIEW THE CITY THAT HAS BEEN CONSTRUCTED UP THERE IN THAT CANYON. FROM WW II ONWARD, CONSTRUCTION APPARENTLY HAS JUST NEVER STOPPED. IT IS THE EVER-INCREASING NUMBER AND SIZE OF THE BUILDINGS THAT CONCERNS ME, ALONG WITH THE CONTAMINATION OF THE ENVIRONMENT AND THE POTENTIALLY HAZARDOUS NATURE OF THE EXPERIMENTS BEING CARRIED ON THERE. THE TOXIC LEGACY OF ALL THIS ACTIVITY HAS LEFT ITS MARK ON NOT ONLY THE SOIL OF THE LBNL, BUT ON THE GROUND-WATER AND THE SURFACE WATER WHICH IS SHARED BY ALL.

STRAWBERRY CREEK DRAINS THE CANYON BUT THEN FLOWS THRU THE CITY OF BERKELEY AND INTO THE BAY. U.C. STUDENTS DOING PROJECTS IN THE CREEK ARE INSTRUCTED TO WEAR PROTECTIVE EQUIPMENT BEFORE TOUCHING THE WATER OF THE CREEK. AND YET THE U.C SITE WAS ORIGINALLY SELECTED BECAUSE OF THE ABUNDANT FRESH-WATER SPRINGS SUITABLE FOR DRINKING WATER.' WHAT HAS HAPPENED UP THERE?

BR-26 cont.

4.0-2 3. "THE PROPOSED PROJECT WOULD RESULT IN RE-LOCATION OF APPROXIMATELY 100 U.C. L.B.N.L. PERSONNEL FROM A SITE ON POTTER STREET TO THE L.B.N.L. MAIN CAMPUS".

I believe that people should be re-located in the other direction: OFF the L.B.N.L. Hill Site.

4.0-4 TO 4.0-10. PROJECTS ON THE LBNL SITE.

THESE PAGES LIST THE 15 MAJOR PROJECTS PROPOSED OR UNDERWAY. EACH OF THESE PROJECTS INDIVIDUALLY IS HUGE, AND THE CUMULATIVE IMPACT OF THEM ALL IS FAR IN EXCESS OF THE AREA'S CUMULATIVE ABILITY TO BEAR THEM. THE CUMULATIVE IMPACTS ARE

TOO GREAT FOR THE CITY TO BEAR;
TOO GREAT FOR THE CITIZENS AND NEIGHBORS TO BEAR;
TOO GREAT FOR THE TAX-PAYERS ABILITY TO FUND;
TOO GREAT FOR THE AREA AND TYPE OF SITE;
and TOO GREAT FOR THE INFRASTRUCTURE,
TRAFFIC, NOISE, DUST, UTILITIES, SAFETY, SUNLIGHT, VIEWS, SCENIC VISTAS, LANDFILLS AND ALL ELSE LISTED IN YOUR D.E.I.R.

THE CUMULATIVE IMPACTS ARE IMMENSE. THEY ARE NOT 'LESS THAN SIGNIFICANT' IN ANY WAY.

BR-26 cont.

THE PHASE II GENERAL PURPOSE LABORATORY PROJECT SEEMS NOT TO CARRY AS MANY NEGATIVE ASPECTS AS SOME OF THE OTHER PREVIOUSLY PRO-POSED LBNL PROJECTS. HOWEVER IT REPRESENTS YET ANOTHER CONSTRUCTION PROJECT AND BUILDING CLUSTER ON THE HILLSIDE. IN SECTION AFTER SECTION THE REPORT STATES "OH, WE'LL PLANT TREES," OR "WE'LL COVER THE DEBRIS TRUCKS" OR "WE WILL RE-LOCATE ANY WHIPSNAKES WE FIND", AND THAT CAN LEAD THE CASUAL READER TO BELIEVE THAT ALL IS WELL ON THE HILL. BUT IT IS FAR FROM AN ACCEPTABLE OUT-COME FOR THE AREA AND THE CITIZENRY AS A WHOLE. THE HILLSIDE ALREADY IS MUCH TOO CONGESTED FOR SAFETY, BEING A LARGE, QUITE POSSIBLY TOXIC EXPERIMENTAL COMPLEX SITUATED ON A DANGEROUS, STEEP, UNSTABLE HILLSIDE LOCATION. RELOCATING A WHIPSNAKE OR WETTING DOWN CONSTRUCTION DUST SOUNDS LOVELY, BUT IT OBSCURES THE LARGER OVERALL PROBLEM.

BR-26 cont.

ADDENDUM TO MY COMMENTS.   10am 15 MARCH 2010

I HAVE JUST CALLED MR. MARK CHEKAL-BAIN, THE COMMUNITY RELATIONS DIRECTOR AT LBNL, TO INQUIRE ABOUT THE BEST METHOD TO SUBMIT MY COMMENTS, TODAY BEING THE DUE DATE... ONLY TO BE INFORMED THAT MR. CHEKAL-BAIN IS NO LONGER EMPLOYED AT THE LAB, HIS LAST DAY BEING FRIDAY.

YET IT WAS HE WHOSE CARD IS ATTACHED TO MY COPY OF THE DRAFT E.I.R., AND HE, ALONG WITH MR. JEFF PHILLIBER, WHO PRESIDED OVER THE PUBLIC COMMENT PERIOD ON FEB. 25.   AS FAR AS I KNOW, NO ONE HAS HAD ANY FORE-WARNING ABOUT THIS CHANGE IN PERSONNEL.

I HAVE HAD SEVERAL QUESTIONS ANSWERED BY MR. CHEKAL-BAIN IN THE PAST, AND I WONDER IF THE ANSWERS I GOT FROM MR. CHEKAL-BAIN WILL STILL BE VALID.   SO OFTEN IN THE PAST, WHEN DEALING WITH INSTITUTIONS, ONE EMPLOYEE WILL GIVE ONE ANSWER, WHILE A SUBSEQUENT PERSON WILL DENY KNOWLEDGE OF THAT AND INSTEAD WILL COME UP WITH SOMETHING QUITE DIFFERENT. I HOPE THAT WILL NOT BE THE CASE AT LBNL.

THIS ABRUPT CHANGE IN COMMUNITY RELATIONS DIRECTORSHIP JUST RE-ENFORCES MY OPINION THAT INSTITUTIONAL EMPLOYEES COME AND GO, AND THAT THEIR OWN PRIORITIES MAY TAKE PRECEDENCE OVER THE LONG-TERM WELL-BEING OF THE COMMUNITY AS A WHOLE.

BR-26 cont.

LETTER #SSC

SAVE STRAWBERRY CANYON
P.O. BOX 1234
BERKELEY, CALIFORNIA 94701

WWW.SAVESTRAWBERRYCANYON.ORG

REC'D JUL 2 9 2010

July 27, 2010

Kim Abbott, NEPA Document Manager
Office of Science
Department of Energy
One Cyclotron Road
Berkeley, California 94720

Re: Inadequate Environmental Assessment (EA) for Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project (Phase 2 Project)

Dear Mr. Abbott:

Having reviewed the EA for the Lawrence Berkeley National Laboratory (LBNL) Phase 2 Project, Save Strawberry Canyon (SSC) urges the Office of Science to determine that an Environmental Impact Statement (EIS) is required in order to be in compliance with the National Environmental Policy Act (NEPA). SSC, a non-profit organization with some 400 members, believes that the Canyon lands are a significant environmental resource of unique geological character, deserving of protection and preservation.

As LBNL continues to proceed in its efforts to implement its 2006 Long Range Development Plan (Plan), intending to build major research facilities on the Canyon hillsides, defined by unstable soils and a complex watershed, our concerns continue. Without a Site-wide EIS, the EA for the Phase 2 Project fails to adequately describe the affected environment, to assess the existing and potential environmental impacts and risks, and to consider a range of alternative choices that could fulfill the project building(s) purposes. SSC-1

Undertaking further federal action to implement the proposed Phase 2 Project, including the General Purpose Laboratory (Building 25) in Blackberry Canyon and the Hazardous Waste Handling Facility (Building 85 and 85A) in Strawberry Canyon, should not proceed without detailed analysis of the geological conditions of each site. In a glaring omission, the EA ignores the fact that the hill campus is encompassed by the western edge of a collapse caldera, formed after a volcanic eruption some 10 million years ago. The caldera presents geological dangers that deserve comprehensive assessment. SSC-2

It is troubling, furthermore, that the EA relies solely upon the LBNL California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) and the SSC-3

Phase 2 Project EIR for background information and analysis regarding the geology of the area. (Please see attachments #1, Letter, March 15, 2010, #2, Letter, July 9, 2010) le this reliance has led incorrectly to a conclusion that no significant impacts are likely. It is critical to note that the EA conclusions neither stand on their own merit, nor are they substantiated by the incomplete information in the Phase 2 Project EIR. Based on the lack of geotechnical analysis in the EA alone, the EA is an insufficient agency action. SSC-3 cont.

SSC refers to the Phase 2 Project EIR materials and in particular the Alan Kropp and Associates (AKA) reports:

- The AKA reports for Building 25 or the General Purpose Laboratory, cited in the Final EIR on disc and on the web, were only added to the web after their absence was reported to LBNL. As they were used in the " matrix" of the FEIR to contest points made by several individuals, they would appear to be important. SSC-4

- AKA, May 29, 2009, a preliminary report, made in two weeks "to meet LBNL's objectives," lays out the problems and what additional work will be necessary to help solve them.

  1) AKA's preliminary investigation of old boring logs are consistent with the presence of a paleolandslide under B25.

  2) Orinda Formation under the Lawrence Road (south and downhill from 25) is potentially part of a paleolandslide rather than in-place bedrock.

  3) Offsets in the curbs are not sufficient to evaluate historic slides. [Evidently AKA was not given access to the files on historic landslides.]

  4) The borings suggest very low factors of safety, although these may be based upon conservative measures.

  5) **Additional trenching is needed** (to establish whether the paleolandslide has moved recently.)

- AKA, April 2, 2010.

  Trenches 1 and 2 are mentioned but only T-1 (southwest of 25, 8' deep) appears on the map. There are no photos of the trench nor is it discussed. The "general sketch" at the end of the report is indeed too general. Were there slickensides, indicative of movement? SSC-5

Historical borings around B25 indicate Moraga volcanics that "break into rubble during drilling." Gravity has moved colluvium downslope. Moraga Formation is highly permeable (although is it called "bedrock," which in common or dictionary definition means hard rock. Neither Moraga Formation nor Orinda Formation fit that definition. SSC-6

- AKA, May 29, 2010, supplemental report

Boring log #1 (north of 25) has 8' of fill. Clay to 11.5', and silty clay below.

Boring #2 (south of 25) Moraga volcanics with weak rhyolite, then andesite down to 90' where Orinda claystone and siltstone are found. (Muds and mudstones give rise to many problems in civil engineering because they are weak and shrink or swell on being dried or wetted." Mudstones are siltstone, mud-shale, or claystone. "Muds are very reactive to physical disturbances or differential loading, and they slump and flow easily when subjected to stress." (*Oxford Companion to the Earth*, 2000, p. 715) A three-story General Purpose Laboratory would indeed exert differential loading and stress. SSC-7

Boring #3 (south of 2) Orinda Formation

Boring #5 & 6 "southern side of proposed central plant site" (not on map): Atterberg Limits;

Boring #5, (4-4.5' deep) Plasticity Index 56;

Boring #6, (6 – 6/5' deep), Plasticity Index 46.

"Onsite soils having a PI of 15 or less are generally considered to have a sufficiently low expansion potential to be used as non-expansive fill." 5 and 6 are marked "Fat Clay" and not to be used for fill. AKA says these must be removed. SSC-8

In effect after all these reports AKA has not come to a conclusion that the Moraga volcanics are a paleolandslide or in-place "bedrock." AKA did not examine the trench for slickensides, nor did it dig a second trench. Moving or not, it is critical to ask whether building on "weak volcanics that break into rubble during drilling" is responsible. And, to ask whether spread footings will do the trick when the earthquake strikes. Or, what will be the affect of contact with Orinda mudstones. SSC-9

Both Buildings 85 and 85A are shown in the EIR to straddle two paleolandslides, characterized in several earlier consulting reports as potentially liable to move in a major seismic event and at different rates. Slickensides were prevalent throughout the area. In earlier reports 60% of the HWHF buildings (the southwestern parts) overlie the Orinda Formation clays. In the EA, however, AKA's plans show only QLS2 (Moraga landslide) crossing all but a small part of 85 and no characterization of the leftover area (please see attachment #3: Figures 1 and 2). AKA had declared in an earlier report that 10 feet of Moraga Formation lies under the northeast corner of the buildings, and below that 25 feet of Orinda Formation. It is significant that what is under the area is unknown. SSC-10

AKA proposes drilling 21 piers around two sides of B85 and 9 piers around two sides of B85A, these to be 5 feet in diameter and 40 to 50 feet deep, TO STOP THE LANDSLIDE, evidently the top one of Moraga Formation (hard but fractured volcanics). What will stop the building from being torn apart? Has anyone ever used SSC-11 piers to stop a landslide? Into what will those piers be drilled that is less expansionary and stronger than mudstones? (AKA 2006, a propos the nearby Animal Care Facility, suggested a mat under the building so that it might move integrally, a proposal AKA could not make, evidently, for 85, as it would entail rebuilding.) SSC-11 cont.

Missing from the reports are 9 boring logs, AKA 7 – 16. Where are these and their interpretations? They will be needed to determine the quality of the Moraga volcanics, the Orinda mudstones, and whatever lies beneath. SSC-12

What does lie not far below the surface is water! In the EIR there are tables recording water heights, taken from monitoring wells. The EA refers to them on p. 22. North of 85 the water measured from 16 to 12 feet below surface while south of 85 the range was from 40 to 35 feet. Accounting for the difference in elevations the water table seems to be level at that point. But east of 85A at the same elevation as the well south of 85, the difference is huge—the level according to AKA ranges between 24 and 0.3 feet. This means that there is a "perched water table" or reservoir and that the other two wells may have penetrated a separate reservoir.

This variance is just what one expects in the caldera of the volcano upon which LBNL has constructed its buildings. When such a reservoir breaks during a seismic event (the breaks in 1973 may have been caused by a series of small events), the landslides could be devastating as they were in 1973. The unpredictable reservoirs, springs, and aquifers mean that contaminants may have spread all over. Monitoring wells are seldom left open for long. See the report *Contaminant Plumes of the Lawrence Berkeley National Laboratory*... (2007) http://berkeleycitizen.org/lbnl/cmtw1.html. SSC-13

The EA notably has only a brief paragraph dealing with fire and concludes that there is no significant finding of an existing or potential hazardous fire impact. Again, in essence it says "trust us!" relying on the Plan EIR that has declared the site to be "not a high potential for wildland fires." This is an obvious oversight as LBNL is located in an area that already has a history of being threatened by the one of the most damaging California urban/wildland fires on record. The Oakland Firestorm of 1991, in fact, reached the south wall of the adjacent Claremont Canyon. At that time LBNL Director Charles Shank ordered all personnel to leave the LBNL site. SSC-14

In particular, The Hazardous Waste Handling Facility site in Strawberry Canyon is in a heavily wooded location, with pines and eucalyptus, grasses and scotch broom, all flammable. Building 85 contains radioactive waste on the first floor and mixed solvents and volatile organic compounds on the second floor. There are a number of storage sheds for liquid and dry combustible compounds. How are these highly flammable and environmentally detrimental structures to be protected from a fire like that of the 1991 Firestorm (2000 degrees, destroying concrete, "fireproof" safes, metals, etc.)? SSC-15

This is another oversight that has led incorrectly to a conclusion that no significant impacts are likely. It is, in fact, not congruent that a sizable Federal Emergency Management Agency grant has been proposed to rid the Canyons of trees because of potential urban/wildland fires and is currently under NEPA review. Please note p. 141 of the EA, "In 1994, UC LBNL published a Wildland Fire Evacuation/Relocation Plan. The plan, which would apply to the Proposed Action, is based on a wildland fire scenario that would require rapid mobilization of resources, quick decision making and well-coordinated execution by emergency responders during a wildland fire." The footnote sends one to a website that is no longer operating. Have the plans been abandoned? The 1994 plan was evidently motivated by the lack of a plan in 1991. At a "Community Advisory Group" meeting in June, someone asked about emergency plans. Evidently there were none! **SSC-16**

In closing, for the above reasons and others not enumerated, SSC urges the Office of Science to determine that an EIS is required for the Phase 2 Project in order to be in compliance with NEPA.

Thank you for your attention given to these important matters. **SSC-17**

Cordially,

Georgia Wright (le)

Georgia Wright, for
Save Strawberry Canyon

Attachments:

#1. Letter from Garniss Curtis, Georgia Wright, and John R, Shively to Jeff Philliber, LBNL, March 15, 2010, with attachments

#2. Letter from SSC to Russell Gould, Chairman Board of Regents, July 9, 2010, with attachments

#3. Figure 1: From Alan Kropp & Assoc; Inc 2006A Geotechnical Investigation Report: Animal Care Facility, and Figure 2: From Phase 2 Project EA, p. 20

SSC-18

Attachment #1

March 15, 2010

Jeff Philliber, UC-LBNL Environmental Planner
Lawrence Berkeley National Laboratory (LBNL)
One Cyclotron Road, MS 76-234A
Berkeley, CA 94720

cc: Kim Abbott, Environmental Program Manager
Office of Science
Berkeley Site Office
1 Cyclotron Road MS 90-1023

re: Draft Environmental Impact Report for Seismic Life Safety, Modernization, and replacement of General Purpose Buidlings, Phase 2 Project, SCH# 2008122030

Dear Mr. Philliber and Ms. Abbott:

This is written in response to the invitation for public written commentary regarding the subject project, as required by the California Environmental Quality Act (CEQA) for a draft Environmental Impact Report (DEIR) and for all requirements of the National Environmental Protection Act (NEPA).

We hereby advise you of the hazards of the construction on the LBNL (Lab) site, as presently proposed in the subject DEIR. We also wish to emphasize the dangers to people, structures and vulnerable research facilites that may in any way contain hazardous materials, should this project be executed at the proposed LBNL site.

Regarding the geology of the site the observations cited in the DEIR concerning the adequacy for construction are seriously deficient. Lacking are geological studies for the General Purpose Laboratory (GPL) deep enough to provide any understanding of the geology below approximately three meters. Furthermore the severe destruction to the Lab infrastructure is predictable due to the mercurial geology and steepness of the Lab site.

Of primary concern should be the fact that an earthquake is now predicted to be imminent on the Hayward Fault trace. That trace runs completely through the lower west side of the Lab site. When the event occurs, it is predicted to destabilize the entire Lab site. CEQA establishes significant relevant criteria for impacts. It asks if the impact of the proposed project related to geology and soils would be considered significant. Certainly it would expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

SSC-18
cont.

a) rupture of a known earthquake fault
b) strong seismic shaking
c) seismic-related ground failure, including liquefaction
d) landslides

The attachments will describe the underlying geology of the LBNL site which should convince you that:

1. No new buildings of any kind should be construsted on the present LBNL site.

2. A plan to relocate all the existing facilities to a safer location, preferably well west of the known Hayward Fault trace should be instituted

3. The available UC Richmond Field Station site should be seriously considered.

Very truly yours,

Garniss Curtis, PhD, Professor Emeritus, Earth and Planetary Sciences, UCB
10 St. James Court
Orinda, CA 94563

Georgia Wright, PhD,
105 Vicente Road
Berkeley, CA 94705

John R. Shively, P.E.,
2 Van Cleave Way
Oakland, CA 94619

SSC-18 cont.

Attachments::
Transcript of Video with John Shively and Garniss Curtis
Map of LBNL and Caldera
Section of Caldera
Garniss Curtis
4 reports from B. J.Lennert (1979-1987)
Questions from the Appendices

Transcript of Video "The Fault: Quakes, Slides, & the Lawrence Berkeley Lab"

I'm Ignacio Chapela, Professor of Environmental Sciences at UCBerkeley. I'm on the board of Save Strawberry Canyon and we've made a video for the university community, the neighbors of Strawberry and Blackberry canyons, and the citizens of the Bay Area. This concerns the danger from the buildings already on the hillside and from those planned for it.

I am standing on the lower fire trail, south of Centennial Drive. Behind me the black box you see is the new Molecular Foundry, 96,000 square feet.
UC and the National Lab want to construct 980,000 new square feet of buildings while demolishing 320,000, thus adding 660,000 square feet to the lab campus. They want 500 new parking places and 860 new employees.

All of this is planned for Blackberry Canyon, directly above Hearst Avenue and its houses and dorms, and in Strawberry Canyon, north and south of Centennial Drive, above the stadium, Greek Theater and dorms.
This is extremely unstable land, and close to the Hayward Fault. This video will explain our concerns.

I'm John Shively.In the early 70's I was the Principal Engineer at UC Berkeley Office of Architects and Engineers.

SSC-18 cont.

In August of 1974, during a major drought, I received a call from Lawrence Berkeley Lab advising that the steep hillsides were sliding in two separate areas near the Lawrence Hall of Science, due to underground water. I called consulting civil engineer, Ben Lennert, and we drove up to observe the slides.

The most active slide was on the steep hillside below Lawrence Hall of Science and above the Lab Hilac accelerator building. It had broken a lab building, broken an internal lab road, and cut the underground utilities . This slide was growing rapidly and threatened the Lawrence Hall of Science.

The other slide was located on the steep hillside above the Lab corporation yard and just below the steep portion of Centennial Drive. It was slower moving but had severed the underground utilities that served the Hall of Science and threatened to take out Centennial Drive above the corporation yard.

Ben's first idea was to drill hydraugers, which are horizontal wells, into the corporation yard hillside, hoping to tap the aquifer and let gravity drain the water. He drilled several hydraugers but failed to hit the aquifer. I then surmised that that much water had to be coming from the much larger watershed located higher up in the expansive Grizzly Peak area of Tilden Park. I proposed drilling a conventional vertical well just at the south end of the Space Science Lab. We drilled the well and hit the aquifer at about 150 feet down.

When we commenced pumping, both slides stopped. We directed the water south into Strawberry Creek. Some of it was intercepted for very welcome use in the drought-parched UC Botanical Gardens.

I'm Garniss Curtis, emeritus professor in the department of Earth and Planetary Sciences at the University of California, Berkeley. Ina Letter I wrote to the regents, I emphasized that there should be no buildings in Strawberry Canyon near the Stadium nor Blackberry Canyon and these are the reasons why.

In working with Ben Lennert 25 or 30 years ago investigating landslides and also places that new buildings could be made, I found geologic reasons that threaten these areas. The geologic setting is this. Here is the active Hayward Fault. Here is the Wildcat Canyon Fault and between them once 10 million years ago was a volcano. That volcano erupted violently and made a big cavity in which this whole area collapsed to form a great void.

The outlines of the western margin of that void is here from the botanical garden going northwards several miles and includes all of these buildings resting on material that collapsed into the void we call a caldera.

In working with John Shively and Ben Lennert concerning the slides on Centennial and this location which threatened these buildings to the west, we found we were in volcanic rock fragments, volcanic rock, in clay matrix which was sliding as water moved it.

In this caldera filled with debris from the old cone, it left great cavities between large blocks of andecite which collected water and that water was gradually seeping out and causing these landslides, and unless they pumped that water out some way, we'd continue to have slides in this caldera material.

A horizontal hole drilled did not relieve the water, but when a vertical hole was put down, it bumped into one of these cavities filled with water and over the next 10 years 16 or 14 million gallons of water were pumped out. That's a huge amount of water to pump out of one place, but that was a function of the collapsed material making many cavities that were not filled with ash and left vacancies for water.

The Hayward Fault, after passing close to Bowles Hall, goes right through the stadium where it has offset the two sides of the stadium since its construction in 1923. The interior pillars damaged some 30 years ago have only recently been reinforced with concrete and reinforcing steel.

Behind Hearst Mining Bldg and a few feet to the east if the Lawson Adit, , that is a tunnel going eastward to the Hayward Fault. In the tunnel are several exposures of the offset of Strawberry Creek as determined from the contained rounded cobbles of Strawberry Canyon origins. This indicates a displacement of more than 2000 feet north along the Hayward Fault. East of the Hayward Fault are cretaceous sedimentary rocks older than 65 million years. These are dipping westward at 20 to 30 degrees.

SSC-18 cont.

(Above Stern Hall)What we're looking at here is sandstone, bedded sandstone, and you can see the parting dipping off toward the Bay and two parting zones dipping off toward the Bay on the outcrop of the sandstone and disappears up hill there and disappears under the soil.

(drawing) This caldera is like a great big tub of mud with no rigidity to it at all and much heavier than water, pressing against these cretaceous beds dipping westward.

The US Geological Survey has made extensive study of the Hayward Fault and found that the return time on earthquakes going back to the time of Christ is about 130 years. The last major quake was in 1868, 140 years ago. In short it's overdue. The survey by USGS says that there's a 65% chance of a major quake, 6.5 to 7 magnitude, occurring in the next 35 years. If an earthquake occurs when these beds have been soaked with winter rain, the chances of a major landslide are great along the slippage planes of sandstone dipping westward towards campus. Buildings in the lower parts of both Strawberry and B Canyons would be buried if not destroyed. These buildings will move Keep in mind the Loma Prieta quake of 1989 of magnitude 6.9 which from a distance of over 60 miles destroyed a section of the Bay Bridge, a section of the overhead freeway in Oakland. killing 63 people, and many houses on filled ground in the Marina of northern San Francisco some 70 miles from the quake!

No major buildings should be built on the hills or canyons above the campus.

(Ignacio)There are alternatives to constructing more buildings above campus. These alternatives are cheaper and certainly much safer and many are owned by the university.

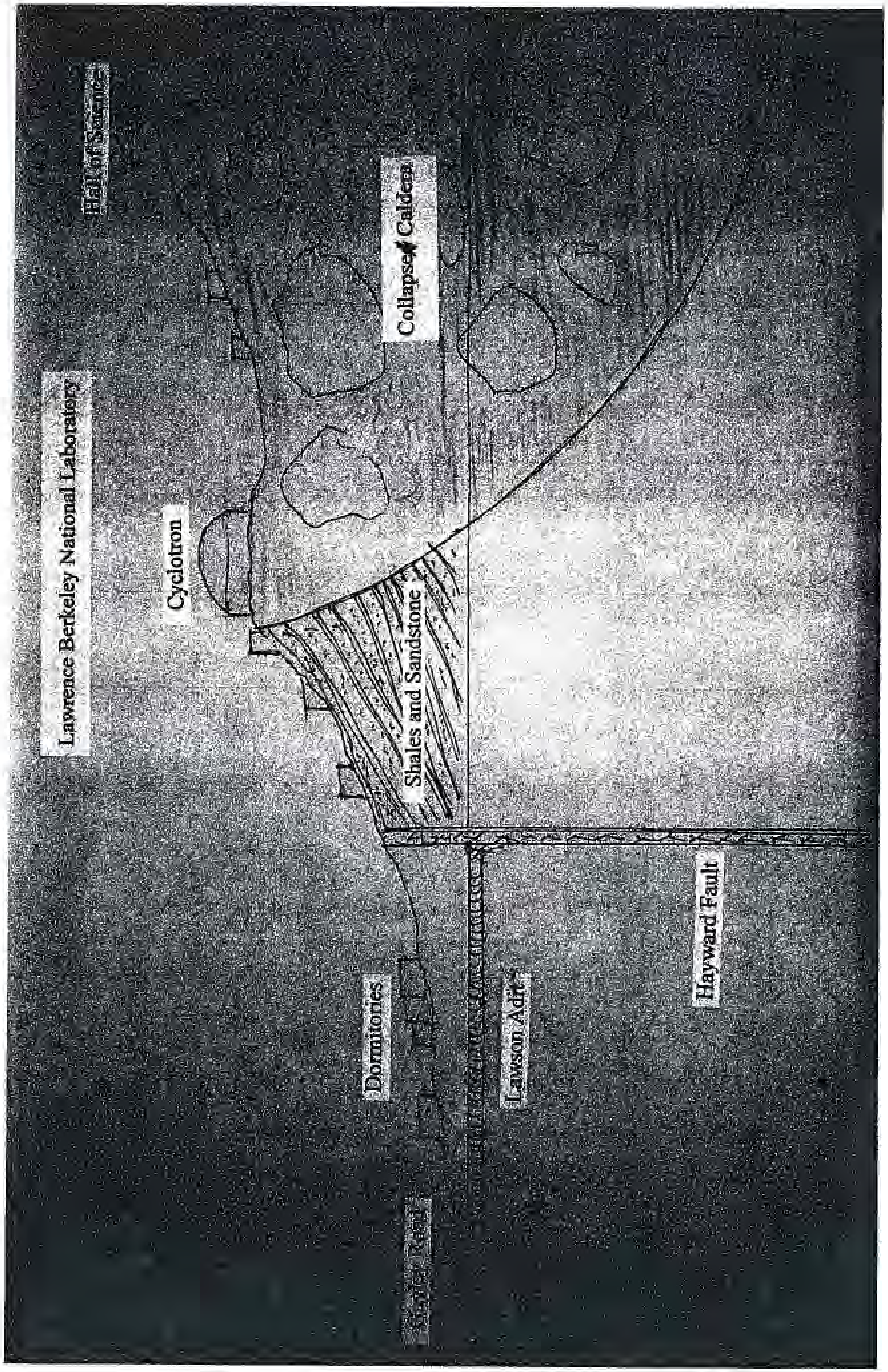
I hope that the Regents and administrators of the university will consider the dangers to students, faculty and neighbors of building on these fragile hill sites so close to the Hayward Fault.

This video is being distributed in order to alert those at risk as well as those with the responsibility for the safety of the campus and its neighbors.

SSC-18 cont.

LBNL with extent of caldera

SSC-18 cont.


Hall of Science
Lawrence Berkeley National Laboratory
Cyclotron
Collapsed Caldera
Shales and Sandstone
Dormitories
Lawson Adit
Hayward Fault

SSC-18 cont.

The soil profiles obtained by Lettis from shallow trenches around Building 25 revealed expansive soils that soak up water during wet seasons and would be subject to sliding during a major earthquake. (Lettis, Appendix Plates 2 & 3 attached here) The trenches also revealed isolated blocks of andesite (volcanic stone) 10 and more feet in length and 4 feet in diameter.

Elsewhere in the Berkeley area are large pieces of andesite 10 feet in width and 30 feet in thickness. These are all randomly oriented. All of these are in a matrix of clay-rich sedments, sometimes horizontally bedded, often, though, in contorted beds, and some piled on top of each other. For example, in a small quarry a few hundred feet north of LaLoma Avenue, these blocks show deformation from the differential pressure they were under from deep burial. The Orinda Formation is named for outcrops near Orinda, beautifully exposed on the east side of Caldecott Tunnel. The consultants' reports label almost any sandy and pebbly beds as Orinda Formation. There is no Orinda Formation in the caldera. The formation is older than the volcano.

Lettis and Associates separate some units and identify formations which, on Grizzly Peak Boulevard may easily be identified as the Orinda and Moraga Formations. Lettis and Associates, however, identify any sandy beds exposed at the surface or in bore holes as Moraga Formation. This sandy material is missing, however, in the Moraga Formation found along the road to Redwood Canyon. The Moraga thrust fault at the base of the Moraga andesite flows is well exposed there.

SSC-18 cont.

None of the reports done for this EIR contain a reputable geologic map of the LBNL area. More investigation of areas outside the Lab site might have alerted the consultants that the LBNL area is geologically different from any other area in the Berkeley Hills. It is bounded on the east by the Wildcat Fault and on the west by an arcuate contact between Upper Cretaceous Great Valley Sequence, well bedded shales and thin sandstone beds, all of which dip westward at about thirty degrees. (See Transcript and its figures) The boundary has been named the "Chicken Creek Fault"; it is probably not a fault as it approximately makes an arc starting at the Wildcat Fault immediately south of the Botanical Gardens and swinging around to meet the Wildcat Fault crossing Shasta Road not far uphill from the Brzilian Room. We identify this contact as the margin of a caldera which collapsed after a large eruption evacuated the magma chamber under the volcano. In fact we think we have identified a large welded ash flow that poured out of this magma champber to the west of the Hayward Fault. It has the same age (10 million years) and mineral composition as a rhyolite tuff exposed in the center of Moraga volcanics along Grizzly Peak Boulevard and at the southern end of the Moraga Formation at the type locality.

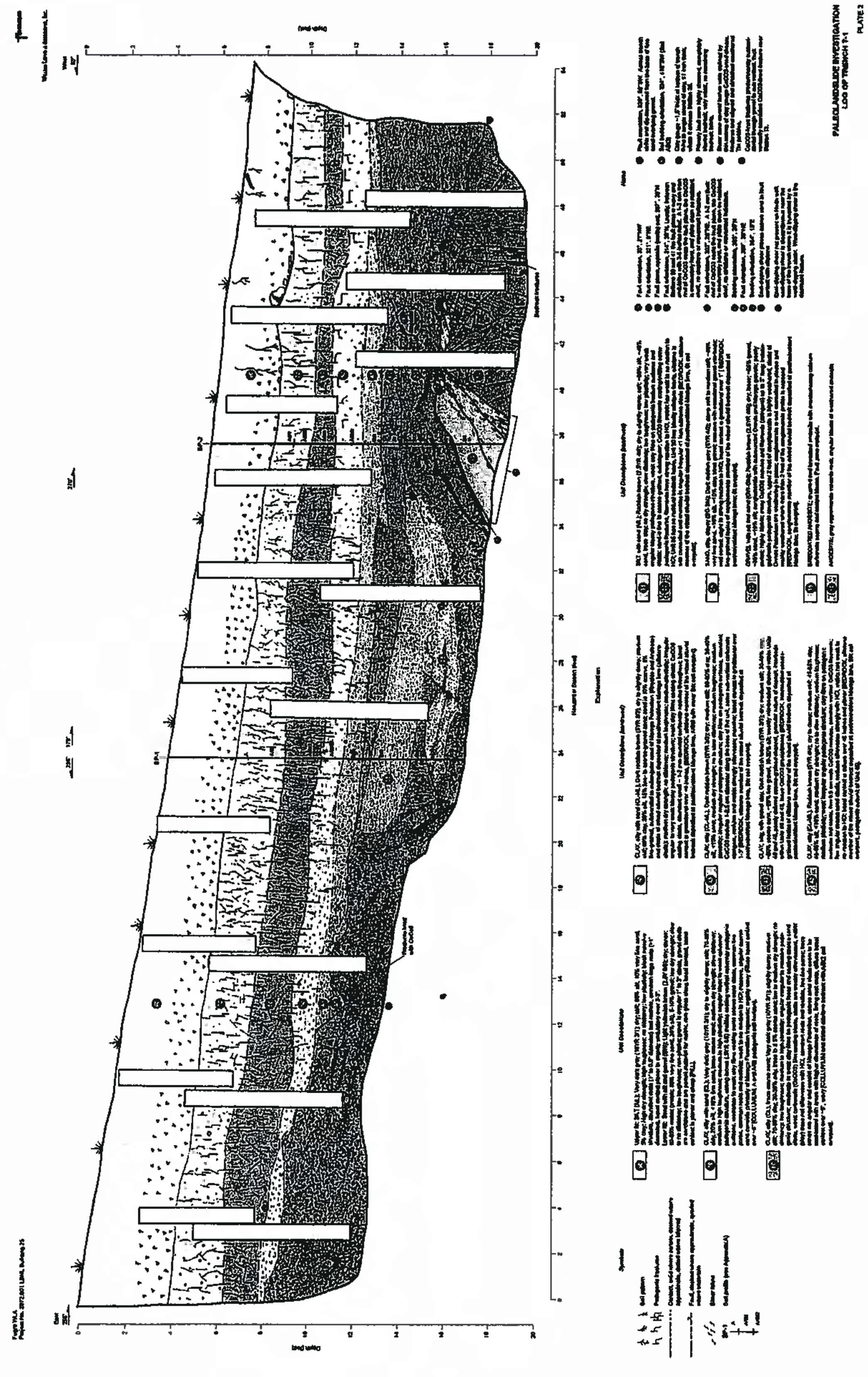
The collapsed volcanic rocks that fell and slid into the caldera were subsequently buried by sediments and volcanic ash. Many voids between the piles of blocks and andesite collected ground water, recently tapped by wells drilled by Lennert and Shively. Lennert told me that over a period of ten years, 14 to 16 million gallons of water were pumped out. (See Lennert Letter of 1987).

The US Geological Survey predicts a major earthquake of magnitude 6.7 or greater will occur on the northern section of the Hayward Fault with a 62% probability before 2032. The great earthquake of 1868 broke along the southern part and extended almost to the campus of UC. The Hayward Fault runs along the west margin of LBNL so that there will be severe ground-shaking in this area. Consider the damage caused to the Bay Bridge and Cyprus Ramp from the Loma Prieto quake in 1989, whose epicenter was 50 miles away. Should the northern Hayward Fault undergo a comparably large failure with an epicenter, say, 7 miles from LBNL, the force would be 50 times that which struck the Bridge and Ramp in 1989.

The sediments collected in the caldera are not suitable material upon which to build. A major eaarthquake during a wet period could lead to landslides in caldera soft sedimentary rocks and the collapse of the west wall of the caldera with its stratified creetaceous shales dipping westwared toward dormitories and houses. Measurements show that the Hayward Fault is creeping right laterally about 0.5 cm per year while the east side of the fault is rising 0.5 cm per year, becoming more unstable. Sooner of later this cretacous wall will slide, taking with it most of LBNL. The imminent earthquake of the Northern Hayward Fault might trigger it.

SSC-18 cont.

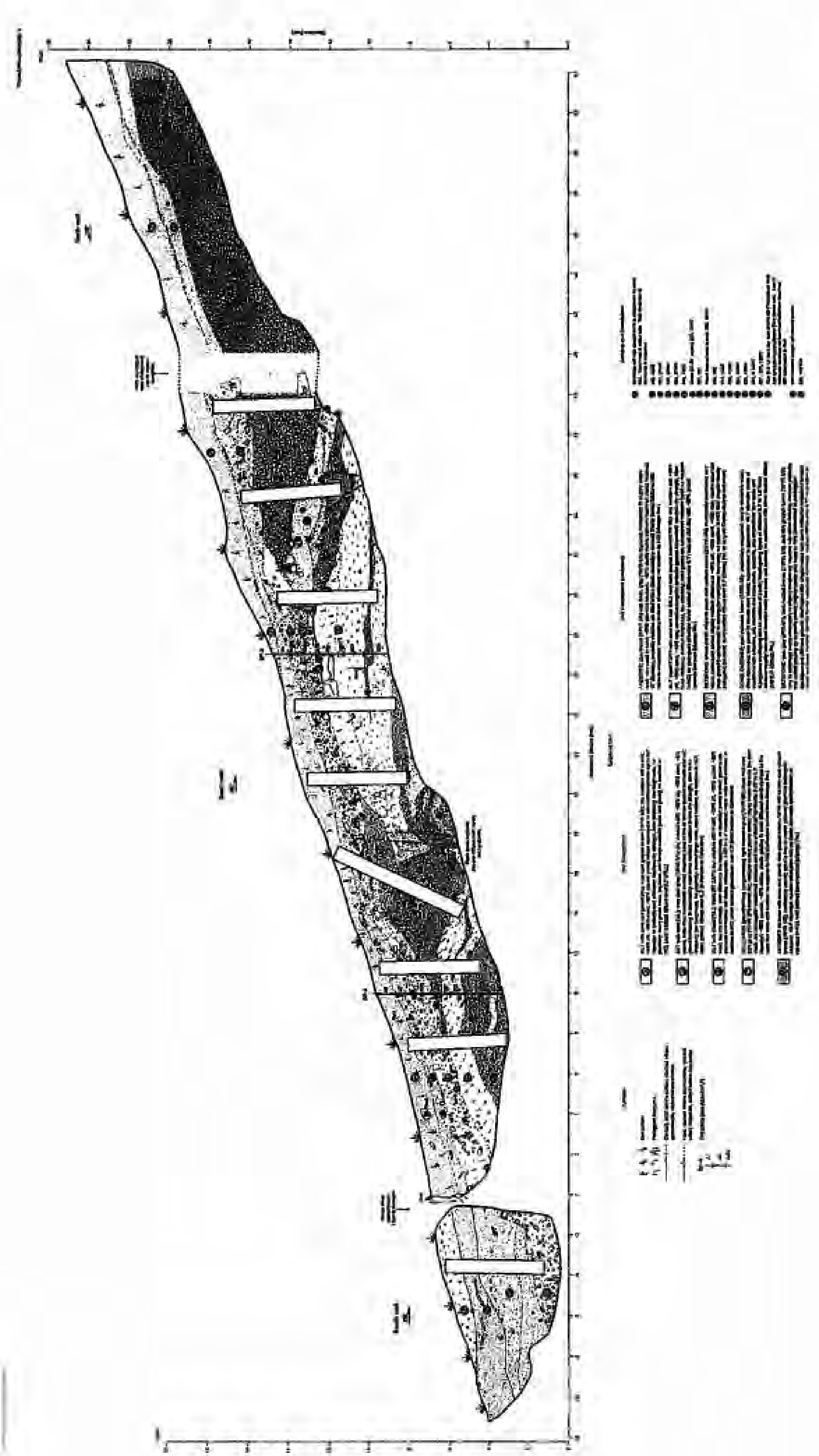
Curtis - 3



Appendix C-2,A Letts Plate 2

SSC-18 cont.

Clarke-4



Appendix C2a Lettis Plate 3

SSC-18 cont.

LENNERT AND ASSOCIATES
SOILS ENGINEERS
3309 BROWNS VALLEY ROAD, NAPA, CALIFORNIA
707 · 252-9273 94558

Job Number 789
27 August 1979

Mr. Gaetano P. Russo
Department of Facilities Management
University of California
2000 Carlton Street
Berkeley, CA 94720

Re: Hill Area Dewatering Program

Dear Mr. Russo:

This letter presents a brief status report on the program to date, and confirms verbal directive received from the University in regard to the on-going drilling program.

The present status of Horizontal Drain No. 789-A is outlined briefly as follows:

The hole was taken to a horizontal depth of 2,102 feet. A profile of the drain, with key information shown thereon, is presented on an informal drawing entitled "Horizontal Drain No. 789-A," dated 19 August 1979, attached.

A fault was encountered at 1,056 feet, as predicted; a maximum-seepage flow of 37 gpm was obtained from the fault. A basalt dike was encountered at about 1,085 feet, not predicted; a maximum seepage flow of 105 gpm was obtained at this point. The Moraga syncline structure was encountered as predicted; a maximum-seepage flow of 450 gpm was obtained upon first penetrating the massive flow rock stratum as encountered in Test Well No. 789-1. The University Fault was encountered at about 2,000 feet, as predicted; a maximum-flow rate of something in the range of 1,000 gpm was obtained at this point. The rock beyond the University fault was a clastic sediment, in comparison to the basaltic and rhyolitic flow rocks and tuffs encountered in the Moraga syncline; however, the sediment contained volcanic clasts and thus probably lies in the lower Moraga tuffaceous sediments rather than in the Orinda formation as predicted.

Sustained, essentially clear, water flow rates have varied from about 15 to 150 gpm. The 15 gpm minimum rate has continued for months, probably coming from the fault and dike at about 1,050 to 1,100 feet. The 150 gpm rate was observed after 24 hours with the hole at about 1,780 feet, where it first entered the massive

SSC-18 cont.

Moraga flow rock stratum. The larger sustained flow rates, encountered at and beyond 1,780 feet, appear to have reduced due to plugging of the drill hole as much or more than due to rapid drainage of local "water pockets." Until the hole is cased full-length with perforated pipe, no valid estimate can be made of the probable long-term flow rate; but with present information it appears that the final sustained flow rate will be substantial if the hole is successfully cased to at least 2,000 feet.

Open voids have been encountered at a number of locations, apparently associated with faults; these voids strongly support our initial concept of open faults resulting from tension in the blocks between the Hayward and Wildcat faults. Some of these structures were heavily water-bearing, as at 1,785 feet. At other locations, the voids are apparently presently drained; all drill water and cuttings for about 250 feet of hole were "absorbed" by such a structure at one time during the drilling.

The 6-inch diameter casing was advanced with no insurmountable problems, using the under-reamer bit and drill-jack technique. On 28 June a slide at about 190 feet began to "bind" the casing; as the "bind" progressively worsened the casing could not be advanced beyond 1,200 feet. The casing was later pulled back to 1,100 feet, to relieve the "bind" and permit drilling through the casing; it is now "locked solid" at 1,100 feet. The casing was perforated in place in the 900 to 1,080 and 600 to 625 foot intervals.

After completing the hole to 2,102 feet on 11 August, 4-inch perforated casing was installed beginning on 13 August. The casing advanced "dead loose" and without problems until a depth of 1,636 feet was achieved on 16 August. At this point "solid rock" was encountered. Probing three times with the 4-inch casing and four times with the 3 7/8-inch bit failed to recover the old hole. The hold had been open for several weeks at this point, and traversed four times with the drilling tools with no trouble. During the period 13 August through 15 August a total of five earthquakes occurred, ranging in Richter Magnitude from 2.0 to 3.3, with epicenters in the nearby Orinda area. There appears to be no reasonable doubt that the hole was offset due to movement of a fault, or large block of rock, during the period 12 through 15 August. As a result the hole must be re-drilled beyond the 1,636-foot depth if work on the drain is to be continued.

Since there is no "under-reamer" bit available for 4-inch casing, the hole cannot be advanced further with this casing in place; it was thus removed during 22 to 24 August. A test was performed to determine if 5-inch casing would pass the "bind" in the 6-inch casing at 190 feet; the test showed some "binding," but it is believed probable that the 5-inch casing can be run through the 6-inch casing. An alternate procedure is to re-drill the hole to 2,100 feet at 5 7/8-inch diameter, and again attempt to install 4-inch casing.

SSC-18 cont.

In conclusion, the hole has been taken 100 feet beyond original target length, and the predicted geologic structure and seepage water conditions were encountered. Our original geologic and engineering concepts, as expressed in our report dated 17 December 1978, have been proven beyond any reasonable doubt.

The tremendous problems which we have encountered in installing the drain have arisen solely from difficulties in drilling and installing casing, and from instability of the rock structure in which the drain is being installed. The drilling and casing problems have been solved by devising a new technique, consisting essentially of drilling an oversize hole with an expanding bit, and jacking the casing into the hole directly behind the bit. In addition, the torque of the drilling equipment was more than doubled to provide sufficient power to overcome friction on the drill rods. The problems of ground instability, such as the slide at 190 feet and the fault offset at 1,636 feet, are beyond control, and pose a very serious hazard of total failure which cannot be assessed.

The water level in Test Well No. 789-1 has been periodically observed, to assess the effects of the horizontal drain on the ground water in the synclinal structure south of the University fault. The average flow rate in the well Shively No. 1 has been observed to monitor the deep ground water conditions in the geologic block north of the University fault. The results are shown graphically on an informal drawing entitled "Deep Well Data," dated 6 August 1979, attached. Referring to the drawing, the following major aspects of the data are commented upon briefly:

SSC-18 cont.

The initial, steeply dropping portion of the curve for the test well represents the drainage of drilling fluid. The intercept with the flat portion of the curve is at the "spillover" elevation of the synclinal major basalt flow rock stratum in the ridge. The flatter portion of the curve appears to be the normal "drainage curve" for the syncline for this season and time of year. The rate of fall stabilized at 0.9 inches per day from 14 June to 28 July, and the water surface then began to rise slightly. On 1 August the water surface began to decline again, at a stable rate of about 1.4 inches per day.

The major basalt flow rock body was first penetrated by the horizontal drain on 28 July, with an initial flow rate of 450 gpm, dropping to 150 gpm after one day and 87 gpm after two days. On 31 July the hole was found to be "plugged," and has not been "clear" since; the flow rate was 70 gpm prior to beginning drilling. The indicated medium-term flow rate without plugging is about 60 gpm; deducting 15 gpm for the structure at 1,100 feet, a flow rate from the basalt stratum of about 45 gpm is indicated.

The well Shively No. 1 shows a gradually increasing flow rate from about 11 1/2 gpm on 1 March, with a steeper rise beginning about

1 May and a very steep rise beginning about 1 August. This flow rate curve is much different from that observed last year; see our report dated 17 December 1978 for the curve for last year. During the past two weeks the curve has "taken off," with a flow rate of 27.4 gpm on 27 August; this is unprecedented, startling, and indicates a massive rise in the ground water level during this period. The recent very rapid rise in flow rate could be related to the unusual seismic activity in this area, mentioned previously.

The curve for the test well indicates that either the horizontal drain produced no appreciable effect on the well, or that the water supply is so large that the effect is very small; while there can be no definite decision made with present data, we believe the second choice to be more probable. Only if the horizontal drain can be cased to 2,000 feet, and the results observed for several weeks or months, will we know for sure whether or not the drain is dewatering the structure tapped by the well.

The curve for Shively No. 1 indicates a massive rise in ground water level; since the well taps a major, widespread acquifer structure, it is reasonable to assume that this rise is occurring generally in the block north of the University fault, if not in the entire hill area. The horizontal drain should have no perceptible effect on the well, since it did not encounter a major acquifer north of the fault, as far as we could determine during drilling. It is reasonable to assume that the rise in ground water north of the University fault, as indicated by the well, will possibly produce a major slide in this area in the near future. The purpose of the contemplated second major horizontal drain is to dewater this structure and prevent such a slide problem.

At this time we believe that the best way to proceed further with Horizontal Drain No. 789-A is to employ 5-inch diameter casing and an under-reamer bit, redrilling and casing the hole as necessary. A guess of the additional cost of this procedure is around $30,000, with no guarantee at all of the accuracy of this figure. The greatest hazard of failure of this procedure appears to lie in the 5-inch casing "binding" in the 6-inch casing at 190 feet, or the 5-inch casing being "locked" by another fault movement.

An alternate procedure is to re-drill the hole to 2,100 feet at 5 7/8-inch diameter, and again attempt to install 4-inch casing. This method is deemed somewhat less likely of success, due to our inability to drill an over-size hole for the casing if the original hole is "lost." Further, a fault movement which "locked" the casing would end all further effective operation. The additional cost of this procedure is guessed at $15,000, with no assurance at all of the accuracy of this figure.

SSC-18
cont.

If the 5-inch casing is employed, and reaches some reasonably deep penetration, it may be feasible to run 4-inch casing through the 5-inch casing and thus complete the drain. Since we already have the 4-inch casing, the extra cost of this procedure would be nominal.

It is hereby confirmed that this office has been directed by the University to employ the procedure using the 5-inch casing. We have thus, on this date, placed orders for the 5-inch under-reamer bit and 5-inch casing on behalf of the University. The drilling crew is now on "home leave," and is to return on 5 September; if all material and equipment is then on site, work will resume on this date. The procedure using the 4-inch casing will be employed as a last resort, if for some reason the 5-inch casing cannot be advanced to the 2,000-foot depth.

It is necessary that a decision be made this week regarding the second major horizontal drain. If this is not done, any later decision to install this drain will entail a delay in starting of at least two months. A rough budget and schedule, with no guarantee of accuracy, will be prepared for the second horizontal drain if you decide to proceed therewith immediately after completion or final failure of the first drain.

The severe problems, and great time and cost over-runs, experienced to date in this project lie solely in the difficulties of pioneering new drilling and casing procedures, and in the instability of the rock structures in which we are operating; while we have dealt with these problems, very effectively we believe, they are not within our control. We thus give no guarantees of cost, time, or success, as we did not at the start of this work. The writer has continued with this project, at great personal and financial cost, solely because there is no apparent alternative for slope stabilization in the upper Campus area, and the potential for a large slide appears so ominous that we dare not stop short of success or proven ultimate failure. Should you feel that the University has a more effective alternate to solution of the hill area stability problems, this office will be most happy to pass the baton to another runner.

Beginning in July, accounting and cost control was assumed by the University. Thus, while we continue to check and approve invoices for payment, we have ceased computing financial status statements.

Respectfully submitted

B. J. Lennert

jel
Attachments

cc: Mr. Forrest E. Tregea
Mr. Richard M. Koch

SSC-18
cont.

LENNERT AND ASSOCIATES
SOILS ENGINEERS
3309 BROWNS VALLEY ROAD, NAPA, CALIFORNIA
707 - 252-9273 94558

Job Number 789-A
28 May 1980

Mr. Gaetano P. Russo
Department of Facilities Management
University of California
2000 Carlton Street
Berkeley, CA 94720

Re: Slide at Centennial Drive Overpass
Progress Report

Dear Mr. Russo:

On 13 May 1980 the diversion pipe to carry water from Shively No. 1 to the storm drain inlet at the overpass on Centennial Drive was essentially completed, and the well flow was admitted to the pipe. The system commences with a 2-inch diameter Schedule 40 PVC line from the pre-existing 2-inch diameter line in the Fire Trail to Test Well No. 789-1, laid in a trench. A riser was installed at the test well to permit flow from this well to be put into the system if it is developed; a gate valve was installed just beyond the riser to permit pumping water from the test well to the fire system storage tank at Shively No. 1. From about 50 feet west of the test well the line consists of 2-inch diameter Wesflex Gold Label 80 psi polyethylene pipe, laid on the ground surface to the storm drain inlet; the surface line is anchored to #4 rebar stakes and trees with galvanized iron wire. Risers to admit air were installed in the polyethylene line at about 200-foot intervals, to reduce flow velocities and prevent undesirable hydraulic phenomena. The line is functioning well, and as expected, with no indications of undesirable hydraulic effects. The flow enters Mather Grove at the outlet of the culvert, about 100 feet below the overpass. Engineering design and field layout was provided by this office, and materials were purchased by this office for the University; installation was performed by University forces. Still to be accomplished is burying the pipe in the fire trail at the power-line tower, installation of a valve box over the gate valve at the test well, and some staking out and tieing at various points along the line; this is to be accomplished by University forces as soon as time permits.

With completion of the above work, any contribution of flow from Shively No. 1 to worsening ground water conditions in the Hill Area has been totally eliminated. The Campus is thus now no longer potentially contributing to development of dangerous ground water conditions in the Campus or LBL areas by reason of disposal of the flow from the well.

SSC-18
cont.

On 28 May 1980 a plan, brief specifications and bid form, for regrading and repaving the slide area in Centennial Drive just below the overpass, were hand-delivered to the University. The work consists of removing the existing surfacing in the slide area and regrading and compacting the existing aggregate base subgrade, placing new aggregate base to new line-and-grade, and repaving the area; the guard rail is to be removed and re-installed on the south side of the road, and a new asphalt concrete curb is to be placed on this side. A new compound vertical curve, with 0.5 foot "hump," is being constructed in the slide area, similar to past major regrading, to reduce the frequency of major regrading as the past slow creep-slide movement continues. If acceptable bids are received next week, it is hoped that the work can be completed in no more than two weeks; this will permit re-opening the road around 16 June 1980.

The past, and recent, slide movements have grossly distorted the embankment below the overpass structure; maximum lateral deflection is in the range of 3 feet. In addition, small slope movements have reduced the roadway area width by up to several feet. With these conditions, the downhill lane can be restored to near-previous geometry, and considering the overall road design and condition, is deemed marginally tolerable; the uphill lane is much too narrow, and must be widened by installation of a retaining wall. This wall will be designed, and then bid, as soon as completion of the area regrading permits the required geometry to be accurately defined; in the interim, barricades must be placed along the shoulder of the uphill lane and the traffic speed limit reduced in this lane. By performing the regrading prior to constructing the retaining wall, we will be able to reopen the road to traffic some 6 weeks earlier than would be the case if the retaining wall were built first.

On Plate I, attached, we have plotted the vertical slide deflection at the center of the overpass abuttment wall versus date; rainfall data supplied by LBL is also shown. Referring to the plate, it is seen that the accelerated slide movement commenced in February, some 10 days after the beginning of a period of heavy and continuous rainfall. The water from Shively No. 1 was being ejected into the canyon above the overpass at this time, and had been since last year. It is seen that the slide movement temporarily ceased some 12 days after the rainfall ended; it then resumed some 6 days after another day of heavy rain. Slide movement then ceased again some 9 days after the flow from Shively No. 1 was removed from the canyon, and has not resumed to this date. As described in previous correspondence, water in the canyon has been entering the ground at the New Fault, some 200 yeards northwesterly of the overpass; we believe that this water has been the key cause of the recent accelerated slide movements. We also believe that the water from Shively No. 1 entering the fault contributed to this causation, and was a substantial cause of the movement continuing until 15 May. At this time it appears that with installation of the pipe to divert the

SSC-18
cont.

flow from Shively No. 1 stability conditions for the slide body have been restored to those pertaining in past years; we would thus infer that the past slow creep, at a vertical rate of about 3 inches per year at the overpass abuttment wall, will continue as before, slower in the summer and more rapid during the rainy season. However, it must be recognized that we have experienced three wet winters in a row; many signs indicate that the stress-field between the Hayward and Wildcat faults is periodically changing the deep aquifer conditions, and ground water conditions are now very severe by recent historical standards; there is thus the obvious possibility of an increase in slide creep-rate, or a major slide movement, at any time.

In consideration of the above information, you are advised that in performing the subject remedial work you are taking a calculated risk; if more rapid slide creep movement resumes, or if a major slide occurs, you will lose the value of the new work. Excepting for removing the flow from Shively No. 1 from the canyon, we have not taken any measures to improve stability conditions for the slide body; thus the previous slide conditions, perhaps worsened by the past three wet winters and recent tectonic phenomena, still pertain. The goal of the present work is simply to restore the road to usable geometry; mitigation of the slide conditions is far beyond the present budgetary limits.

In past years the overpass structure has been progressively tilted to the east by creep-movement of a fairly large slide body occupying the canyon northerly of the structure; the distortion became so severe two years ago that structural failure appeared imminent, and this office installed steel reinforcing members to prevent sudden collapse. During drilling Horizontal Drain No. 789-A last year, the New Fault was encountered at 1,050 feet, and produced a large flow of water; this flow has continued, now at the rate of about 7 gpm, coming mainly from the New Fault. Referring to our hill area Geologic Map (revised 11/26/79), it is seen that this fault must supply (or drain) most of the deep ground water which activates the slide body. Shortly after the fault was tapped by Horizontal Drain No. 789-A last year, movement of the overpass structure ceased, and has not resumed during this past rainy season; contrary to the experience of past years, there has been absolutely no movement of the structure since last fall. We thus tentatively conclude that the drainage provided by No. 789-A has stabilized the slide body, and the structure is now comparatively safe, with the past serious threat of structural collapse eliminated. Barring a major change in deep aquifer conditions resulting from the stress field between the Hayward and Wildcat faults, it is our opinion that the overpass structure is no longer in hazard.

As described in our letter dated 13 April 1980, the present slide is a local embankment failure of the fill placed to form the roadway below the overpass. It has been creeping since it was first constructed, necessitating major regrading twice in about the past

SSC-18
cont.

10 years. We have no reason to believe that stability conditions are any more favorable now than they were in past years, and they may be considerably worse. It is noted that flow from Hydrauger No. 2 abruptly ceased when the slide moved overtly in February; this is strongly suggestive that the drain may have failed, thus causing the slide, or that the slide may have sheared off the drain. We intend to rod-out the drain, to check it, as part of the present program, if funds permit. A major attempt to stabilize the slide would involve, at the least, drilling several 1,000±-foot horizontal drains into the slide area, in an attempt to provide deep and area-wide dewatering of the area around the fill embankment; this would entail expenditure of at least $100,000. A modest attempt to improve stability conditions would be implementation of our previous recommendation of placing a culvert in the canyon above the overpass and across the New Fault, to keep runoff from rain water from entering the fault; this measure would be appropriate under the present program if funds are available. An assuredly successful stabilization program, involving removing the fill embankment and underlying weak soils, and replacement with a stable embankment section, would involve a major incursion into Mather Grove and an expenditure of at least $500,000.

We have been attempting to clean Test Well No. 789-1, by blowing with air and use of commercial detergent, with little success to date. The space between the drilled hole and casing appears to be solidly packed with silt and clay, and rock fragments, originating from the tuffaceous rocks overlying the andesite rock aquifer at the 300- to 390-foot depth. We shall continue this attempt for another week, using both detergent and foam. If we succeed in cleaning the well, we will test-pump it to see if it taps a sufficiently extensive aquifer system to warrant permanent pumping. We cannot evaluate the potential yield of the well unless and until it can be cleaned. If we do not succeed in cleaning the well, we will abandon the attempt to pump it, but will retain the well as a piezometer to monitor the water level in the syncline. In the meantime the water level in the well continues to rebound to the 240-foot level between periods of blowing, a somewhat disturbing level but not apparently excessively dangerous. If the water level resumes the past pattern of rising at 3 or 4 inches per day, and reaches the 200-foot level, more drastic measures may be warranted.

SSC-18
cont.

In the past two years deep ground water levels, as evidenced by the flow rate from Shively No. 1, have peaked about the first part of June, in mid-July and again in September-October, with each peak successively higher; we do not yet know if Horizontal Drain No. 789-A, or the Test Well No. 789-1, will also show this pattern. At this time there is substantial reason to believe that this pattern will be repeated, with even higher levels possibly occurring due to the past three wet winters and on-going stress conditions between the Hayward and Wildcat faults. If this situation does repeat this year, there will be a condition of increased hazard of a major slide occurring at any of several locations during these periods of more severe ground water conditions. With accumulation of more data this year, we will be in a better position to evaluate this situation. Thus the present program of observations of ground water flow rates and embankment deflections, now being handled by University personnel, should be continued.

SSC-18 cont.

Respectfully submitted,

B. J. Lennert
R.C.E. No. 9232

jel

Attachment

cc: Mr. Richard M. Koch
Mr. Forest C. Timberman

LENNERT AND ASSOCIATES

SOILS ENGINEERS

3309 BROWNS VALLEY ROAD, NAPA, CALIFORNIA

707 · 252-9273 94558

Job Number 789-A
10 September 1980

Mr. Gaetano P. Russo
Department of Facilities Management
University of California
2000 Carlton Street
Berkeley, CA 94720

Re: Hill Area Stabilization Program

Dear Mr. Russo:

This letter presents a brief final status report for the dewatering and slide repair measures recently implemented by this office. Reference is made to letters from this office dated 26 June, 28 May, and 30 April 1980.

Recent measurements by University personnel have shown that the slide at the overpass on Centennial Drive is still moving, at a rate much higher than has been experienced in the past at this time of year. Ground water conditions in that area appear to be unusually severe, probably due to the past three wet winters and/or to stress conditions associated with the Hayward and Wildcat faults. Recent "rodding" of the old horizontal drains at the overpass (Hydraugers Nos. 1 and 2) has revealed that Hydrauger No. 2 is ruptured at 138 feet; this is on the projected surface of recent slide movement. Flow from this drain ceased abruptly when the slide showed a large movement last February. The water previously outletted by the drain is thus now "backing up" behind the slide, worsening stability conditions. It thus appears probable that the slide will move again sufficiently to necessitate closing Centennial Drive, either during the deep ground-water high in September-October or during the next winter rainy season. The only apparent remedial measures with a reasonable chance of success are long hydrauger drains drilled from Chicken Canyon or major regrading of the fill embankment, as described in previous reports; any such measures would entail the expenditure of a large sum of money. Replacing Hydrauger No. 2 might be helpful, but we feel that overall this would be inadequate to bring stability conditions back to the previous marginal level if we experience another wet winter.

SSC-18
cont.

The proposed retaining walls at the overpass slide have not been constructed. It is our understanding that you wish to hold this work in abeyance until the stability of the embankment is determined by further observations of the creep or slide movements.

The proposed culvert across the fault northerly of the overpass structure has not been installed. This culvert would prevent rain runoff from entering the fault, and would thus improve stability conditions at the overpass during the rainy season; the cost of this installation would be minor. We recommend that this culvert be installed prior to the forthcoming winter rains, if you wish to attempt to preserve the fill embankment at the overpass.

The attempts to develop Test Well No. 789-1 for pumping were unsuccessful. It appears doubtful that this well will yield sufficient flow to warrant pumping. If you wish to attempt dewatering with a well in this area, a new well located much closer to the University fault appears to offer the most probability of success. Due to the difficulty in assuring intercepting a major aquifer with a vertical well, we do not feel that the chances of success with this procedure warrant the cost, excepting only in a critical situation.

Horizontal Drain No. 789-A has apparently dewatered the slide body above the overpass sufficiently such that since the flow from the fault at 1,050 feet was developed the overpass structure has ceased to be deflected by the slide. It thus appears that, barring a change in the fault-permeability conditions, the overpass structure is no longer in hazard due to this slide movement.

It is our opinion that Centennial Drive in the area of the LBL Corporation Yard remains in hazard of slide movement due to high ground water levels and continuing changes in area fault-permeability conditions. The same is true of the Lawrence Hall of Science fill embankment, which is over-steep at about 1.35 to 1 slope, and lies in a very large Pleistocene slide body; this fill embankment is also considered to be potentially unstable during a major earthquake. Past measurements by University personnel indicate continuing slow creep of both embankments, ceasing in the dry season and increasing during winter seasons with heavy rainfall.

SSC-18
cont.

NERT AND ASSOCIATES
SOILS ENGINEERS

Job Number 789-A
10 September 1980

Mr. Gaetano P. Russo
Page 3

Since you have no present expectation of drilling any more major horizontal drains, we are returning the under-reamer bits, which were developed for Horizontal Drain No. 789-A, to the supplier. These bits have been held, with the supplier's permission, pending further drilling.

It is our understanding that the program of dewatering and slide repair has now been terminated. The activities of this office in connection with this program are thus ended with issuance of this letter. Should you wish to retain the samples obtained in the past drilling programs, please so notify this office and we will deliver them to you.

Respectfully submitted,

B. J. Lennert

jel

cc: Mr. Richard M. Koch

SSC-18 cont.

BEN J. LENNERT
CIVIL ENGINEER • SOILS ENGINEER
(RETIRED)
CONSULTATION ONLY

30 June 1987

'87 -5

Mr. Gene B. Cross
Assistant Vice Chancellor
Department of Facilities Management
2000 Carlton Street
Berkeley, CA 94720

Dear Mr. Cross:

On 26 June 1987 Mr. John DeLucchi of DeLucchi Well and Pump Co. called me on the telephone and described apparent conditions at the dewatering well southerly of the Space Sciences Building, which I installed in 1975, which indicated that there may be a potential for failure and loss of the well; he called me because he knew that I had installed the well and he did not know that I had retired. This letter is being written because I have been advised by Counsel that if an engineer has knowledge of a hazardous condition and fails to inform someone at hazard, even though he has no connection with them, he may be liable under the legal doctrine of "failure to inform". This letter is addressed to you because I have been told that you are head of the appropriate department and I do not know of any other suitable person; by this letter I hereby inform you, and the Campus, in accordance with the presumed "obligation" described above.

The information which I recieved from the driller, and which I remember from the past, is presented very briefly on the following two pages; I give no assurance as to the correctness or completeness of this information; the evaluations and judgements are given to fulfill my presumed "duty", and the same reservations apply.

It is the judgement of the undersigned that failure to continue pumping this well will result in appreciably increased hazard of embankment failure involving Centennial Drive and nearby downslope buildings; in the event of a major earthquake failure of this hill-slope area is virtually certain, with resulting life-hazard to those present in the area.

A reply to this letter is neither expected nor desired.

Very truly yours,

B. J. Lennert

B. J. Lennert
R. C. E. No. 9232

Copy to: Dave Wenner
Gene Metz
Dick Koch

SSC-18 cont.

3309 BROWNS VALLEY ROAD • NAPA, CALIFORNIA 94558 • (707)252-9273

BEN J. LENNERT
CIVIL ENGINEER • SOILS ENGINEER

HISTORY AND CONDITIONS

The well was completed in April 1975. See our report for Job Number 734 dated 25 April 1975. The drilled depth was 475 feet; the casing length was 397 feet; the pump was set to 390 feet. The pump was a 10 hp Gordon hung on 3 inch pipe. The initial water level was at a depth of 172 feet from TOC.

The well was pumped continuously, and the ground water surface reached the bottom electrode level after a period of months. The well then held the groundwater surface between the electrodes. As far as we know the well has been pumped continuously since excepting for breakdowns and pump replacement.

The well was installed to lower the groundwater in the ridge area above the Lawrence Hall of Science and the LBL corporation yard, in response to previous and potential slide movements as well as "creep" in Centennial Drive and the Lawrence Hall of Science fill area. See our report for Job Number 789 dated 26 November 1979. As best I can recall the well lowered the groundwater surface from a depth of about 175 feet to 350 feet, and then produced between 10 and 20 acre feet per year.

SSC-18 cont.

DRILLERS REPORT

The Writers understanding of the gist of the Drillers report is as follows:

> A new pump was installed something less than one year ago. Everything was the same as when the pump was replaced around three years previously.
>
> This month, when a new pump was installed, the casing appeared to be "grossly distorted" such that the string "hung up" at one point until it then passed and "bumpiness" was felt over a considerable depth. Much scale from the casing was found in and on the pump and pipe, indicative of probable stress in the casing; fine rock fragments (sand sizes) were also recovered. All this is new since last year.
>
> The Driller is concerned that the above may indicate impending failure of the casing and loss of the well.
>
> The Driller believes that drilling and casing a new well may be difficult and slow.

The Writer does not gaurantee any of the above; you should deal directly with the Driller.

BEN J. LENNERT
Civil Engineer • Soils Engineer

EVALUATION AND WARNING

If the casing has deformed during the past year, since the casing is in bedrock the bedrock is presumeably deforming. The only apparent probable causes for this are tectonic deformation between the Hayward and Wildcat faults, greatly accellerated due to an impending major earthquake, and/or an extremely large developing landslide.

If the well is no longer pumped the groundwater surface will presumeably rise some 175 feet; this could pose a major threat to hillside stability and to existing buildings thereon, as well as to Centennial Drive; in the event of a major earthquake the result could be an order of magnitude increase in hazard to life and property.

In the Writers judgement drilling and casing a new well could take weeks. The new well must be some distance from the existing well to limit interaction during drilling; if located too far from the existing well and/or incorrectly, the new well could "miss" the higher permeability "target" and not suitably replace the old well.

SSC-18 cont.

The situation appears to be serious. At the least the existing well should be subjected to inspection by television camera and a "gyroscopic rabbit" to evaluate the condition of the well; if a potential for failure of the well is indicated a new well should be drilled and cased as soon as possible and/or other equal or more effective measures taken.

Apparently the well pumping rate and groundwater surface level have not been checked since the Writer resigned from this work in 1979. These should be checked in correllation with the above, and any indicated changes made in pump size, etc.

It is not certain at this time that the well is in danger, but the evidence does warrant the investigation described above; since installing a new well will be quite costly, it is not reasonable to do so unless the need is established. If the monitoring program maintained by the writer prior to 1979 had been continued, you would probably now know what has caused (or is causing) the observed phenomena; it appears that reinstating that program at this time is strongly indicated by the recently obtained data, as well as by the current concensus that a major earthquake is immanent in the Campus area.

Questions from the Appendices

Where are the specific reports, in January in draft form, mentioned in 4.5 p. 18?

Where is Alan Kropp 2009, mentioned in the Wm Lettis report on Bldg 25 but not included?

Alan Kropp 2007 (Bldg 85) advised tiebacks and drilled piers to strengthen Building 85. These would simply increase the number already there, drilled into claystone and siltstone, not bedrock. The consultants warn, moreover, of landslides in this area, especially seismically-induced. They found slumps and instability within mixed landslide deposits. See especially the charts on page 26 (2006A) where the stability is analyzed and fails under certain conditions.

The hazards to be mitigated.

4.5-19 "The proposed project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving **landslides**." Rather than suggest mitigation measures, the report promises more specific investigations. The trenches were too shallow to show anything save the presence of large volcanic rocks in a clay matrix, the sign of the caldera.

4.5-p. 24 Expansive soil. 2006 EIR determined soil was not expansive save in southern part of LBNL site, which includes Bldg. 85/85/A. Alan Kropp 2006A (for Bldg 86, between 83 and 85 and for 85) shows Atterberg Limits far exceeding those of non-expansive material.

Atterberg Limits were not cited for Bldg. 25 area. What are they?

Without consideration of the caldera and the past evidence of its instability, (the landslides of 1974 and the later problems of dewatering the hill during small seismic events: Lennert September 1980), these consulting reports and the mitigation suggestions are dangerously inadequte.

SSC-18 cont.

Attachment #1

SAVE STRAWBERRY CANYON

P.O. BOX 1234

BERKELEY, CALIFORNIA 94701

Save Strawberry Canyon is a citizens' group that seeks to preserve and protect the watershed lands and cultural landscape of Strawberry Canyon. Save Strawberry Canyon was formed out of the urgent need to take action in response to the threat of intrusive, inappropriate development on the Canyon lands.

Strawberry Canyon, opposite the Golden Gate, is a unique link to the East Bay Regional Park District lands and, by its streams and views, to San Francisco Bay. The Canyon itself with its streamside vegetation, oak-bay woodlands, grasslands, and surrounding slopes, is a rich repository of wildlife directly adjacent to the dense urban populations of the UC Berkeley Campus and the cities of Berkeley and Oakland.

Save Strawberry Canyon seeks to inform the public about the impacts of proposed developments, to encourage location of such developments to more suitable sites, and to promote better public access to the beautiful Canyon with its wildlife and scenic resources. **Mission Statement**

July 9, 2010

Russell Gould, Chairman
Board of Regents
University of California
% Office of the Secretary and Chief of Staff
111 Franklin Street, 12th Floor
Oakland, California 94607
Anne.Shaw@ucop.edu
FAX: (510) 987-9224

Leslie Tang Schilling, Chair
Committee on Grounds and Buildings
Board of Regents
University of California
%Office of the Secretary and Chief of Staff
111 Franklin Street, 12th Floor
Oakland, California 94607

Re: GB4 Certification of Environmental Impact Report (EIR) and Approval of Design of the Seismic Life Safety Modernization and Replacement of General Purpose Laboratory Building, Phase 2 (Seismic Phase 2) Project, Lawrence Berkeley National Laboratory (LBNL)

SSC-18 cont.

Dear Mr. Gould, Ms. Schilling, and Members of the Board of Regents:

Save Strawberry Canyon (SSC) urges the Board of Regents not to certify the Environmental Impact Report (EIR) for LBNL's proposed Seismic Phase 2 Project. The EIR fails to consider fully the impacts to the natural environment, the risks to the health and safety of the community, and the use of resources without degradation and unintended consequences.

SSC, a non-profit corporation representing some 300 members, remains concerned that LBNL's Long Range Development Plan (LRDP) to build an alternative and sustainable energy research campus on the hillsides above the University of California Campus may have significant detrimental effects upon the environment. While it is laudable that the Seismic Phase 2 Project proposes to replace unused and unsafe buildings, both the LRDP and the Seismic Phase 2 Project overlook the obvious fact that there are other safer, underutilized industrial locations upon which to develop, such as the Richmond Field Station. The once-in-a-lifetime monies committed to the Seismic Phase 2 Project, whether from the American Recovery and Investment Act (ARA), that is public investment, from diminishing University resources, and/or from the financial support of private corporations, all, merit wise-use expenditure to create the most productive opportunity for research.

We are concerned by the EIR's continuing lack of acknowledgement and consideration of the cumulative impacts. Past LBNL projects as well as the ongoing and projected future University projects within the hill area are of serious consequence. The effects include soil, water and air contamination, traffic congestion, damage to aesthetic and natural values, and strain on scarce fire and disaster services.

In particular, the Regents must know of the growing concern over the question of the stability of the hillsides and the insufficient information for review. Accordingly, SSC makes the following comments:

1) The FEIR is missing the AKA 2009 and 2010 geotechnical reports. These were promised in the DEIR and in the Lab's responses to comments on the DEIR appended to the FEIR (pp. 5-259 and 5-265 among others). These were not provided during the CEQA reiew process. Such geotechnical reports are essential for assessing the Project.

2) The missing Figures 1 & 2 in the FEIR, provided in the "Notice of Errata" when asked for, are not new but include a map showing the two landslides beneath the Hazardous Waste Handling Facility (Buildings 85 and 85A) and a section of the hill under the General Purpose Laboratory (Building 25) in the Old Town area showing unstable Moraga volcanics over Orinda formation.

3) Responses in the DEIR "Master Responses" to the video "The Fault: Quakes, Slides, & the Lawrence Berkeley Lab," letters, and comments, indicate either a willful misunderstanding or misreading of a sketch section of the caldera. Geotechnical reports submitted with the LRDP and with EIRs for individual Lab buildings reveal all of the features that geologists associate with such a caldera: lobate deposits of andesite and blocks of basalt, both volcanic rocks; inclusions of other volcanics; mudstones and bedded water-tables, reservoirs of water at different levels rather than consistent aquifers, that filled up the magma chamber. [1]

SSC-18 cont.

4) Welded tuff (ash) defines the edge of the caldera that has been identified with precision before it became overgrown or built upon. The part of the caldera east of the Wildcat Fault lies to the south in Sibley Volcanic Park, separated from the LBNL caldera by 4 miles in 10 million years. (See the Hayward fault two-foot offset of the two halves of Memorial Stadiums over a mere 90 years.)

---

[1] Dunn and Goodman, Oct, 1984. "Hill Area Dewatering and Stabilization Studies"

"This synclinal structure is locally complicated by faulting and the presence of remnants of the volcanic vents through which the Moraga rocks were extruded. Rocks of the campus hill area represent part of a vent complex that has been truncated and displaced along the Wildcat fault and lack the well-developed synclinal structure of the rocks east of the Wildcat fault. The remainder of the vent complex is located several miles to the southeast in Robert Sibley Volcanic Regional Preserve (formerly Round Top Regional Park). The upper campus hill area represents a portion of this complex, juxtaposed between Hayward, Wildcat and Strawberry Canyon faults, with complex internal structure resulting from the superposition of uplift and folding on the volcanic vents and associated volcanic and sedimentary rocks."

5) How will LBNL stabilize the Hazardous Waste Handling Facility (85 and 85A), so dangerous that it cannot be moved or disturbed during retrofitting? By drilling piers "under the overhang" (that is, outside the building) to "stop the landslide"! Some of the twenty-one "40' to 50'piers" are evidently intended to reach beyond the perched water tables that range from 11' to 40' below surface. But what do the engineers expect to find under all this mudflow and water? Imagine trying to anchor Jello with toothpicks on a tilted plate. (These mitigating measures are described in the Environmental Assessment for DOE, June 28, 2010.)

6) Buildings 85 and 85A are located in the East Canyon, at the other end of the site from the fire station. Flammable brush surrounds the site. No plan to safeguard these buildings and their dangerous contents has been reviewed. Is the plan simply to evacuate the site at the smell of smoke? Do any fire crews aside from the one at the Lab know which buildings need to be safeguarded, wetted down, or quickly emptied of their contents? The area is subject to wildfires.

7) The costs of dewatering the hill and repairing slopes, roads, and buildings (20 slides in 12 years—1964-1976, now up to slide no. 40, according to the map published in the EA) indicate that the site is the most expensive and dangerous place to build. Orinda Formation as described in all the borings is composed of claystone and siltstone, which are different forms of mudstone. "Mudstones give rise to many problems in civil engineering because they are weak and shrink or swell on being dried or wetted. Muds are very reactive to physical disturbances of differential loadings, and they slump or flow easily when subjected to stress." (*The Oxford Companion to the Earth*, 2000, p. 715.) Buildings, as stated in at least one geo-tech report, destabilize these mudstones, so misleadingly labeled "bedrock."

8) The caldera, loaded with buildings, presses against the cretaceous shale and sandstone above the dormitories, private residences and campus properties below. A dip-and-strike measurement taken by Emeritus Professor Garniss Curtis on June 6, 2010 above Bowles Hall indicated a westward dip of around 40 degrees. This is in the hill area topped by some of the newer Lab buildings, a hill which has slid in the recent past and has had to be reinforced with a web of concrete. *Buildings on the LBNL site endanger not only Lab personnel but also those below in the event of the expected earthquake.*

9) Planners are undecided about the placement of the GPL. As the composition of LBNL grounds varies every few feet, a new set of reports will be necessary if the building is differently sited.

SSC-18 cont.

SSC appreciates the recommendation to the Regents that action not be taken to give final approval of the General Purpose Laboratory (GPL) site at Building 25, pending completion of the National Environmental Policy Act (NEPA) review. SSC expects that the inadequacies of the EIR will be answered in an Environmental Impact Statement (EIS) with a presentation of serious alternative site analysis.

It is too soon to certify the EIR or to proceed with any aspect of the Seismic Phase 2 Project given the many unresolved concerns, including the question of harmful impacts of contaminated water flow during demolition and construction. SSC has recently sought the engagement of the State and Regional Water Quality Control Boards to pose the possibility that LBNL may have acted prematurely by requesting demolition and construction permits. (Please see enclosed letter, SSC to San Francisco Regional Water Quality Control Board, July 2, 2010)

SSC believes that the Regents will benefit if they pause to request further environmental review for the proposed Seismic Phase 2 Project. In the fall of 2008 the Regents decertified LBNL's proposed Helios Energy Research Facility (Helios) due to discussions initiated by the public regarding the stability of LBNL's proposed hillside site in Strawberry Canyon. (Please see the three enclosed letters.)

Thank you for your serious attention given to these matters.

Sincerely,

Georgia Wright

Georgia Wright, for
Save Strawberry Canyon

SSC-18 cont.

Encl:

1. Letter, SSC to San Francisco Bay Regional Water Quality Control Board, July 2, 2010
2. Letter, Garniss Curtis to Anne Shaw (Regents), May 11, 2008
3. Transcribed from original, letter, A. Paul Alivisatos to Professor Emeritus Curtis, May 5, 2020
4. Letter, Garniss Curtis to Director Alivisatos, June 12, 2010, including 2 figures

Cc:
Mark G. Yudof, President, University of California
Paul Alivisatos, Director, LBNL

Attachment #1

SAVE STRAWBERRY CANYON

P.O. BOX 1234
BERKELEY, CALIFORNIA 94701

Save Strawberry Canyon is a citizens' group that seeks to preserve and protect the watershed lands and cultural landscape of Strawberry Canyon. Save Strawberry Canyon was formed out of the urgent need to take action in response to the threat of intrusive, inappropriate development on the Canyon lands.

Strawberry Canyon, opposite the Golden Gate, is a unique link to the East Bay Regional Park District lands and, by its streams and views, to San Francisco Bay. The Canyon itself with its streamside vegetation, oak-bay woodlands, grasslands, and surrounding slopes, is a rich repository of wildlife directly adjacent to the dense urban populations of the UC Berkeley Campus and the cities of Berkeley and Oakland.

Save Strawberry Canyon seeks to inform the public about the impacts of proposed developments, to encourage location of such developments to more suitable sites, and to promote better public access to the beautiful Canyon with its wildlife and scenic resources. Mission Statement

July 2, 2010

Bruce Wolfe, Executive Officer
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, California 94612

Re: Request for Risk Assessment vis-à-vis Section X State Water Board Order No. 2009-0009-DWQ for Lawrence Berkeley National Laboratory (LBNL) Seismic Phase II Project, Construction General Permit (CGP) issued May 13, 2010

Dear Dr. Wolfe:

Per a letter received from Dorothy Rice, Executive Director, State Water Resources Control Board, dated June 8, 2010, Save Strawberry Canyon understands that in accordance with Section X State Water Board Order No. 2009-0009-DWQ, a recent CGP granted to LBNL for the Seismic Phase II Project may be rescinded if the San Francisco Bay Water Board deems it appropriate to evaluate issuance of an individual storm water construction/demolition permit. It is our request that the San Francisco Bay Water Board initiate such an assessment for the Seismic Phase II Project. We request, too, that your agency review Notices of Intent (NOI) for all LBNL projects going forward. **SSC-18 cont.**

Matters of water quality, contamination, quantity, and release would seem to be of particular consequence at LBNL. It has only recently been recognized that the 200-acre site adjacent to the Hayward Fault is encircled by a collapsed caldera within which there may be a deeply embedded residue of accumulated radioactive waste, volatile organic compounds and chemical solvents. In fact, it should be noted by your agency that in 1998 the Environmental Protection Agency determined that LBNL was eligible for listing on the National Superfund Priorities List, due to detection of tritium in the air, soil, groundwater, and surface water. In 2001 LBNL was administratively removed from the eligibility list without comment.

At this time, in light of the unique geological nature of the LBNL site and in light of LBNL's long-term association with the research of the Cold War years, we urge the San Francisco Bay Water Board to exercise the authority given it by Section X State Water Board Order No. 2009-0009-DWQ. It must be presumed that the entire LBNL site may pose a significant risk to the water quality of local, state, and national resources.

Thank you for your attention given to this request.

Sincerely,

Lesley Emmington Jones.

Lesley Emmington Jones, for
Save Strawberry Canyon

SSC-18 cont.

Cc:
Dorothy Rice, Executive Director, State Water Resources Control Board
Bruce Fujimoto, State Water Resources Control Board
Shin-Roei Lee, San Francisco Bay Water Board
Cherry Seward, San Francisco Bay Water Board
John Muller, Chair, San Francisco Bay Water Board
Carole Schemmerling, Strawberry Creek Watershed Council
Barbara Boxer, U.S. Senator
Diane Feinstein, U.S. Senator
Barbara Lee, Congresswoman, U.S. Congress
Keith Carson, Alameda County Supervisor
Kim Abbott, Department of Energy/LBNL
Gary S. Hartman, DOE ORO NEPA
Paul Alivisatos, Director, LBNL
Mark G. Yudof, President, University of California
Phil Stevens, Urban Creeks Council

Attachment #2

On Sun, May 11, 2008 at 2:10 PM, Garniss Curtis
<gcurtis@berkeley.edu> wrote:
To: anne.shaw@ucop.edu
From: Garniss Curtis <gcurtis@berkeley.edu>
Subject: regarding certification of final environmental impact reports for the proposed computational research and theory facility and the helios energy resource facility and project approvals.
Cc:
Bcc:
Attachments:

As the request for my geologic opinion on the advisabilty of constructing large buildings in the lower part of Strawberry Canyon and in the next canyon to the north known as Blackberry Canyon came to me on May 4th, I have to be brief and rely on my memory. I shall first say as strongly as I can "absolutely do not construct any buildings in those two canyons", then I shall go into the reason based on the work I did as consultant to Mr. Ben Lennart 25 to 35 years ago who was contracted by the University to investigate a number of sites for possible constructions or for stopping landsldes that were threatening buildings.

First, the geologic setting of the two areas: The active Hayward Fault goes across the mouths of both canyons. Further east, the Wildcat Canyon fault parallels the Hayward Fault behind the Botanical Gardens and northward joins the Hayward near the town of San Pablo. Southward the Wildcat Canyon fault can be easily traced to Sibley Park and beyond. A few small epicenters lie along this fault near its junction with the Hayward, but it does not seem to be active elsewhere to the south. However, in the past the the area between the two streams and the two faults. which includes the whole of the Lawrence Laboratory complex lay four miles to the south next to Sibley Park. The volcanic rocks in both areas have potassium-argon dates of approximately 10 million years, and the rhyolite found in both of them is the same rhyolite. The volcanic rocks underlying most of the Lawrence Lab complex fill an old crater, a collapse caldera. The old volcano that once rose above these rocks collapsed after the expulsion of a very large amount of rhyolite ash, now largely removed by erosion. The volcanic rocks broke up as the collapse occurred and many show crushing and deformation and are mixed with large amounts of ash and volcanic fragmental debris. This material should never have been built on as it is so clay-rich and unconsoidated. The western rim of this caldera is easily traced trom its arcuate shape which is cut off by the Wildcat Canyon Fault just south of the Botanical Gardens near the upper part of Strawberry Creek. It swings around very close to the old Cyclotron and continues north to join the Wildcat Canyon Fault in Wildcat Canyon not far from the Merry-go-Round in Tilden Park. The boundary rocks to the west are sandstones and shales thought to be of Cretaceous age, that is, they are older than 65 million years. Exposures of these sandstones and shales are good below Bldg 50 down to Bowles Hall, and they dip westward at angles of 20 to 25 degrees, about which more later. The Hayward Fault passes very close to the rear of Bowles Hall after going through the Stadium where it has caused major deformation of the support pillars and offset of the two sides of the stadium since its construction in 1927.

Behind Hearst Mining Bldg and a few feet to the east, is the Lawson Adit which is a tunnel going eastward. Begun in the 1920' or earlier, it was completed in 1938 when it reached the Hayward Fault. Professor George Louderback told me (Personal comm.)

SSC-18 cont.

that it was not ordinary fault gouge that he found in the Hayward Fault zone but a pecular mixture of serpentine and metamorphic rocks that also appear on the surface and underlie Stern Hall and part of Foothill Student Housing. Founders Rock near the corner of Hearst and Gayley Road is in this melange. Also in the tunnel are several exposures of the offset of Strawberry Creek as determined from the contained rounded cobbles of Strawberry Canyon origin . Thus this indicates a displacemeent of more than 600 feet north along the Hayward Fault.

Still further north along the Hayward all the way to San Pablo huge amounts of the melange similar to that in the Lawson Adit have been squeezed out of the Hayward Fault and are gradually sliding down the slope below the fault Much of this melange has reached the bottom of the hill back of El Cerrito. Along the Arlington many houses built on this melange are sliding and have caused a great number of legal problems. Within the fault itself no movement can be detected in these deposits, some of which are more than 100 feet thick. Thus we believe that movement and expulsion of this melange takes place during major earthquakes on the Hayward Fault.

A great deal of research has been done recently on the Hayward Fault by the USGS at Menlo Park which was reported in a talk on the last Thursday of this past April. They have established a return time of major quakes of 6.5-7 magnitude on the Hayward Fault of 130 years. The last major quake along the northern part of the Hayward Fault was 140 years ago, so we are over-due. They estimate that there is approximately a 65 percent chance a major quake will occur in the next 30 years.

Lennart was able to get survey notes from East Bay Municipal Utility District for the San Pablo Dam water tunnel to El Cerrito which crosses the Hayward Fault and shows that the right lateral horizontal movement of approximately one centimeter per year is matched by uplift of the east side of the fault of approximatelly one centimenter per year also. So, with the evidence of the horizontal displacement of the old Strawberry Creek of 600 feet horizontally along Galey Road, the Cretaceous sedimentary rocks east of the Hayward Fault there have also risen 600 feet . Building 50(?) sits on these Cretaceous strata which, as mentioned dip westward 20-25 degrees. If an earthquake occurs when these beds are soaked with winter rains the chance of a major landslide are great along the slippage planes of shale dipping westward. Minor slides have already occurred in these beds behind Bowles Hall. Indeed, the Foothill Student Housing was planned to be built there until I called attention to the landslide. A major landslide would probably destroy all the buildings on both sides of Galey Road from the Stadium to the buildings on both sides of Hearst Avenue and would probably reach Dow Library, destroying everthing in its path to that point and possibly beyond. Buildings in the lower parts of both Strawberry and Blackberry Canyons would be buried if not destroyed. **SSC-18 cont.**

Major landslides of the type I have described here are not rare along the Hayward Fault as was shown to us during our study of the Hayward fault at the base of the hill behind the Clark Kerr Campus. We discovered that most of that campus was underlain by a large landslide that had originated in Claremont Canyon, and was gradually moved northward along the Hayward Fault. Trenches and drill holes showed this landslide to be up to 30 feet thick. It extends westward to and possibly beyond Piedmont Ave. Further south is a huge landslide that underlies most of the campus of Mills College and extends westward another quarter mile Still further south are more large slides that have originated in canyons and steep slopes east of the Hayward Fault. As the hills rise and become unstable, earthquakes cause them to break loose and slide. Very few large slides have occurred on the eastern slopes of the Berkeley Hills, hence fhe relationship to earthquakes of major land slides close to the Hayward Fault along the western slopes of the Berkeley Hills. Normal erosion rounds off unstable areas on the eastern slope of the Berkeley Hills before they break loose and slide.

Most of the buildings of the Lawrence Lab. are on the unstable ground filliing the old caldera. particularly the Bevatron and associated buildings. As the Cretaceous beds immediately west of these buildings have been eroded away there is nothing to keep these soft caldera-filled beds from sliding. The buildings on them will certainly move a few feet in a major earthquake if not hundreds of feet. Keep in mind the Loma Prieta quake of l989 of magnitude 6.9 which from a distance of over 60 miles destroyed a section of the Bay Bridge, a section of the overhead freeway in Oakland killing 63 people, and many houses on filled ground in the Marina of northen San Francisco some 70 miles from the quake!

No! Major buildings of any kind should not be constructed in either of these canyons bordering this huge block of unstable rock.

SSC-18 cont.

--

Profesor Emeritus Garniss H. Curtis
Dept. Earth and Planetary Science
Univ. Calif, Berkeley, CA

--

Garniss H. Curtis
Berkeley Geochronology Center
E-Mail: gcurtis@uclink.berkeley.edu

Attachment #3

May 5, 2010 (transcribed from original)

Dear Professor Emeritus Curtis:

Thank you for your letter dated April 11, 2010, advising us of the USGS predictions related to the Hayward fault. We appreciate your expressed concerns, and, as we discussed at our meeting with you on March 31, 2010, the Lab has devoted considerable effort to study the local geology in relation to human safety and construction. The risks posed by future seismic events are significant for all residents and organizations in the East Bay, and we should work together to prepare for such an event.

It is also important to assess risks on the basis of evidence. In our meeting, you acknowledged that your caldera hypothesis does not match the full range of evidence that is now available. I hope that you have given more thought to the matter and have reconsidered in light of the new data presented to you. In the interest of presenting the full case to the public, I invite you to attend our next Community Advisory Group meeting on July 8, present your current thinking and hear more of the research presented by our geologists. This will afford interested members of the public an opportunity to hear a full spectrum of views on the matter.

SSC-18 cont.

As you know, the Berkeley Lab has been a fixture of the East Bay for over 80 years with an auspicious history. As the current Director I am acutely aware of the need for responsible stewardship on behalf of the neighborhood residents, the larger East Bay community, and the nation.

Thank you again, for taking the time to meet with me and others at Berkeley Lab. I look forward to continuing our dialogue and hope that you will join us on July 8.

Sincerely, A. Paul Alivisatos
Director

Attachment #4

10 St. James Court
Orinda, CA 94563
June12, 2010

Paul Alivisatos, Director
Lawrence Berkeley National Laboratory
One Cyclotron Road
Berkeley, CA 94720

Re: Your letter of May 5, 2010

Dear Director Alivisatos:

I have not changed my mind about the validity of LBNL's location on a collapse-caldera. The evidence I presented to all of you at our meeting showing an arcuate line extending from the Wildcat Fault south of the Botanical Gardens around the cyclotron and following closely Shasta Rd to its intersection with Grizzly Peak Blvd and beyond to its intersection again with the Wildcat Fault 150 yards north of Shasta Rd has been called the Chicken Creek Fault and Cyclotron Fault in reports done for LBNL. Neither of the two reports show the continuation of this fault to intersections with the Wildcat Fault, which should have been done.

To clarify my evidence for a collapse-caldera, I have made a tracing of the caldera and the Wildcat Fault and have shown the age of 10 to 12 million years for all the exposed rocks in the caldera in pink. Outside of its margin the Cretaceous rocks belonging to the Great Valley Sequence of 65 to 138 million years have been colored green. Once, of course, the 10 to 12 million year old rocks of mid-Miocene age covered all the Cretaceous rocks surrounding the caldera but have been eroded away. The caldera rocks dropped down far enough in the caldera so were not completely eroded away. SSC-18 cont.

Not discussed in any report but exposed in the ridge west of the Wildcat Fault and inside the caldera are flat-lying layered welded tuff beds 50 feet and more in thickness composed of rhyo-dacite. These once were much thicker and covered a wide area. It was the expulsion of this welded tuff that caused the collapse of the caldera. The source conduit is oval-shaped and shown in red and now covered with houses so it is difficult to see, but its mineral and chemical composition are identical with the welded tuff.

The source of the Moraga volcanics and the caldera was in Sibley Park. Tectonic deformation has turned these beds up to the vertical, allowing erosion to remove most of the Moraga volcanic source and all of the other half of the caldera.

Sincerely,

Garniss H. Curtis

Garniss Curtis, Professor Emeritus UCB, Earth and Planetary Sciences

Attachment #5
Figure 1

SSC-18 cont.

Figure 2

SSC-18
cont.

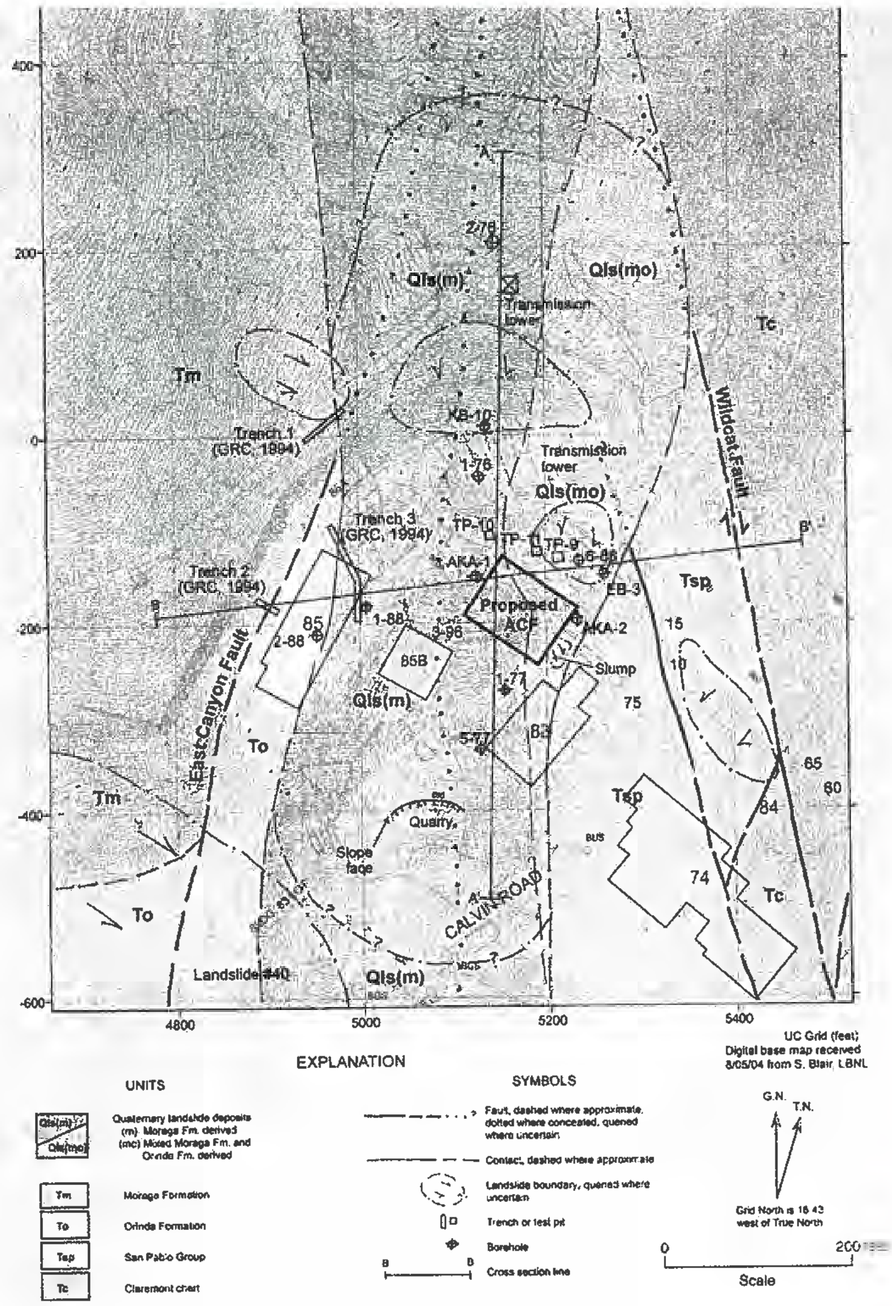


Figure 6. Geologic map of the East Canyon area of the LBNL campus, including the proposed ACF. Base topography from S. Blair, LBNL, 2004. Map shows bedrock units and bedrock-involved landslide deposits, bedrock faults, and outlines of landslide bodies. Quaternary unconsolidated deposits and artificial fill are omitted for clarity, but are shown on cross sections A-A' and B-B'. Borehole, trench, and test pit sources used to construct cross sections are listed with the cross sections. Mapping based on field reconnaissance, borehole compilation and reinterpretation (including Gilpin, 1994), RFI Final Report (2000), as part of this study. Unpublished data from P. Jordan (pers. communication, 2004).

LBNL ANIMAL CARE FACILITY

Preliminary Geologic Map

WLA William Lettis & Associates, Inc.

SSC-18 cont.

Attachment #3

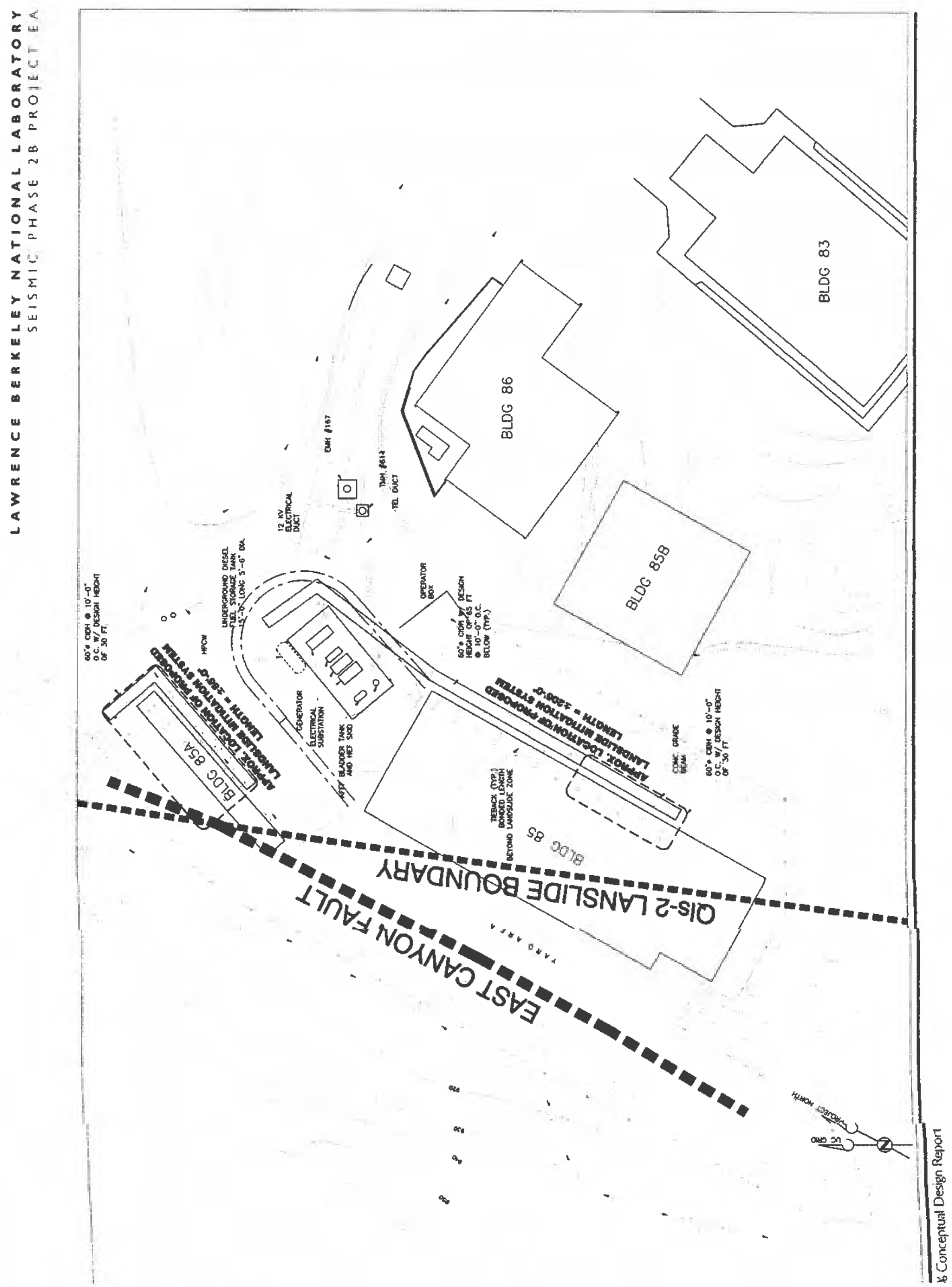
From Alan Kropp & Assoc, Inc 2006A
Geotechnical Investigation Report: Animal Care Facility

428-00050

Fig. 1

Attachment #3

From Environmental Assessment, p. 20   2010   Fig. 2



SSC-18
cont.

REC'D JUL 2 9 2010

Committee to Minimize Toxic Waste

LETTER #CMTW

DOE/SLSII/DEA
COMMENTS#1of5

Kim Abbott, NEPA Document Manager
Department of Energy, Berkeley Site Office
One Cyclotron Road, MS 90-1023
Berkeley, CA 94720

July 26, 2010

Re: Comments on the Draft Environmental Assessment (DEA) for a project titled: The Lawrence Berkeley National Laboratory (LBNL) Seismic Life-Safety, Modernization and Replacement of General Purpose Buildings, Phase 2B.

Dear Mr. Abbott,

Landslides at LBNL have created havoc at the site since the inception of the University of California Radiation Laboratory (UC Rad Lab) in the 1940s. Attachment 1. "Chronology of the Campus Hill Area Development and Slope Instability Through 1984" is especially note-worthy, since it shows how major slides started occurring immediately after and as a result of construction on the hill. CMTW-1

The Department of Energy (DOE) has not fulfilled its obligation under the National Environmental Policy Act (NEPA) to adequately describe, analyze and consider the natural and man-made hazards at each of the sites of the proposed Seismic Life-Safety Phase 2B project (the Project). Indeed, the 43,000 square foot General Purpose Laboratory (GPL) building is proposed to be constructed in the Old Town/Strawberry Canyon Landslide Area on top of the most contaminated soils and groundwater contamination plumes extending under the entire B25/GPL site. In the East Canyon, B85 Complex, the lab's Hazardous Waste Handling, Storage and Treatment Facility is undermined by the East Canyon Slide and the yet unknown, undetermined impacts/influences and transport paths of the millions of gallons of perched groundwater along the Wildcat Fault! And in the Blackberry Canyon B55 and B71 sites are impacted by the Blackberry Canyon slide, radioactive and chemical contamination in soil and groundwater and the influences of springs, earthquake faults and the North Fork of Strawberry Creek. CMTW-2

In an article "Geologist reveals nature's plan in Berkeley hill walk" (Hills Publication/Berkeley Voice February 24, 1994) retired geologist Hal Wollenberg states: "One plant engineer said this is the last place to build a national laboratory," about the unstable ground (Attachment 2.) And yet, the projects continue with deficient analysis fueled by the seemingly unending taxpayer funded ARRA monies! (Attachment 3 A & B) CMTW-3

ATTACHMENT 1.

Chronology of the Campus Hill Area Development and Slope Instability Through 1984

Early 1900's	Development of the campus hill area begins
1949	Numerous slides occur as a result of Bevatron (Building 51) construction (1st recorded stability problems)
1950's	LBL significantly increases construction, massive cuts and fills undertaken to create flat pads for roads and buildings
1962	Small slope failures occur in the slopes behind Building 46, at site of Building 77, and reactivation of old slide uphill and east of Building 17
1962	Hydraugers installed to stabilize cut slope at northeast corner of Building 77 site
1963	Additional hydraugers installed behind slope north of Building 77 to stabilize old slide area
1963	Centennial Drive constructed
1967 - 1969	Slope instability continues at cut and fill behind Building 77, slope repairs and installation of hydraugers
1967	Slide on natural slope between Building 76 and 79
1969	Wet winter, much larger and more damaging slides occur including major failure of slope between LBL Corporation Yard and Centennial Drive which is repaired with buttress fill and subdrainage
1968-69	Serious slide occurs at the Centennial Drive overpass eastern abutment, road partially closed, hydraugers installed
1970	Slide occurred adjacent to Building 71 southeast parking lot, hydraugers installed
* 1973 →	Building 46 bisected by a very large slide, major repairs required including dewatering; slide continues to move in wet seasons
1975	Slide at compacted fill south of Building 77
1978	Slide at compacted fill south of Building 72
1975 →	Major hill area dewatering program undertaken, Shively Well No. 1 drilled (still continuously pumped)
1978	Centennial Drive overpass deforms further, steel bracing added
1979	Large scale dewatering of the hill attempted, second well drilled, two long nearly horizontal hydrauger drains installed into hill from Poultry Husbandry site
1980's	Numerous small slumps and mudflows occurred throughout hill area
1982	Earth movement at Centennial Drive overpass causes road closure, temporary repairs
1983	More movement at Centennial Drive overpass, road closed, major buttress fill repair required
1984	Centennial Drive reopened

Source: Complied from information contained in the Hill Area Dewatering and Stabilization Studies (Converse Consultants, 1984).

CMTW-4

In addition to the information above, by 1987 LBNL had mapped some 30 landslides within the lab's Strawberry and Blackberry Canyons, and by 2008 the number of slides was up to 40, including LBNL's East Canyon landslide area.

Regarding Building 46 slide (see above), notes from a site visit by Robert Dunn and Professor Richard Goodman (October 18, 1976) state: Building 46 was "first founded on what was thought to be solid basalt-actually was LARGE BLOCKS." See also attached figure of the collapsed caldera (after Garniss Curtis, Professor Emeritus) at LBNL.

CMTW-5

ATTACHMENT 2.

Geologist reveals nature's plan in Berkeley hill walk

Hills Publication Feb. 24, 1994

By Julie Freestone

Nearly 100 employees turned out at Lawrence Berkeley Laboratory at lunch time recently to hear a retired geologist provide an explanation of the history of land formations in the hills above Berkeley.

Speaking with a megaphone and leading the group up steep hills to see firsthand what earthquakes and volcanos did to the terrain, Hal Wollenberg communicated his enthusiasm during the more than one-hour al fresco lecture.

Describing rocks which are over 70 million years old, Wollenberg said, "We have a juxtaposition of terrains, some might call it geological chaos." He showed the group "younger" Orinda rocks and much older ones, but pointed out 50 million years was missing in between.

Although the Orinda rocks may sound like ancient history, Wollenberg described how the rocks, which have relatively low permeability affect current conditions. When ground water moves through the hills, the Orinda rocks block the flow and exacerbate landslides.

→ "One plant engineer said this is the last place to build a national laboratory," he said with a laugh about the unstable ground.

Wollenberg said the Orinda formation was probably deposited seven to eight million years ago, made up of stream deposits, sandstone and landslide deposits which formed the hills.

Later. volcanic rock capped the ridges and valleys.

Leading the group to a hillside behind building 46, Wollenberg traced the history of a tunnel dug into the hillside, explaining it had once been used to provide Berkeley with a water system, but more recently was the site of drilling to better identify the rock formations in the hill.

He pointed to a spot where a 1973 landslide "sundered" building 46 and threatened other buildings. Emergency procedures were started to put in drains to reduce the level of water in the hills and prevent future slides.

"After the rain, 300,000 cubic years of materials were removed, composted and returned to the slope," Wollenberg said, pointing out it is now thickly vegetated with Scotch broom.

Besides being fueled by the accumulation of water, Wollenberg said landslides also occur where volcanoes have deposited material which undergoes a sort of baking action, creating a softer clay layer. "It becomes a slide plane," he explained.

During the walk, employees who didn't know each other compared notes on recent layoffs and on the work their units were doing, but all seemed fascinated with the geological lecture.

"Working here is like being in school," said Peter Fraser, a quality engineer at LBL. "You drive down the road and see things but don't usually have anyone to ask. Here, there are experts everywhere. Why not use them?"

Standing at the highest point of the lab, the group did just that, peppering Wollenberg and several other geologists on the walk with questions about different colored rocks.

Wollenberg pointed the Orinda formation, which he said is especially beautiful near the Caldecott tunnel. Above that is the Moraga rocks, which he described as "highly fractured, a typical mud flow, more common and much more dangerous" than the hard, intact lava flow.

Explaining mud flows, he said, "They travel the farthest and wipe out whole cities."

Wollenberg and geologist Pat Williams promised to lead another walk in the spring to describe more recent features such as faulting and explain the role they play in the current life of LBL.

CMTW-6

3/84

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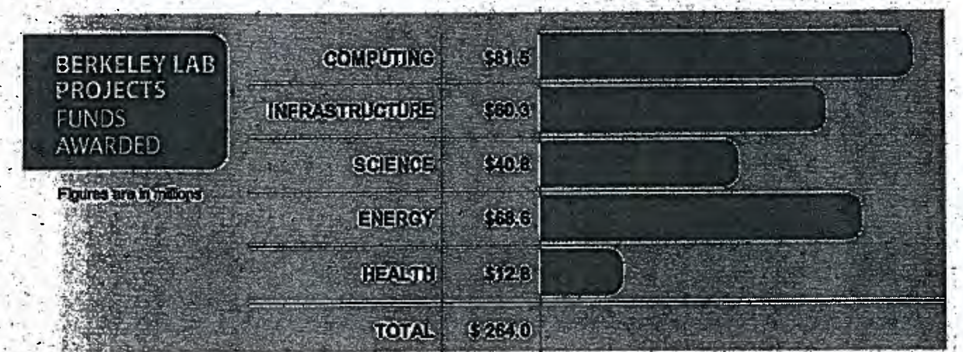
THE DAILY CALIFORNIAN

Berkeley, California · Tuesday, February 2, 2010 · www.dailycal.org



LAWRENCE BERKELEY NATIONAL LABORATORY/COURTESY

Berkeley Lab Reaps Benefits of Stimulus

by Cristian Macavei
Contributing Writer

While double-digit unemployment continues to plague many areas of the country, federal stimulus grants are funding research at Lawrence Berkeley National Laboratory that may lead to long-term economic growth.

About $264 million has been allocated to the lab since March 2009 through the American Recovery and Reinvestment Act for research in computing, energy, health and other sciences.

ONLINE PODCAST
Cristian Macavei talks about the stimulus grants to Berkeley lab.

"Last year, we made the largest investment in basic research funding in history, an investment that could lead to the world's cheapest solar cells or treatment that kills cancer cells but leaves healthy ones untouched," said President Obama in his State of the Union address last week.

The lab is pursuing a variety of projects in areas such as energy, biofuels and computing that will provide scientific benefits in the future, according to Julie Chao, a lab spokesperson.

"The $11.3 million for the Advanced Light Source, one of the world's brightest sources of ultraviolet and soft X-ray beams, alone will facilitate scientific discoveries in everything from disease research to alternative fuels," she said in an e-mail.

Another stimulus grant, a $12.8 million grant from the National Institutes of Health, will help fund research into radioactive decontamination, cancer and other health conditions, according to a lab statement.

The institutes awarded $4.2 million of the grant to the lab's two-year radioactive decontamination project. The funding will allow researchers to further develop two molecules that may better treat nuclear contamination.

About $81.5 million for computing research and development and $60.3 million for infrastructure spending has been awarded to the lab since March 2009, according to a lab statement.

Chao said in an e-mail that the first portion of the stimulus money was allocated to the lab for infrastructure projects, while additional funding for science and research came in later months. Many projects are still under development.

"Many of them are still hiring, purchasing equipment, setting up experiments and so forth," she said. "A good number of these are multi-year projects."

At least 192 jobs have been created or retained as of Dec. 31, 2009 due to the influx of stimulus funding, according to Chao.

"All kinds of jobs have been created and retained thanks to the Recovery Act funding, from construction workers and electricians to research assistants, project managers, engineers and, of course, scientists," she said in the e-mail. "Plus, through the procurement of goods and services, many jobs have been created or retained at vendors and subcontractors, both locally and nationally."

The lab itself has seen its budget—most of which comes from the U.S. Department of Energy—increase by about $58 million since the 2008 fiscal year to about $648 million in the 2009 fiscal year, according to a November 2009 lab statement. $11 million of the increase came from stimulus funding.

The lab's budget is estimated at $774 million for the 2010 fiscal year, with about $122 million from stimulus funding, according to the statement.

Chao said federal agencies are allocated

>> STIMULUS: PAGE 2

STIMULUS: Research Spending May Boost Economy

FROM FRONT

money by Congress, which they then route for specific use to laboratories such as Berkeley lab.

Mike Janes, a spokesperson for New Mexico-based Sandia National Laboratory, said in an e-mail that the Sandia lab has received $45.3 million of stimulus funding from the act as of Jan. 22 this year. $21.9 million has been assigned for capital funding and $23.4 million has been assigned for operating funding.

Sandia is using the stimulus funds to develop low-carbon energy solutions and to address key energy security challenges, such as reducing U.S. oil dependence, Janes said.

John Ellwood, a UC Berkeley professor in the Goldman School of Public Policy, said it is important to consider which funding would most effectively stimulate the economy.

"The interesting thing is we are awash in research money while we are starved at the state," he said.

Stimulus funding for research would not necessarily temper stubborn unemployment rates, Ellwood said.

"Someone could argue that the cost per job created will be very high with stuff at the labs because you'll have to buy lots of expensive equipment and lots of expensive labor," he said.

But stimulus spending for research will allow the American economy to grow in the long run, he said. Additionally, the funding will provide needed resources for university-related projects.

"As a resident of California and as a faculty member of Berkeley, this stuff is great," Ellwood said. "The money is coming from all American taxpayers, and it's going to California and to the University of California, which we in a narrow selfish world love."

Cristian Macavei covers research and ideas. Contact him at cmacavei@dailycal.org.

ATTACHMENT 3A

4/84

CMTW-6
cont.

CMTW-6 cont.

ATTACHMENT 7D

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THE DAILY CALIFORNIAN

Berkeley, California Monday, March 30, 2009 www.dailycal.org

5/84

RESEARCH & IDEAS

Lawrence Berkeley Lab Gains Federal Funds

by Christine Chen
Contributing Writer

Lawrence Berkeley National Laboratory will receive $115 million as part of President Barack Obama's American Recovery and Reinvestment Act, as announced by Secretary of Energy and former director of the lab Steven Chu last week.

The funding comes from a portion of the $787 billion act Obama signed in February aimed to move research forward at major science institutions, while creating new jobs at the same time.

"Most of these projects (being funded by the act) have to do with infrastructure upgrades, and a number of those have been approved, but we have not received any of the money yet," said Jeff Miller, a spokesperson for the lab.

Among the projects that will be funded is the construction of a lab and office building for the Advanced Light Source synchrotron, a soft X-ray light source used by scientists to learn more about atomic structure.

About $14.3 million will go toward constructing a building next to the synchrotron as well as toward the ongoing project of demolishing the Bevatron, an older particle accelerator, to make room for new science buildings.

Another $1.5 million will go toward maintenance for the synchrotron, which is an open facility used by two thousand scientists and industries per year, said Roger Falcone, director of the synchrotron and a UC Berkeley professor of physics. The lab will need to hire about three dozen extra construction workers, he said.

"This will accelerate the completion of the project and fulfill the other half of the requirement of stimulus funding, which is to create jobs, so it provides additional work for the construction field," Falcone said. "It will accelerate the process, which will make the research happen sooner."

Another proposed project at the lab is the Berkeley Lab Laser Accelerator, which scientists anticipate will receive $19 million. The money could

>> LAB: PAGE 2

$115 Million

Money the lab will receive from the economic stimulus bill

VICTORIA CHOW/STAFF

Projects the money will fund include:

- Construction for the Advanced Light Source synchrotron
- Demolition of the Bevatron
- Completion of the Berkeley Lab Laser Accelerator

SOURCE/LAWRENCE BERKELEY NATIONAL LABORATORY

LAB: Funding May Help Create New Jobs

FROM FRONT

potentially fund 50 to 60 new employees to do technical work on the laser system.

Because the high-energy laser system produces a large electric field, it can be built at a smaller scale than normal-sized accelerators while producing the same amount of energy, said Wim Leemans, director of the project. He said while the project received high ratings among scientists, there wasn't enough funding available to build it until recently.

"We were afraid we would lose our leadership in this area, and now we're back in the position so we can maintain the lead," Leemans said. "They told us that we would have gotten money about two years from now, but they would have to spread the project out more years than we wanted. Now, with the (act), we can do it on a much faster timescale, so it allows us be competitive with the rest of the world."

Again, DOE has failed to follow NEPA regulations regarding communicating with the public the most important information pertaining to the LBNL site, including, but not limited to the critical significance of the CURTIS CALDERA, inside which LBNL buildings are located, including all the components of this Project, on the unconsolidated melange of volcanic fragmental debris left behind when the caldera collapsed. (Attachment 4 A & B)

In fact LBNL is located in the northwestern crater (Curtis Caldera) of the Sibley Volcanic Cluster, connected to the Sibley Volcanic Regional Preserve of the East Bay Regional Park District.

Information provided by the Sibley Volcanic Preserve states the following: " 10 million years ago volcanic eruptions began near what is now Round Top Volcano in Sibley Park. The magma may have risen through a fractured zone now known as "Wildcat Fault". Two volcanic centers developed here: a larger volcano rose to the west; a smaller cone (Round Top Volcano) formed on the eastern flank of the larger. The two eruptive centers were separated by the Wildcat Fault, a branch of the large Hayward Fault System.

9 million seven hundred thousand years ago a violent eruption blew the lid off the larger volcano. Rhyolite ash spread over 3 counties. Ash deposits have been traced many miles to the east and south - and can be found today 40 miles north at Sears Point. Following this great eruption, the volcano collapsed to form a crater or "caldera" 2 miles long and a mile wide. The Lawrence Berkeley Laboratory is now located on the deeply eroded remains of this volcanic caldera."

The Sibley Volcanic Preserve's informational brochure further states: "How many volcanos? Round Top is the obvious one. There are smaller ones outside the Preserve to the north and southeast. Another, of rhyodacitic composition (rather like the ash from Mount St. Helens), underlies the Lawrence Berkeley Laboratory and Little Grizzly Peak in Tilden Regional Park. About 9.8 million years ago it was erupting beside Round Top. Subsequently it was shifted about 3.5 miles northwest by movement along Wildcat Fault. That makes a total of 4 volcanos." (Attachment 5, 2 pages).

CMTW-7

The proposed Project does not assure, as required by NEPA, "safe, healthful surroundings", due to the UNMITIGABLE nature of the site itself. Elevated Life-Safety Risks will continue at the lab as long as LBNL operates at the current site on the unconsolidated soils of the collapsed caldera. The DEA projects a false sense of security/ safety as it ignores the fact that seismic upgrading of buildings does not remedy the instability of the site. Indeed, CONDITIONS OF THE LAND ARE THE DOMINANT HAZARD FEATURES, NOT BUILDINGS ALONE!

CMTW-8

ATTACHMENT 4A

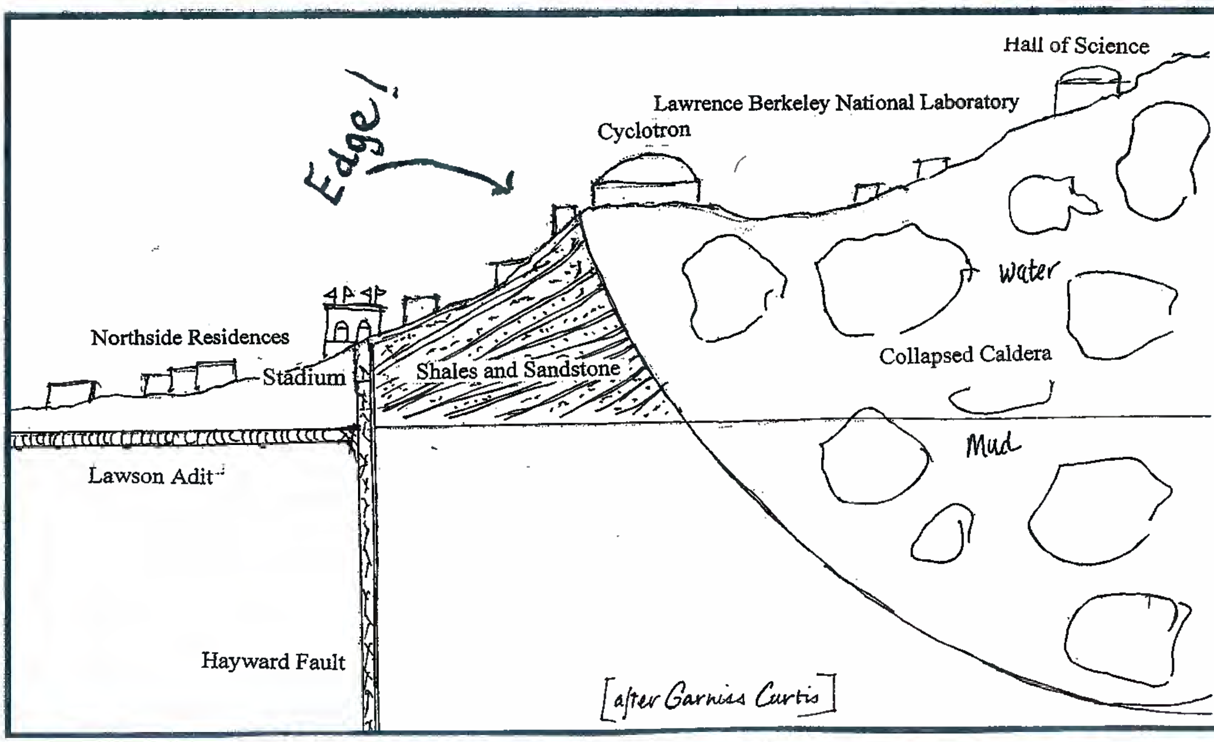

Figure above shows an unknown mixture of mud, perched water and boulders, for which LBNL has yet to do a comprehensive hydrogeological study of its composition. Also missing is the mapping of LBNL's hydrostratigraphic units (HSUs), which would show the hydraulic connection between various permeable layers of the HSUs sedimentary sequences.

7/8

CMTW-9

ATTACHMENT 4B.
(3 PAGES)

Statement of Garniss H. Curtis, Professor Emeritus
Department of Earth and Planetary Science, U.C. Berkeley

On Sun, May 11, 2008 at 2:10 PM, Garniss Curtis <gcurtis@berkeley.edu> wrote:

To: anne.shaw@ucop.edu
From: Garniss Curtis <gcurtis@berkeley.edu>
Subject: regarding certification of final environmental impact reports for the proposed computational research and theory facility and the Helios energy resource facility and project approvals. [*Please note that several typographical errors and misspellings have been corrected in the following text.*]

As the request for my geologic opinion on the advisability of constructing large buildings in the lower part of Strawberry Canyon and in the next canyon to the north known as Blackberry Canyon came to me on May 4th, I have to be brief and rely on my memory. I shall first say as strongly as I can "absolutely do not construct any buildings in those two canyons", then I shall go into the reason based on the work I did as consultant to Mr. Ben Lennart 25 to 35 years ago, who was contracted by the University to investigate a number of sites for possible constructions or for stopping landslides that were threatening buildings.

CMTW-9 cont.

First, the geologic setting of the two areas: The active Hayward Fault goes across the mouths of both canyons. Further east, the Wildcat Canyon fault parallels the Hayward Fault behind the Botanical Gardens and northward joins the Hayward near the town of San Pablo. Southward the Wildcat Canyon fault can be easily traced to Sibley Park and beyond. A few small epicenters lie along this fault near its junction with the Hayward, but it does not seem to be active elsewhere to the south. However, in the past, the area between the two streams and the two faults (which includes the whole of the Lawrence Laboratory complex) lay four miles to the south next to Sibley Park. The volcanic rocks in both areas have potassium-argon dates of approximately 10 million years, and the rhyolite found in both of them is the same rhyolite. The volcanic rocks underlying most of the Lawrence Lab complex fill an old crater, a collapse caldera. The old volcano that once rose above these rocks collapsed after the expulsion of a very large amount of rhyolite ash, now largely removed by erosion. The volcanic rocks broke up as the collapse occurred and many show crushing and deformation and are mixed with large amounts of ash and volcanic fragmental debris. This material should never have been built on as it is so clay-rich and unconsolidated. The western rim of this caldera is easily traced from its arcuate shape which is cut off by the Wildcat Canyon Fault just south of the Botanical Gardens near the upper part of Strawberry Creek. It swings around very close to the old Cyclotron and continues north to join the Wildcat Canyon Fault in Wildcat Canyon not far from the Merry-go-Round in Tilden Park. The boundary rocks to the west are sandstones and shales thought to be of Cretaceous age, that is, they are older than 65 million years. Exposures of these sandstones and shales are good below Building 50 down to Bowles Hall, and they dip westward at angles of 20 to 25 degrees, about which more later. The Hayward Fault passes very close to the rear of Bowles Hall after going through the Stadium where it has caused major deformation of the support pillars and offset of the two sides of the stadium since its construction in 1927.

Behind Hearst Mining Bldg and a few feet to the east, is the Lawson Adit which is a tunnel going eastward. Begun in the 1920' or earlier, it was completed in 1938 when it reached the Hayward Fault. Professor George Louderback told me (Personal comm.) that it was not ordinary fault gouge that he found in the Hayward Fault zone but a peculiar mixture of serpentine and metamorphic rocks that also appear on the surface and underlie Stern Hall and part of Foothill Student Housing. Founders Rock near the comer of Hearst and Gayley Road is in this melange. Also in the tunnel are several exposures of the offset of Strawberry Creek as determined from the contained rounded cobbles of Strawberry Canyon origin . Thus this indicates a displacemeent of more than 600 feet north along the Hayward Fault.

Still further north along the Hayward all the way to San Pablo huge amounts of the melange similar to that in the Lawson Adit have been squeezed out of the Hayward Fault and are gradually sliding down the slope below the fault. Much of this melange has reached the bottom of the hill back of El Cerrito. Along the Arlington many houses built on this melange are sliding and have caused a great number of legal problems. Within the fault itself no movement can be detected in these deposits, some of which are more than 100 feet thick. Thus we believe that movement and expulsion of this melange takes place during major earthquakes on the Hayward Fault.

CMTW-9 cont.

A great deal of research has been done recently on the Hayward Fault by the USGS at Menlo Park which was reported in a talk on the last Thursday of this past April. They have established a return time of major quakes of 6.5-7 magnitude on the Hayward Fault of 130 years. The last major quake along the northem part of the Hayward Fault was 140 years ago, so we are over-due. They estimate that there is approximately a 65 percent chance a major quake will occur in the next 30 years.

Lennart was able to get survey notes from East Bay Municipal Utility District for the San Pablo Dam water tunnel to El Cerrito which crosses the Hayward Fault and shows that the right lateral horizontal movement of approximately one centimeter per year is matched by uplift of the east side of the fault of approximately one centimeter per year also. So, with the evidence of the horizontal displacement of the old Strawberry Creek of 600 feet horizontally along Galey Road, the Cretaceous sedimentary rocks east of the Hayward Fault there have also risen 600 feet. Building 50(?) sits on these Cretaceous strata which, as mentioned, dip westward 20-25 degrees. If an earthquake occurs when these beds are soaked with winter rains the chance of a major landslide are great along the slippage planes of shale dipping westward. Minor slides have already occurred in these beds behind Bowles Hall. Indeed, the Foothill Student Housing was planned to be built there until I called attention to the landslide. A major landslide would probably destroy all the buildings on both sides of Galey Road from the Stadium to the buildings on both sides of Hearst Avenue and would probably reach Dow Library, destroying everything in its path to that point and possibly beyond. Buildings in the lower parts of both Strawberry and Blackberry Canyons would be buried if not destroyed.

Major landslides of the type I have described here are not rare along the Hayward Fault as was shown to us during our study of the Hayward fault at the base of the hill behind the Clark Kerr Campus. We discovered that most of that campus was underlain by a large landslide that had originated in Claremont Canyon, and was gradually moved northward along the Hayward Fault. Trenches and drill holes showed this landslide to be up to 30 feet thick. It extends westward to and possibly beyond Piedmont Ave. Further south is a huge landslide that underlies most of the campus of Mills College and extends westward another quarter mile Still further south are more large slides that have originated in canyons and steep slopes east of the Hayward Fault. As the hills rise and become unstable, earthquakes cause them to break loose and slide. Very few large slides have occurred on the eastern slopes of the Berkeley Hills, hence the relationship to earthquakes of major landslides close to the Hayward Fault along the western slopes of the Berkeley Hills. Normal erosion rounds off unstable areas on the eastern slope of the Berkeley Hills before they break loose and slide. **CMTW-9 cont.**

Most of the buildings of the Lawrence Lab. are on the unstable ground filling the old caldera, particularly the Bevatron and associated buildings. As the Cretaceous beds immediately west of these buildings have been eroded away there is nothing to keep these soft caldera-filled beds from sliding.. The buildings on them will certainly move a few feet in a major earthquake if not hundreds of feet. Keep in mind the Loma Prieta quake of l989 of magnitude 6.9 which from a distance of over 60 miles destroyed a section of the Bay Bridge, a section of the overhead freeway in Oakland killing 63 people, and many houses on filled ground in the Marina of northern San Francisco some 70 miles from the quake!

No major buildings of any kind should be constructed in either of these canyons bordering this huge block of unstable rock.

Profesor Emeritus Garniss H. Curtis
Dept. Earth and Planetary Science
University of California, Berkeley, CA

Garniss H. Curtis
Berkeley Geochronology Center
E-Mail: gcurtis@uclink.berkeley.edu

Attachment 9.

Sibley Volcanic Regional Preserve

Continued from reverse

is disrupted, giving the appearance of drag-folding resulting from relative uplift of the lava occurring during the past 10 million years. Alternatively, the disruption of the mudstones may have occurred earlier, at the time of volcanic activity. This site was close to, or was in, the wall of the volcano, and would have been subject to all kinds of slumping, sliding, and plowing. To see Post 5, proceed northwest along the main road, then take the first right, then left to the quarry pit.

5 Massive basalt was removed from this major quarry pit. The north wall shows a set of thick lava flows tilted on edge, nearly vertical. The well-defined layers near the top of the face are jointing-units resulting from shrinkage caused by cooling. They are analogous to the basalt pillars of Devil's Postpile in the southern Sierra.

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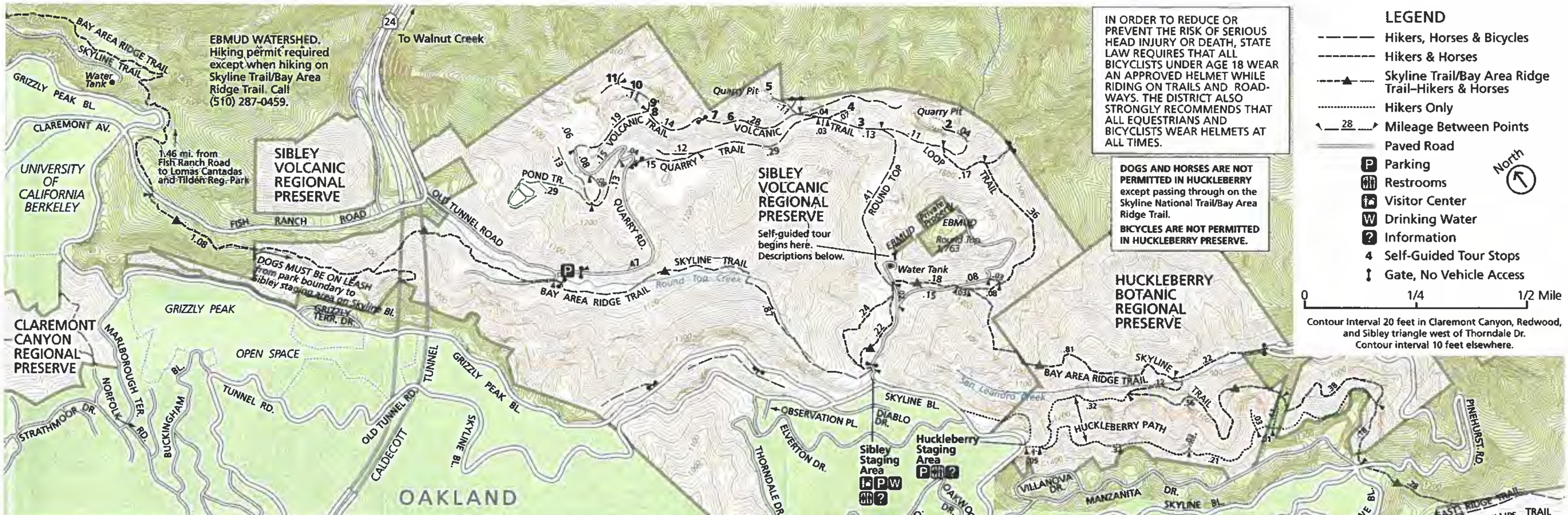

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The blocks of stone scattered everywhere around the flanks of Round Top are basalt lava (a hard, dense, dark volcanic rock). Lava from the vent has been dated at UC Berkeley by the potassium-argon radioisotopic dating method. The oldest is 10.2 million years old.

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2 This pit was made by quarry operations in which huge amounts of massive basalt lava were removed. The result is a tremendous boon to geology, for the pit exposes the interior of the Round Top volcano. You are standing on bedded tuff-breccias, which filled much of the crater, settling at times into a small lake. Studies of exposures north and south suggest the crater was a little wider than the present quarry pit. The steep wall across the pit consists of lava that capped the crater after it was filled. Eventually the Round Top vent buried itself in basalt flows. From this point, note the view of Mt. Diablo, which, though it contains some submarine volcanic rocks, never was a volcano.

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Continued on reverse

CMTW-9 cont.

Sibley Volcanic Regional Preserve

Continued from reverse

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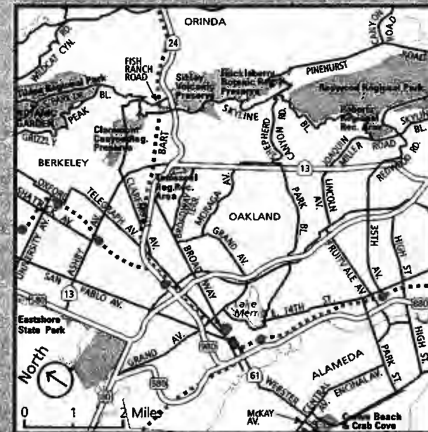

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ATTACHMENT 5.(A)

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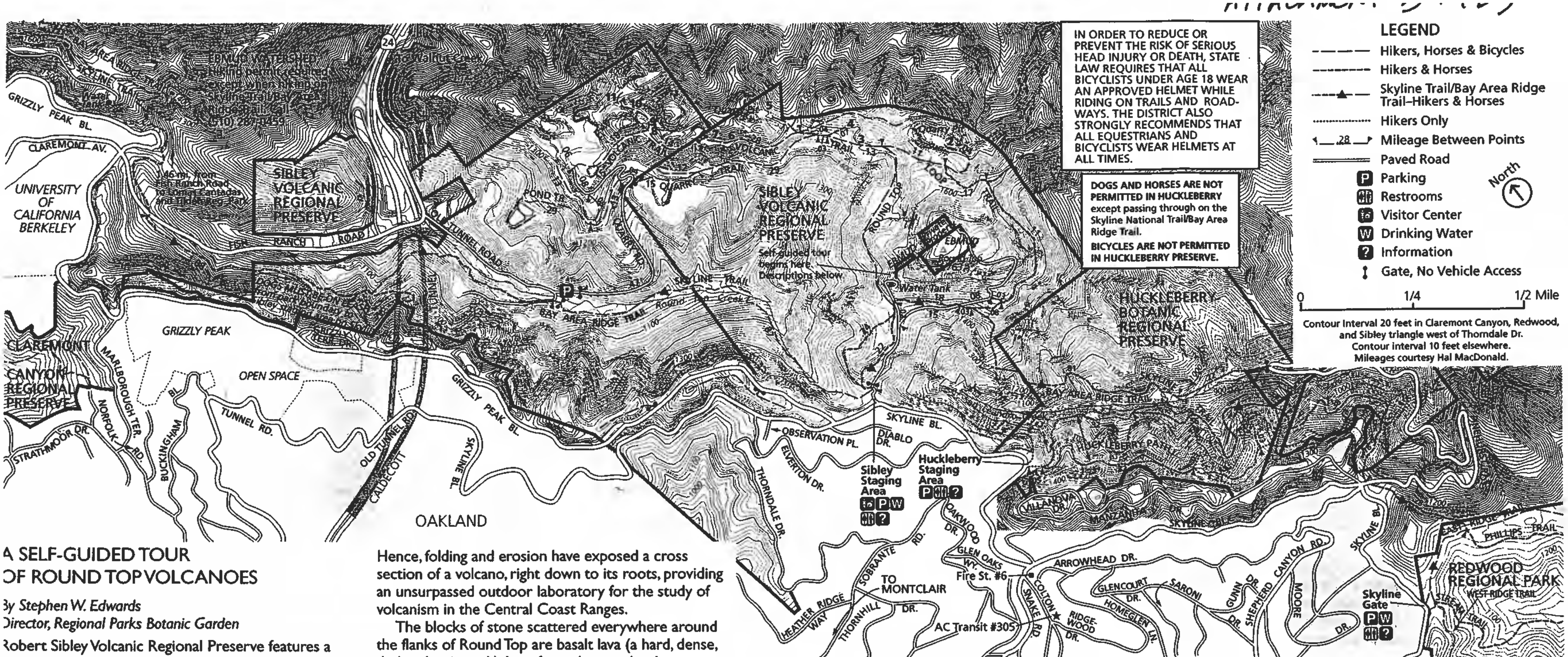

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Continued on reverse

CMTW-9 cont.

The Curtis Caldera at LBNL is like a giant bowl, basin, syncline holding millions of gallons of water, perched groundwater, at various elevations causing instability in the hillside soils, landslides. Groundwater moves along the many earthquake faults at the lab site, comes up to the surface from springs, associated with the faults, continually causing havoc. (Attachment 6.)

Of special interest is the presence and movement of groundwater along the Wildcat Fault in the East Canyon at LBNL's Hazardous Waste Handling Facility site, B 85 complex. We understand that a project/study, titled NUMO, funded by the Japanese Nuclear Waste interests, is presently investigating the movement of water along the Wildcat Fault.

The DEA is extremely deficient in addressing concerns related to soils and groundwater. Indeed, the DEA completely excluded the analysis of soils (IV.B.6./p.49/53), and the importance of groundwater, its impacts on soils and movement along faults (IV.C.3./p.79) We therefore request that a full-scale EIS (Environmental Impact Statement) be prepared to address these and other concerns. We also ask that the findings of the NUMO Study, including the analysis of→the two 500 feet deep soil borings, taken at the HWHF site be included in the EIS.

As Attachment 7. we are enclosing the HYDROGEOLOGIC INVESTIGATION section (#5) of the Converse Consultants, Inc. 1984 HILL AREA DEWATERING AND STABILIZATION STUDIES, illustrating the continuing nature of slope stability problems at LBNL.

CMTW-10

Another glaring omission of the DEA was the total exclusion of analysis of Hazards from Wildfires under Cumulative Effects (V.B./p.160). LBNL is located in a High Risk Wildland Fire Zone/Critical Fire Area (California Fire Hazard Severity Zone).
In 1991, when some 4000 structures burnt in the Berkeley-Oakland Hills Firestorm, just 3/4 miles from LBNL, one canyon away, the entire lab was evacuated. The lab director gave orders to the 2 remaining firefighters at the lab's firestation to evacuate, all LBNL firetrucks had already been sent to Oakland, and thus the Nuclear-Industrial Complex, in the middle of a residential neighborhood, during a historic firestorm was left alone, unprotected.

What indeed are LBNL's plans to fight a radioactive fire? What plans are in place to protect the surrounding residential neighborhoods from radioactive fallout? Are there any coordinated efforts to evacuate surrounding residents, some only some 100 meters from LBNL's fenceline? The more laboratory buildings in the canyon, the more chemical and radioactive materials and waste will result, all of this needs detailed analysis in a full-scale EIS!

CMTW-11

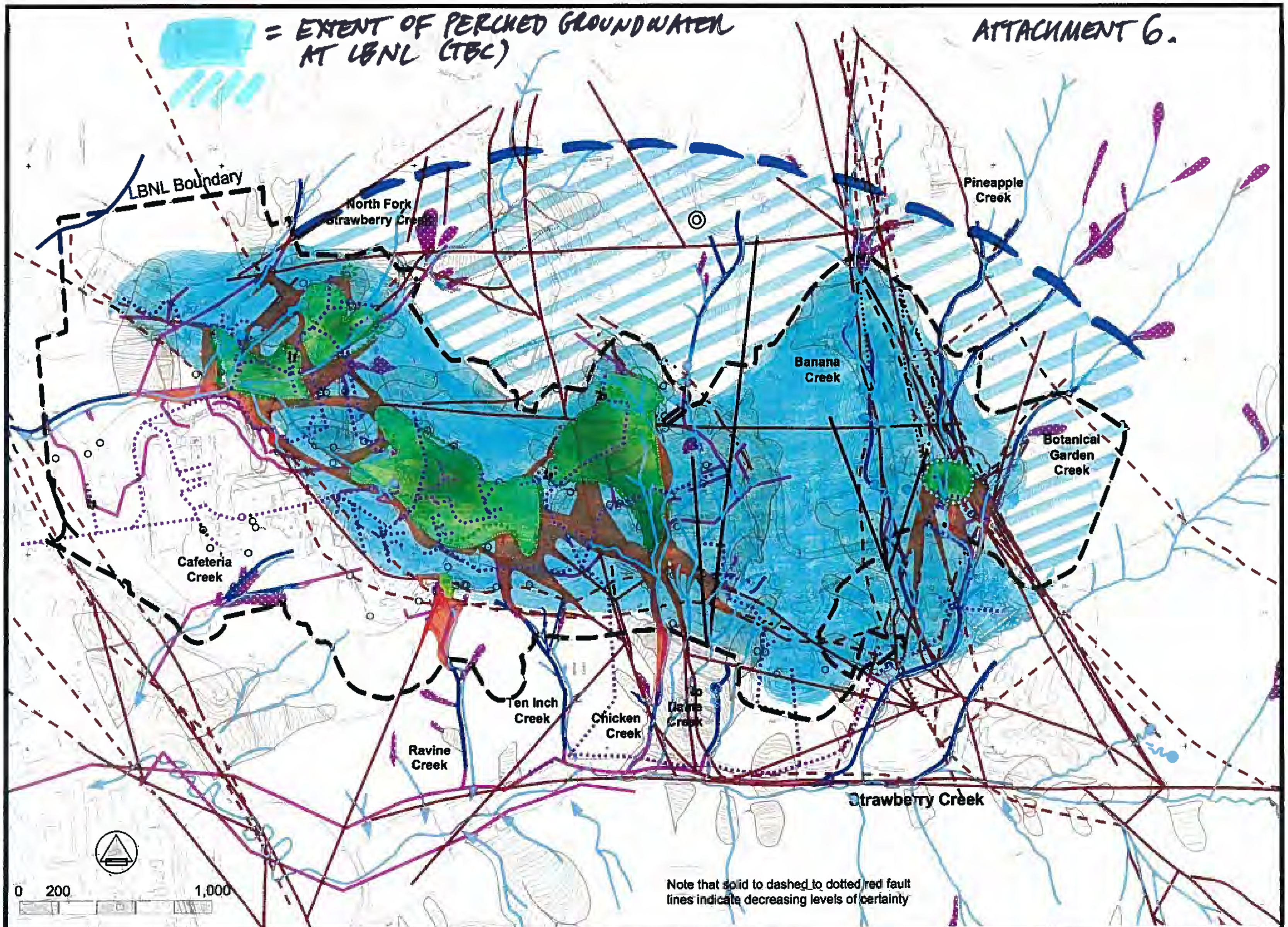

FIGURE 18a. ZONES OF CONCERN FOR GROUNDWATER PLUME EXPANSION ALONG COMPILED FAULTS, BEDROCK CONTACTS, LANDSLIDES, HISTORIC AND MODERN CREEKS. SEE NEXT PAGE FOR MAP LEGEND.

CMTW-12

14/84

ATTACHMENT 7.
(25 PAGES)

HILL AREA DEWATERING AND STABILIZATION STUDIES

October 1984

Prepared for:

University of California
Department of Facilities Management
2000 Carleton Street
Berkeley, California 94720

P. 15/84

CMTW-12 cont.

5. HYDROGEOLOGIC INVESTIGATION

5.1 PURPOSE

Continuing slope stability problems in the Lawrence Berkeley Laboratory (LBL) - Centennial Drive hill area have been thought in the past to be related to large amounts of ground water and high groundwater levels. Various measures have been attempted in the past to remove ground water from the hill area slopes in order to improve the gross stability of the slopes, with varying degrees of success. Such work, including the installation of wells and horizontal drains (hydraugers) has been less expensive than other potential mitigations but apparently has not been successful for all conditions in preventing further landsliding, creeping deformation and other slope instability.

The present investigation was undertaken for the following reasons:

(1) to clarify the role of ground water in affecting slope stability of the area,

(2) to identify specific areas where high groundwater levels may present a slope stability problem,

(3) to formulate opinions as to the effectiveness (past, present, and future) of dewatering, or groundwater removal in the upper hill area in improving the stability of the area, and

(4) to develop preliminary recommendations for a type and extent of a dewatering program should such a program be determined to be effective and economical.

CMTW-12 cont.

5.2 SCOPE

The following items were included in the scope of investigation:

(1) collect and review previously existing data on both University and LBL wells and hydraugers in the study area;

(2) collect rainfall data for the hill area;

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(3) install a network of piezometers at selected locations to provide additional information on groundwater conditions throughout the hill area;

(4) monitor the groundwater net by taking water level measurements in the newly installed piezometers and in selected LBL well and inclinometer holes for a period of approximately one year;

(5) reduce, tabulate, and plot all rainfall, piezometric, well and drain data for the hill area in the vicinity of Centennial Drive (i.e., excluding all portions of LBL to the southwest and west of LHS);

(6) develop contour maps showing seasonal variations of the primary groundwater surface and depth to ground water for the study area, and identify areas where high groundwater levels may present a slope stability problem;

(7) analyze all data in order to develop conclusions regarding the relationship between groundwater depth and slope stability in the area and the effectiveness of past and future dewatering attempts in the hill area; and

(8) provide preliminary recommendations for a dewatering program if judged to be warranted.

CMTW-12 cont.

5.3 PREVIOUS WORK

Past geotechnical work performed in the LBL-Centennial Drive hill area is described in general in Section 1.5. Small-scale dewatering had been performed in the past for LBL for localized areas of slope instability or failure under consultants such as Harding-Lawson (HLA) and Dames and Moore (D&M). An attempt was made by the University to institute a hill area dewatering program in the 1970's. Lennert and Associates was retained by the University in April, 1973 as consulting civil engineers for the program.

The first attempt at dewatering the hill area was the installation in the spring of 1975 of Shively Well No. 1 (see Section 5.4.2) by Lennert. The second, and last attempt by Lennert involved the installation in the summer of 1979 of two hydraugers (789-A and 789-B; see Section 5.4.3) from the Poultry Husbandry area northward toward the Animal Behavior Research Station (Hydrauger 789-A) and Building 77 (Hydrauger 789-B). Together with the hydraugers, a second dewatering well (789-1) was drilled at the top of the hill overlooking Centennial Drive and the Corporation Yard to the southwest.

This well, however, became clogged and could not be effectively pumped. The well was subsequently abandoned but has intermittently been used as an observation well (see Section 5.4.3).

Dewatering measures instituted by Lennert were based on the belief that the main reservoir of deep ground water in the hill area is the volcanic flow (i.e., fractured) rocks of the Moraga Formation situated within a synclinal structure underlying the ridge extending from LBL Building 62 northward to Little Grizzly Peak. These flow rocks were thought to be bottomed in the syncline by less permeable Orinda Formation bedrock (although some permeable sandstone and conglomerate beds within the Orinda exist, they are interbedded with impermeable shales and siltstones). Lennert asserted that ground water was also controlled in the hill area by faults such as the University fault (Section 4.4.1.2.4) and the New fault (Section 4.4.1.2.5) which acted as groundwater barriers or as conduits for water flow through cracks and voids along these faults. Lennert also asserted that surface water entered these "tension faults," entering directly and quickly into the groundwater regime.

Lennert's dewatering program was designed to intercept water in the tension faults and to lower the regional groundwater table by removing water from the reservoir of permeable Moraga flow rocks within the syncline. An evaluation of the effectiveness of Lennert's program is discussed in Section 5.4.4.

CMTW-12 cont.

5.4 CURRENTLY AVAILABLE DATA AND DATA SOURCES

Currently available hydrogeologic data consisted of flow and piezometric measurements of various wells, hydraugers, and subsurface drains by consultants or by LBL or University personnel. The general locations of the wells, hydraugers, and drains with information utilized in this investigation are shown on Plate 4. Measurements have been and are currently being recorded by University personnel for flows in Shively Well No. 1 (Section 5.4.2), hydraugers in the Botanical Garden and Poultry Husbandry areas (Section 5.4.3), and the subdrain for the LHS creek fill (Section 5.4.4).

Measurements on wells and slope inclinometers on LBL property have been and are currently being recorded by LBL maintenance personnel. The records include flow and water level measurements in the Building 46 and 51 (Bevatron) area, Corporation Yard area, Building 77 (Mechanical shops) area, and Building 71 (HILAC) area. Of the many wells and inclinometer holes on LBL property, only those located in areas judged to be critical in the past were measured by LBL personnel. Readings were continued only if sufficient variations in water levels were noted. Readings were taken more frequently during rainy months as opposed to dry months. Because of personnel changes, most of the LBL records could not be found and only records covering the periods from January, 1979 to November, 1981, and August, 1983 to the present were available.

5.4.1. Rainfall Data

Rainfall records for the period July 1, 1964 through January 31, 1984 were obtained from the LBL Environmental Health and Safety Group. The rainfall gauge is located a Building 75 in the LBL Corporation Yard. Daily rainfall figures for the five-year period 1979-83 are tabulated on Drawings C-1 through C-10 and are shown in bar graph form on Drawings C-11 through C-15. Total annual rainfall figures for the rainfall years 1964-65 through 1982-83 are summarized in Table 5-1.

CMTW-12 cont.

TABLE 5-1

TOTAL ANNUAL RAINFALL BY RAINFALL YEAR*

LAWRENCE BERKELEY LABORATORY, BLDG. 75

Rainfall Year	Rainfall (inches)	Rainfall Year	Rainfall (inches)
1964-65	25.16	1974-75	24.00
1965-66	18.73	1975-76	10.79
1966-67	32.92	1976-77	12.79
1967-68	17.22	1977-78	37.22
1968-69	34.21	1978-79	22.53
1969-70	27.09	1979-80	30.95
1970-71	23.94	1980-81	16.90
1971-72	13.93	1981-82	48.91
1972-73	36.78	1982-83	43.52
1973-74	35.92		

*July 1 - June 30

5.4.2 Shively Well No. 1

Shively Well No. 1 was installed by Ben Lennert in the spring of 1975 adjacent to the dirt road near the south end of the Space Sciences Laboratory parking lot (see Plate 4). The well was intended to help lower the groundwater level in the rock structure underlying the ridge and to improve stability conditions in the LHS and Corporation Yard areas. The well was drilled to a depth on the order of 400 feet. A boring log for this well could not be found.

A 10-hp pump was installed in the well at a depth of approximately 380 feet, with an automatic switching probe to activate the pump whenever the water level rose to 30 feet above the pump (depth of 350 feet). A pneumatic gauge for direct reading of water depth in the well is located in a box next to the well. The first 10-hp pump was activated in April, 1975 and operated more or less continuously (with occasional breakdowns) until the pump burned out and was replaced in March, 1982 by a 3-hp pump. The 3-hp pump operated on a continual basis from March, 1982 to December, 1983, when the pump was replaced again with a 10-hp pump which was installed on December 7, 1983. The pump was replaced because the groundwater level was found to be approximately 160 feet above the pump elevation in the well (i.e., at a depth of 220 feet). This fact indicated that either the pump had failed, or that the pump did not have sufficient capacity to draw down the water table to the level of the pump.

CMTW-12 cont.

Pumped water from the Shively well is stored in an adjacent water tank. Overflow from the tank was originally discharged into the drainage basin leading to the Centennial Drive overpass area. Because of concern for excess groundwater recharge, a diversion pipe was constructed in May, 1980 to connect the storage tank to a storm drain inlet near the Cell Culture Laboratory parking lot in the overpass area. This pipeline broke around December, 1982 and was replaced by a temporary line running from the well to a catch basin in the LHS east parking lot. The original diversion pipe was repaired and reconnected to the storage tank in December, 1983.

Pump flow readings (in gpm) in the Shively well were taken by Lennert between the time of installation to the end of 1979. His detailed records, if any, were not found, but his past correspondence with the University indicated that the well was pumping about 31 gpm in late 1975, and between 8 and 15 gpm between April, 1978 and July, 1979.

Pump flow readings for Shively No. 1 have been recorded by University personnel on an intermittent basis since October, 1979. These records were tabulated and are presented on Drawings C-16 through C-23. The results are also plotted for calendar years 1979 through 1983 on Drawings C-32 through C-36. The records indicate that flow between October, 1979 and February, 1980 ranged from 20 to 27 gpm, after which flows dropped to 15 to 16 gpm through 1980. Flows ranged from 11 to 15 gpm from January, 1981 through mid-February, 1982 when the 10-hp pump failed. After replacement with the 3-hp pump, flows were measured at 22 to 28 gpm until December, 1982, when readings were discontinued because the temporary overflow pipe was connected to the measurement point at the storage tank. Flow readings were resumed when the 10-hp pump was reinstalled in December, 1983.

Water levels in the well were not taken in the past. The water level was recorded on December 1, 1983 to be at a depth of 220 feet when the 3-hp pump was removed. On December 7, 1983, the depth to water was measured at 200 feet prior to installation of the 10-hp pump. As of February 7, 1984, the depth to water in the well was measured at 334 feet.

5.4.3 Lennert Hydraugers

As part of University contract work, numerous hydraugers were installed in the hill area by Lennert and Associates. These included hydraugers installed in the Corporation Yard slope in 1968, Hydraugers Nos. 1 and 2 and two others in the overpass/Botanical Garden area installed in 1969, and Hydraugers Nos. 789-A and 789-B installed in the Poultry Husbandry area in 1979. The hydraugers installed by Lennert in the Corporation Yard were apparently connected to a manifold within the buttress fill constructed in 1975 (Section 6.2.-4.1), and can no longer be individually measured.

CMTW-12 cont.

Hydrauger Nos. 1 and 2, as shown in Plate 4, were installed to lower groundwater levels in the overpass area because of the noted instability in the overpass abutments. Hydrauger Nos. 1 and 2 were 4.5-inch and 2.5-inch diameter drains, respectively, drilled into the area north of the overpass. Both drains exited in Mather Grove south of the overpass and west of Mather Creek. In addition, a 27-foot deep subdrain was installed on the north side of Cyclotron Road terminating at a vertical well connected to Hydrauger No. 1. Two other hydraugers were installed on the north side of Cyclotron Road north of the guard shack, but are sealed and cannot be measured.

A hydrauger was also supposedly installed through the cistern in the old quarry at the northeast end of the Cell Culture Lab parking lot. According to LBL personnel, this hydrauger may have been the upstream end of the original Hydrauger No. 2 which was reportedly sheared off in the 1970's and then connected to the storm drain system. A

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replacement Hydrauger No. 2 was then drilled. This account of such a replacement could not be confirmed from written correspondence or maps.

Flow records were supposedly kept by Lennert for Hydrauger Nos. 1 and 2 through 1979. Measurements of these two hydraugers have been recorded by University personnel since October, 1979. The latter records are tabulated in Drawings C-24 through C-31 and are plotted in Drawings C-37 through C-40. Readings were not taken between May and August, 1980, when the ends of the hydraugers rusted off. The ends were subsequently re-exposed and readings taken until April, 1982 when measurements could no longer be taken. Flow has since been observed in Hydrauger No. 1, but flow apparently ceased in Hydrauger No. 2 in 1982 probably because of the slide movement in the east overpass abutment. Hydrauger No. 2 was removed south of the overpass during excavation for the east abutment compacted fill repair in late 1983.

Hydrauger Nos. 789-A and 789-B were drilled in 1979 to lengths of approximately 2,100 and 910 feet, respectively, as shown in Plate 4. Hydrauger No. 789-A was drilled with the intent of dewatering the Moraga flow rocks located in the syncline as postulated by Lennert. The holes were encased with 6-inch diameter casing for the first 1,100 feet, and with 5-inch or 4-inch diameter casing at greater horizontal depths. Three alignments were actually drilled into the hill starting at the same entry point in the Poultry Husbandry area. According to Lennert, aquifers were encountered between 1,057 and 1,092 feet and at approximately 1,780 feet (horizontal distance). Maximum initial water flows from these aquifers were on the order of 100 and 1,000 gpm, respectively, dropping off substantially with time to flows at the pipe outlet presently on the order of 4 to 12 gpm. Hydrauger No. 789-A was intended to intersect Test Well 789-1, but it cannot be determined how close to the well the hydrauger is actually located.

Hydrauger No. 789-B was intended to intercept any seepage resulting from leakage from Hydrauger No. 789-A, and was drilled to the northeast corner of Building 77. This hydrauger was cased to 100 feet with 6-inch diameter steel pipe, and the rest of the way with 1.5-inch diameter slotted plastic pipe. The initial flow from this hydrauger was on the order of 30 gpm, decreasing to about 1 gpm after one month.

Flow measurements of Hydrauger Nos. 789-A and 789-B have been recorded by University personnel since October, 1979 and February, 1980, respectively. These flows are tabulated on Drawings C-24 through C-31 and are plotted on Drawings C-41 through C-45.

CMTW-12 cont.

5.4.4 LHS Creek Fill Subdrain

Measurements of flow from the subdrain outlet of the LHS creek fill subdrain (Section 6.1.4) have been recorded by University personnel since October, 1979. The measurements are tabulated on Drawings C-16 through C-23 and are plotted on Drawings C-46 through C-50. The outlet for the 8-inch diameter subdrain pipe is located in Blackberry Canyon below the toe of the creek fill.

5.4.5 Test Well No. 789-1

Test Well No. 789-1 was drilled in 1979 to a depth of 667 feet on the knoll southeast of Shively Well No. 1, as shown on Plate 4. The well was intended to complement the Shively Well in dewatering the Moraga volcanic flow rocks in the postulated underlying syncline. The well could not be developed, however, and currently functions only as an observation well. A limited number of water level readings have been recorded in the past and during the present investigation. These readings are tabulated on Drawing B-23.

5.4.6 LBL Wells and Slope Inclinometers

Numerous wells (pumping or observation-type) and slope inclinometer casings have been installed throughout LBL property by LBL or its consultants. These installations are concentrated at locations experiencing previous slope stability problems such as in the Bevatron area (Buildings 46 and 51), the Corporation Yard, the Building 77 area, and the HILAC building (Building 71). Water level readings were obtained for a number of these holes in which LBL personnel have taken past readings. A certain number of these holes were selected for use in helping to develop groundwater contour maps for the hill area (Section 5.7.1). For these holes, past variations in groundwater depth were noted, certain 1983 readings were utilized, and additional readings taken during the course of the present investigation by Converse personnel. The selected holes are listed in Table 5-2.

CMTW-12 cont.

5.4.7 LBL Hydraugers

Slope stabilization work on LBL property has also included the installation of hydraugers in previously identified unstable areas such as east of Buildings 46 and 51, on the slope to the southeast of Building 71, and in the Corporation Yard and Building 77 areas. Measurements by LBL maintenance personnel have been tabulated and plotted in this report for hydraugers measured at Buildings 71 and 77.

TABLE 5-2

SUMMARY OF EXISTING LBL WELLS AND CASINGS UTILIZED FOR GROUNDWATER MEASUREMENTS

LBL Hole Designation	Hole Type	General Location
HLA-1.064	SI	Corporation Yard Guard Shack
HLA-2.064	SI	NE Corner, Building 76
HLA-1.098	SI	Centennial Drive
HLA-2.098	SI	Corporation Yard Fill Slope
HLA-3.098	SI	Centennial Drive
HLA-7.102	OW	SW Corner, Building 53
HLA-8.107	SI	NW Corner, Building 46
HLA-1.108	SI	On Road E of Building 76
HLA-2.108	SI	SW Corner, Building 77
HLA-7.130	SI	Lower Corporation Yard Slope
HLA-10.130	OW	Corporation Yard
HLA-15.130	OW	Corporation Yard
HLA-18.130	SI	N Side of Building 77
HLA-19.130	OW	Loading Dock, NE Corner, Bldg 77

KEY

OW = observation well
SI = slope inclinometer casing

The Building 71 hydraugers were installed to the south of Building 71 on the east side of the "Y" road intersection.

CMTW-12 cont.

These hydraugers were installed in 1970 and were drilled eastward into the LHS hill, underlying an old landslide which occurred in 1970 and was repaired in 1974. The hydraugers are connected to a manifold and are measured at a location below the building.

The Building 77 hydraugers measured by LBL personnel are one of numerous sets of hydraugers drilled in the cut and fill slope behind Building 77 below the Corporation Yard. Flows are measured from a manifold daylighting from the slope connected to four hydraugers installed by HLA which extend beneath the Corporation Yard. In addition to these and other hydraugers installed in the slope by HLA, 15 hydraugers were installed in 1962-63 in the same slope by Dames and Moore.

Measurements for the hydraugers are tabulated on Drawings C-16 through C-31 and are plotted on Drawings C-46 through C-50 (Building 71) or on Drawings C-42, C-43 and C-45 (Building 77). Measurements for the Building 71 hydraugers were obtained for the periods October, 1979 through November, 1981 and August, 1983 through December, 1983 as recorded either by LBL or University personnel. Measurements for the Building 77 hydraugers were obtained from March, 1980 through February, 1981, and from August, 1983 through December, 1983.

CMTW-12
cont.

5.5 NEW DATA SOURCES

In order to obtain a reasonably accurate network of groundwater level measurement points, new piezometers and inclinometer holes were installed by Converse throughout the hill area. These installations were used in combination with surviving piezometers, wells, and inclinometers installed during previous work for the University or LBL.

A total of 17 Converse piezometers, labelled P-1 through P-17 were monitored during the study period (through February, 1984). Installation details for the piezometers are described in Section 3.1.3. A total of eight slope inclinometers, labelled SI-1 through SI-8, were also monitored for water levels during the study period. The locations of the piezometers and inclinometers and other general information are shown on Plate 1.

Water level measurements were taken during the period from December, 1982 to February, 1984, though not all installations were measured over the entire period. Piezometers P-1 through P-12 and slope inclinometers SI-1 through SI-8 were installed during or before December, 1982, while piezometers P-13 through P-17 were installed at a later date.

Water level readings taken from the piezometers and inclinometers are tabulated on Drawings B-12 through B-26. These readings are also plotted on Drawings B-27 through B-34.

5.6 GROUNDWATER GEOLOGY

Adverse groundwater conditions have been evident at the Berkeley hillside throughout its gradual change from undeveloped rangeland to an office and research complex for the University. In the 1880's and early 1900's, the abundant springs on the hill supplied water to some of the residents of eastern Berkeley. At one time a spring on the hill fed a storage tank located near the south end of the LHS. This tank was connected to residential areas below by a buried pipe that can be seen today where it has been exposed in a landslide scarp below the LHS. During excavations for the LBL Bevatron an adit into the hillside was exposed. The adit served as a collection gallery for spring water that was piped to Hilgard Avenue for domestic use, and flowed at a steady 18 to 20 gpm once reopened by a bulldozer.

Periodically springs appear at other locations on the hill where they never occurred before. Water levels in an observation well above the LBL Corporation Yard have risen 30 feet in a 48-hour period at a time when no rain had fallen for weeks. A similar well located less than 100 feet away showed no change in level during this time.

CMTW-12 cont.

Relatively continous monitoring of hill area groundwater levels has been conducted by University and LBL staff and by various outside consultants as described in Section 5.4. Ben Lennert has stated in past reports that deep groundwater levels in the hill tend to vary during a typical year, with highest levels generally occurring in September with lesser peaks in May-June and July. This contention was not well supported, however, by the presently available and newly generated data reviewed for this investigation. In 1983, many hydraugers and wells appeared to reach maximum flow levels and water elevations around April, declining after April and starting to rise again in November or December (see Section 5.7.2.1). Most wells also show some differences in time of response to precipitation, and some do not appear to respond to any conventional stimuli, including rainfall, drought, drainage installation or local pumping.

5.6.1 Structure and Controls

Groundwater levels and flow patterns within the Berkeley hillside are controlled by the combined effects of the deformed, interbedded rocks and fractures superimposed on the rocks. Contact relations and discontinuity patterns are important for understanding the groundwater flow regime.

5.6.1.1 Permeability

The permeability of a rock (its ability to permit fluids or gases to reside within or move through the rock mass) is generally thought of as being composed of two component permeabilities: primary and secondary permeabilities. Primary permeability is dependent upon interconnected voids within the rock mass. This permeability can range from extremely high in clean, coarse sandstones or gravel conglomerates, having many large, connected voids that transmit fluids easily and rapidly, to nearly zero in hard crystalline rocks and shales having low void ratios and restricted flow paths. Secondary permeability is that derived from discontinuities within the rock, including all sizes of cracks, features, fault zones or bedding planes. Similarly, secondary permeability can range from extremely high in rocks containing open fractures to negligible in isotropic, unfractured plutonic rocks.

In the rocks of the Berkeley Hills near the campus, secondary permeability in the form of rock fractures is by far the most important. Though large contrasts in primary permeability undoubtedly exist between the different rock types on the hillside, the primary permeabilities are all too low to play an important role in local groundwater flow. Locally, the Orinda Formation may contain a few small lenses of pervious sandstone and conglomerate, but these are not believed to be extensive.

CMTW-12 cont.

Secondary permeability in the form of fractures within the rock mass is therefore thought to control groundwater flow in the upper campus hill area. All of the rocks within the hill area appear to have been fractured to some degree, with the resultant permeability depending partly on the lithologic characteristics of the host rock. Generally, softer, clay-rich formations such as the Cretaceous shales and Orinda shales do not develop high permeabilities when fractured, since the softer rock tends to "heal" fractures unless they are mechanically opened. Extremely high secondary permeability is typically developed by fracturing of hard volcanic rocks of the Moraga Formation, which includes tuff-agglomerate, breccias and flow rocks. Flow rocks often develop a network of open cracks oriented perpendicular to cooling surfaces after extrusion. Later tectonic and vent-collapse related fractures are then superimposed on the original breaks, leaving an extensively fractured rock that provides a conduit for rapid flow of large quantities of water. The 100+ gpm instantaneous flows noted during the drilling of Hydrauger 789-A were associated with highly fractured volcanic flow rock. Drillholes made at many locations of the upper hill area have revealed the Moraga volcanics to be pervasively fractured at depth, in many cases to the extent that drilling became impossible owing to rapid loss of drilling fluids from the borehole. Infrequent surface exposures of slightly weathered bedrock on the hill show closely spaced joints and irregular fractures in a chaotic assemblage. Fracture margins locally show some weathering or alteration of the rock mass to clay, but most remain clean and hard. Consistent patterns of strong fracturing are not discernible due to the poor exposures and highly weathered state of most outcrops.

5.6.1.2 Contacts

Both depositional and faulted geologic contacts have significance for the movement of ground water, in that often a contact represents a surface across which large variations in the physical characteristics, including primary and secondary permeabilities, may occur. Fault contacts may have special importance because they can form a groundwater boundary or conduit in otherwise isotropic rocks. The Orinda Formation overlies the Cretaceous shales at the site along an old fault zone composed of highly fractured, weathered gouge and clayey material, probably an effective barrier to groundwater flow. The two formations, however, are predominantly composed of weathered, soft shales and mudstones with low primary permeability, so little flow occurs through these rocks anyway. In terms of permeability contrasts, the contact between the older sedimentary Orinda and younger, volcanic Moraga Formations is more important. These rocks are interfingered and interbedded, forming an irregular contact zone locally altered to rock fragments, in a clayey matrix.

CMTW-12 cont.

Ground water may move relatively freely through the fractured Moraga rocks, but is impeded from flowing easily into and through the Orinda by the relatively impermeable contact zone and the less pervious nature of the Orinda rocks. This restriction results in an accumulation of water at and above the contact zone, and flow along the contact when gradients are sufficient. Often, such flow exits the hillside in the form of springs or seeps. A comparison of observed springs and seeps on the hill in recent years with mapped geology shows a strong correlation between spring locations and the Orinda-Moraga contact zone. Since this contact is irregular, owing to the partly interbedded nature of the formations, springs do not occur at a single level on the hill.

Consideration of available data indicates that of the three fault zones in the area supported by geologic evidence (i.e., the Wildcat, Hayward, and Strawberry Canyon faults), the Wildcat fault zone bears the most important role in the hydrogeology of the hill. Both the Hayward and Strawberry Canyon zones occupy topographically low positions, placing them well below the elevations of hill area trouble spots. The Wildcat fault, however, may locally create a groundwater barrier, and is also important because it juxtaposes the hill area rocks with the probable source area for the prodigious quantities of ground water that have plagued the hill area.

The inferred source area of ground water is a major northwest striking syncline east of the Wildcat fault, formed in Claremont, Orinda and Moraga rocks. The synclinal structure, one of a series of major folds in the Berkeley hills, extends from southeast of Round Top Regional Park/Sibley Volcanic Preserve to north of the campus hill area. The syncline is relatively flatlying, with portions dipping northwest or southwest in detail. It is probable that the syncline is interconnected with the campus hill area via fractures within the volcanic rocks, providing relatively free flow between the syncline and the hill area.

It is not presently known how the fault gouge within the Wildcat zone affects flow. Since the Wildcat has been mapped previously as a collection of en-echelon faults not necessarily continuously connected, it may be possible that it does not represent an effective barrier to flow across its trace.

CMTW-12 cont.

5.7 EVALUATION AND CONCLUSIONS

5.7.1 Groundwater Contour and Depth Maps

In order to more accurately develop a picture of groundwater conditions in the hill area and help identify locations where slope stability may be influenced by ground water, maps showing the seasonal variation of groundwater elevation and depth were prepared. The maps were based on water level measurements taken in various wells, piezometers, and slope inclinometer casings throughout the study area representing the following four periods:

(1) Spring, 1983 (mid-April)

(2) Summer, 1983 (early-August)

(3) Fall, 1983 (early-November)

(4) Winter, 1984 (early-January)

The time of readings selected (e.g., mid-April) for mapping were chosen to best exemplify the conditions to be expected over the particular season. Unavoidably these maps do show some anomalies that are peculiar to the particular study period and may not be representative of other years (See Section 5.7.2 for discussion). Readings for early January, 1984 were used to represent typical winter conditions rather than mid-season readings, since a period of relative drought occurred after January, 1984 as compared to normal rainfall years.

The measurement points used to construct each map are shown on the groundwater contour map for each season. The maps are intended to represent the approximate location where the main body of ground water would be expected to be encountered. The maps do not take into account nor identify the presence of perched water tables. Perched ground water was noted at some locations measured by the double-installation piezometers such as at P-4, P-5, and P-9. At these locations, the measured water level judged to represent the location of the main groundwater body was selected for use.

Since close spacing of measurement points was required to obtain reasonable accuracy, only the portion of the hill area centered on Centennial Drive was selected for mapping. The mapped area is oriented roughly southeast-northwest and includes the overpass and Botanical Garden areas, Building 77 and Corporation Yard areas, and the LHS and Space Sciences Laboratory areas. Because of a lack of closely-spaced data points, the Bevatron, Cyclotron, HILAC, Poultry Husbandry and southern Botanical Garden areas were not mapped.

CMTW-12 cont.

Maps showing both groundwater contours and depth to ground water were generated using computer program GPCP, developed originally by California Computer Products, Inc. (CALCOMP). The degree of accuracy of these maps is primarily dependent on the spacing of the input measurement points and a selected spacing of the computer program grid. As expected, the degree of accuracy of any extrapolated points on the map (i.e., any locations that are not between two or more measurement points) is much lower than for interpolated points.

A total of eight maps were produced and are included in Plates 5 and 6 (groundwater contour maps) and Plates 7 and 8 (depth to ground water maps). The maps represent a simplification of actual groundwater conditions because of limitations on the number of available data points and on the method of analysis. For instance, the program cannot model local fluctuations in groundwater levels due to geologic factors such as seepage barriers, faults, or formational contacts. The generated groundwater contours, however, do appear to be quite reasonable compared to the topographic ground surface and the groundwater level input data. The only reasonably suspected fault-related groundwater barrier in the study area; i.e., the Wildcat fault, is, for the most part, not included in the mapped area.

It should be noted in particular that the "depth to ground water" maps are most likely accurate only near points of water level measurement. The depth values generated by the computer program were obtained with respect to a generally "smoothed" topographic surface rather than the actual topographic surface. This was done because depth to ground water may vary radically within a small area due to the presence of local cuts, fills, creek bed depressions, and mounds. Such local anomalies were too small in scale to be modeled by the computer program given the 300 to 500-foot spacing of the measurement points. The main value of the depth maps is therefore limited to distinguishing areas underlain by a "shallow" groundwater table versus areas underlain by "moderate" to "deep" groundwater tables as referred to in the following section. Extreme care must therefore be exercised in using these maps for any other purpose other than their use in this study.

5.7.2 Discussion and Evaluation

5.7.2.1 Interpretation of Groundwater Maps

CMTW-12 cont.

The depth contour maps indicate that, as can be expected, the primary groundwater table as measured by the piezometers and other measurement points is relatively deep under the ridge on the northeast flank of Centennial Drive and relatively shallow on the lower portions of the ridge within the Strawberry Creek drainage areas. Uphill of the LBL Grizzly Gate entrance road, the depth to ground water was found to exceed 50 feet below Centennial Drive, becoming deeper to the northeast. Downhill of the LBL Grizzly Gate entrance road, the depth to ground water below Centennial Drive was found to generally decrease to the order of 20 feet or less in the overpass and Botanical Garden areas.

Groundwater depths of 20 feet or less throughout the year were identified at the north end of the Corporation Yard, near the eastern end of Building 77, and in the Strawberry Creek drainage area containing the Botanical Garden, overpass structure, Mather Grove, Cell Culture Laboratory (Building 83) and Biomedical Laboratory (Building 74). Groundwater depths of less than 10 feet were measured throughout the year in Piezometer P-7 at the greenhouse in the Mather Grove area. A groundwater depth of less than 20 feet was registered in the vicinity of the Crafts Building

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(Building 76) and between Buildings 72 and 77 on the winter and spring contour maps.

Input data and maps generated by this study indicate that there is little seasonal variation in groundwater levels in the study area. Variations on the order of 10 feet or less throughout the study period were noted in the majority of the measurement points. Though closely spaced readings were not taken, the available data still suggests that the groundwater table does not fluctuate more than on the order of one or two feet in direct response to periods of heavy rainfall. Most peak groundwater levels were found to occur in March or April. Some of these observed peaks for selected localities are summarized in Table 5-3.

TABLE 5-3

PERIODS OF PEAK GROUNDWATER LEVELS AT

VARIOUS LOCALITIES IN 1983

Locality	Month(s) of Peak Ground Water
Overpass Structure	March - April
Mather Grove	March
Corporation Yard	March
Crafts Building (Bldg. 76)	March - April
Centennial Drive (E of Bldg. 77)	March - April
LHS NW Parking Lot	December - January *

* Peak not pronounced

Readings taken in early 1984 indicated peak levels in many piezometers in January, with lower levels in February. Since minimal rainfall occurred between January and May of 1984 as compared to other years, it could be inferred that peak groundwater levels in many hill area locations probably

CMTW-12 cont.

occur at the end or within a month after the end of the last heavy rainfall of the season.

The groundwater maps show a large variation in water levels in the vicinity of the Space Sciences Laboratory and Shively Well No. 1 over the four seasons monitored. The variation appeared to be due to the operational characteristics of the Shively Well pump rather than a function of time of year. Apparently, during 1983 the pump was experiencing a slow failure, or groundwater flows exceeded the capacity of the pump (see Section 5.4.2). The maps show a progressive rise in groundwater level in the well from the spring through fall of 1983. Though water level measurements were not actually taken in the well until December, 1983, measurements in nearby piezometers indicated that the water level in the Shively Well was rising. Water level elevations at the Shively Well were estimated in the maps in order to show this trend. Measurements taken in December, 1983 prior to reinstallation of the 10-hp pump suggest that the natural depth to ground water at the well site is probably on the order of 200 feet.

As of April, 1984, the 10-hp pump should have been maintaining a water depth in the well of 350 to 380 feet. Assuming that the capacity of the new pump is adequate to maintain the intended water level in the well, water surface elevation, groundwater levels in the vicinity of the well should be fairly constant year-round. Measurements from adjacent piezometers indicate that the radius of influence of the well (i.e., distance from the well to zero drawdown) is on the order of 600 to 700 feet around the well. CMTW-12 cont.

5.7.2.2 Ground Water and Slope Stability

The stability of a slope is governed primarily by the following factors:

1) engineering properties of the materials underlying the slope;

2) water pressures within the slope induced by the presence of ground water;

3) bedrock structure (includes orientation of discontinuities, faults, or other zones of weakness);

4) geometry (e.g., steepness) of the slope; and

5) external loads or forces on the slope.

Given the presence of ground water, there can be a significant reduction the overall stability of a slope through: 1) the addition of weight to a potential sliding mass and 2) the reduction of maximum shear strength available to resist a failure along a potential sliding surface. Slope failures may be of the wedge, block, spreading, flow, or rotational type. It is important to note that although high water pressures induced by ground water are usually the initiating cause of a slide, other adverse factors such as those listed above must also be present in order for slope failure to occur.

The measured groundwater levels in the hill area indicate that the groundwater table would most likely contribute to slope failures in the Strawberry Creek drainage basin area containing the overpass structure, Botanical Garden, Mather Grove, and Biomedical Laboratory. In addition to high groundwater levels, the area is flanked by steep slopes and underlain by thick colluvial deposits and residual soils that have been subjected in the past to both flow and deep-seated slides. Additional surcharge loads on the slopes, such as the overpass abutment fills, have contributed to local instability. The source of ground water in the area is judged to be from a combination of the following:

- volcanic Moraga flow rocks underlying the ridge to the north;
- surface infiltration through the extensive colluvium deposits extending upstream in the creek basin;
- Claremont cherts, shales, and sandstones to the east and southeast; and
- possible water flow along the Wildcat fault.

CMTW-12 cont.

Other areas identified where the groundwater table may affect slope stability include the rear slope of the Corporation Yard area, the slopes to the north and east of the Mechanical Shops (Building 77), and the area near the intersection of Cyclotron road and the Building 77 access road (at the north end of Building 72). The Corporation Yard and Building 77 slopes have been the sites of extensive dewatering installations including wells and hydraugers, and the stability of these areas appears to have been improved based on recent performance. The Corporation Yard slope is analyzed in detail in Section 6.2.4.

The slope behind Building 77 consists of a fill slope above the upper retaining wall on the north side of Building

77 and a cut slope on the east side of the building. Seepage zones and old slide planes were exposed in the cut slope when it was originally excavated in 1962, and hydraugers were installed by Dames and Moore to relieve the seepage pressures. Slides continued to occur in the cut slope during the 1960's, and in 1969, a compacted fill slope with subdrainage was installed at the northeast corner of the building behind the loading dock. Measurements from slope inclinometers installed through the Corporation Yard fill indicate that the fill slope behind Building 77 is still creeping southwestward.

The slope downhill of Cyclotron Road to the south of Building 77 has also experienced stability problems in the past. The steep slope below the intersection of Cyclotron Road and the Building 77 access road has been identified as an old slide area. Two adjacent portions of the slope have already been repaired by buttress fills. Near-surface ground water in this area may conceivably cause future sliding in this area.

Other sites of deep-seated sliding on LBL property not included in the study area were discussed in the available literature reviewed. Most notable of these are the following:

- slide on slope behind Building 64
- slide through Building 46 east of Bevatron
- slide on hill slope southwest of LHS building

CMTW-12 cont.

Abundant groundwater seepage was noted in each of these slides. The large slide which distorted Building 46 and threatened the Bevatron during the winter of 1972-73 was stabilized by removing the upper half of the slide and by installing dewatering wells and hydraugers throughout the area.

The majority of the slide plane of the Building 46 slide was said to be located in the baked, altered clays at the Orinda-Moraga formational contact. In this case, a large proportion of the slide mass was composed of Moraga volcanics overlying the contact which was found to be adversely dipping out of the exposed slope. Sliding along the contact, identified as an old landslide slip plane, was re-initiated by high groundwater pressures. HLA concluded that these high pressures were caused by seepage along faults passing through the slide area. A similar geologic condition (i.e., adversely dipping contact) was encountered in the mass of Moraga volcanics underlying the slope between Buildings 64 and 71, although an HLA investigation later concluded that no sliding along the formational contact at this location has taken place to date.

Slides in the study area not directly related to the groundwater table are primarily of the shallow, flow type (sloughs, slumps, or flows) caused by saturation of surficial soils on the slope. Water within the slope may be the result of rainfall, surface runoff or infiltration, locally perched water tables or water transmitted by springs or faults. Perched water tables are common in the hill area due to the complex folding and faulting of the underlying bedrock and the presence of permeable beds (e.g., sandstone, conglomerate) within impermeable layers (e.g., shale, siltstone). The presence of perched water may tend to be seasonal. Many perched water tables in the hill area may possibly be fed by the groundwater table via fault or shear zones, permeable layers, or formational contacts. Another type of perched water table that may develop during a period of heavy rainfall would form above the soil-bedrock contact below the slope due to the relative impermeability of the bedrock. Water pressures would therefore build up as the slope became saturated, causing a flow slide along the soil-rock contact.

Shallow flow slides or slumps have been observed in the LBL and Centennial Drive areas, primarily in areas underlain by Orinda sediments, but also on occasion in the highly weathered soils overlying Moraga volcanics. Such slides have been observed in some fill slopes, as well as in cut slopes where old slide materials or slide-susceptible soils were exposed. Highly plastic clays exposed in many locations in the hill area are susceptible to failure since they tend to lose strength when saturated. These clay soils are also susceptible to the formation of shrinkage cracks which would allow surface infiltration of water. Shallow slides have been observed in the past in areas including below Centennial Drive at road Station 10+50 and other location prior to construction of the road; in the ravine area near Building 62, the slope below Cyclotron Road south of Building 77, and areas in the Blackberry Creek drainage area that were repaired during construction of LHS. It is very difficult to quantitatively predict the probability of failure for these shallow slides, but the following locations within the study area are judged to possess a greater than average probability for future shallow sliding:

CMTW-12 cont.

(1) Mather Grove and west Botanical Garden area south and west of Centennial Drive,

(2) colluvial slopes overlying the Cell Culture Laboratory parking lot,

(3) slope between Centennial Drive and Building 77 access road,

(4) slope between Centennial Drive and Building 69, and

(5) slope west and downhill of Building 62.

5.7.2.3 Evaluation of Past Dewatering

Past dewatering efforts in the hill area performed for the University consisted basically of the following:

- Shively Well No. 1
- Hydrauger Nos. 789-A and 789-B
- hydraugers in overpass/Botanical Garden area

Shively Well No. 1 was installed in 1975 with the intent of dewatering the Moraga flow rocks in the postulated syncline underlying the ridge and to improve stability conditions in the Corporation Yard, LHS, and overpass areas. As discussed in Section 4.3.2.1, a review of all geologic work has indicated that the volcanic flow rocks underlying the ridge are most likely part of a volcanic vent complex that does not exhibit a synclinal structure such as seen east of the Wildcat fault.

CMTW-12 cont.

Water level data was not available to compare groundwater conditions before and after installation of the Shively well; however, hydrauger flows in the Corporation Yard were contended by Lennert to have decreased substantially after installation of the well. This contention is consistent with observations in 1983 that the radius of influence (radius to zero groundwater drawdown) of the well is on the order of 600 to 700 feet. There is insufficient evidence to show that the Shively well has lowered groundwater levels under the creek fill/LHS northwest parking lot, which is located at the periphery of the well's influence. There is also no evidence to indicate that the Shively well has improved groundwater conditions in the overpass area. However, since the well has appeared to improve stability conditions in and below the Corporation Yard slope and in the benched areas between the LHS and Space Sciences Laboratory, we recommend continued pumping of this well. Failure of this well would likely result in a slow rise of the groundwater level in the Corporation Yard area which could eventually result in decreased stability of the Centennial Drive road fill.

Hydrauger No. 789-A was installed in 1979 to assist in dewatering the syncline, while Hydrauger No. 789-B was drilled primarily to intercept leakage that might occur from the perforated casing of Hydrauger No. 789-A. Analysis of flow records and the groundwater history of the hill area over the past five years indicates that these hydraugers have not been noticeably effective in improving the overall stability of the hill area. Current flows in Hydrauger No. 789-A (on the order of 3 to 12 gpm) are judged to be too small to noticeably influence groundwater levels in the hillside.

Hydraugers installed in the overpass/Botanical Garden area appear to have contributed to increasing the near-surface slope stability of the area while in an operative condition, but did not eliminate stability problems in the area. Analysis of the limited flow data indicated that the hydrauger flows were very responsive to rainfall when in an unclogged, intact condition, indicating that hydraugers should be successful in helping to drain shallow perched water tables, seeps along faults and other impervious water barriers, and near-surface water flow, particularly from pervious colluvial soils. The number of hydraugers installed however, is judged to have been too small to prevent the numerous slope stability problems that have occurred in this area. Hydraugers were not placed in sufficient quantity and in the optimum locations to have possibly prevented the failure below the east abutment overpass fill.

CMTW-12 cont.

5.7.3 Conclusions and Recommendations

Slope stability problems in the Centennial Drive/LBL area appear to be affected by the groundwater table which may contribute primarily to deep-seated slope failures anytime during or shortly after the rainy season, and by shallow ground water which may cause flow slides, slumps, or sloughs that occur usually during or shortly after periods of prolonged rainfall. Our current investigation has determined probable areas where a high groundwater table may contribute to landslides. Likely areas susceptible to such failures were discussed in Section 5.7.2.

The occurrence of shallow flow slides is highly dependent on underlying soil materials, slope geometry and presence of subsurface water. Flow slides may be evaluated in terms of general risk of future failure potential. Areas judged to be particularly susceptible to shallow slope failures in the study area were also discussed in Section 5.7.2.

We conclude that past dewatering efforts in the hill area have been effective in improving slope stability on a local, site-specific basis, a exemplified by the installation of hydraugers and wells in the LBL Bevatron and Building 77 areas. Past dewatering efforts with the intent of improving the slope stability over a wide area; i.e., area-wide dewatering are judged to have been of limited benefit. Installation of area-wide dewatering measures such as Shively Well No. 1 and Hydraugers 789-A and 789-B have not appeared to have noticeably improved the overall stability of the hill area. Shively Well No. 1 has appeared to have locally improved the stability of Centennial Drive in the vicinity of the LBL Corporation Yard, however.

Based on current groundwater levels and detailed analyses of the hill area, we also conclude that further areal, deep watering of the ridge traversed by Centennial Drive is not likely to substantially improve the stability of the hill area. Slope failures on University property in the upper campus hill area (i.e., in the vicinity of LHS, Centennial Drive and the Botanical Garden) have been and will probably continue to be mainly of the shallow, flow type activated by slope saturation during or shortly after periods of heavy rainfall. Dewatering of the deep groundwater bodies in the ridge using deep wells or long hydraugers is not expected to noticeably reduce the occurrence of the shallow flow slides. The failure of the Centennial Drive overpass east abutment fill appeared to have been influenced by the rising of the groundwater table, but this failure occurred primarily because of the added load imposed on the slope by the saturated abutment fill and the loss of strength of residual soil at the contact between the colluvium and the weathered bedrock.

We recommend any that future dewatering efforts be concentrated in local areas where instability problems have been shown to exist, and in areas where groundwater levels are found to be close to the surface in areas where other factors conducive to slope instability are present. Pumping of the Shively well should be continued since it appears to benefit the stability of Centennial Drive and the Corporation Yard slope below the road. Detailed recommendations for dewatering where applicable for the specific sites analyzed in this investigation are presented in Chapter 6.

CMTW-12 cont.

We also ask that the EIS include the entire transcript from LBNL's July 8, 2010 Community Advisory Group (CAG) meeting. The agenda included presentations and discussions related to LBNL geology and geotechnical status of the Berkeley Lab site, as well as comments from concerned members of the public. (Attachment 8) Many conflicting statements were made by LBNL geotechnical experts. CMTW-13

Also, after reviewing some of LBNL's geotechnical reports associated with the DEA projects, it appears that extreme time pressure was put on contractors. For instance Alan Kropp & Associates (AKA) Memorandum of May 29, 2009 regarding B25 Slide Investigation, states: " The preliminary study was conducted over a two week-period in order to meet LBNL schedule objectives. For this reason, the scope of our investigation and analyses were limited to what could be reasonably completed within the targeted timeframe." The study contained data sheets for 3 test borings, first numbered as WLA-B 1 to3 (William Lettis & Associates), then changed to AKA 1 to 3, with a notation that AKA-3 was AKA-4 (?), there were references to 25 photos, which were not included in our copy, and a page titled Soil Boring Locations Near Bldg's 25&48, without any map showing the boring locations. CMTW-14

An other report by Furgo William Lettis & Associated, dated December 10, 2009 regarding LBNL B25-Core Review for the GPL Geotechnical Study makes the following statements:"...samples appeared to be missing...samples were not readily found by FWLA in the core library. According to LBNL staff, logs for soil borings SB25-95-1 through SB25A-95-1 are not available...evaluating physical properties (e.g. stiffness and plasticity) is difficult to impossible because the samples are on the order of 10 to 15 years old and thus, the original moisture content in unknown...some key samples were not located in the core library (borings W25-95-26) and thus we are unable to evaluate the quality of these boring logs...etc." CMTW-15

Furthermore, Appendices attached to AKA's April 2, 2010 Report regarding geotechnical investigations GPL at B25 Site, included Logs of Borings by AKA/WLA, Logs of Borings from Previous Geotechnical Reports by Others and Logs of Previous Environmental Borings by LBNL but excluded all reports and conclusions. We therefore ask that all these reports be included in their entirety as Appendices to the EIS! CMTW-16 We also ask that a Report by Laurel M. Collins titled "Geology of the East Canyon and the Proposed Hazardous Waste Handling Facility, LBNL" be included as an Appendix to the EIS. (A Draft of April 1993 is enclosed as Attachment 9) CMTW-17

Also statements such as:" The recommendations presented herein are not intended to stabilize the site or mitigate the potential for landslide type movement", by AKA (April 8,2010, Geotechical Investigation, B71 BELLA) reflect the limitations of geotechnical experts regarding the uncertainties associated with sites, such as LBNL. CMTW-18

ATTACHMENT 8.

LAWRENCE BERKELEY NATIONAL LABORATORY (LBNL)

Community Advisory Group (CAG)

Thursday, July 8, 2010
7:00 – 9:30 pm
North Berkeley Senior Center, 1901 Hearst Avenue, Berkeley, CA 94709

Meeting objectives:

- Understand and discuss the geology and geotechnical status of the Berkeley Lab site.
- Identify potential concepts and strategies for improving geotechnical safety at the Lab and reducing related community impacts.

CMTW-19

A G E N D A

7:00 pm	1.	Welcome
	2.	Update on Currently Proposed and Possible Future Projects
	3.	Overview of Geology and Geotechnical Status of the Berkeley Lab
	4.	Concepts and Strategies for Improving Geotechnical Safety
	5.	Public Comments
9:30 pm		*-- Close --*

ATTACHMENT 9

DRAFT

Geology of the East Canyon and the Proposed Hazardous Waste Handling Facility, Lawrence Berkeley Laboratory

Laurel M. Collins
Senior Research Associate
Earth Science Division
Lawrence Berkeley Laboratory
Berkeley California

April 1993

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List of Abbreviations

DM - Dames and Moore

ECF - East Canyon Fault (Borg)

GRC - Geo/Resource Consultants

HF - Holland Fault

HLA - Harding Lawson Associates

HWHF - Hazardous Waste Handling Facility

KF - Korbay Fault

Ku - Upper Cretaceous

LF/B - Lawson Fault/Borg

LF/DM - Lawson Fault/Dames and Moore

LF/K - Lawson Fault/Korbay

LF/L - Lawson Fault/Lawson

LBL - Lawrence Berkeley Laboratory

NF - New Fault (Lennnert)

Tc - Tertiary Claremont Formation

Tm - Tertiary Moraga Formation

Tm-e - Tertiary early Eocene to Miocene

To - Tertiary Orinda Formation

UCB - University of California, Berkeley

WF - Wildcat Fault

CMTW-19 cont.

Introduction

The Hazardous Waste Handling Storage Facility (HWHF) for the Lawrence Berkeley Laboratory (LBL) is proposed for the lower portion of East Canyon (Fig. 1) within Strawberry Creek watershed. For the purposes of this report, the East Canyon area is bounded by the Wildcat Fault (WF) to the east, the East Canyon Fault (ECF) to the west, Centennial Drive along the UCB Botanical Garden to the south, and Grizzly Peak to the north. The proposed HWHF (Building 85) is located about 150 feet west of Building 83, Cell and Molecular Biology Laboratory.

The need for geologic investigation of the proposed HWHF site was identified in a September 1992 Memorandum (Appendix I). The rationale for this study is twofold: 1) to investigate the presence and possible activity of faults, and 2) to evaluate the potential effect of faults upon ground water hydrology.

The complex geology of East Canyon, including the effects of volcanism, interfingering of formations, folding, faulting, erosion, as well as the lack of bedrock outcrops in the central portion of the canyon, likely account for most of the disagreement among experts about its geology. Despite the various geologic maps that have accumulated, their reliability is uncertain because the maps do not depict the field evidence that constrains the location and contact of different bedrock units.

Since September 1992, bedrock outcrop mapping has been conducted by the author. New geophysical and geotechnical investigations have been collaboratively performed by Geo/Resource Consultants (GRC) and Pat Williams (Staff Scientist/Geologist, LBL). These investigations have produced greater definition of the geologic characteristics of the site. This report will discuss the results and implications of the previous studies and the new bedrock outcrop mapping. The geologic outcrop map is shown on Plate I, a cross section is shown on Plate II, and other pertinent maps are included as Figures in Appendix IV.

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Scope of Work

The aim of this study was to resolve confusion about location of geologic units and associated faults. To this end, a bedrock outcrop map was made on which field evidence was differentiated from assumed or inferred bedrock relations.

Reconnaissance along stream courses, gullies, remote hillsides, and construction sites was conducted to map outcrops within the East Canyon area. Because there are few outcrops within East Canyon, some reconnaissance mapping was conducted along the upper areas of Strawberry and Claremont Canyons. Some field mapping was conducted in a mutual effort with Professor David Jones, UCB Department of Geology and Geophysics. His contribution is gratefully acknowledged.

Historical and recent stereo air photography was used to identify lineations that could represent faults or bedrock contacts and to help identify the distribution of different formations through geomorphic and vegetation analysis. Black and white stereo photos from 1939, 1946, 1947, 1974, 1983 and 1990, as well as color stereo photos from 1973, 1978 and 1992 were examined.

Numerous geotechnical reports covering the greater vicinity of East Canyon were examined. Boring logs for buildings 74, 83, 66 and 62 were reviewed to help resolve conflicting interpretations. This report focuses only upon the geology of the East Canyon relative to the HWHF.

Samples and thin sections from several outcrops were made to determine if some of the bedrock units in the East Canyon study area could be found in other portions of Strawberry Canyon. Steve Flexser (Earth Science Division, LBL) performed petrographic analyses, and the samples are available for future reference.

Background

SUMMARY DESCRIPTION OF GEOLOGIC UNITS

A brief description of the bedrock units is given below. These units have been well described in numerous published documents and geotechnical reports on file at LBL. Throughout East Canyon, however, the distribution of these units has not been well resolved.

The oldest rocks present in the study area occupy the lower portions of Strawberry Canyon. On the accompanying map (Plate I), these upper Cretaceous (Ku) rocks comprise marine sandstones and shales. Generally, they are believed to be faulted against the younger formations. The second-oldest unit comprises rocks of early Eocene to Miocene age (Tm-e). They include Sobrante Formation marine shales and various interbedded marine sandstones, cherts, and occasional volcanic outcrops. The nature of contacts among units within the Tm-e, and the distribution of Tm-e throughout East Canyon is not well understood. The mid-Miocene marine Claremont Formation (Tc) that consists of interbedded cherts and shales is considered to be in fault contact with the Tm-e sediments (Jones and Curtis, 1992). The Claremont is highly folded and faulted, with numerous sandstone, tuffaceous, and diabase dikes cutting and/or interstratified with the chert beds. The late Miocene-early Pliocene Orinda Formation (To) is stratigraphically above the Claremont, but is considered to be in fault contact with the Claremont. The Orinda consists primarily of non-Marine pebble conglomerates, sandstones and siltstones. It is prone to landsliding, typically earthflows, due to the presence of montmorillinite clay that has expansive properties. The geomorphic expression of the Orinda Formation is that of gentle slopes, as compared to the steep slopes of adjacent formations. The Orinda sediments interfinger with Pliocene Moraga (Tm) volcanic rocks comprising a series of intercalated basalts, andesites, and tuffaceous agglomerates. Volcanic feeders and vents (Ng, et al, 1989; Borg, 1991; Holland and Wollenberg, 1992; Garniss Curtis, personal communication, 1993) are inferred to occur within Strawberry Canyon, and thus some of the complexity of folding and faulting may be related to processes occurring contemporaneously with deposition of Moraga volcanics. These volcanic rocks cap the highest peaks in the watershed, and extend into and occupy a good portion of the study area. Deposits of alluvium, colluvium, and landslide debris cover much of the bedrock units throughout East Canyon.

CMTW-19 cont.

KNOWN FAULTS OF THE EAST CANYON

Although much information about the geology of the Berkeley Hills is available, there is disagreement among existing reports about the local pattern of faulting within East Canyon. Two faults, the Wildcat (WF) and the East Canyon (ECF), have been verified to exist within the Canyon. The ECF, as originally proposed by Borg (1991), was recently confirmed during trench studies at the HWHF and interpreted as inactive (pending Geo/Resource Report, 1993). Borg's geologic map (1991) showed that the ECF defined the western edge of East Canyon and that its trace was very near the proposed HWHF.

The Wildcat Fault, which defines the eastern edge of East Canyon, juxtaposes the older Claremont Formation with the younger Orinda Formation in this area. Its existence has been proposed by many investigators, although the local context and configuration of the WF throughout the Berkeley Hills has never been well understood or adequately described. About 1,000 feet northwest of LBL Building 74, a trace of the WF was trenched by Korbay and Lewis (1980). This is the only known subsurface investigation of the WF. Korbay and Lewis reported that they considered the WF to be inactive in the East Canyon. They also reported that it was considered to be active north of El Cerrito (Korbay and Lewis, 1980, cite Bishop, 1973)(where evidence of fault creep from offset curbs, pavement cracks, deflected streams and breaks in slope ~~have been observed~~.) A detailed review of previous investigations, involving the various interpretations of the WF and other postulated faults, is included in Appendix III and summarized in the section pertaining to past studies.

CMTW-19 cont.

Bishop ~~were~~ reported? (otherwise cite source or omit)

Near the HWHF, the WF and the ECF are approximately 4,000 feet from the active trace of the Hayward Fault, which passes near the mouth of Strawberry Canyon. The maximum magnitude earthquake anticipated on the Hayward Fault is 7.5 (Steinbrugge, et al, 1987). The WF is nearly parallel to the Hayward Fault and there has been some speculation that a structural connection exists between the active Hayward and Pinole faults and that some such structure may pass through the Wildcat Fault (Williams, personal communication).

Other Geologic Investigations

RECENT STUDIES, 1992-1993

During December 1992 Geo/Resource Consultants (GRC) performed seismic refraction and magnetometer surveys of the HWHF site in preparation for exploratory trenching (Tryhorn and LeFebvre, 1992). At this time two inferred faults, the ECF (Borg, 1991) and the Korbay Fault (KF) (Korbay, 1985) were to be investigated. The KF was inferred to be east of the ECF (Fig. 2a). Some graphical results of GRC's magnetometer survey are shown on a contour map of the magnetometer data (Fig. 2b). On the basis of the magnetimetry, GRC suggested that the ECF might exist north of the HWHF footprint and connect to the inferred KF south of the footprint (Fig. 2a). An additional, and perhaps tenuous interpretation is suggested by this author: the magnetometer data indicate that the ECF could be offset by a SW-NE trending fault that cuts a

sp? magnetometry

topographic saddle near the margin of a volcanic outcrop that is just west of Building 83 (Fig. 3). Volcanic outcrop is out of place so saddle is probably not indicative.

Three trenches were excavated in January 1993, and were investigated collaboratively by GRC and LBL staff (Fig. 4). Trenches 1A and 1B were near the power line access road, north of the HWHF site. The unstable walls in trenches 1A and 1B prohibited entry or close examination of the strata but, observed from a distance above the trench walls, a wide zone of sheared rock was noted in the western half of trench 1A. In trench 1B volcanic bedrock was seen at the western end; this bedrock stepped downward toward the east and abruptly became highly fractured at the east end of the trench. Trench 2, very close to the footprint of the HWHF site, exposed a very well defined NW-striking, E-dipping shear zone in Moraga Formation volcanic rock. Horizontal slickensides in the projected area of the ECF were observed. On the western edge of this shear zone, bedrock stepped about 2 feet downward toward the east. The shear zone yielded an initial flow of about 50 to 60 gpm when the trench was first opened, that later diminished to a steady 5 gpm. (Although speculative, it ~~may be~~ possible that ground water flow along the trace of the ECF is exacerbating slope stability to the south, near the fill for the Centennial Drive overpass.) This shear zone corroborated the evidence for the presence of the ECF. The ECF was interpreted by Williams and GRC to be inactive because the shear zone could not be detected to extend into the overlying colluvium. Trench 3, extending into the footprint of the HWHF, exposed low angle shears near the middle of the trench that appeared to be related to a rotational toe of a landslide. A small amount of water flow was generated from this trench. No evidence of the KF was discovered. A detailed report is anticipated from GRC in May 1993.

CMTW-19 cont.

An historical map by Soulé (1875) showed natural sources of water supply in Strawberry Canyon (Fig. 5). It indicated the presence of a spring near the location of trench 2 (spring "f" on Soulé map). It is possible that natural spring flow was intercepted for water development at this site. Borg (1991) suggested that other springs mapped by Soulé demarcated the trace of the ECF.

Past movement associated with the ECF may have had both vertical and horizontal components, as indicated by the bedrock steps in trenches 1B and 2 and by horizontal slickensides in trench 2. These bedrock steps may be connected along the trace of the ECF. Trench notes taken by Williams indicate the following shear directions (Fig. 4): south wall in trench 2, about 30 feet from the west end, N6W and N20W dipping easterly; north wall trench 2, about 35 feet from west end, N0W and N38W dipping easterly. The projection of some of the bearings conforms with GRC's magnetometer survey (Tryhorn and LaFebvre, 1992) that suggests that the ECF may jog eastward toward the inferred KF. These fracture pattern data may be important for future characterization of ground water flow patterns. The trench investigation also confirmed that the underlying bedrock ~~was~~ Moraga volcanics and that the overlying colluvium ~~was~~ as much as 15 feet deep, thickest toward the northern end of trench 3. ?)

PAST STUDIES, 1900 TO 1991

Previous investigations are reviewed in detail in Appendix III and are summarized here. Because Borg's geologic mapping indicated that the ECF was a splay of the WF that merged together in the northern end of East Canyon, it was important to assess the WF as part of this investigation. Appendix III serves as the basis for my conclusions concerning the unresolved geology of the East Canyon.

Numerous geotechnical reports have been produced for the HWHF and nearby buildings. Several inconsistencies occur in the earlier geologic maps and interpretations of faulting for the area are inconsistent. This can be demonstrated by plotting various fault interpretations from different investigators on a single map (Fig. 6). To some degree the differences in interpretation of the WF reflect the likelihood that it is a broad shear zone (perhaps greater than 600 feet wide in the vicinity of the HWHF) with numerous splays. Differences also may result from the interpretations of the fault from land form features by different geologists, and from the production of maps at many different scales. Inconsistencies in fault locations were demonstrated by Steve Blair (LBL) in his 1992 Memo concerning Synopsis of Current Geotechnical Data on the WF and the East Canyon Area (Appendix II).

The location and activity status of the WF has been addressed in the literature and in several consultant reports to LBL. Some of the older maps by Lawson and Palache (1900) indicate that the WF is a single trace that has been offset by a cross fault. A geology Ph.D. thesis by Untermann (1934) describes the WF as a zone of disturbance one fourth of a mile wide. Contemporary maps still show a number of interpretations that include a single fault trace that may or may not be offset, two traces that splay near Building 74, or a wide shear zone with multiple traces throughout the northeastern edge of East Canyon. However, only one report from Korbay and Lewis (1980) presents actual data on the fault from the afore mentioned trench, 1,000 feet north of Building 74. They conclude that the WF is an inactive vertical fault with the east side displaced upward relative to the west side. Their report also cites the belief of Garniss Curtis (Emeritus Professor of Geology and Geophysics, UCB) that the WF exhibits right lateral displacement as well. David Jones (personal communication) believes that within the East Canyon the WF may be a thrust fault, with older rocks to the east overriding the Orinda sediments to the west.

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The LBL and UCB consultant reports reviewed for this study cite the Korbay and Lewis (1980) study as the basis of their conclusion that the WF is inactive. Other reports, such as King (1984), refer to a disagreement that occurred between trench investigators (Korbay and Curtis) about the inactive classification of the WF. Curtis, as well as Ben Lennert, who was also present at the trench, both believed that the sharp vertical face of the bedrock step was a young feature that had to represent recent and thus "active" faulting (personal communication); Korbay and subsequently Burton Marliave (a co-investigator) did not agree (see Appendix III section on Harding Lawson Associates for a more detailed discussion of the trench investigation). In my opinion, which is based upon review of the Korbay and Lewis report (1980), there is insufficient ~~and confounding~~ evidence in the trench log ~~that makes it impossible~~ to establish whether that trace of the WF has been active during the Holocene. Despite all the investigations to date, the WF has been poorly defined regarding location and number of splays within its larger zone of shearing. Borg (1991) considers the WF to be "possibly active" and based upon the occurrence of similar volcanic units, that it has had approximately 6 km of offset (for comparison the Hayward Fault has had tens of kilometers offset). There has been some agreement that the characteristic mode of movement of the WF is right lateral strike slip and that relative motion is downward to the west, either normal or thrust, in the vicinity of East Canyon. In my opinion, only substantial subsurface investigations incorporating trenching could definitively characterize the WF zone.

The ECF had not been investigated or inferred prior to Borg's 1991 study. He suggested that movement on it might be more recent than that on the WF. This assumption was based upon a jog of the WF that Borg interpreted at the northern end of East Canyon (Fig. 7a and 7b). Borg thought that the WF may have been offset by right lateral movement of the ECF. This interpretation is different from that shown on Plate I. The intersection of the WF and the ECF is appears complex and thus subject to different interpretations. The question of whether one fault has been more recently active than the other might only be definitively resolved with future subsurface investigation near the faults' intersection. If these faults delineate a graben, they may have both been active at similar times. On the other hand, one fault, perhaps the WF, could have had a greater degree of right lateral movement (creep or discrete displacements) and could have been active without requiring movement from the other fault. The recent 1993 trench investigation established that the ECF did not appear to be recently active, as discussed in the previous section.

Rock types and their distribution in the East Canyon have also been poorly characterized. Past interpretations of the East Canyon have invoked large-scale landsliding in combination with colluvial deposition, or numerous parallel faults in a broad WF shear zone, to explain the lack of stratigraphic continuity among various bedrock formations. There is poor agreement between different geologic maps in the location of bedrock contacts. And further, the nature of the contacts between the Moraga and Orinda on the west side of the WF, and between the Claremont and Sobrante on the east side of the WF, is uncertain. According to Jones and Curtis (1992) the contact between the Sobrante and Claremont Formations is faulted throughout the extent of these two units. It is possible that this contact has been mistaken for the WF in some cases. Jones (personal communication) also considers that the contact between the Orinda and Moraga, just west of the WF on the northern fire trail below the UCB Animal Behavior Station, appears faulted. Additionally, the dip of adjacent sedimentary beds and volcanic flows are unconformable. The geologic maps by previous investigators have not indicated fault contacts between these formations.

CMTW-19
cont.

East Canyon Geologic Field Mapping

FINDINGS

The Geologic Map of East Canyon is shown on Plate I and the cross section of A-A' is shown on Plate II. The map highlights outcrops that were verified in the field. Outcrops are depicted as heavily shaded areas outlined in black, and are labeled according to their associated formation. Deposits of colluvium, with the exception of some float material, and alluvium are not depicted on this map; it is intended to only show bedrock relationships if the overburden of colluvium and alluvium were removed. Float, depicted by an "x" symbol, was occasionally mapped in some areas to try to determine the extent of particular formations. Some borehole information from previous studies is indicated as circles with crosses. Outcrops exposed in WF trench A (Korbay and Lewis, 1980) and GRC (pending report, 1993) trenches 1-3 are shown. Since there are

Something missing

colluvium/alluvium. Previous bore hole data by GRC indicates that volcanic agglomerate and andesite occur in the HWHF footprint. The agglomerate appears to overlie the andesite.

Second, the question concerning the existence of the East Canyon Fault, as previously mapped by Borg, has been verified in GRC trench 2 just north of the HWHF footprint. Field evidence of the projected northern extent of the ECF includes slight variations in soil type, and changes in topography noted in the field and to some extent depicted on the contour map.

With regard to the lithologic units present in the East Canyon, conclusions and questions raised from the geologic mapping are presented below. The discussion is ordered geographically from central, south, east, north, and west East Canyon. An historical photo of the East Canyon (Lawson and Palache, 1900) has been included because it exhibits the geomorphic expression of the bedrock units that cannot be observed today due to the vegetative cover of the hills (Fig. 7).

In the central portion of East Canyon, the Moraga is in contact with the Orinda Formation. Surface mapping and subsurface exploration have not revealed whether the contact is depositional or faulted. Either alternative is possible, as inferred on Plate I. The triangular-shaped canyon, that is bounded by faults, suggests the presence of a graben rather than large-scale landsliding for the mechanism responsible for its formation.

There is still some question about the orientation of the ECF south of the HWHF. It trends generally north-south, but it appears either to curve or splay southeastward (Plate I). This is a slightly different interpretation than Borg's (Fig 8a and 8b) and is based upon several lines of evidence. These include the GRC magnetometer data, the measured direction of shear planes in GRC trench 2, and a linear channel that is apparent in the field but not well depicted on the base map for Plate I (Fig. 6, an historical contour map, depicts this linear channel much better than Plate I). The splay of the ECF may be intersected by a possible cross fault interpreted from the GRC magnetometer survey (1992), and by a small fault that was inferred from slickensides observed in volcanic rocks at the small quarry east of the security gate. **CMTW-19 cont.**

The southern segment of East Canyon, the area within the hairpin curve of Centennial Drive, is the most poorly understood. Borg indicates that Moraga volcanics are offset by the ECF. Very few exposures occur in this area that has been planted as a redwood grove. Because of the tree cover, the contour map does not show the details of topography or the gullies. As a result, the geologic interpretation for this area is highly speculative. Outcrops of both Orinda and Moraga Formation were observed in a gully. Landsliding has been documented near the Centennial Drive overpass and may be related to ground water movement along the ECF. Hummocky topography within the redwood grove indicates historical landsliding that is likely more extensive than depicted by LBL Plant Engineering (1981) for Landslide # 40. The presence of the Orinda Formation in this area is highly probable, as indicated by the earthflow type of landsliding, which is particularly characteristic of the Orinda Formation rather than the Moraga.

If the Moraga occupies a faulted wedge, just southeast of the security gate, then a fault may extend along the Moraga - Orinda contact into central East

Canyon. This would be similar in projection to Dibblee's (1980) interpretation of the WF (Fig. 9). Alternatively the fault may veer eastward and extend into Korbay's projected cross fault LF/K (Fig. 10). Without further geologic characterization the pattern of outcrops and faulting in this area cannot be resolved.

In the eastern portion of East Canyon, the Tm-e sandstone outcrops near Building 74. A sample was taken from the bedrock exposure located in an excavation for a new substation. A thin section of the sample has been examined by both Jones and Flexser. They independently confirm that this sandstone is not from the Orinda Formation. Jones believes that it is probably Miocene, older than and not part of the Claremont Formation. Bore hole data from Dames and Moore (DM) (1962) and from Korbay and Lewis (1980) suggest that Orinda units occur to both the east and west of the Tm-e outcrop. This is supported by float from the Orinda Formation that was mapped in the field. The extent of the Tm-e unit southward is very speculative.

The presence of the Tm-e is possibly explained by its being faulted and displaced against the Orinda Formation within a broad WF shear zone (Plate I). Brown-colored shales that were intercepted at 25 and 9 feet by Dames and Moore (DM) (1962) in borings 9 and 13 (Fig. 11), respectively, were interpreted by DM as part of the Claremont Formation. Alternatively, the shales could be associated with the Tm-e units rather than the Claremont Formation, as numerous shale and outcrops are representative of the Tm-e along the upper, southern fire trail bordering the ridge between Strawberry and Claremont Canyon (about one half mile south of the HWHF, between the Claremont Formation and the Upper Cretaceous units). This hypothesis is represented on Plate I.

CMTW-19 cont.

In the eastern segment of East Canyon the Claremont Formation occurs east of the WF zone. The Claremont has numerous faults and folds, many of which are not portrayed on this map due to their lack of relevance to the questions concerning the HWHF. The numerous faults in the Claremont have commonly been thought to be associated with the intense folding that happened prior to the deposition of the Orinda Formation. This does not mean, however, that all the faults in the Claremont should be considered Pliocene or Miocene in age. More recent offsets could have occurred along splay faults associated with the WF shear zone. The predominant dip of the chert is steep, varying slightly to either side of vertical. A sandstone dike intrudes the basal portion of the near-vertical chert beds. This sandstone unit has been observed as outcrops, and it causes geomorphic breaks in slope. This geomorphic expression is apparent in stereo aerial photography, and on high resolution contour maps. Both the eastern and western boundaries of the Claremont Formation appear to be defined by a thick shale bed, devoid of chert. One plausible working hypothesis for the occurrence of the Claremont Formation in the East Canyon area is that it occupies an anticline whose axial plane dips steeply toward the west, and with its east limb overturned. Extensive limb shearing is suggested by the numerous northwest-southeast trending faults cutting the Claremont Chert (Cross Section Plate II).

To the north side of East Canyon, which is beyond the extent of Plate I, the Claremont Formation pinches out between the eastern and western sections of the Orinda. The head of the canyon is defined by a saddle of Orinda sediments between peaks of Moraga volcanics near Grizzly Peak Blvd. The WF continues northwestward, but the down dropping associated with its westward side does not seem readily apparent much beyond a quarter mile to the NW of the canyon head.

The local structural setting of the Moraga volcanics on the west side of East Canyon is not well resolved. Along Centennial Drive, just north of the base map used for this project, Borg (1991) and Dibblee (1980) show that the Moraga rocks strike northwesterly and dip eastward about 25 to 35 degrees, respectively. Along the power line/fire trail that starts at Centennial Drive and then heads eastward into the East Canyon, the dip of the Moraga Formation appears to vary. From the beginning of the trail at Centennial Drive to the nose of a small ridge (near a power pole) the volcanic beds dip westward. Continuing eastward along the fire trail, numerous fractures and calcite filled veins occur where the beds dip eastward and then westward again. The deformed configuration of these beds could be representative of other faults in this area. Plate I shows an inferred fault paralleling the ECF. Field evidence is scant but also includes a small escarpment along the northeast side of the valley.

Because of the critical character of the HWHF, the effects of faults on ground water flow are particularly important to establish in the East Canyon. In some cases, faults are permeable flow paths. This for example is likely within the Moraga volcanics. In other cases, such as within the Orinda shale or where fault gouge occurs, impermeable barriers may form. Hydrology of fault zones can thus influence landsliding. In this respect, it is relevant to note that two landslides in the East Canyon that have required past mitigation occur along the projected traces of the ECF and the WF. A 1981 revised map from LBL Plant Engineering (Fig. 12) showing landslides 41 and 40 is of interest because landslide #40 may be affected by ground water flow associated with the ECF. Evidence of substantial flow was revealed during the excavation of trench 2. Landslide #41 is also situated between two inferred traces of the WF at Building 74. Additionally, during a landslide investigation for the UCB Botanical Garden and the Jordan Trail (Fig. 13), Provenzano (1991) suggested that excessive pore pressures from seepage flow along his interpreted projection of the WF were affecting slope stability. It appears that a portion of an historical landslide has been reactivated. The springs mapped by Soulé (1875), that occur along the trace of the ECF, are also likely examples of water seepage controlled by faulting (Borg, 1991).

CMTW-19 cont.

UNRESOLVED QUESTIONS FOR THE GREATER EAST CANYON AREA:

1. What is the nature of the Wildcat Fault? For example, is it a wide shear zone with numerous traces or a single trace; is it a shallow thrust or a high-angle strike-slip fault; are any or all of the possible traces and splays of the WF active?

2. What is the nature of the contact between the Moraga and Orinda Formations throughout central East Canyon? This is particularly important for characterizing ground water flow in the area.

3. What are the distribution and significance of sedimentary rocks (Tm-e?) west of the WF that are not considered Orinda or Claremont Formation?

Conclusions

No active faults have been found to exist beneath the HWHF building footprint. Concerning overall geology of the East Canyon, and based upon my original field work and past studies, I conclude that there is insufficient evidence to confidently explain the relationships among the various geologic units between ECF and the WF or to determine the activity status of all the faults that potentially exist in the area.

The Geologic Map (Plate I) suggests that the East Canyon occupies a broad shear zone of the WF, and that the ECF may be a major splay within that zone. Both these faults show elements of right-lateral and vertical displacement. The canyon may have formed as a result of shearing and/or down dropping between the ECF and the WF. It should therefore, be considered a graben.

The Geologic Map shows inferred fault splays beneath Buildings 74 and 83. If an earthquake occurred on the WF, vertical or horizontal motion would ~~not~~ likely be much less ~~as great as motion in response to~~ a moderate to large quake nearby on the Hayward Fault. Yet even if the WF ~~is inactive~~ does not produce eq's, the potential for displacement to occur on it or other subsidiary faults of the Hayward must not be disregarded if the Hayward generated a very large quake.

This is confusing — do you mean motion on the HF in response to a HF EQ? — any way — the motion causes the earthquake doesn't result from it.

This surface mapping effort has not found new evidence to indicate that the WF is active, nor can potential activity in the broader shear zone near Buildings 74 and 83 be ruled out. To date, the only subsurface investigation of the WF involved trenching of a single splay that was more than 1,000 feet north of Building 74. The fault splays that are inferred to occur beneath Buildings 74 and 83 can only be confirmed by examination of the presently concealed subsurface. Exposures of the fault traces may be revealed during excavation of the planned access road to the HWHF.

CMTW-19 cont.

Recommendations

1. Because faults and hydrologic flow patterns are important to the settings of Buildings 74 and 83, geologists should investigate the planned excavation for the access road to the HWHF. If bedrock is encountered, the evidence to prove or disprove the presence of a fault and its status of activity may be at hand. If only colluvium is encountered along the road cut, then subsurface investigations may be prudent to resolve these questions. The Geologic Map of East Canyon (Plate I) should be updated by information revealed during grading excavations.

2. A map showing "raw" geological observations at LBL should be produced. This map should show outcrop information as well as borehole lithologies, such as those compiled by Holland and Wollenberg (1992) for the on-going LBL Site Characterization Project. The previous geological maps prepared by consultants to LBL are in conflict with boring and outcrop information in a number of locations (Holland, personal communication). A single updated geological map should be compiled to aid in foundation design, ground water control, and slope stability.

3. Recommendation 2 should be a component of an integrated, comprehensive, and computerized data base for the geology of LBL. An efficient computer-

based system would allow simplified and on-going amendments of the map as more is learned from future investigations. The map could be implemented as a layer in Facilities new AutoCAD system. This implementation would make the latest geological understanding of the LBL site available on-line, particularly to the Facilities civil/structural group.

4. A repository for all boring samples, outcrop samples and thin sections should be established to aid in the identification of local stratigraphy. This resource should be made available to consultants who perform geotechnical studies for LBL and available to LBL staff involved in site characterization studies. This repository could contain many samples suitable for future geotechnical and engineering soils tests. This ~~could possib~~ly save costs to future investigations. would likely

5. When future geotechnical investigations are performed, consultants should utilize computer-based maps discussed in recommendation 3 as a base. This would assure more accurate and consistent results from project to project. The results of their investigations should be subsequently entered into the computer system. At a minimum, contracted geotechnical consultants should make use of the "raw" updated geological map discussed in recommendation 2.

6. Contracted geotechnical consultants should be required to submit maps that delineate between physically verified/observed and inferred/interpreted geological information (ie., outcrop maps). Additionally, consultants should be required to yield unused boring samples for inclusion in the sample repository discussed in recommendation 3.

7. Local consultants and researchers that have performed past studies on LBL property should be contracted or at least contacted to submit outcrop information compiled from their previous studies.

CMTW-19 cont.

Appendix I - Memorandum on Geological Investigation, East Canyon

CMTW-19 cont.

LAWRENCE BERKELEY LABORATORY
Bldg.: 50C Room: Ext.: 5344

September 24, 1992

MEMORANDUM

To: Steve Blair, Kam Tung

From: Harold Wollenberg, Pat Williams

Subject: Geological investigation, East Canyon area

Introduction

The need for accurate representation of local geology in the vicinity of Lawrence Berkeley Laboratory has been long standing. Numerous maps with varying interpretations have been produced since Andrew C. Lawson's work at the turn of the century. Recent preliminary geologic mapping of the Berkeley Hills, by Scott G. Borg (1991), summarized by Wollenberg et al. (1992), reveals an interpretation of local geology that includes an inferred East Canyon Fault trending approximately N-S and crossing the eastern part of the lab, just west of the biomedical research facilities. Previous geologic maps have delineated the Hayward and the Wildcat faults as significant and seismically active in the general vicinity, although the status of the Wildcat fault has been of recent debate. The status, as well as possible seismic and hydrologic implications of the inferred East Canyon fault are yet unknown. However, Borg suggests that the age of this fault is probably younger than the earliest activity on the Wildcat fault. To properly characterize the geologic setting of the LBL's East Canyon area, which will include the Waste Handling and Storage Facility planned for construction in 1993, we propose detailed investigations to determine 1) if the fault exists, 2) if so, its accurate location, and 3) the possible seismic and hydrologic ramifications of the fault to the existing and planned facilities.

CMTW-19 cont.

Background

The eastern part of LBL is located on steep-sided slopes in Strawberry Canyon that have been subject to repetitive geologic processes that include seismic and landslide activity. Consequent to the urbanization of these hillsides, these processes now constitute hazards to the human population and to the infrastructure of LBL. As part of the Site Restoration Program at LBL, preliminary geologic studies to assess the hydrogeologic conditions of bedrock were initiated in 1992 by the Earth Sciences Division.

A geologic map and report was produced by Borg (1991). Borg's map combined field reconnaissance, historical air photo interpretation and some original site mapping. The existence of the East Canyon Fault is inferred from 1) airphoto lineations, 2) apparent offsets in the stratigraphy, 3) an alignment of springs known to exist in 1875, and 4) right lateral movement that may be creating a northward jog in the Wildcat fault. The northern terminus of the East Canyon fault has not been established, but its northern intersection with the Wildcat fault warrants further investigation to clarify possible interrelation.

Exposures of the Moraga Volcanics adjacent to, and west of the East Canyon fault are extremely altered and oxidized, suggesting past ground water movement. Borg suggests that the absence of altered volcanics east of the inferred trace of the fault indicates that the fault could be a groundwater barrier. Exposures of the mineralized zone are located on a powerline trail northwest of the proposed waste handling storage facility. New exposures may be revealed during grading and excavation operations for the access road.

The wedge of property bounded by the Wildcat and East Canyon faults and the roadway to the Cell and Molecular Biology facilities has the geomorphic characteristics of a large landslide deposit. Geologic investigations in the early 1980s by Harding, Lawson & Assoc. depicts this segment of land as a landslide, yet mapping by Borg (1991) shows that bedrock contacts can be followed on some portions of this feature. Lineations from the Wildcat fault and the inferred East Canyon fault are observable on stereo air photos. This indicates that if this feature is a landslide, it has been cut by younger faulting. The nature of this landform should be established in order to determine the potential for either storm or seismic-induced failure.

CMTW-19 cont.

1992 Progress

During September 1992 some field reconnaissance of the East Canyon area has been performed by Earth Sciences Division staff. Laurel Collins, Senior Research Associate, has been collaborating in a mutual field mapping effort with Dr. David Jones, Dept. of Geology and Geophysics, University of California at Berkeley. Their field mapping in the general vicinity of the East Canyon area yields additional information that was not indicated on the Borg map. Collins and Jones' mapping effort includes reconnaissance of bedrock exposures in streambeds, banks, and gullies, and detailed lineation mapping and geomorphic airphoto interpretation from low altitude, 1971, color stereo airphotos. Interpretation of vegetation assemblages associated with the different bedrock types, geomorphic characteristics, and assessment of previous mapping efforts are used to extrapolate bedrock contacts for inaccessible sites. Previous mapping to the south and in upper portions of the watershed by Jones has established additional field verification of bedrock exposures over a broader area than that covered by Borg.

CMTW-19 cont.

Recommendations for FY1993

A detailed geologic map of the East Canyon area is necessary to better define the seismic and hydrologic characteristics of the Waste Handling and Storage Facility's site. Of primary hydrologic concern are the questions: are the faults in this area permeable pathways for the movement of fluids into the Strawberry Creek drainage, or are they impermeable barriers to fluid movement? What effects will future movements on the faults have on the hydrologic integrity of the facility? In addition to the direct benefits to LBL, investigation of the inferred East Canyon fault and its seismic significance will benefit the greater community of the Berkeley Hills.

To complete and produce a final geologic map we recommend the following:

1. Conduct additional field mapping along stream courses, trail cuts, and at excavation sites for new construction projects. Additional bedrock outcrops may become exposed as LBL and UCB perform vegetation clearing and prescribed burning treatments for their fuel reduction programs. A schedule of such activities will be

furnished to L. Collins, who is also a member of the Hill Area Fire Prevention Committee. Though most field mapping should be concentrated near the East Canyon site in an effort to detail the local geologic characteristics, a minor amount of mapping in adjacent watersheds will be necessary to define the boundary and extent of the East Canyon fault.

2. Review historical photo archives, make copies of selected frames and annotate when pertinent. Stereo airphotos, taken during 1939 and 1946, will be utilized to interpret geomorphic conditions prior to major construction activities in the canyon. Additional photography from different years will also be reviewed.

3. Review and summarize existing geotechnical documents concerning landslide and fault hazard studies.

4. Observe and document flow conditions, during fall drought and later wet season, at springs discovered in the field or depicted in the 1875 map that are located along the proposed trace of the East Canyon fault.

5. As drilling information becomes available within the LBL property, supplement maps with subsurface information.

6. As bedrock exposures are revealed during road grading operations at the East Canyon construction site, concurrently advise LBL with respect to appropriate level of required study in the interim between grading and start of building construction.

7. In cooperation with the LBL site restoration project, complete a definitive report and map on bedrock, fault and landslide locations for the East Canyon area.

CMTW-19 cont.

Suggested FY 1993 Budget:

0.1 FTE, Pat Williams: $8K*

0.4 FTE, Laurel Collins: $25K*

60/84

Expenses, report preparation: $3K

*does not include overheads

References:

CMTW-19 cont.

Borg, S.G., 1991. Geology of Lawrence Berkeley Laboratory; internal rept. Earth Sciences Div., 3 Oct. 1991.

Wollenberg, H.A., Borg, S.G., Holland, P.J., Williams, P.L., and Evelland, M., 1992. Geological studies relating to the site restoration program at the Lawrence Berkeley Laboratory. Proc. Waste Management Conf. San Juan, PR, April 9-11, 1992. LBL-32172.

Appendix II -Memorandum on Geotechnical Synopsis

CMTW-19 cont.

SYNOPSIS OF CURRENT GEOTECHNICAL DATA ON THE WILDCAT FAULT AND LBL EAST CANYON AREA

The following is a brief summary of geotechnical reports and studies between 1974 and the present concerning the Wildcat Fault and LBL East Canyon Area. All documents are available for review in their entirety through LBL Plant Engineering.

- **Active Faults are defined by the State Geologist as those exhibiting evidence of surface displacement during the last 11,000 years (Holocene Age).**

- **Potentially active faults are defined as those that have been active in the last 3 million years.**

List of Reports:

1) ***Geologic Investigation, Building 74 Addition,*** HLA, July 25, 1974, LBL Geotechnical File #238

2) ***Review of Building 74 Addition Geologic Investigation,*** letter from Burton Marliave dated Oct. 15, 1974. LBL Geotechnical File #239

3) ***Preliminary Geologic Investigation, Proposed Biodynamic Laboratory Building,*** HLA, dated July 31, 1975, LBL Geotechnical File #29

4) ***Wildcat Fault Study, Biomedical Laboratory II Project,*** HLA, February 19,1980, LBL Geotechnical File #35

5) ***Review of Wildcat Fault Study by Harding Lawson Assoc.,*** letter from Burton Marliave dated Feb. 27, 1980. LBL Geotechnical File #35

6) ***Preliminary Geotechnical Evaluation, Proposed East Canyon Corporation Yard***, HLA, January 18, 1985. LBL Geotechnical File # 190

7) ***Geotechnical Investigation, Replacement Hazardous Waste Handling Facility,*** Geo/Resource Consultants, Inc., October 17, 1989. LBL Geotechnical File #

8) ***Geology of Lawrence Berkeley Laboratory,*** Scott G. Borg, Geologist, October 3, 1991.

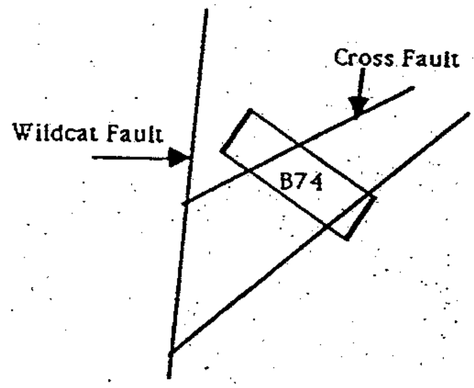
9) *Geologic Studies Relating to the Site Restoration Program at the Lawrence Berkeley Laboratory,* H.Wollenberg, S.Borg, P.Holland, B.Smith, P.Williams, M.Eveland, for Proceedings, 1992 Waste Management Conference, San Juan, Puerto Rico, April 9-11, 1992

CMTW-19 cont.

Report Synopsis

Geologic Investigation, Building 74 Addition, HLA, July 25, 1974, LBL Geotechnical File #238

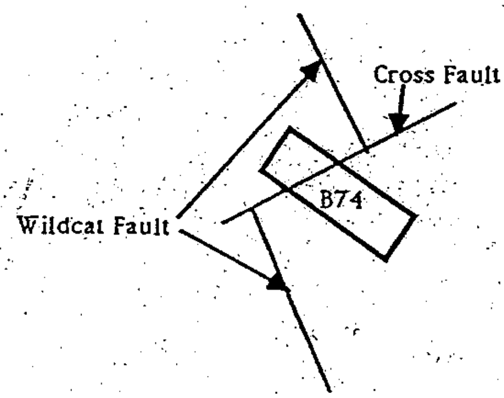
Discusses Alquist-Priolo Act, Wildcat Fault and cross fault "all considered seismically inactive." "The Wildcat Fault and the unnamed adjacent faults do not displace alluvial sediments of Holocene Age or bedrock younger than the Moraga volcanics" (8 million years).



CMTW-19 cont.

Review of Building 74 Addition Geologic Investigation, letter from Burton Marliave dated
Oct. 15, 1974. LBL Geotechnical File #239

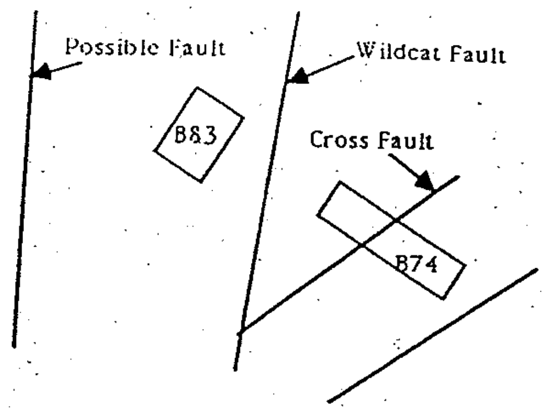
Disagrees with location of Wildcat Fault from above HLA report. Does agree that "no potential hazard exists from the faults in the immediate area". Recommends design earthquake is 7.5 magnitude on the Hayward Fault. Suggests the fault configuration shown at right.



64/84

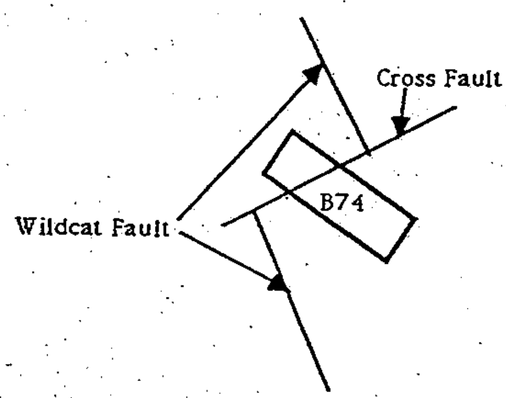
Preliminary Geologic Investigation, Proposed Biodynamic Laboratory Building, HLA, dated July 31, 1975, LBL Geotechnical File #29

Plate 1 shows "possible faults" just east of Bldg 83 site and in overpass ravine both running north and south. Report recognizes Wildcat Fault in the area but states that "neither the Wildcat Fault in this area nor any other fault in the site vicinity is known to be active." as discussed in the Bldg 74 report dated July 25, 1974. Simplified version of Plate 1 is shown at right.



Wildcat Fault Study, Biomedical Laboratory II Project, HLA, February 19,1980, LBL Geotechnical File #35

Trenches excavated across Wildcat Fault north of Bldg 83 and just south of Bldg 74.. Trenches were examined by Korbay, Curtis, Lennert, and Marliave. Report again concludes that neither the Wildcat Fault or the cross fault are active or potentially active. Fault layouts shown at right.



Review of Wildcat Fault Study by Harding Lawson Assoc., letter from Burton Marliave dated Feb. 27, 1980. LBL Geotechnical File #35

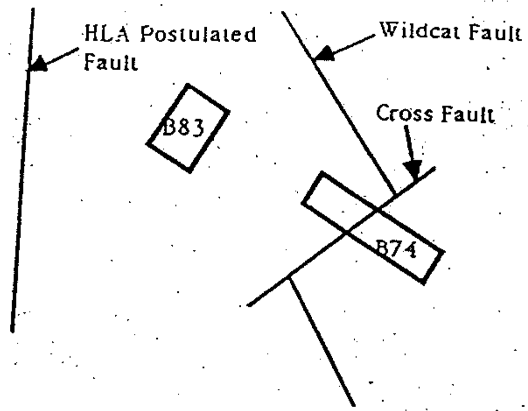
Letter concurs with HLA report of 2/19/80 that there is no evidence of recent fault activity on the Wildcat Fault in the vicinity of LBL property 1

CMTW-19 cont.

65/84.

Preliminary Geotechnical Evaluation, Proposed East Canyon Corporation Yard, HLA, January 18, 1985. LBL Geotechnical File # 190

Reiterates that the Wildcat Fault is not seismically active. Report mentions that a branch of the Wildcat fault may underlie the site. "This postulated fault is based on our interpretation of the site geology including information gained in previous investigations and conditions exposed during landslide repair work adjacent to the overpass along Centennial Drive." Fault layouts shown at right.



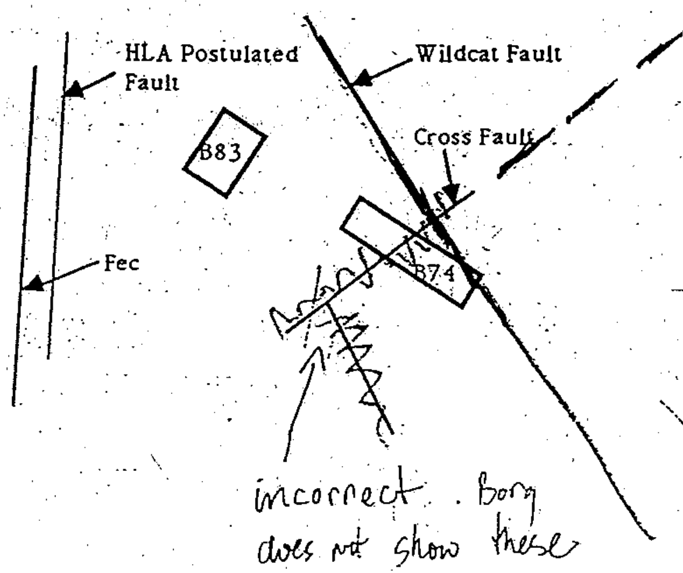
Geotechnical Investigation, Replacement Hazardous Waste Handling Facility, Geo/Resource Consultants, Inc., October 17, 1989.

Refers to Wildcat Fault Study by HLA of 2/27/80 to conclude that fault is inactive.

CMTW-19 cont.

Geology of Lawrence Berkeley Laboratory, Scott G. Borg, Geologist, October 3, 1991.

States that there is substantial (though circumstantial) evidence for the existence of a N-S East Canyon fault designated Fec. Also states that "this fault is inferred to be younger than the earliest activity on the Wildcat Fault and it is possible that this fault has been recently active." Recommends additional mapping and initial trenching in 3 locations. If fault evidence is discovered, then follow up with deep (100-200') drilling.



66/84

Geologic Studies Relating to the Site Restoration Program at the Lawrence Berkeley Laboratory, H. Wollenberg, S.Borg, P.Holland, B.Smith, P.Williams, M.Eveland, for Proceedings, 1992 Waste Management Conference, San Juan, Puerto Rico, April 9-11, 1992

Paper refers to **Borg, 1991** and reiterates that there is substantial evidence for the existence of the East Canyon fault (F_{ec}) based on 1) air photos, 2) apparent stratigraphic offsets, and 3) spring alignment in 1875. Paper mentions other possible faults at LBL and concludes that "once these faults are verified, their roles as pathways or barriers for movement of groundwater can be determined." Location of F_{ec} is the same as shown in Borg's paper above.

CMTW-19 cont.

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CMTW-19
cont.

1. Borg

The geology of Strawberry Canyon was recently mapped by Scott Borg (LBL Geologist) as part of the Site Characterization project to evaluate hydrogeologic conditions of the LBL property. In his report on the Geology of the Lawrence Berkeley Laboratory, Borg (1991) depicted the ECF as a right-lateral, N-S trending fault in the eastern portion of East Canyon (Fig. 8a and 8b). The ECF provided Borg an explanation for the jog in the otherwise fairly linear trace of the WF that separates older Miocene-early Eocene sediments and Claremont Formation from younger, mostly Pliocene Orinda and Moraga Formations. He did not determine whether the ECF terminates at the intersection of the WF but he did consider movement on the ECF to be more recent than movement on the WF.

Borg showed two other faults that splay northwestward from the WF shear zone. These faults define the central northern area of East Canyon. Borg infers that they may separate and define wedges of Siesta and Orinda sediments. There may have been a color error in his map such that it is more likely that he was depicting the Sobrante Formation rather than the Siesta. His map shows that the Building 85 footprint would be on Moraga volcanics.

At the southern portion of East Canyon, west of the WF, and within the hairpin curve of Centennial Drive, Borg shows an E-W depositional contact between Moraga and Orinda bedrock. This interpretation is different from any previous maps for the area.

To the east of the WF Borg shows a queried NE-SW trending fault that displaces Claremont and Orinda sediments. This fault is herein referred to as Lawson Fault/Borg (LF/B) because it was first depicted in 1900 by Lawson and Palache in their publication about the geology of the Berkeley Hills. Lawson indicated that the fault, herein referred to as Lawson Fault/Lawson (LF/L), crossed and offset the WF and continued southwestward toward Strawberry Creek (Fig. 14). On the other hand, Borg believes that the LF/B does not crosscut the WF. Thus, Borg considers movement to be more recent on the WF, while Lawson considered movement on the LF/L to be more recent.

CMTW-19 cont.

2. Geo/Resource Consultants (GRC)

During 1989, GRC performed a Geotechnical Investigation for the proposed HWHF (Ng, et al, 1989). Their mapping showed a trace of the WF separating Claremont and Orinda bedrock along eastern East Canyon (Fig. 15). The LF/L was not within their study area. The Orinda is shown to contact the Moraga to the east of the HWHF. Building 83 is shown to straddle the contact and this interpretation was probably based upon an earlier geotechnical evaluation by Korbay (1985). GRC reports the WF and LF/L as inactive. This was based upon GRC's review of the HLA report (Korbay and Lewis, 1980). The proposed HWHF footprint is shown to be on Moraga bedrock as borne out by GRC's borings and test pits.

3. Dames and Moore (DM)

Dames and Moore (1962) showed cross faulting in a roughly E-W projection through Building 74 (Fig. 11). The cross fault lined up between boring #10, which reportedly intersected Orinda Formation at the surface, and borings #9 and 13, which intersected brown silicious shale at 25 feet and 14 feet depth, respectively. This shale was interpreted by DM to represent the Claremont Formation. An alternative interpretation could be that the silicious shale is part of the Tm-e bedrock that contains interbedded shales and sandstones. DM indicates that boring #10 is to the north of the cross fault, which herein is designated Lawson Fault/Dames and Moore (LF/DM). Their study does not confirm the existence of the cross fault through any other analysis.

4. Harding-Lawson Associates (HLA)

Reports by HLA have included a variety of interpretations of the geology and faulting within East Canyon. Their most recent reports are referenced herein. In their Preliminary Geotechnical Evaluation of the Proposed East Canyon Corporation Yard Development (Korbay, 1985) the HWHF footprint would occur on Moraga bedrock (Fig. 10). The WF is delineated as a single trace to the east of East Canyon, and to the south the WF is offset by an E-W trending cross fault intersecting Building 74. This cross fault is in the general vicinity of LF/L but it has a slightly different location and projection than LF/B or LF/DM. It is thus referred to as Lawson Fault/Korbay (LF/K), after the HLA Project Engineering Geologist. LF/K intersects Centennial Drive just south of the security gate at Cyclotron Road and projects westward. The map in Figure 9 also shows the inferred KF paralleling a linear drainage channel to the west of the WF.

The earlier HLA report (Korbay and Lewis, 1980) showed a slightly different geologic interpretation than that shown in 1985. In particular, the KF is not indicated (Fig. 16). The 1980 HLA report discusses that Lennert (1976) expressed concern for potential activity on either the WF or the cross fault (LF/L or LF/K?). Accordingly, HLA performed a trench analysis in 1980 and concluded that the WF and the LF/K were both inactive. This determination was based upon HLA's analysis of two trench studies: trench A on the WF in northern East Canyon; and trench B on the cross fault LF/K just west of Building 74 (Fig. 16 and Plate I).

In 1980 Korbay, Lennert and Curtis were all present at the trench A site for the WF, which was located approximately 1000 feet north of the HWHF (HLA's Log of trench B is shown in Fig. 17). Their disagreement regarding activity of the WF has been noted (King, 1984; personal communication from Curtis and Lennert, 1993). Furthermore, since Borg's map and Plate I show several faulted strands near the trench location, and HLA's WF trench never intersects chert from the Claremont Formation (which might define the eastern edge of the WF), it is impossible to say with certainty that Korbay actually viewed "the" WF in the HLA trench. HLA's trench shows that a contact between the Orinda and a light yellow brown clayey sandstone demarcates the WF. This sandstone may be sandstone that is associated with the Sobrante or Tm-e unit, that is frequently found near the base of the Claremont. Curtis has remarked (personal communication) that he has observed a light gray, poorly cemented sandstone near the base of the Claremont Formation at the east side Building 74. He interprets it as distinct from the Orinda and Moraga, which could imply that there may be yet another sandstone unit that is unresolved along the WF shear zone near Building 74.

CMTW-19 cont.

The WF has been postulated to be a wide shear zone which implies that it may not have a single trace, as depicted on so many of the maps. Korbay concluded that since there was no displacement of colluvium, the WF was not active. However, a discrepancy exists in the HLA log of trench A. The detail of the WF shear shows that there is a vertical bedrock step on the eastern edge of the fault trace, but it is not shown in the larger diagram of the entire trench wall, nor is an explanation given in the text for the stepped feature. Notes on the detailed drawing indicate that "no gouge on sandstone surface" was observed by Korbay on the face of the bedrock step. It is conceivable that if gouge had formed it could have been removed by erosion subsequent to the displacement. Alternatively, landsliding following the displacement could have overlain the fault displacement and would not require evidence of shears in the colluvium. Curtis (personal communication, 1993) considers that the opportunity for gouge or slickensides to form is very unlikely when near-surface colluvium is faulted against bedrock. The sharpness of the bedrock face led him to believe that the WF had been recently active. Given that the bedrock step is shown in Korbay's detailed drawing, where more care was taken to draw features exposed at the fault trace, the step clearly seems to exist. It is the discrepancy, about the interpretation of the bedrock step and whether shears, fault gouge, or slickensides are even required when colluvium is faulted against bedrock that makes resolution of whether the WF has been active during the last 11,000 years very difficult. This latter problem plus the lack of continuous bedrock outcrop along the base of the trench, lack of detailed characterization of the overlying soil and colluvium above the fault trace, and the failure of the trench to intersect chert from the Claremont Formation, in my opinion, leaves the only known trench analysis on the WF unresolved.

CMTW-19 cont.

A second trench B was excavated by HLA to determine if LF/K was active since it was interpreted to offset the WF (Fig. 16). HLA states that the location of the cross fault was previously determined from an exposure behind building 74 and interpretation of test borings from other investigations. Information about the exposure is not given nor has it been found in previous reports reviewed for this study. No trenching has ever been done on the LF/K to verify its location on the East side of the WF. The projection of LF/K actually plots to the north of the DM's boring #10 (Fig. 10), which was DM's basis for the location of the cross fault to the south of the boring, and thus Korbay's cross fault trench was to the north of DM's projection of LF/DM. If HLA's trench was only 65 feet long, as indicated on their trench log (and not 73 feet as shown by Korbay and Lewis, 1980) then it is unlikely that the HLA trench intersected the cross fault projected by DM. The HLA trench log B (Fig. 18) indicates that bedrock was not intersected and that only an altered zone in a sandy clay colluvium was encountered to demarcate the possible location of the LF/K. Korbay concluded that since the upper three feet of soil did not show displacement, the LF/K was not active. On the basis of this scant information, I do not believe the location of a cross fault, whether it is LF/L, LF/B, LF/DM, or LF/K has been verified. Additionally, if there is a cross fault, it cannot be ascertained from existing reports whether it offsets the WF or vice versa.

In a subsequent report by HLA (Korbay, 1982) a different interpretation of the WF and the cross fault is shown (Fig. 19). Two cross faults were inferred and displacement of the Claremont cert is indicated by the cross faults.

The nature of the contact between the Moraga and Orinda Formations in central East Canyon is not explained by Korbay in his 1985 report because the contact is shown to be overlain by Quaternary Colluvium (described as landslide debris and colluvium) (Fig. 10). However, the older 1980 Geologic Map shows a depositional contact existing between Orinda and Moraga bedrock in northern East Canyon, north of the fire trail near the UCB Animal Behavior Station (Fig. 19). This differs with Jones' interpretation that these two units are faulted against each other in this area.

5. Converse Consultants (CC)

In a report by Converse Consultants (King, 1984), the mapping of the WF and the LF/K (Fig. 20) is similar to that by Korbay in 1985 (Fig. 10). CC discuss that the WF has a sense of displacement similar to the Hayward Fault Zone, right lateral slip with a similar east-side-up vertical component. The CC report quotes Curtis that 3.5 miles of right lateral displacement from the Sibley Volcanic vent to the East Canyon Area has occurred over the last eight million years. CC concludes that the activity of WF remains a question but based upon Korbay and Lewis' (1980) study of the WF, they judge that it is most likely not active within the study area. However, they did not perform a critical review of Korbay and Lewis' trench investigation.

The central East Canyon is mapped by CC as Quaternary Colluvium overlying Orinda and Moraga bedrock. The nature of their contact is shown to be depositional at the northern extent of the East Canyon. Southwestern East Canyon is shown as a Quaternary landslide that has destabilized portions of Centennial Drive and Cyclotron Road west of the security gate.

CMTW-19 cont.

The 1984 CC report depicts faults identified by HLA and Lennert (Fig. 21). HLA's interpretations are discussed in the text above. Lennert's mapping is from Lennert and Associates Hill Area Dewatering Study, Revised Geologic Map (1979). Lennert depicts an E-W trending fault, referred to as New Fault (NF) by the CC report. Voids encountered during drilling and the disappearance of surface runoff into cracks in a ravine were the basis for his postulated NF. Based upon lack of surface expression and lack of offset geologic units, CC did not support the existence of NF.

Lennert also depicted the E-W trending University Fault to cross the Upper portion of East Canyon and that it and NF are both truncated by the WF. A smaller fault trending northwestward into the Animal Behavior Research Station is indicated to the north of University fault. The CC report did not support the existence of the University Fault. The smaller fault was not addressed in CC's analysis.

6. Holland & Wollenberg

In their Initial Appraisal of the Geologic Controls of Ground Water Occurrence and Movement in the "Grizzly" Area of the LBL, Holland and Wollenberg (1992), suggest an E-W trending fault, herein referred to as the Holland Fault (HF), just north of Lennert's postulated NF (Fig. 22). This fault is suggested in one of two hypotheses to explain the geology near Building 77 as interpreted from numerous boring logs. The HF is discussed as part of a hypothesized setting that includes a volcanic center. The eastward projection of the HF would intersect the ECF at about 1,000 feet elevation. Holland and Wollenberg hypothesize that this fault would have an apparent south-side down offset.

This is consistent with the geomorphology of central East Canyon. A slightly northerly projection of the HF may be used to possibly explain two geomorphic features that can be seen on Figure 6. The saddle behind the knob just north of the end of the trace of the HF could be down dropped to the south. Two drainage channels, at points A and B, are also beheaded near the 1,000 feet elevation in central East Canyon.

7. Provenzano

A report on Slide Repair Investigation for the UCB Botanical Gardens by Provenzano (1991) indicated that the cause of a landslide in the Botanical Gardens was due to excessive subsurface seepage flow, partly related to the crossing of the WF. Provenzano sites unpublished data that was provided to him by Ben Lennert and includes a geologic map with Lennert's interpretation of the location of the WF (Fig. 13). This map indicates that the WF is not displaced by any cross faults and that the WF projects through Building 74 in a different southeasterly trend than previously indicated on Lennert's map cited by CC.

CMTW-19 cont.

8. Dibblee

The published Geologic Map of the Briones Valley Quadrangle (Dibblee, 1980) shows a different interpretation of the WF from those of other investigators. Dibblee indicates that it veers west of Building 74, and appears to meet up with the KF in the area within the hairpin curve of Centennial Drive (Fig. 9). The distribution of bedrock is also shown to be quite different than that of other investigators, particularly that the Orinda Formation is not shown to occur west of the WF or between the Moraga and Claremont Formations.

Appendix IV - Figures

CMTW-19 cont.

In 1998 the US Environmental Protection Agency declared LBNL eligible for listing on the National Priorities List (NPL) for Superfund clean-up.

The legacy contamination at LBNL is significant and a couple of pump and treat operations do not adequately deal with the contamination issues. LBNL has never mapped the site's hydrostratigraphic units (HSUs) to better understand the hydraulic connection between various permeable layers of the HSU's sedimentary sequences to facilitate a more accurate construction of groundwater flow and contaminant fate-and-transport model. We ask that DOE fund a rigorous mapping of all the HSUs associated with the Project sites and that this mapping be included in the EIS. Section IV.C.2 was superficial and did not adequately address the serious contamination present at LBNL. As a reference to groundwater cleanup we include a presentation by Lawrence Livermore National Laboratory's Site Restoration Program Leader, available at UC Water Resources Center Archives' website. (Attachment 10.) CMTW-20

After 70 years in Strawberry Canyon, it is time for LBNL to move offsite to better facilitate the vision of its current director Alivisatos (Attachment 11, p.2) to reorganize the lab's physical layout and <u>create a second campus</u>. The lab's antiquated concept of co-locating research (buildings) should be changed to embrace a modern "Global Network University" concept with "Portals" (campuses) not just in different cities but countries, which is the cutting edge trend among universities (NYU) and other institutions of higher learning. CMTW-21

To exercise the principle of co-locating research in every day lab life is impossible, based on the DEA's description (IV.B.7./p.54) of lab practices to prevent Intentional Destructive Acts. "The entire LBNL site is fenced, and controlled access is available only at three entry gates. <u>Card keys would be used for building access</u>... The building would have a guard on the door during normal business hours and <u>card key access</u>. " Indeed, no one from the outside, even from labs next door can casually walk in and "exchange ideas", as is continually purported by LBNL officials. In fact access to any building/lab/office is strictly controlled and available only on a "need to know" basis. CMTW-22

For the reasons stated above, we ask that LBNL very seriously consider expanding the co-location concept to the entire Bay Area, i.e. consider alternative locations for the second campus in Richmond (Richmond Field Station), Vallejo (Mare Island), Oakland (former Navy Base), Alameda (former Naval Station) and in Fremont (former NUMMI plant/See attachment 12.) to avoid continuing logistical, environmental, geotechnical constraints and legal challenges, currently crippling LBNL and its future! CMTW-23

ATTACHMENT 10.

Lawrence Livermore National Laboratory

History of a Ground Water Cleanup Project: LLNL's Livermore Site

May 4, 2010

Pete McKereghan
Site 200 Restoration Program Leader

Lawrence Livermore National Laboratory, P. O. Box 808, Livermore, CA 94551

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344

CMTW-24

Presentation Outline

- Site Background
- Site Hydrogeology
- Remediation Approach
- Effectiveness of Selected Remedy
- Regulatory Process
- Accomplishments
- Summary

(Technology Ventures Corp in partnership with US DOE . Nodes on tech transfer)

INNOVATION:
America's Journal of Technology Commercialization

ATTACHMENT 11
(4 PAGES)

Vol 8 #2

Raising the Energy Level at the Berkeley Lab

April/May 2010
Paul Alivisatos

By Ken Castle

He has an endearing laugh, an amiable personality and a sense of informality that puts people at ease. But behind the affable demeanor is a man with a mission. Paul Alivisatos, the new director of the Lawrence Berkeley National Laboratory, isn't wasting time or energy in his assault on global warming. He's determined to establish the lab as an energy research hub and to accelerate the transfer of technology in ways that can have significant impact. To accomplish this, he's asking his 4,000 employees to overhaul the lab's culture, priorities and collaborative processes. And could they please do this yesterday?

With a Ph.D. in chemistry, Alivisatos is soft-spoken but resolute. "Our lab needs to be much more strategic and much better coordinated in its approach to research on climate and the carbon cycle," he says. "The scale of innovation that is required to address these global problems is enormous and there is an urgent need for us to step up with more focus and more resources." In his view, it's time to get scientists out of their silos, encourage them to work as a team on common objectives and convert their research into deliverable applications.

CMTW-24 cont.

Alivisatos, 50, was named in November to the position that was formerly occupied by Steven Chu, who was appointed secretary of the Department of Energy last year. Alivisatos was acting director until the University of California's Board of Regents made the appointment permanent. Managed by the University since 1931, Berkeley Lab—which was the first in the national laboratory system—performs research in nanoscience and advanced materials, life sciences, computing, energy and earth sciences, physics and cosmology.

It might be argued that Alivisatos, who was raised in Chicago but spent part of his childhood in Greece, has big shoes to fill, and quite a legacy to inherit. But, as deputy director during Chu's tenure at the lab, he's been well-groomed for management, which is often outside the comfort zone of academics. "He's an incredible scientist with incredible judgment on a variety of issues," Chu says of his former colleague. "He's level-headed and calm, and he has an ability to inspire people. Also, he has the leadership to take projects from material science to real-world applications."

Indeed, the multi-tasking Alivisatos, who still conducts his own nanoparticle research and still regularly meets with a group of grad students at the university, knows something about what it takes to create a business. He was a scientific founder of Nanosys Inc. and Quantum Dot Corporation and is a board member of Solexant, Inc. Nanosys, which was launched in 2003, produces materials that give LCD displays better color and brightness and extend the capacity of lithium ion batteries. Quantum Dot, a nanotech startup acquired by Invitrogen in 2005, develops tiny semiconductor crystals that fluoresce brightly with small amounts of light, thus providing detailed imaging tools for medical researchers studying the behavior of cells and organs. Solexant, founded in 2006, manufactures third generation thin film photovoltaic technologies that significantly increase the efficiency of solar cells and thus reduce the cost of solar modules. All of these technologies spun off from projects that Alivisatos spearheaded at the lab.

Being involved with startups, he says, has been a sometimes humbling and frequently enlightening experience. "When you take things from the lab to the marketplace, there are so many considerations and so many ways to work that issue," he says. The commercial success of a new company, he adds, has more to do with the talent of the leadership, especially the CEO, than with the technology. Without strong marketing, sales and production efficiencies, groundbreaking discoveries can have difficulty finding a life outside of the laboratory—a reality that often confounds scientists, says Alivisatos.

A key challenge for the Berkeley Lab, as well as for the nine other DOE labs across the country, is coming up with a system of collaborating with industry. Last year, the Government Accountability Office issued a report on shortcomings in the labs' technology transfer programs. It said that the facilities lacked parameters such as consolidated goals, performance measurements, incentives, funding and flexibility.

While the Berkeley lab has a track record of giving birth to startups and licensing its science, Alivisatos acknowledges that sometimes the catalyst is little more than "throwing it over the fence"—a comment punctuated by his trademark laugh. "But the consensus is that this is not the preferred model," he says, "and that we need to think about better structures." One organization that is trying to tackle the bottlenecks, he adds, is the Joint BioEnergy Institute, a San Francisco Bay Area partnership that consists of the Berkeley Lab and five other nearby labs and institutions, among them Lawrence Livermore and Sandia national laboratories. Their mission is to stimulate development of the next generation of biofuels—liquid fuels derived from the solar energy stored in plant biomass.

CMTW-24 cont.

"When we talk to our friends in industry, both the large established companies and the startup entrepreneurs, we often find that each one has a different idea on how to interact with us," he says. "We have to be flexible, and hopefully the DOE will be flexible. It's very possible that a nimble industry innovator will be able to do things that our lab would never be able to do, and yet our lab has the basic science that is a good resource. We might need to do research cooperatively in different ways. It might be that we would have a consortium, if it is a competitive situation, or particular partners that want a closer relationship. There are a lot of challenges, but we have to be excited about the opportunities."

Certainly, Alivisatos is turning up the wattage at Berkeley Lab, which is situated on a hill above the UC campus but also maintains satellite facilities in west Berkeley and neighboring Oakland. Among his five key objectives is a major reorganization of the physical layout. He'd like to consolidate the outliers into a second campus and revitalize the main campus by replacing old, seismically challenged buildings with new ones. Potential sites for the second complex are being identified and a recommendation is in the wings. While the need exists to add more staff and work space (and, not incidentally, more grants), Alivisatos is reaching out to the surrounding neighborhoods with assurances that the main campus will not extend beyond its existing footprint, thus addressing the concerns of environmentalists and residents.

As part of a new community relations initiative to dispel the lab's walled garden impression, Alivisatos regularly meets with members of the Berkeley City Council, inviting them to come up and visit. And he's formed an advisory group to engage friends and critics alike, providing updates and inviting feedback on existing and proposed projects. Given the "green" sensibilities of Berkeley and the local economic stimulus from the lab, that sort of relationship would seem natural. However, the reality is that it hasn't been warm and fuzzy in years past. "We haven't done a good job of telling our story," says James Krupnick, chief of operations and a lab veteran of 33 years. "But Paul has a knack for explaining things in layman's language."

Another goal is to improve efficiency at the lab. Alivisatos wants to initiate peer and scientific reviews of all 14 divisions, which function with their own directors and set their budgets independently. He wants to see if the operations staff can tighten up on administrative costs and if scientists can network more frequently with other teams. These reviews, suggests Krupnick, are aimed at eliminating duplication, as well as reorienting the staff to focus on key technological objectives. The vision is that if the fundamental and applied science groups can work cooperatively at much higher levels than they have in the past, real progress can be made on the innovations that are needed to affect climate change.

Alivisatos has identified two key science initiatives that hold the most promise for commercial applications: Carbon Cycle 2.0 and Next Generation Light Source. The second of these is an extension of his own pioneering research in nanocrystals, and reflects his involvement in creating startups. He believes there are more opportunities to develop low-powered light sources, using quantum dots and quantum rods for a variety of electronics and medical devices, and thus reduce demand from the grid.

But his overriding priority is an ambitious, all-hands-on-deck effort to eliminate carbon emissions. "Our lab is supposed to solve big problems," he told his staff in a February call-to-action briefing. The goal of this initiative, he said, "is to make sure that the lab itself has the biggest impact that it is capable of having. We have lots of people who are making wonderful discoveries in fundamental science but who could contribute more to the issues of carbon cycle research than they are today."

CMTW-24 cont.

The lab scientists are being tasked to create more precise climate modeling and to move the needle on biofuels, solar photovoltaics, battery efficiency and carbon capture. Also, said Alivisatos, they should expedite their research into the relatively new field of artificial photosynthesis, which holds long-term promise. Berkeley Lab has been working on something called the Helios project, in which the goal is to create photovoltaic cells in the form of a semiconductor membrane of nanocrystals that would mimic natural photosynthesis, the process by which green plants convert sunlight into electrochemical energy. The end product would be the storage of solar energy in the form of renewable liquid transportation fuel. Alivisatos has calculated that 58 million acres of non-arable land covered with photovoltaic nanocrystals would be enough to replace all of the gasoline consumption in the United States. In this effort, the lab is investigating three prototype systems: generating biofuels from biomass and algae, and using solar energy to directly convert water and carbon dioxide to fuels.

While some teams are developing new technologies, others, he says, need to concentrate on short-term solutions. Specifically, the lab should address how to make more efficient use of fossil fuel, since reliance isn't going away anytime soon, and to temporarily store carbon dioxide—in processes referred to as capture and sequestration—without releasing it into the atmosphere.

Clearly, life will change for the scientists at Berkeley Lab as they rally around a new, more critical mandate. But there is little doubt that Alivisatos is held in high esteem by his colleagues and knows how to manage change. "It's amazing to see how Paul handles both his academic research and his administrative duties," says Peidong Yang, himself a world-renowned Berkeley chemist with expertise in nanoscience and solar-based nanotechnology. Years ago, Yang worked with Alivisatos to build a molecular foundry at the lab and, more recently, is helping him develop a solar innovation hub as an outgrowth of the Helios project. "Paul has always had vision and a deep grasp of the science behind the problems," says Yang. "He communicate exceptionally well with scientists from various disciplines, with chemists, physicists and engineers. He has this ability to pull people together."

With his multiple talents, Alivisatos seems to be the right man in the right place. And he embraces a profound chance to make history. "This is an amazing period for the lab," he says, one in which he anticipates expansion, improved integration and transparency, and more financial support from the federal government. "Since the nation has decided to rely on science to lay a foundation for the future, as well as help dig ourselves out of recession, our job with the labs is to make sure there is good return on investment."

Paul Alivisatos realizes that his is a high-stakes assignment. Time is running out, and every nanosecond counts.

Ken Castle is a freelance writer who reports from California for Innovation.

CMTW-24 cont.

ATTACHMENT 12.

Lawrence Fremont National Laboratory

A New National Center with Consortium Partners for Green Clean Technologies/Research/Development/Manufacturing.

Five million square feet of laboratory/office/research and manufacturing space **already built and immediately available** at the NUMMI Fremont site, previously occupied by a joint venture between General Motors and Toyota, which ended on April 1, 2010.

The site is in the **geographic center of the Bay Area**, served by an excellent transportation infrastructure, a trained workforce and research and development communities nearby as well as supportive elected officials!

The new **Lawrence Fremont National Laboratory (LFNL)** will be just
35 miles from Berkeley (UC/LBNL)
30 miles from Oakland (22 miles from the Oakland International Airport)
41 miles from San Francisco/UCSF (32 miles from SFO)
18 miles from Livermore (LLNL/SANDIA),
12 miles from Hayward (Cal State EB)
16 miles from San Jose (Airport) and Silicon Valley
18 miles to Menlo Park/Palo Alto/Stanford/SLAC

CMTW-24 cont.

The LFNL, future anchor/center and hub of the Green Corridor going north, south, east and west, is centrally located to all of the East Bay, South Bay, Peninsula and San Francisco!

This is the **Opportunity of the Century for the Department of Energy**, Lawrence Laboratories, UC and the Consortium of Private Industries they are now or will be partnering with in the future; British Petroleum (BP), Energy Biosciences Institute (EBI), Joint BioEnergy Institute (JBEI/Jay Keasling), Amyris Biotechnologies, Nanosys Inc., Quantum Dot Corporation/Invitrogen, Solexant Inc. (Last 3 associated with Paul Alivisatos), etc.

It is specifically an Opportunity of a Lifetime for the Lawrence Berkeley National Laboratory, to offload facilities from the unstable Strawberry Creek watershed site, with its unconsolidated soils, water and mud of a collapsed caldera, riddled with landslides and earthquake faults, stifled by logistical, environmental, geotechnical constraints and legal challenges, currently crippling LBNL and its future.

Since this Project is so huge, expensive and controversial, we are submitting all of our 3 previous comment letters*to the CEQA process to be considered (and responded to) as comments to the NEPA DEA process. Especially we ask you to review our report titled: "Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California", specifically sections dealing with Contaminant Sites, both regarding chemical and hazardous contamination and radioactive contamination, Drainage Network Mapping, Geologic "Bedrock" (Formation) Mapping, Fault Mapping, Landslide Mapping, Plume Monitoring Sites and Zones of Concern for Potential Plume Migration, as well as Future Development and Site Conditions and in conclusion our General Recommendations warrant careful consideration in the full-scale EIS, as they all deal with concerns related to Project sites, i.e. B85 complex, B25 complex (GPL) and B 71/55 sites of the DEA. (Attachment 13). CMTW-25

Inadequacies of the DEA are blatant, uncertainties associated with these sites enormous, "Detailed information concerning significant environmental impacts" (required by NEPA) were glaringly missing, thus denying decision makers the ability to adequately assess all potential and existing environmental risks associated with the Project. THUS A FULL-SCALE EIS IS REQUIRED, especially since significant amounts of public, taxpayer funds under ARRA are proposed to be committed to this ill conceived Project with extreme risks inherent at the site.

Sincerely, Pamela Sihvola

Pamela Sihvola
Co-chair, CMTW
P.O. Box 9646
Berkeley, California 94709

CMTW-26

* Our comments on the DEA are organized in 5 sections titled:
DOE/SLSII/DEA
COMMENTS#1of5 through #5of5

ATTACHMENT 13(A)

CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRELATION TO FAULTS, LANDSLIDES, AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA

CMTW-27

Strawberry Creek Watershed ca. 1965

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for

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Committee to Minimize Toxic Waste
P.O. Box 9646
Berkeley, California 94709

83/84

Attachment 13 (B)

CMTW-27 cont.

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Committee to Minimize Toxic Waste

DOE/SLSII/DEA COMMENTS#2of5

Board of Regents, University of California
Russell Gould, Chairman

c/o Anne Shaw, Secretary
Office of the President
1111 Franklin Street, 12th. fl.
Oakland, California 94607

URGENT

July 8, 2010

Via fax # (510) 987-9224

Subject: Comments on Action item GB 4, before the Regents' Committee on Grounds and Buildings (July 13, 2010): Certification of Environmental Impact Report (EIR) and Approval of Design of the Seismic Life Safety Modernization and Replacement of General Purpose Laboratory (GPL) Building, Phase 2 (Seismic Phase 2) Project, Lawrence Berkeley National Laboratory (LBNL)

Honorable Chair Russell Gould and Members of the UC Board of Regents,

We urge you not to certify the above referenced EIR for the Project proposed for the Lawrence Berkeley National Laboratory (LBNL) site, located in the Strawberry Creek Watershed in Berkeley and Oakland, California, for the following reasons:

CMTW-27 cont.

1. The entire EIR for LBNL's Seismic Life Safety Project is wrong-headed by stating that the "Project" would remedy LBNL space which poses Seismic Life Safety risks, because it willfully ignores the fundamental meaning of the fact, that the entire LBNL site is on the State of California's delineated official seismic hazard zone for earthquake induced landslides (CGS 2003 a/b).

The following is a citation by LBNL's Geotechnical consultant Alan Kropp & Assoc. in reference to another ARRA funded project at LBNL also associated with the Building 71 site: "The recommendations presented herein are not intended to stabilize the site or mitigate the potential for landslide type movements." (April 8, 2010 Geotechnical Investigation, Building 71 BELLA). Building 71 site is on top of a major landslide, included in the CGS Seismic Hazard Zone Report map, showing a landslide extending from the hills - upslope of B 71-beneath most of the B 71 complex and into the valley below.

These same concerns apply to the sites of the other components of the Project EIR currently before you. Of special concern are the landslides undermining Building 85 complex, LBNL's Hazardous Waste Handling, Storage and Treatment Facility and the Building 25 complex, the proposed site for the General Purpose Laboratory (GPL).

THE DAILY CALIFORNIAN
Berkeley, California
Monday, July 12, 2010
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CMTW-27
cont.

UC Board of Regents Set To Hear Lab's Seismic Plan

by **Zoe Filippenko**
Contributing Writer

The Lawrence Berkeley National Laboratory will propose a seismic modernization plan to the UC Board of Regents at their Tuesday meeting to begin updating the hazardous buildings within the facility, but concerns have been raised by community members over the environmental impacts of the construction.

The proposal suggests retrofitting one building, constructing a new general lab and demolishing two buildings and six trailers. It is part of the lab's long-term development plan pioneered in 2006. According to the plan, only 51 percent of the lab's buildings were assessed as suitable for use and 24 percent of the structures needed seismic upgrades.

Additionally, the report states that 62 percent of all lab buildings are more than 40 years old, pushing them past the age where it becomes more cost-effective to construct a new building.

"The takeaway message for us is that safety is of primary importance," said Jeff Miller, head of public affairs at the lab.

However, the nonprofit organization Save Strawberry Canyon has been continuously voicing concerns about the lab's building endeavors.

According to the organization's president, Lesley Emmington, the lab is built on the remains of a dead volcano that is composed of soft soils and large amounts of water.

The composition of the land is relatively unknown, but it has proven to be susceptible to serious erosion and landslides, Emmington said. Not only is building on top of this soft soil dangerous, but the natural resources and beauty of the watershed will be

>> LAB: PAGE 2

LAB: Proposal Estimates Plan to Finish by 2014

FROM FRONT

threatened, she added.

"How are they going to stabilize the building if there is nothing but soft, shaky soil underneath?" she said. "Lawrence Berkeley Lab places things in this area, but if the structures are moved 20 feet, there is nothing solid from part to part."

But Jerry O'Hearn, the retrofit project's director, said there are "no significant, unavoidable environmental impacts in the Environmental Impact Report." He added that the new building will out-perform set energy standards by 50 percent.

Buildings are chosen for repair and retrofit through a rating system on a scale of very poor to good. Those deemed most hazardous become the highest priority to retrofit, according to Miller.

Projected timelines under the new proposal estimate that the various projects would begin in 2011 and be completed by 2014. The lab, which employs approximately 4,000 people, would have to relocate employees in one of the buildings scheduled for demolition. The other building has been vacant for years due to its hazardous structure.

The lab already received funding for the proposed construction, allocated by the U.S. Department of Energy as part of a stimulus package for all of the 10 labs under the authority of the department's Office of Science.

Contact Zoe Filippenko at zfilippenko@dailycal.org.

1a.

2/11

2.

In addition to the landslide risks of the proposed GPL site, the area, known as LBNL's Old Town, contains some of the most serious and extensive legacy contamination at the lab, especially VOCs, Volatile Organic Compounds, potentially causing a threat to any personnel from construction workers to LBNL employees present at the site at any time!

CMTW's concerns regarding radioactive and hazardous waste contamination at LBNL were largely ignored, specifically as they were expressed in our report: "Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California" submitted as part of our comment letter to LBNL.

Enclosed is a brief chronology of some of the 40+ landslides already mapped at LBNL (Attachment 1.) as well as a figure showing the collapsed caldera of the site with unknown mixture of mud, perched water and boulders, for which LBNL has yet to do a <u>comprehensive</u> hydrogeological study of its composition. (Attachment 2.) Also missing is the mapping of LBNL's hydrostratigraphic units (HSUs), which would show the hydraulic connection between various permeable layers of the HSUs sedimentary sequences, thus facilitating a more accurate construction of ground water flow and <u>contaminant fate-and-transport models.</u>

CMTW-27 cont.

3. Two critical figures, referred to on page 5-227 of the Final EIR, were missing . They were hastily sent out with a Notice of Errata on June 30, 2010. The title of Figure 1. is "<u>Bedrock</u> geologic map of LBNL", and yet it only refers to various <u>formations</u> present at LBNL, such as Moraga Formation, Orinda Formation etc. There is <u>no</u> bedrock at LBNL, the use of the word bedrock is misleading, it is a <u>misnomer</u>, and LBNL should carefully describe what they mean specifically when using this word! (Attachment 3.)
Furthermore, the Draft EIR contained a figure titled:" Wildcat Fault Study" by William Lettis & Assoc. Inc. (Figure 4.5-2, on page 4.5-13). This figure was replaced by another, modified figure, on page 3-9 of the Final EIR, <u>without any reference</u> to the author/source of the modifications, date or reason for the modifications. There should have been a proper explanation attached to this new figure, as to what was changed and why, since it is related to that critical East Canyon landslide, undermining LBNL's Hazardous Waste Handling Facility!
Indeed, the entire EIR provides <u>no</u> information or discussion regarding any investigations performed to determine the depth, width and length of each of the 3 landslides impacting the projects at B 71, B 25 complex and B 85 complex sites. No discussion or analysis or proposals as to how to actually remedy the landslides themselves, by removing the hazardous soils etc. No serious discussion was provided for the consideration of alternate sites either.

In conclusion, we again urge you not to certify the EIR before you.

Elevated Life Safety Risks will continue as long as LBNL operates at the current site on the unconsolidated soils of a collapsed caldera. The EIR projects a false sense of safety, as it ignores the fact that what ever is done structurally to the buildings, does not remedy the instability of the site. The conditions of the land are the dominant hazard features, not the buildings alone! The EIR offers only superficial mitigations, as if a landslide could be stopped by a row of toothpicks, as is the case with the lab's Hazardous Waste Handling Facility (HWHF) proposal.

No new structures should be erected at LBNL's known landslide areas, and it is imperative that the HWHF be relocated outside the seismic and wild land fire hazard zone to a more stable ground, away from residential populations. The same applies to the GPL building.

Taxpayer funds are scarce, whether it is state/UC funding or federal ARRA/DOE funding, good money should not be thrown after bad places.

We therefore propose the consideration of the old NUMMI plant in Fremont as the new Lawrence Fremont National Laboratory, to be LBNL's II Campus. Five million square feet of laboratory/office/ research and manufacturing space already built is immediately available. Tesla Motors will occupy only some 5% of the facility. (Attachment 4.)

CMTW-27 cont.

And lastly, LBNL is a nuclear industrial complex, with radioactive and hazardous releases in Berkeley's Strawberry Canyon since the 1940s. It would be imperative for UC/LBNL to clean up the canyon lands and waters and restore them to their pre-industrial state, and start a new campus somewhere else with better regulations, technologies to prevent future releases into the atmosphere. There is NO SAFE DOSE OF IONIZING RADIATION was the June 2005 finding of the National Academy of Sciences Panel: BEIR VII, Committee on Biological Effects of Ionizing Radiation. (Attachment 5.)

Save Strawberry Canyon from future development, restore it to its natural state.

Sincerely, Pamela Sihvola

Pamela Sihvola, Co-chair
CMTW
P. O. Box 9646
Berkeley, CA 94709

cc: Leslie Schilling, Chair, UC Regents Committee on Grounds and Buildings

ADDENDUM Geology of the East Canyon and the proposed Hazardous Waste Handling Facility, Lawrence Berkeley National Laboratory, a Study (April 1993) to be hand-delivered at the BG Committee meeting on July 13, 2010.

Attachment 1.

Chronology of the Campus Hill Area Development and Slope Instability Through 1984

Early 1900's	Development of the campus hill area begins
1949	Numerous slides occur as a result of Bevatron (Building 51) construction (1st recorded stability problems)
1950's	LBL significantly increases construction, massive cuts and fills undertaken to create flat pads for roads and buildings
1962	Small slope failures occur in the slopes behind Building 46, at site of Building 77, and reactivation of old slide uphill and east of Building 17
1962	Hydraugers installed to stabilize cut slope at northeast corner of Building 77 site
1963	Additional hydraugers installed behind slope north of Building 77 to stabilize old slide area
1963	Centennial Drive constructed
1967 - 1969	Slope instability continues at cut and fill behind Building 77, slope repairs and installation of hydraugers
1967	Slide on natural slope between Building 76 and 79
1969	Wet winter, much larger and more damaging slides occur including major failure of slope between LBL Corporation Yard and Centennial Drive which is repaired with buttress fill and subdrainage
1968-69	Serious slide occurs at the Centennial Drive overpass eastern abutment, road partially closed, hydraugers installed
1970	Slide occurred adjacent to Building 71 southeast parking lot, hydraugers installed
* 1973	Building 46 bisected by a very large slide, major repairs required including dewatering; slide continues to move in wet seasons
1975	Slide at compacted fill south of Building 77
1978	Slide at compacted fill south of Building 72
1975	Major hill area dewatering program undertaken, Shively Well No. 1 drilled (still continuously pumped)
1978	Centennial Drive overpass deforms further, steel bracing added
1979	Large scale dewatering of the hill attempted, second well drilled, two long nearly horizontal hydrauger drains installed into hill from Poultry Husbandry site
1980's	Numerous small slumps and mudflows occurred throughout hill area
1982	Earth movement at Centennial Drive overpass causes road closure, temporary repairs
1983	More movement at Centennial Drive overpass, road closed, major buttress fill repair required
1984	Centennial Drive reopened

Source: Complied from information contained in the Hill Area Dewatering and Stabilization Studies (Converse Consultants, 1984).

In addition to the information above, by 1987 LBNL had mapped some 30 landslides within the lab's Strawberry and Blackberry Canyons, and by 2008 the number of slides was up to 40, including LBNL's East Canyon landslide area.

Regarding Building 46 slide (see above), notes from a site visit by Robert Dunn and Professor Richard Goodman (October 18, 1976) state: Building 46 was "first founded on what was thought to be solid basalt-actually was LARGE BLOCKS." See also attached figure of the collapsed caldera (after Garniss Curtis, Professor Emeritus) at LBNL.

CMTW-27 cont.

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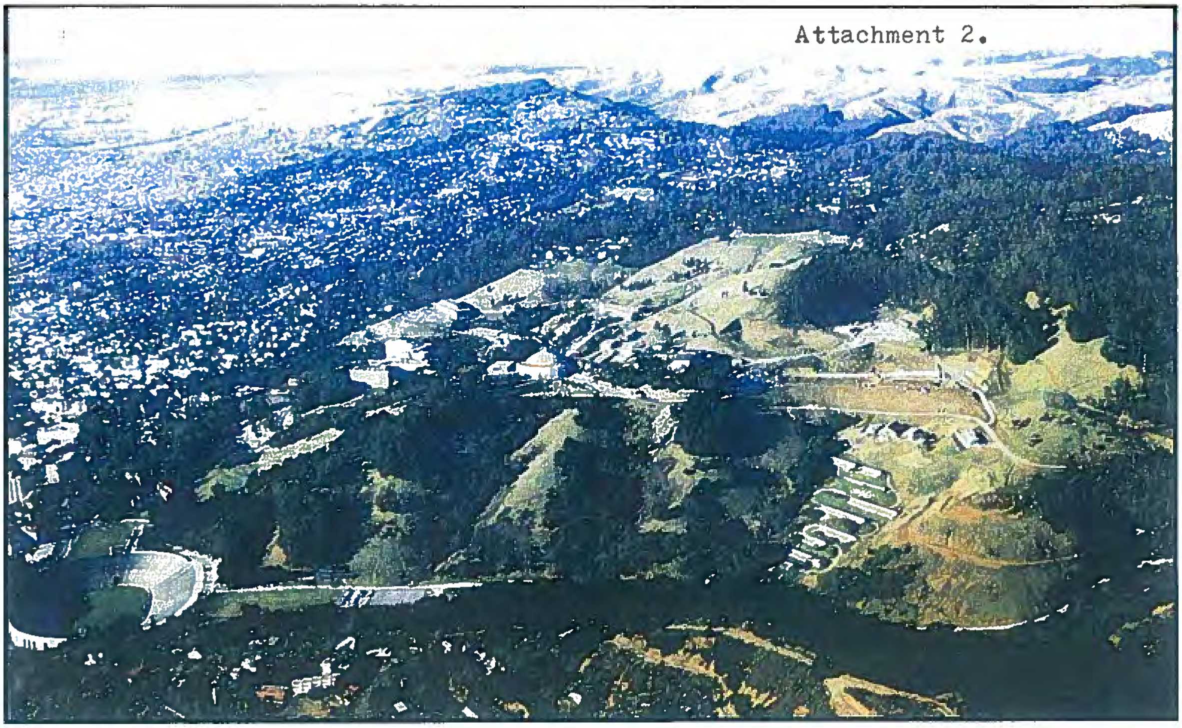
Attachment 2.



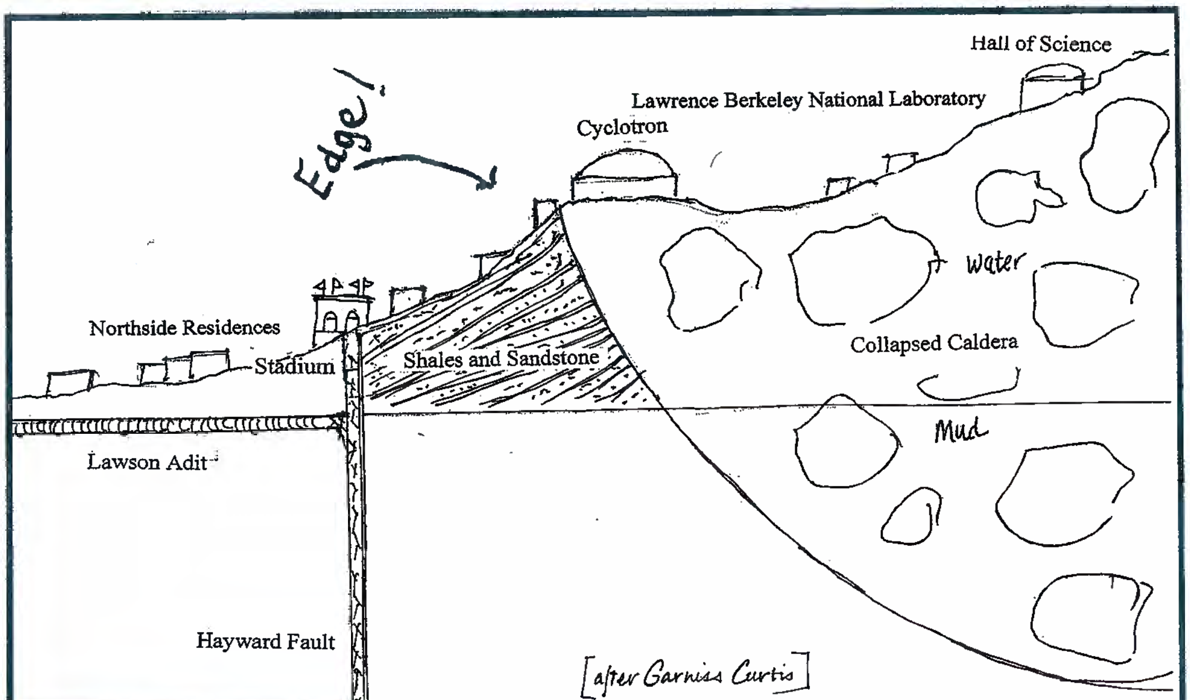


Figure above shows an unknown mixture of mud, perched water and boulders, for which LBNL has yet to do a comprehensive hydrogeological study of its composition. Also missing is the mapping of LBNL's hydrostratigraphic units (HSUs), which would show the hydraulic connection between various permeable layers of the HSUs sedimentary sequences. 6/11

CMTW-27 cont.

Lawrence Berkeley National Laboratory

June 29, 2010

NOTICE OF ERRATA
FINAL ENVIRONMENTAL IMPACT REPORT

Project Title: Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project, SCH# 2008122030

Lead Agency: University of California

Location: Lawrence Berkeley National Laboratory
One Cyclotron Road, Berkeley, California 94720

County: Alameda County

Contact Person: Jeff Philliber, Environmental Planner
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 76-234A
Berkeley, CA 94720

Final Environmental Impact Report:
The above-referenced Final Environmental Report (EIR) has been submitted to The UC Regents for review and consideration, and it has also been made available on June 23, 2010 for viewing by the public. The Final EIR will be considered for certification by the UC Regents at the July 13-15 UC Regents' meeting to be held at UC San Francisco Mission Bay. Over 400 Notices of Availability of the Final EIR have been sent out to agencies and the public, along with paper copies and CDs to those who commented on the Draft EIR or who otherwise requested them. A copy of the Final EIR is available for viewing in the Berkeley Public Library at 2090 Kittredge Street, Berkeley, California. The Final EIR is also available on the following website: http://www.lbl.gov/Community/SeismicPhase2B/index.html.

CMTW-27 cont.

Errata:
Two figures referenced as being in the Final EIR inadvertently were not included in the initial production of that document. They are included in this errata notice, which is hereby incorporated into the Final EIR. The two figures are referenced in that document as follows:

> **Final EIR page 5-227, paragraph 1:** "Figure 1 shows the most recent and comprehensive bedrock geology map of the entire LBNL main hill site, which was prepared by Parsons Engineering Science, Inc. (PES) and the UC LBNL."
>
> **Final EIR page 5-227, paragraph 2:** "Figure 2 shows a geologic section through the LBNL main hill site from PES and UC LBNL (2000), again based on data from many years of borings, outcrops, road cuts and construction excavations."

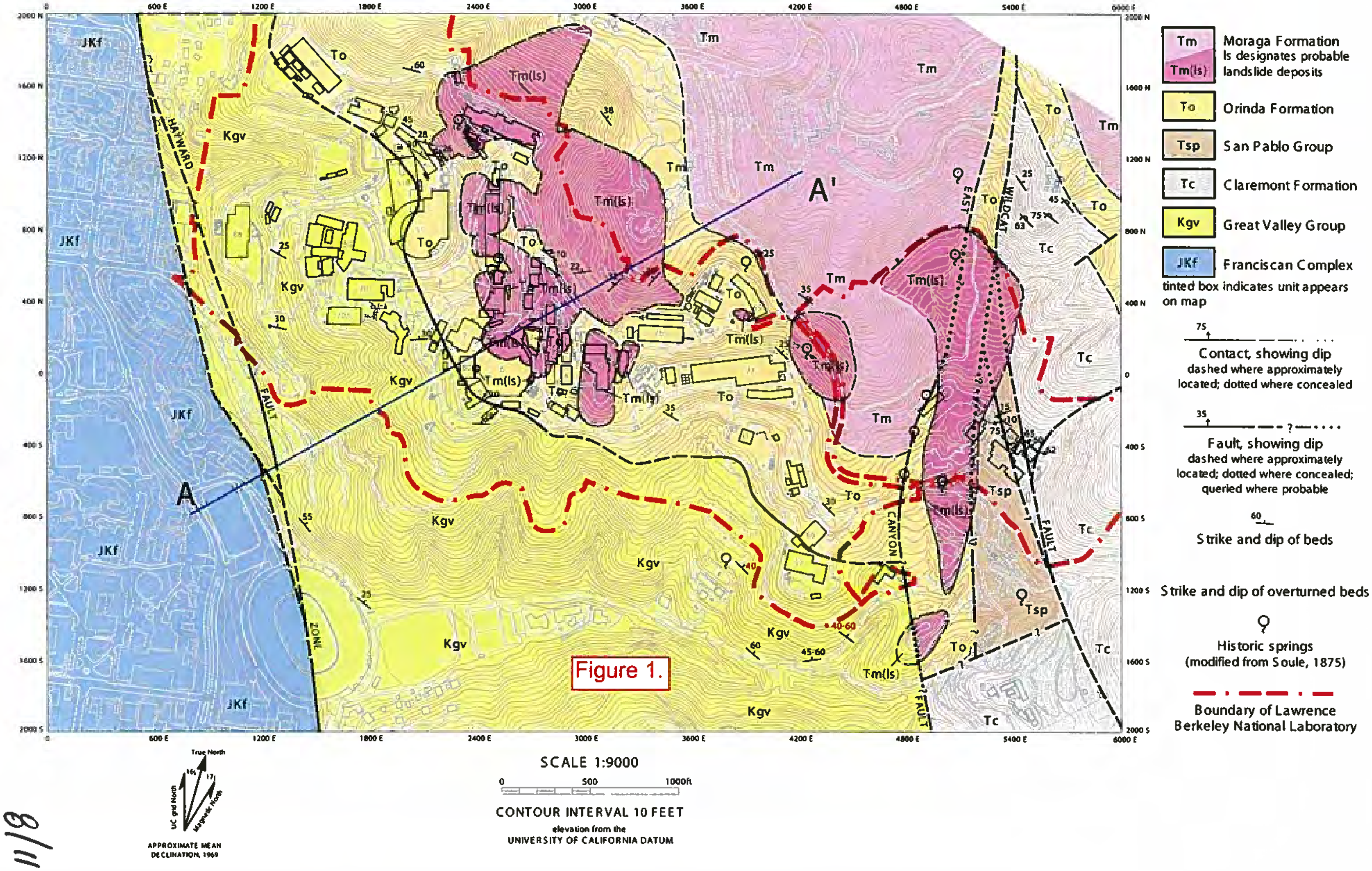
Both Figure 1 and Figure 2 are attached and included in this errata notice.

If you have any question, please contact Jeff Philliber at the above address or via email at planning@lbl.gov.

Signature_______________ Date: 6-29-10
Jeff Philliber, Environmental Planner
Lawrence Berkeley National Laboratory

cc: LBNL CEQA Agency and selected Public Mailing List

ATTACHMENT 3A



8/11

Figure 1. Bedrock geologic map of LBNL. (modified from Figure 4.2-1 of PES and LBNL 2000)

CMTW-27 cont.

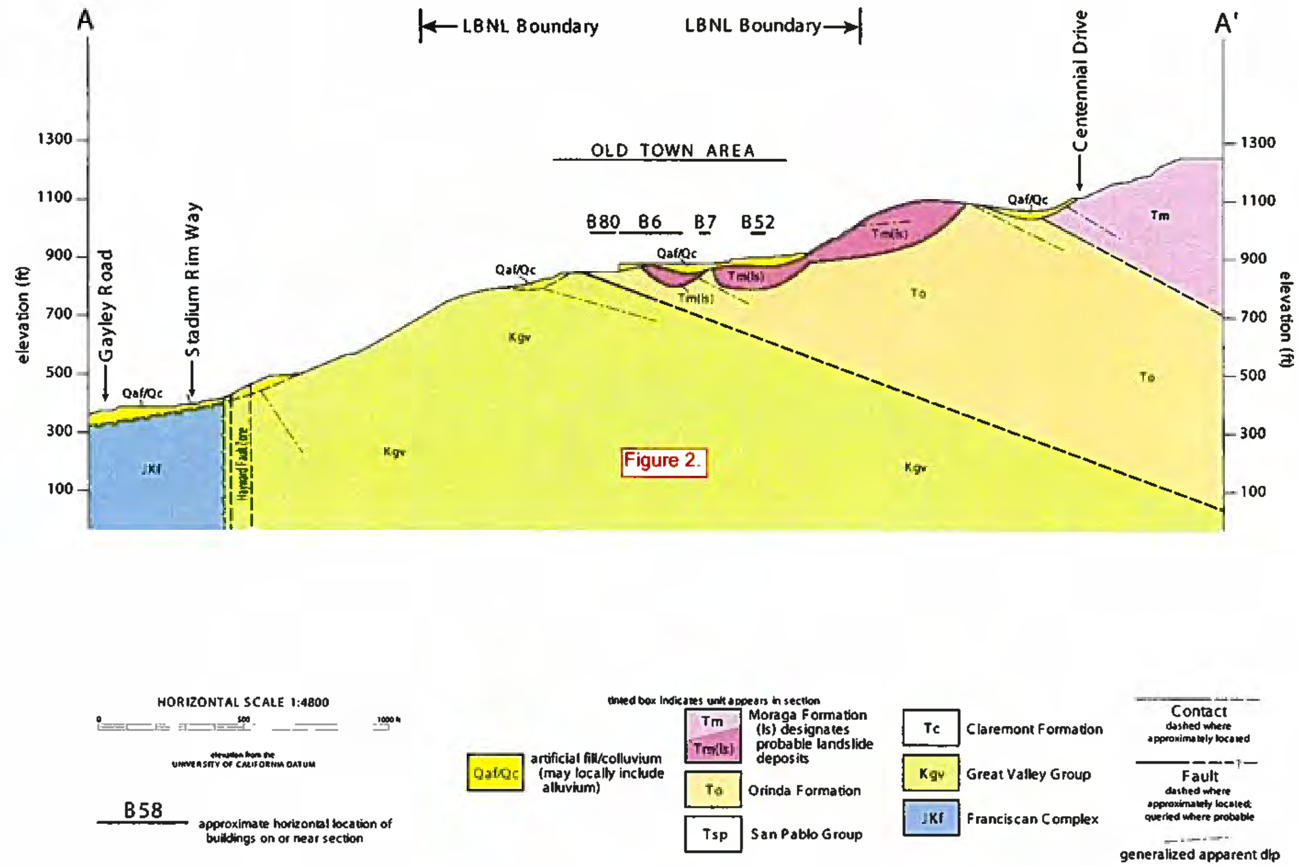


Figure 2. Cross section A-A' (location shown on Figure 1). Near dip section through the Tertiary strata. Depth to the base of the lowest volcanic mass relative to the top of the Orinda Formation shown. (Figuire 4.2-3 of PES and LBNL 2000.)

ATTACHMENT 3B

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CMTW-27 cont.

Lawrence Fremont National Laboratory

A New National Center with Consortium Partners for Green Clean Technologies/Research/Development/Manufacturing.

Five million square feet of laboratory/office/research and manufacturing space **already built and immediately available** at the NUMMI Fremont site, previously occupied by a joint venture between General Motors and Toyota, which ended on April 1, 2010.

The site is in the **geographic center of the Bay Area**, served by an excellent transportation infrastructure, a trained workforce and research and development communities nearby as well as supportive elected officials!

The new **Lawrence Fremont National Laboratory (LFNL)** will be just
35 miles from Berkeley (UC/LBNL)
30 miles from Oakland (22 miles from the Oakland International Airport)
41 miles from San Francisco/UCSF (32 miles from SFO)
18 miles from Livermore (LLNL/SANDIA),
12 miles from Hayward (Cal State EB)
16 miles from San Jose (Airport) and Silicon Valley
18 miles to Menlo Park/Palo Alto/Stanford/SLAC

The LFNL, future anchor/center and hub of the Green Corridor going north, south, east and west, is centrally located to all of the East Bay, South Bay, Peninsula and San Francisco!

This is the **Opportunity of the Century for the Department of Energy**, Lawrence Laboratories, UC and the Consortium of Private Industries they are now or will be partnering with in the future; British Petroleum (BP), Energy Biosciences Institute (EBI), Joint BioEnergy Institute (JBEI/Jay Keasling), Amyris Biotechnologies, Nanosys Inc., Quantum Dot Corporation/Invitrogen, Solexant Inc. (Last 3 associated with Paul Alivisatos), etc.

It is specifically an Opportunity of a Lifetime for the Lawrence Berkeley National Laboratory, to offload facilities from the unstable Strawberry Creek watershed site, with its unconsolidated soils, water and mud of a collapsed caldera, riddled with landslides and earthquake faults, stifled by logistical, environmental, geotechnical constraints and legal challenges, currently crippling LBNL and its future.

CMTW-27 cont.

NO SAFE DOSE OF IONIZING RADIATION

June 2005 finding of the
National Academy of Sciences Panel: BEIR VII,
Committee on Biological Effects of Ionizing Radiation

San Francisco Chronicle

THURSDAY, JUNE 30, 2005 · 415-777-1111 · 46 CENTS

Even lower radiation poses risk, panel says

No exposure level found below which dosage is harmless

By H. Josef Hebert
ASSOCIATED PRESS

WASHINGTON — The preponderance of scientific evidence shows that even very low doses of radiation pose a risk of cancer or other health problems and there is no threshold below which exposure can be viewed as harmless, a panel of prominent scientists concluded Wednesday.

The finding by the National Academy of Sciences panel is viewed as critical because it addresses radiation amounts commonly used in medical treatment and is likely also to influence radiation levels the government will allow at abandoned nuclear sites.

The nuclear industry, as well as some independent scientists, have argued that there is a threshold of very low-level radiation at which exposure is not harmful, or possibly even beneficial. They said current risk modeling may exaggerate the health impact.

The panel, after five years of study, rejected that claim.

"The scientific research base shows that there is no threshold of exposure below which low levels of ionized radiation can be demonstrated to be harmless or beneficial," said Richard R. Monson, the panel chairman and a professor of epidemiology at Harvard's School of Public Health.

The committee gave support to the "linear, no threshold" model that is currently the generally acceptable approach to radiation risk assessment. This approach assumes that the health risks from radiation exposure decline as the dose levels decline, but that each unit of radiation — no matter how small — still is assumed to cause cancer.

"It is unlikely that there is a threshold below which cancers are not induced," said the report, although it added that at low doses "the number of radiation-induced cancers will be small." And it said cancers from such low-dose exposures may take many years to develop.

The panel, formally known as the Committee on Biological Effects of Ionizing Radiation, or BEIR, generally supported previous cancer risk estimates — the last one by an earlier BEIR group in 1990.

Contrary to assertions that risks from exposure to low-level radiation may have been overstated, the panel said "the availability of new and more extensive data have strengthened confidence in these (earlier) estimates."

The committee examined doses of radiation of up to 100 millisievert, a measurement of radiation energy deposited in a living tissue. A single chest X-ray accounts for 0.1 millisievert, average background radiation 3 millisievert a year and a whole body CT scan delivers 10 millisievert.

The committee estimated that 1 out of 100 people would probably develop solid cancer or leukemia from an exposure of 100 millisievert of radiation over a lifetime with half of those cases being fatal.

The report noted that exposure from a whole body CT scan is much higher than the usual X-ray, and it raised concerns about the frequency in which such medical diagnostics should be used.

11/11

CMTW-27 cont.

Committee to Minimize Toxic Waste

March 14, 2010

Jeff Philliber, UC-LBNL Environmental Planner
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 76-234A
Berkeley, California 94720

Subject: Comments on the Draft Environmental Impact Report (DEIR) for Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project at the Lawrence Berkeley National Laboratory (LBNL)

Dear Mr. Philliber,

The above referenced Project consists of the demolition of Buildings 25, 25B and 55, six modular trailers associated with Building 71, the construction of an approximately 43,000 gross square foot General Purpose Laboratory (GPL), and the seismic strengthening of the Building 85 complex – LBNL's Hazardous Waste Handling, Treatment and Storage Facility, all located in the Strawberry Creek Watershed's Strawberry and Blackberry Canyons.

CMTW-27 cont.

Our comments are provided in two (2) parts. Since all the project components (areas associated with B85 complex, B25 and B71) are located site- wide at LBNL, in areas of great concern to the community, i.e. on top of earthquake faults, active landslides, radioactive and chemical contamination plumes (both soil and groundwater), creeks and networks of creeks etc., Part 1 of our comment letter is titled: **Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California,** and cover our concerns in the following areas evaluated in the DEIR: Biological Resources, Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Transportation and Traffic, Utilities and Service Systems – and we ask that you respond to our concerns in a comprehensive and serious manner.

Part 2 of our comment letter on DEIR consists of all the comments we provided on the Notice of Preparation (NOP) of the above referenced document, as these comments and concerns were largely ignored in the preparation of DEIR .The only changes that occurred between the NOP and the NOA (Notice of Availability) of the DEIR related to the demolition of several buildings and structures in the Old Town area, i.e. Buildings 4, 5, 14, 16, and 17, possibly some of the most contaminated buildings at LBNL, and Building 74F in the East Canyon, which were all removed from the EIR process, escaped all public and agency comment as they were secretly included into the Old Town

Demolition project, for which a Categorical Exclusion under NEPA was filed in December 2009, without any notice to the public. Please, explain why? We also ask that a full blown EIS under NEPA be prepared for the Old Town Demolition project.

Every single structure evaluated in the DEIR is located in a landslide area, as officially defined by the State of California, as being in an Earthquake Induced Landslide Hazard Zone, i.e. landslides will be mobilized in the event of a major earthquake – expected to happen any day now on the active Hayward Fault! (See attachment 1). Furthermore all the components of this Project are located in areas of LBNL where legacy chemical and radioactive contamination is present in the soil and groundwater, due to operations during the last 70 years, which the DEIR failed to describe in the kind of detail that the site and its history warrants! The DEIR is deficient, inadequate, misleading and in sections erroneous. For instance a claim is made that the new proposed location of the GPL is not located in Strawberry Canyon, when indeed Figure 4.8-1 of the DEIR shows the Strawberry Creek Watershed divisions into Blackberry Canyon and Strawberry Canyon, indicating clearly that the entire Building 25 site, the proposed location of the GPL, is in Strawberry Canyon, in the middle of the Building 25 slide and Building 25A Lobe of the Old Town Groundwater Solvent (VOC) Plume! (See attachment 2, A and B)

In conclusion, LBNL, UC and the Department of Energy (DOE) continue to willfully ignore and exclude the most significant, fundamental facts related to the Lab site, i.e. the unconsolidated nature of the volcanic rocks, mud and water that fill an old crater, a collapsed caldera, on which LBNL facilities were built starting in 1940! What is the use of drilling 35-50 foot deep holes for piers into this unconsolidated mélange of volcanic fragmental debris, without ever reaching bedrock, to attempt to tieback the Lab's Hazardous and Radioactive Waste Treatment and Storage Facility (B85 complex), further wasting taxpayer funds! The landslide on which the Hazardous Waste Handling Facility (HWHF) was built is over 2200 feet (7+ football fields) long, between the East Canyon Fault (with its numerous springs already identified by UC in 1875) and the Wildcat Fault.(See attachment 3, A and B).

CMTW-27 cont.

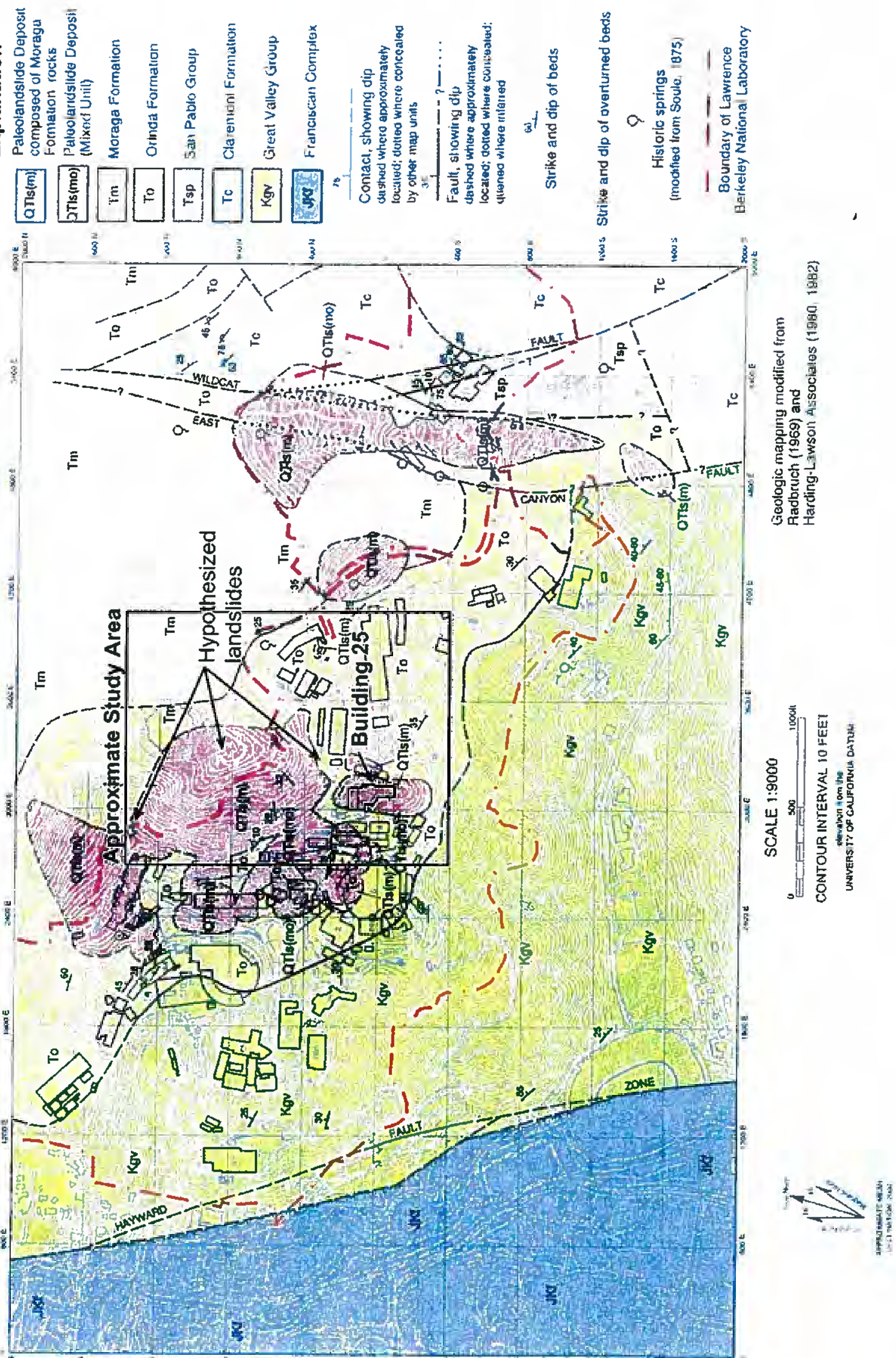
The same danger is present at the B71 and B25 sites, as both are on top of active landslides (See attachment 1). We therefore ask that LBNL/DOE/UC immediately issue a site-wide **MORATORIUM** to any new construction and immediately assemble an international, world-class, independent group of geotechnical experts to perform all-encompassing, site-wide geological investigations and excavations regarding faulting, geology and landslides in the Strawberry and Blackberry Canyons, and that these experts be paid by some of the $ 264 million of ARRA (American Recovery and Reinvestment Act) funds, already received by LBNL! (See attachment 4, A and B)

We also ask that at the same time, during the moratorium, a comprehensive Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) be prepared for this Project!

ATTACHMENT 1.

Fugro WLA
Project No. 2072.001 LBNL Building 25

FUGRO



LBNL GEOLOGIC MAP FROM THE RFI (PARSONS, 2000) REPORT

CMTW-27 cont.

FIGURE 3

Graphics, Active Projects, 2072.001, Modified 08.31.09

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ATTACHMENT 1A

JANUARY 28-FEBRUARY 3, 2010

THE BERKELEY DAILY PLANET

Volume 11, Issue 43 DAILY ONLINE, WEEKLY IN PRINT $2 Donation Requested

The Volcano Beneath

By GEORGIA WRIGHT

Most people do not know that the Lawrence Berkeley National Laboratory is almost entirely sited on a caldeara, a collapsed volcano. Below this caldera there is the Hayward Fault, which cuts through Memorial Stadium and across the bottom of the hills. The Hayward Fault is due for a magnitude 6.5 to 7.0 earthquake anytime within the next 30 years. Still, LBNL plans to build up to a million square feet of research facilities on its steep and unstable hills above the city and UC campus.

The Save Strawberry Canyon organization has successfully challenged the lab's building plans in court on both the state and federal level, but remains concerned that three new construction projects are now planned for the Blackberry Canyon area, within the caldera, including the BELLA laser accelerator. In addition, the controversial Computational Research and Theory facility (CRT) is planned to be built below the edge of the caldera, marked by the Cyclotron.

A new YouTube video explains the caldera phenomena. It makes a strong case for preventing any new construction on the LBNL sites within both the Blackberry and Strawberry canyons. Such buildings would be unstable and could further endanger the lives and structures below them.

Years ago, Professor Emeritus of Geology Garniss Curtis and civil engineer Ben Lennert did field testing throughout the East Bay. They located the perimeter of the old volcano, whose constituent rocks, mud, and water press downhill on the strata of sandstone and shale that have been pushed up to a 30-degree angle by the Hayward Fault, moving up one centimeter a year. The plates along the Hayward Fault have moved north on the east and south on the west at the same rate. The stadium, constructed in 1923, is evidence of

Continued on Page Twenty-Six

PARTISAN POSITION

The Volcano Beneath

Continued from Page One

this offset, the crack on the south only partially disguised today by a huge image of a football player, but visible above it. The whole length of the stadium sits astride the fault.

When the predicted earthquake occurs, buildings and hills will most certainly slide, and the material squeezed up by the plates will cause even more damage. Researchers have said that Indian Rock and Founders' Rock were thrown up in a past event. Professor Curtis and Dr. Ignacio Chapela, associate professor of environmental science, explain in the video that the university's building plans, both at LBNL and at the stadium, create an unnecessary risk for the campus and the citizens of Berkeley.

For LBNL there are viable alternative sites. The university does own 50 acres of underutilized space at the Richmond Field Station with beautiful bay views, only 10 minutes farther from campus than the hill site.

(It is ironic that the university recently engineered a state bill, with the help of the city of Berkeley, to exempt the stadium from the Alquist-Priolo Earthquake Safety Zoning Act.)

The regents are in charge of lives as well as buildings and research. The video, entitled *The Fault, Quakes, Slides, and the Lawrence Berkeley Lab*, contributes new information that should give everyone as well as the regents serious pause.

The YouTube video featuring Professors Curtis and Chapela can be found at www.youtube.com/watch?v=8FOmck-AHpes. More information is on the Save Strawberry Canyon website, www.savestrawberrycanyon.org.

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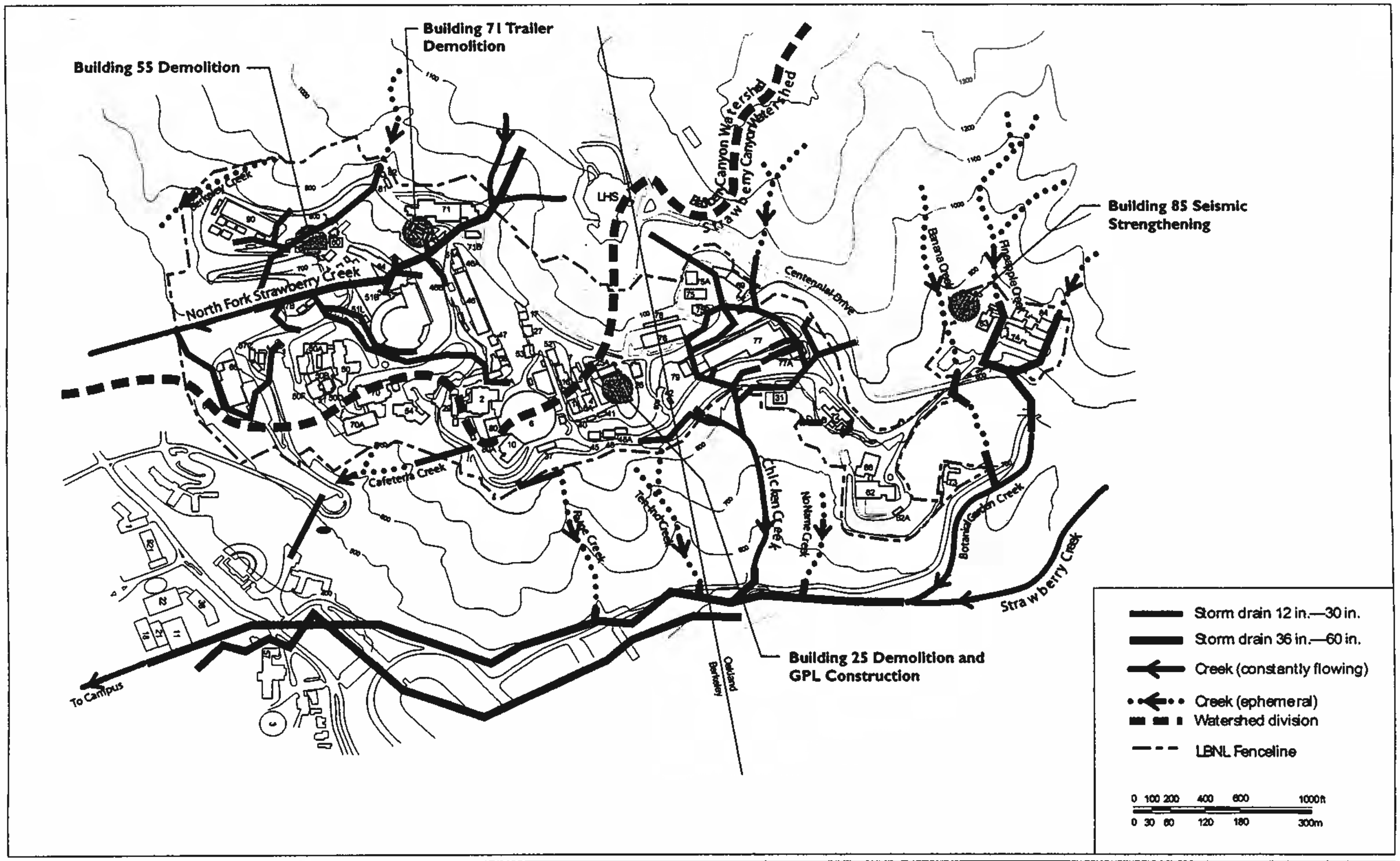
CMTW-27 cont.

ATTACHMENT 2A



Source: LBNL Environment, Health, and safety Division, 2009, Stormwater Pollution Prevention Plan, June, Page 2-5.

FIGURE 4.8-1

STORM WATER POLLUTION PREVENTION PLAN

5/83

CMTW-27 cont.

ATTACHMENT 2B

§5.6 E. Stormwater

Berkeley Lab lies within the Strawberry Creek watershed, which covers an area of about 354 hectares (874 acres). There are two main creeks in the watershed, Strawberry Creek and the North Fork of Strawberry Creek, plus several small tributaries that generally do not flow all year long. This watershed includes other University of California property, public streets in both Oakland and Berkeley, and private property. Near Berkeley Lab, the Strawberry Creek watershed is further subdivided into the Blackberry Canyon and Strawberry Canyon watersheds (see Figure 5-4).

Surface runoff from Berkeley Lab is substantial because of the site's hillside location, the amount of paved or covered surface, and the moderate annual rainfall. In the 1960s, Berkeley Lab began installation of its storm drain system, which is designed to handle runoff intensities expected in a 25-year maximum-intensity storm. All stormwater runoff from the site drains through this system to Strawberry Creek or its north fork, which join below the Laboratory on the UC Berkeley campus.

Under the State of California's NPDES program, Berkeley Lab must follow the General Permit for Stormwater Discharges Associated with Industrial Activities.[6] Permit

CMTW-27
cont.

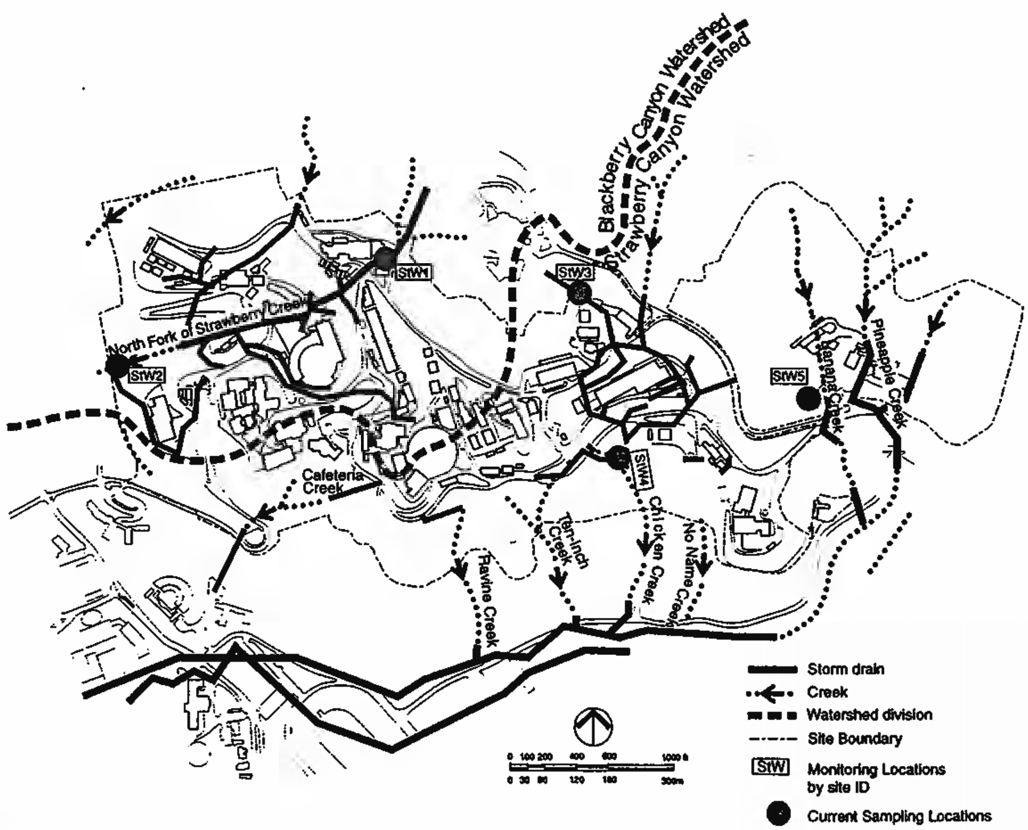
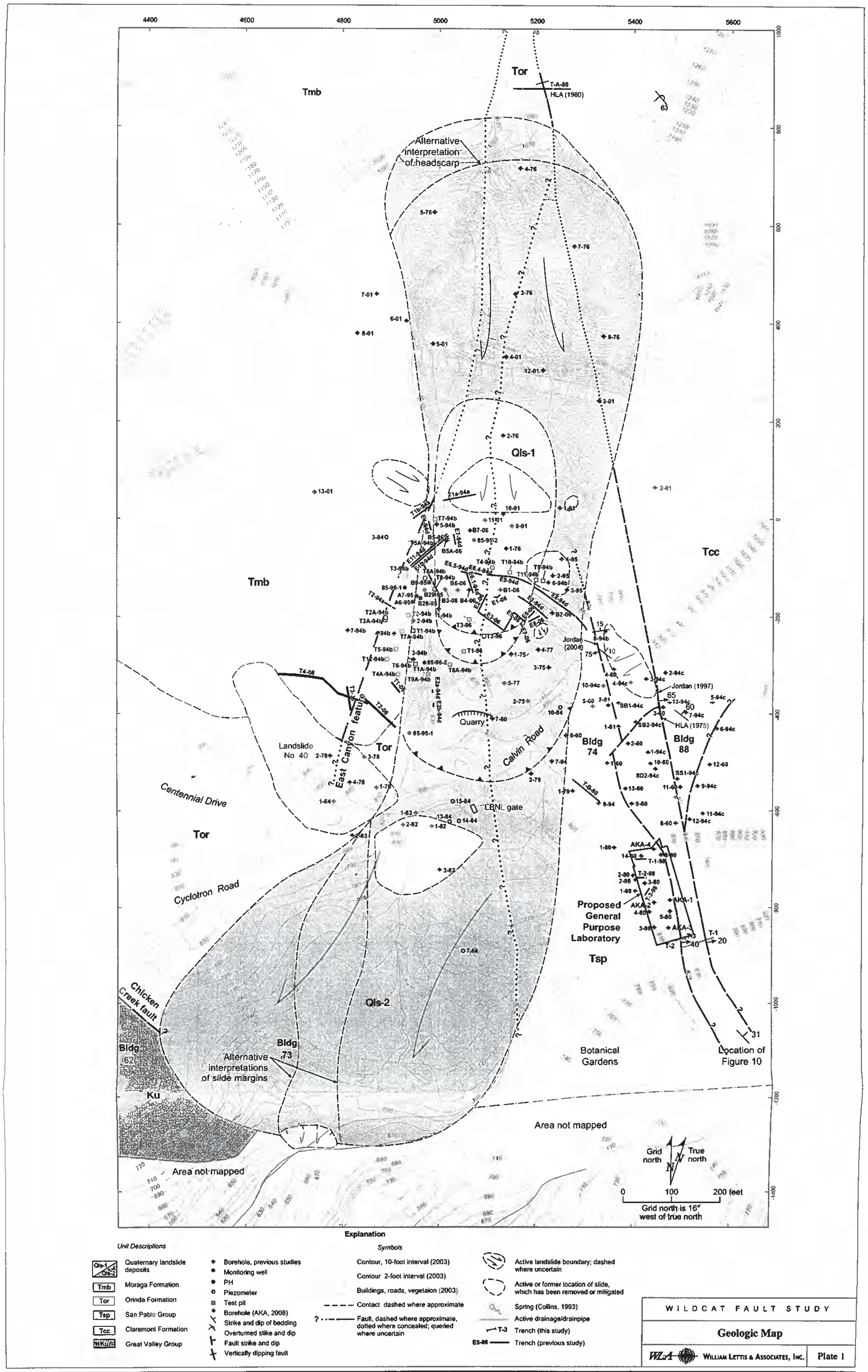


Figure 5-4 Stormwater Sampling Locations

6/83

CMTW-27 cont.



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ATTACHMENT 3A

FIGURE 4.5-2

GEOLOGIC MAP OF THE EAST CANYON AREA

Figure 5. Historical springs and water development are shown for Strawberry Canyon Watershed as mapped by Soulé (1875). Springs d, f, g and h, which are highlighted in yellow, plot very closely to the trace of the ECF according to Borg (1991).

Attachment 3B

8/83

CMTW-27
cont.

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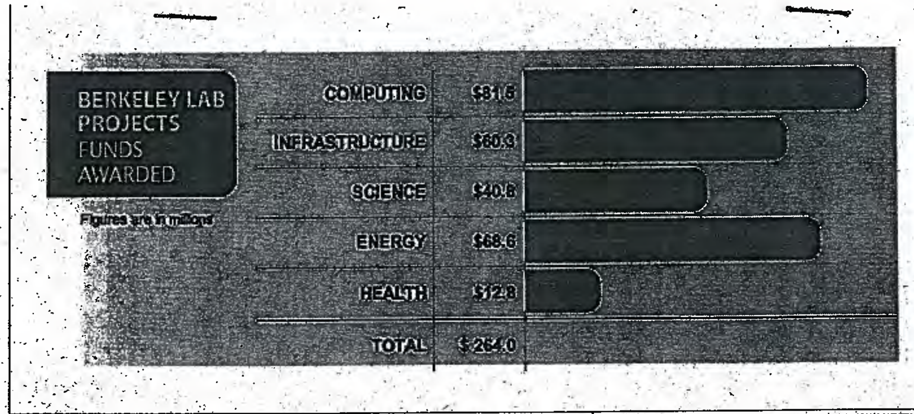
THE DAILY CALIFORNIAN
Berkeley, California Tuesday, February 2, 2010 www.dailycal.org

ATTACHMENT 4A



LAWRENCE BERKELEY NATIONAL LABORATORY/COURTESY

Berkeley Lab Reaps Benefits of Stimulus

by Cristian Macavei
Contributing Writer

While double-digit unemployment continues to plague many areas of the country, federal stimulus grants are funding research at Lawrence Berkeley National Laboratory that may lead to long-term economic growth.

ONLINE PODCAST Cristian Macavei talks about the stimulus grants to Berkeley lab.

About $264 million has been allocated to the lab since March 2009 through the American Recovery and Reinvestment Act for research in computing, energy, health and other sciences.

"Last year, we made the largest investment in basic research funding in history, an investment that could lead to the world's cheapest solar cells or treatment that kills cancer cells but leaves healthy ones untouched," said President Obama in his State of the Union address last week.

The lab is pursuing a variety of projects in areas such as energy, biofuels and computing that will provide scientific benefits in the future, according to Julie Chao, a lab spokesperson.

"The $11.3 million for the Advanced Light Source, one of the world's brightest sources of ultraviolet and soft X-ray beams, alone will facilitate scientific discoveries in everything from disease research to alternative fuels," she said in an e-mail.

Another stimulus grant, a $12.8 million grant from the National Institutes of Health, will help fund research into radioactive decontamination, cancer and other health conditions, according to a lab statement.

The institutes awarded $4.2 million of the grant to the lab's two-year radioactive decontamination project. The funding will allow researchers to further develop two molecules that may better treat nuclear contamination.

About $81.5 million for computing research and development and $60.3 million for infrastructure spending has been awarded to the lab since March 2009, according to a lab statement.

Chao said in an e-mail that the first portion of the stimulus money was allocated to the lab for infrastructure projects, while additional funding for science and research came in later months. Many projects are still under development.

"Many of them are still hiring, purchasing equipment, setting up experiments and so forth," she said. "A good number of these are multi-year projects."

At least 192 jobs have been created or retained as of Dec. 31, 2009 due to the influx of stimulus funding, according to Chao.

"All kinds of jobs have been created and retained thanks to the Recovery Act funding, from construction workers and electricians to research assistants, project managers, engineers and, of course, scientists," she said in the e-mail. "Plus, through the procurement of goods and services, many jobs have been created or retained at vendors and subcontractors, both locally and nationally."

The lab itself has seen its budget—most of which comes from the U.S. Department of Energy—increase by about $58 million since the 2008 fiscal year to about $648 million in the 2009 fiscal year, according to a November 2009 lab statement. $11 million of the increase came from stimulus funding.

The lab's budget is estimated at $774 million for the 2010 fiscal year, with about $122 million from stimulus funding, according to the statement.

Chao said federal agencies are allocated

>> STIMULUS: PAGE 2

STIMULUS: Research Spending May Boost Economy

FROM FRONT

money by Congress, which they then route for specific use to laboratories such as Berkeley lab.

Mike Janes, a spokesperson for New Mexico-based Sandia National Laboratory, said in an e-mail that the Sandia lab has received $45.3 million of stimulus funding from the act as of Jan. 22 this year. $21.9 million has been assigned for capital funding and $23.4 million has been assigned for operating funding.

Sandia is using the stimulus funds to develop low-carbon energy solutions and to address key energy security challenges, such as reducing U.S. oil dependence, Janes said.

John Ellwood, a UC Berkeley professor in the Goldman School of Public Policy, said it is important to consider which funding would most effectively stimulate the economy.

"The interesting thing is we are awash in research money while we are starved at the state," he said.

Stimulus funding for research would not necessarily temper stubborn unemployment rates, Ellwood said.

"Someone could argue that the cost per job created will be very high with stuff at the labs because you'll have to buy lots of expensive equipment and lots of expensive labor," he said.

But stimulus spending for research will allow the American economy to grow in the long run, he said. Additionally, the funding will provide needed resources for university-related projects.

"As a resident of California and as a faculty member of Berkeley, this stuff is great," Ellwood said. "The money is coming from all American taxpayers, and it's going to California and to the University of California, which we in a narrow selfish world love."

Cristian Macavei covers research and ideas. Contact him at cmacavei@dailycal.org.

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CMTW-27 cont.

ATTACHMENT 4B

THE DAILY CALIFORNIAN

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Berkeley, California | Monday, March 30, 2009 | www.dailycal.org

RESEARCH & IDEAS

Lawrence Berkeley Lab Gains Federal Funds

by **Christine Chen**
Contributing Writer

Lawrence Berkeley National Laboratory will receive $115 million as part of President Barack Obama's American Recovery and Reinvestment Act, as announced by Secretary of Energy and former director of the lab Steven Chu last week.

The funding comes from a portion of the $787 billion act Obama signed in February aimed to move research forward at major science institutions, while creating new jobs at the same time.

"Most of these projects (being funded by the act) have to do with infrastructure upgrades, and a number of those have been approved, but we have not received any of the money yet," said Jeff Miller, a spokesperson for the lab.

Among the projects that will be funded is the construction of a lab and office building for the Advanced Light Source synchrotron, a soft X-ray light source used by scientists to learn more about atomic structure.

About $14.3 million will go toward constructing a building next to the synchrotron as well as toward the ongoing project of demolishing the Bevatron, an older particle accelerator, to make room for new science buildings.

Another $1.5 million will go toward maintenance for the synchrotron, which is an open facility used by two thousand scientists and industries per year, said Roger Falcone, director of the synchrotron and a UC Berkeley professor of physics. The lab will need to hire about three dozen extra construction workers, he said.

"This will accelerate the completion of the project and fulfill the other half of the requirement of stimulus funding, which is to create jobs, so it provides additional work for the construction field," Falcone said. "It will accelerate the process, which will make the research happen sooner."

Another proposed project at the lab is the Berkeley Lab Laser Accelerator, which scientists anticipate will receive $19 million. The money could

>> LAB: PAGE 2

$115 Million

VICTORIA CHOW/STAFF

Money the lab will receive from the economic stimulus bill

Projects the money will fund include:

- Construction for the Advanced Light Source synchrotron
- Demolition of the Bevatron
- Completion of the Berkeley Lab Laser Accelerator

SOURCE/LAWRENCE BERKELEY NATIONAL LABORATORY

LAB: Funding May Help Create New Jobs

FROM FRONT

potentially fund 50 to 60 new employees to do technical work on the laser system.

Because the high-energy laser system produces a large electric field, it can be built at a smaller scale than normal-sized accelerators while producing the same amount of energy, said Wim Leemans, director of the project. He said while the project received high ratings among scientists, there wasn't enough funding available to build it until recently.

"We were afraid we would lose our leadership in this area, and now we're back in the position so we can maintain the lead," Leemans said. "They told us that we would have gotten money about two years from now, but they would have to spread the project out more years than we wanted. Now, with the (act), we can do it on a much faster timescale, so it allows us be competitive with the rest of the world."

10/83

CMTW-27 cont.

Since 1940, land use and planning at LBNL has been sporadic, haphazard, initially due to the secret nature of the Manhattan Project and later, during the cold war, the culture of secrecy continued under the Atomic Energy Commission and Department of Energy. If indeed UC considers this site to be a viable Hill Campus – now is the time to finally determine that fact, and if the unconsolidated soils of the collapsed caldera are deemed **unsuitable** for future development, it is critical that no more taxpayer funds be wasted into this landsliding, fault fractured sinkhole, but instead in the future of a new LBNL campus in Richmond or Oakland!

CMTW-27 cont.

Sincerely,

Pamela Sihvola
CMTW
P.O. Box 9646
Berkeley, CA 94709

PS. What is the total estimated cost of the Project?
Please list projected costs per each Project component.

How much of the Project is funded by LBNL's $ 264 million ARRA funds?
Please list ARRA funded portions, in dollar ($) amounts per each Project component.

CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRELATION TO FAULTS, LANDSLIDES, AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA

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for

Pamela Sihvola, Project Manager
Committee to Minimize Toxic Waste
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INTRODUCTION

The Lawrence Berkeley National Laboratory (LBNL), initially called the UC Radiation Laboratory, was originally located on the University of California Berkeley (UCB) central campus in Alameda County during 1932. By 1940, it was relocated to its present site in the steep hills of Strawberry Canyon east of the Hayward Fault and the central UCB campus (Figure 1). The first major facility, the 184-inch synchrocyclotron was built with funds from both private and university sources, and was used in the Manhattan Project in the development of the world's first nuclear bomb. Beginning in 1948 the U.S. Atomic Energy Commission and then its successor agency, the Department of Energy (DOE) funded the lab while it continued to expand its facilities in Strawberry Canyon.

CMTW-27 cont.

Numerous geotechnical investigations have been conducted during the past six decades as LBNL expanded while also experiencing problems with slope stability. The many geotechnical and environmental reports generated by LBNL, as well as research from local academic, state, and federal entities, indicate that minimal agreement has existed among scientists on the location of bedrock contacts or location and status of earthquake faults and landslides in the Canyon.

This is important because LBNL has been required to monitor radioactive accidents and chemical releases that have contaminated the groundwater and tributary streams of Strawberry Creek, which flow westward from the jurisdictional boundaries of Oakland to Berkeley and the UCB Campus. There has been concern by the public that mitigation to protect public health might be compromised by the lack of comprehensive (and agreed upon) information on the potential transport pathways of contaminants along bedrock contacts, faults, and landslides. Without such information, the array of sampling wells

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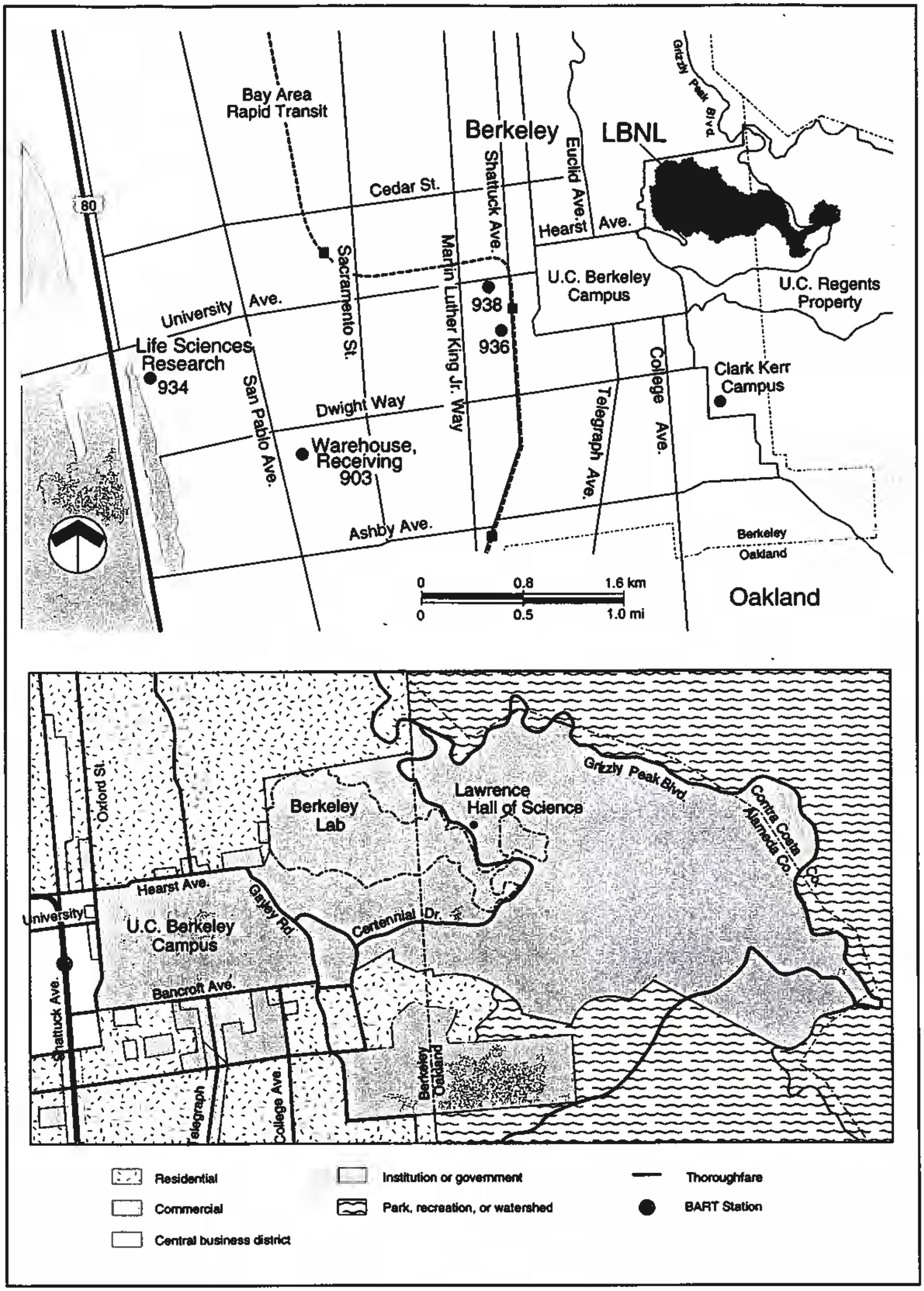

FIGURE 1. VICINITY AND ADJACENT LAND USE. Source: LBNL RCRA Facility Investigation Report, (also known as LBNL, 2000).

CMTW-27 cont.

designed to monitor contaminant migration have not been strategically placed to define the limits of contamination or potential plume migration. During 1991, the Department of Energy's (DOE) Tiger Team found 678 violations of DOE regulations that cover management practices at LBNL. A key finding was that air, soil, and water in Berkeley and Oakland are contaminated with tritium and other radioactive substances and toxic chemicals.

Our project and this report "Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California" was supported by a grant from the Citizens' Monitoring and Technical Assessment Fund (MTA Fund) to the Committee to Minimize Toxic Waste (CMTW). The report addresses the need to compile and develop publicly accessible maps of Strawberry Canyon, which show the geologic and geomorphic characteristics that might influence ground and surface water movement near known LBNL contaminant sites. The intent of this map compilation project is to show where there is or is not agreement among the various technical reports and scientific interpretations of Strawberry Canyon. This report can be found on the following web site: http://www.cmtwberkeley.org

OBJECTIVES

The specific objectives of the project were:

1) Help define or show where there is potential confusion or disagreement about the location of geological units and associated faults by showing interpretations by various science organizations.
2) Help define the historical channel and landslide network.
3) Locate verifiable bedrock outcrops as the basis for geologic interpretation;
4) Identify sites of slope instability, especially those associated with groundwater, and landslides;
5) Synthesize surface geotechnical information with contaminant plume information for the greater Strawberry Canyon area on a common base map.
6) Post results of technical report on CMTW's web site.

CMTW-27 cont.

This project provides necessary information to better evaluate the status of existing geological knowledge for Strawberry Canyon and the potential for contaminant migration pathways at existing plumes sites. By achieving a common base of understanding, a more effective monitoring and mitigation plan can be developed for the contamination sites. Benefits will also be provided for future geotechnical investigations during expansion of facilities at either LBNL or UCB. We have started by compiling available information on a series of overlays that show:

a) Current stream and storm drain network, and all sewer lines and hydraugers, delineation of the Lennert Aquifer;

b) Interpretation of historic drainage network and springs as indicated on the Map of Strawberry Valley and Vicinity Showing the Natural Sources of the Water Supply of the University of California, by Frank Soulé, Jr. 1875;
c) Geology;
d) Faults, seismicity, and Alquist Priolo Earthquake Fault Zone;
e) Landslides;
f) Areas of contamination evaluated in the Resource Conservation and Recovery Act (RCRA) process;
g) Additional toxic sites located outside the LBNL fence line, but on UC land, such as the old waste pit at the former Chicken Creek animal husbandry site as well as groves of trees and vegetation, south of the Lawrence Hall of Science, contaminated with tritium (radioactive hydrogen) in soil;
h) Topography with building sites, and roads.

REPORT ORGANIZATION

This report is specifically designed to demonstrate what is known about the key components of Strawberry Canyon that can influence surface and subsurface water transport, particularly near infrastructure and known contaminant plumes at LBNL. We have taken the key elements of surface drainage, geology, faults, and landslides and divided them into distinct subsections for this report.

We first provide a General Site Description and then provide information about the Contaminant Sites. This is followed by a brief discussion of Methods used in this report to produce original maps and compile existing information. Within the Results section, each subsection on Surface Drainage, Geology, Fault mapping, and Landslides provides background information and a few smaller scale maps showing recent interpretations. Larger maps are provided to show compilations of recent information. **CMTW-27 cont.**

These compilations are used to determine whether there is agreement by different researchers about the location of faults, bedrock contacts, or landslides. Each compilation map shows the contaminant plumes in the context of the different physical elements to determine if those elements could have potential influences on contaminant transport. The Plume Monitoring Sites are then shown to indicate the array and position of sampling and monitoring wells. This latter information is presented in much detail in several online documents produced by LBNL (2000, 2003, 2004 and 2007) that can be downloaded from their web site (www.lbl.gov/ehs/index2.shtml).

Within the Results subsection, a map on Zones of Concern is provided that indicates potential groundwater migration sites near each plume that might not be adequately sampled or understood given the present status of knowledge of factors that can influence groundwater transport. A map showing Future Development and Site Conditions and the compilation of potential factors that could influence plume migration is shown as the final map within the Results section. Conclusions and General Recommendations are provided at the end of the report.

GENERAL SITE DESCRIPTION

LBNL is located in a very seismically active area, next to the Hayward Fault on the steep west facing slopes of the Berkeley Hills within the 874-acre Strawberry Canyon. Figure 2 shows the location of the Alquist Priolo Earthquake Fault Zone and the footprint of buildings and roads in Strawberry Canyon. It also shows the location of several known contaminant plumes that are monitored by LBNL. The nature of these plumes is discussed further in the section on Contaminant Sites. The building sites and their associated numbers are shown in Figure 3a, while Figure 3b provides a legend to the building numbers.

Topographic relief in the canyon ranges from 400 feet to 1800 feet, whereas elevations within the LBNL boundary range from about 500 feet to 1000 feet. The Mediterranean climate of the Coast Ranges produces a mean annual rainfall of about 28 inches. Within the LBNL site, two major east-west trending creeks, Strawberry and North Fork of Strawberry, have perennial flow that drains respectively through Strawberry and Blackberry Canyons toward the City of Berkeley and the San Francisco Estuary.

CONTAMINANT SITES
Chemical and Hazardous Contamination

LBNL operations fall under a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Facility Permit. The Permit requires that LBNL investigate and address historic releases of hazardous waste and hazardous constituents within their property as part of the RCRA Corrective Action Program. LBNL's Environmental Restoration Program is responsible for carrying out these activities.

CMTW-27 cont.

Waste products at the LBNL have included solvents, gasoline, diesel fuel, waste oils, polychlorinated biphenyls (PCBs), Freon, metals, acids, etchants, and lead and chromate based paints. According to the LBNL RCRA Facility Investigation (RFI) Report (2000), the primary contaminants detected in soil and groundwater at LBNL have been volatile organic compounds (VOCs) including tetrachloroethene (also known as tetrachloroethylene or perchloroethene [PCE]), trichloroethene (also known as trichloroethylene [TCE]), carbon tetrachloride, 1,1-dichloroethene (1,1-DCE), cis-1, 2-dichloroethene (cis-1, 2-DCE), 1,1,1- trichloroethane (1,1,1-TCA), and 1,1-dichloroethane (1,1-DCA). Some of these are common solvents and degreasers that have been used at LBNL for equipment cleaning. Smaller concentrations of other VOCs (e.g., benzene, toluene, ethylbenzene, and xylenes [BTEX]; chloroform; and vinyl chloride) have also been detected.

The LBNL RFI (2000) reported that contamination of soil and groundwater by petroleum hydrocarbons was associated with former underground storage tank sites and that PCB contamination has been primarily associated with spilled transformer oils and waste oil tanks. Freon- 113, a coolant for experimental apparatus, has been detected in groundwater south of Building 71.

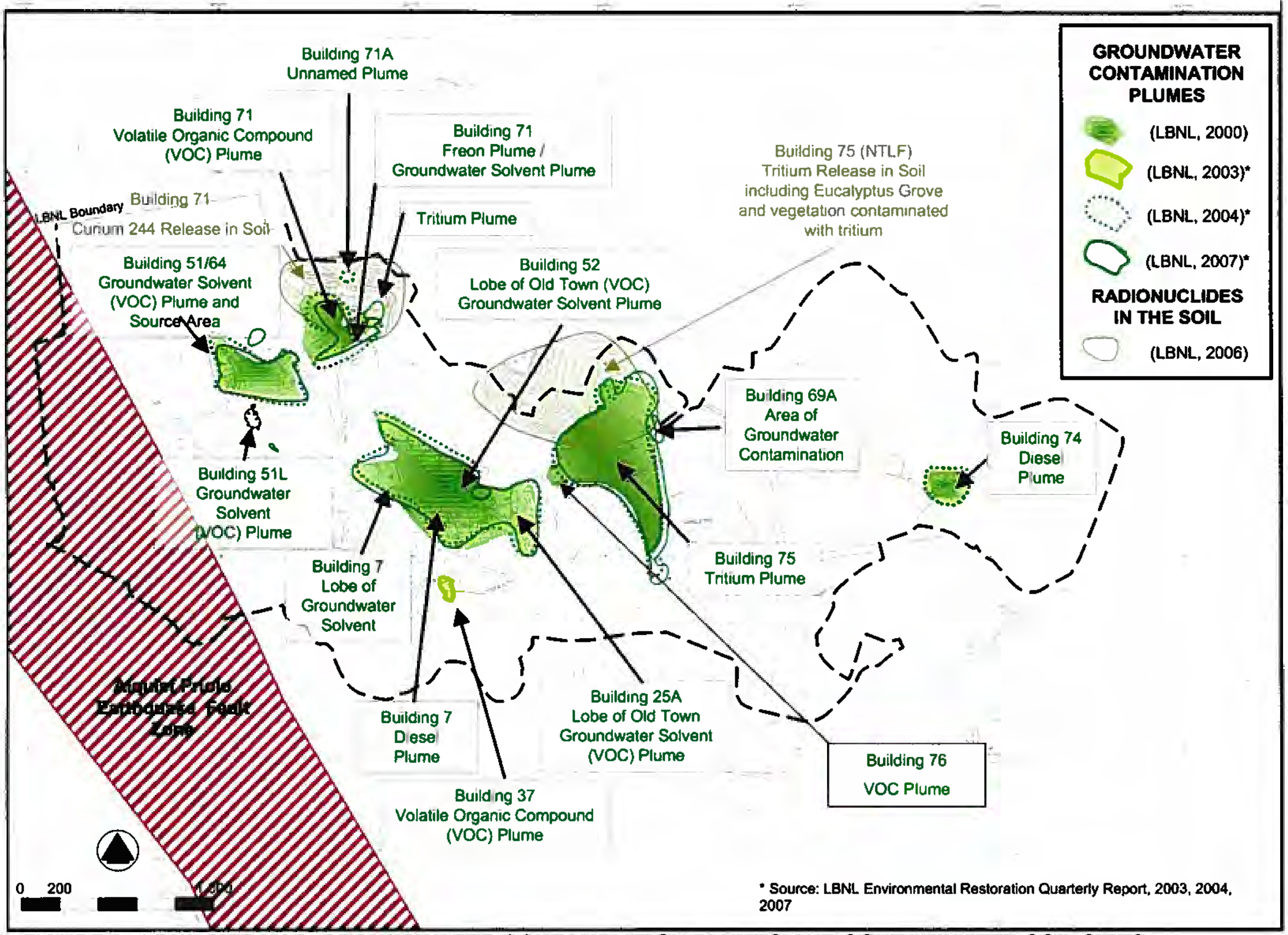

FIGURE 2. LBNL SITE MAP, GROUNDWATER CONTAMINATION PLUMES AND CONTAMINATED SOIL SITES.

CMTW-27 cont.

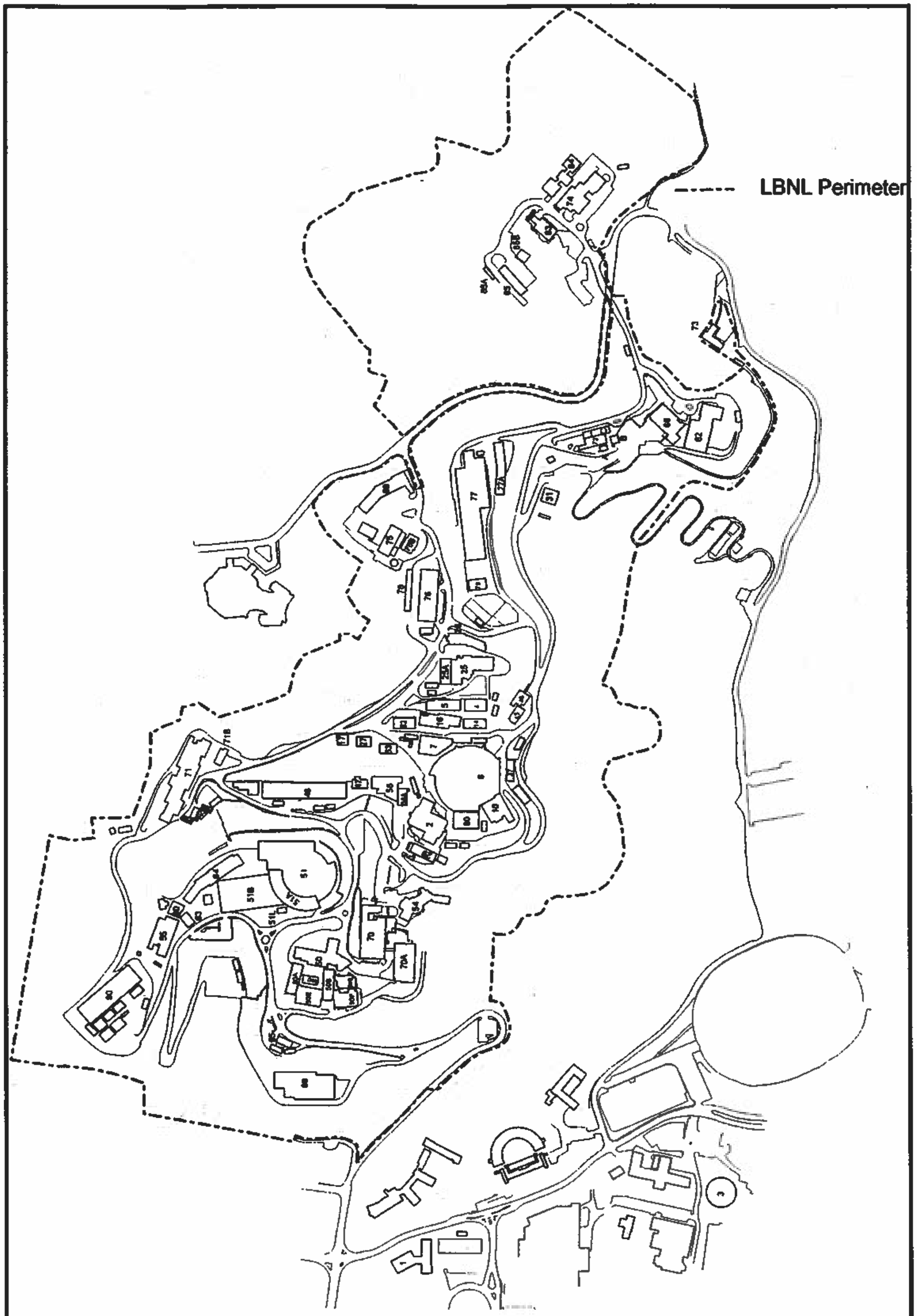

FIGURE 3a. BUILDINGS AT LBNL.
Source: LBNL RCRA Facility Investigation Report, (also known as LBNL. 2000).

CMTW-27 cont.

2	Advanced Materials Laboratory (AML)	55	Life Sciences
2a	Materials Storage	55A	Life Sciences
4	ALS Support Facility	55B	Emergency Generator
4A	Safety Equipment Storage	55C	Life Sciences
5	Accelerator and Fusion Research	56	Biomedical Isotope Facility
5A	Mechanical Storage	58	Heavy Ion Fusion
5B	Electrical Storage	58A	Accelerator Research & Development
6	Advanced Light Source (ALS)	58B	Lubricant and Solvent Storage
7	ALS Support Facility	60	High Bay Laboratory
7A	Radio Shop	61	Standby Propane Plant
7C	Office	62	Materials & Chemical Sciences
10	ALS Support Facility	62A	Environmental Energy Technologies, Materials Sciences
10A	Utility Storage	62B	Utility Storage
13A-C	Environmental Monitoring	63	Environmental Energy Technologies
13E,F	Sewer Monitoring Station	64	B-factory, Life Sciences
13G	Waste Monitoring Station	64B	Riggers
13H	Radiation Monitoring Station	65	Site Access Office
14	Earth Sciences Laboratory	66	Surface Science Catalysis Lab, Materials Sciences, Center for Advanced Materials
16	Accelerator and Fusion Research Laboratory	67B,C	Environmental Energy Technologies
17	EH&S	67D	Mobile Infiltration Test Unit
25	Engineering Shop	67E	Environmental Energy Technologies Field Lab
25A	Engineering Shop	68	Upper Pump House
25B	Waste Treatment Facility	69	Archives and Records, Shipping
26	Health Services, EH&S	70	Nuclear Science, Environmental Energy Technologies
27	ALS Support Facility	70A	Chemical Sciences, Earth Sciences, Engineering, Life Sciences, Nuclear Science
29	Engineering, Life Sciences	70B	Utility
29A,B	Engineering	70E	Storage
29C	Environmental Energy Technologies	70G	Liquid Nitrogen Storage
31	Chicken Creek Maintenance Bldg., Earth Sciences	71	Center for Beam Physics, Ion Beam Technology
31A	Earth Sciences	71A	Ion Beam Technology, Low Beta Lab
34	ALS Chiller Building	71B	Center for Beam Physics
36	Grizzly Substation	71C,D,F,H,J,P	B-factory
37	Utilities Service	71K	Accelerator and Fusion Research, B-factory, Chemical Sciences
40	Engineering Electronics Lab	72	National Center for Electron Microscopy (NCEM)
41	Engineering Communications Lab	72A	High Voltage Electron Microscope (HVEM)
42A	Emergency Generator House	72B	Atomic Resolution Microscope (ARM)
43	Compressor Bldg.	72C	ARM Support Laboratory
44	Indoor Air Pollution Studies	73	Atmospheric Aerosol Research
44B	Environmental Energy Technologies	74	Life Sciences Laboratory
45	Fire Apparatus	74C	Emergency Generator
46	Accelerator and Fusion Research, Engineering, Environmental Energy Technologies, Photography Services, Printing	75	Radioisotope Service & National Tritium Labeling Facility (NTLF)
46A	Engineering Div. Office	75A,B,C	Environment, Health & safety
46B	Engineering	76	Facilities Shops, Motor Pool/Garage
46C, D	Accelerator and Fusion research	77	Engineering Shops
47	Accelerator and Fusion research	77A	Ultra High Vacuum Assembly Facility (UHV)
48	Fire Station	77C	Welding Storage
50	Accelerator & Fusion Research, Physics, Library	77D	Drum Liquid Storage
50A	Director's Office, Nuclear Science, physics	77H	Auxiliary Plating
50B	Physics, Computing Sciences	77J-N	Chemical Storage
50C	Computing Sciences, NERSC	78	Craft Stores
50D	Center for Computational Sciences and Engineering	79	Metal Stores
50E	Computing Sciences, Offices	80	ALS Support Facility
50F	Computing Services	80A	ALS Support Facility
51	Technical and Electronics Information	81	Liquid Gas Storage
51A	Bevatron	82	Lower Pump House
51B	External Particle Beam (EPB) Hall	83	Life Sciences Laboratory
51F, G	Nuclear Science	84	Human Genome Laboratory
51L	Computer Training Center	85	Hazardous Waste Handling Facility
51N, Q	Earth Sciences	88	88-Inch Cyclotron, Nuclear Science
52	Cable Winding Facility	88B	Compressor Shelter and Storage
52A	Utility Storage	88C	Flammable Gas/Liquid Storage
52B	ALS Support	88D	Emergency Generator
53	Environmental energy technologies	90	Copy Center, DOE Site Office, Earth Sciences, Environmental Energy Technologies
53A	Gardner's Storage	90B,F,G,H,J,K	Facilities
53B	Accelerator and Fusion Research	90C, P	Earth Sciences
54	Cafeteria	90R	Utility Storage

FIGURE 3b. KEY TO LBNL BUILDINGS SHOWN IN FIGURE 3a. Source: LBNL, 2000

CMTW-27 cont.

The Human Health Risk Assessment (LBNL, 2003) identified chlorinated volatile organic compounds in soil and groundwater and PCBs in soil as chemicals of concern (COC) at LBNL. Prior to submission of the Corrective Measures Study (CMS) Report, Berkeley Lab completed Interim Corrective Measures (ICMs) that reduced residual PCB concentrations at the two units where PCB levels were a concern to less than the required media clean-up standard. LBNL (2007) discusses that after submittal of the Corrective Measures Implementation Work plan, elevated concentrations of PCBs were detected in shallow groundwater samples collected near the Building 51 Motor Generator Room Filter Sump, indicating PCBs were a potential COC in the soil at this location.

Groundwater is not used for drinking or other domestic water supply at LBNL. Water is supplied to LBNL and Berkeley residents by the East Bay Municipal Utility District (LBNL, 2007). In addition there are many private backyard wells in the city. Unless otherwise designated by the State's Water Quality Control Board, all groundwater is considered suitable, or potentially suitable, for municipal or domestic water supply. Exceptions to this policy are specified in State Water Resources Control Board Resolution 88-63.

Resolution 88-63 defines all groundwater as a potential source of drinking water, with limited exceptions for areas with total dissolved solids exceeding 3,000 milligrams per liter (mg/L), low yield (<200 gallons per day [gpd]), or naturally high levels of toxic chemicals that cannot reasonably be treated for domestic use. Under the Water Board's Water Quality Control Plan, groundwaters with a beneficial use of municipal and domestic supply have cleanup levels set no higher than Maximum Contaminant Levels (MCL's) or secondary MCLs for drinking water. **CMTW-27 cont.**

The following descriptions from the 2007 Draft LBNL Long Range Development Plan (LRDP) report exemplify some of the conditions and circumstances at the contaminant sites. Note that Old Town is in the general vicinity of Buildings 25 and 52, near the central land holdings of LBNL. All plumes can be seen in Figure 2. Further details can be found within the referenced reports.

> The Old Town Groundwater Solvent Plume is a broad, multi-lobed plume of VOC contaminated groundwater, which underlies much of the Old Town area. The distribution of chemicals in the plume indicates that it consists of three coalescing lobes that were originally discrete plumes derived from distinct sources. The Building 7 lobe, which contains the highest VOC concentrations of the three lobes, extends northwestward from the northwest corner of Building 7 to the parking area downhill from Building 58. Leaks and/or overflows of VOCs (primarily PCE) from the Former Building 7 Sump, an abandoned sump that was located north of Building 7, were the primary source of the Building 7 lobe. These chemicals were initially released as free product to the soil around the sump and then migrated as dense non-aqueous-phase liquid (DNAPL) into the saturated zone, forming a source zone for further migration of contaminants. Continuing dissolution of contaminants from the soil and westward to northwestward flow of the groundwater from the sump area has resulted in the development of the Building 7 lobe of the Old Town Groundwater Solvent Plume.

> Contaminated soil and groundwater were present beneath the area where Building 51L was located. The principal contaminants were VOCs that were used as cleaning solvents, or were derived from degradation of cleaning solvents. In addition, a small area of VOC-contaminated soil was present beneath the abandoned Building 51A stormdrain catch basin next to the Building 51A B-door. Contaminated soil in the bottom of the catch basin was removed in 2002. However, groundwater samples from temporary groundwater sampling point SB51A-01-8B installed through the catch basin have contained elevated VOC concentrations, suggesting the presence of additional contaminated soil beneath the catch basin.
>
> A network of subdrains and relief wells located around the perimeter of Building 51 collects subsurface water from the adjacent hillside. Water collected by this network discharges to the Motor Generator Room Filter Sump, which is part of the Building 51 internal floor-drain system. After submittal of the Corrective Measures Implementation (CMI) Work plan, elevated concentrations of PCBs were detected in shallow groundwater samples collected near the sump, indicating that PCBs were a potential COC in the soil at this location.
>
> The Building 51/64 Groundwater Solvent Plume extends south and west from the southeast corner of Building 64 beneath the former location of Building 51B. The corrective measures required for the Building 51/64 Groundwater Solvent Plume consist of operation of an in situ soil-flushing system in the up gradient portion of the plume, implementation of Monitored Natural Attenuation in the down gradient portion of the plume, and collection and treatment of water from the Building 51 subdrain system.

CMTW-27 cont.

The location of the Building 69A Area of Groundwater Contamination is shown in Figure 2. The most likely source of the contamination was leakage from a pipeline in the Building 69A Hazardous Materials Storage and Delivery Area that drains to the Building 69A Storage Area Sump. A dislocation was observed in one of the sump drainpipes and repaired in 1987.

Radioactive Contamination

Since November 1991, the State of California Department of Toxic Substances Control (DTSC) and LBNL have identified 174 "units" of hazardous contamination in the Strawberry Creek Watershed. At least 8 of these 174 "units" were identified as having radioactive contamination. At the same time the California Department of Health Services (DHS) also participated as an additional quality assurance check and provided independent laboratory results to complement LBNL's environmental monitoring programs.

In September of 1995, the California Department of Health Services (DHS) Environmental Management Branch released the Agreement in Principle (AIP) Annual Report, which identified LBNL's National Tritium Labeling Facility (NTLF), Building 75 as a major concern for radioactive contamination in the environment. The AIP report states:

> This facility (NTLF) handles kilocurie quantities of tritium (^3H) to label a variety of molecules that are subsequently employed in chemical, pharmaceutical, and biomedical research. It is conceded that releases from the tritium-stack as well as fugitive releases from Building 75 are the primary source of tritium at LBNL. Air-fall, rainout, and possibly transport in fog impacts soil, groundwater, and surface water. There is an area of tritium contaminated groundwater in the vicinity of Building 75. The Quarterly Progress Report, First Quarter FY 1992, (May 1993) reports sampling ten hydraugers, one, immediately down-slope from NTLF, reportedly contained 32,000 pCi/L of tritium.

The AIP Program collected and analyzed surface water samples, which demonstrated that tritium is detectable in surface water around LBL. The AIP further states:

> One recent investigation, by Leticia Menchaca (LBNL), analyzing for tritium in transpired vapor from plants on LBNL suggest that there may be significant amounts of tritium in the upper, non-saturated, soil strata. It appears that there may be sufficient evidence to suggest that there may be more tritium in the environment than previously suspected. There are apparently no validated explanations for the appearance of tritium in streams not obviously associated with NTLF. (See Table 1)

During the above referenced investigation, tritium concentration in rainwater was detected as high as 239,000 pCi/L and 197,946 pCi/L in transpired water vapor from trees near the University of California's Lawrence Hall of Science.

Table 1. Comparison of Tritium Levels from Split LBNL Surface Water Samples

Collection Date: June 15, 1995 (Table LBNL-6c, AIP Report, 1995)

Location	AIP Results (pCi/L)	AIP Duplicate Results (pCi/L)	LBNL Results (pCi/L)
Blackberry Creek	3335 ± 255		
Claremont Creek	< 328		
Wildcat Creek	1147 ± 218	944 ± 214	
Lower Strawberry Creek	5902 ± 294		
Upper Strawberry Creek	< 328	< 328	

In addition, the AIP report expressed concern over the release of Curium-244 from Building 71, the Heavy Ion Linear Accelerator (HILAC). It states:

> An area of soil near Building 71 is historically (circa 1959) reported to have been contaminated with Curium-244 when a Curium target being used in an experiment was vaporized. Some of this contamination, reportedly, was transported by the buildings ventilation system and deposited outside. This is documented in two interviews in the RCRA Facility Assessment at LBL Sep. 30, 1992: this document reports that "Cleanup of curium contaminated concrete inside the building is documented but there is no record of sampling outside Bld. 71."

The AIP program's other concerns for radioactive contamination in the LBNL environs included former radioactive waste storage and staging areas, former radioactive decontamination areas and abandoned above ground radioactive waste holding tanks.

CMTW-27 cont.

In 1998, the US Environmental Protection Agency (EPA) performed a Superfund reassessment of LBNL concluding that "Based upon a preliminary Hazard Ranking System score, the US EPA has determined that LBNL is eligible for the National Superfund Priorities List" for cleanup, due to tritium in air, soil, groundwater, and surface water.

In September of 2001, LBNL announced that the NTLF would cease operations by 12/31/01.

In June 2005 National Academy of Sciences panel, formally known as the Committee on Biological Effects of Ionizing Radiation, or BEIR, concluded that there is no exposure level found below which dosage of radiation is harmless. The preponderance of scientific evidence shows that even very low doses of radiation pose a risk of cancer or other health problems. The National Academy of Sciences panel is viewed as critical because it addresses radiation amounts commonly used in medical treatment and is likely to also influence the radiation levels that the government will allow at abandoned and other nuclear sites.

METHODS

Our approach to developing a basic understanding of the contaminant plumes of the Lawrence Berkeley National Laboratory and their interrelation to faults, landslides, and streams in Strawberry Canyon was to develop a series of overlays that would show the conditions and various interpretations by previous investigations. The base map data sources were from the City of Berkeley and LBNL Facilities Division, the map projection: California State Plane, Zone III, (map scale 1:3000). Map layers for plumes, geology, faults, and landslides were scanned and then digitized as individual slides.

CMTW-27 cont.

For the historic channel and landslide network mapping, a base map scale of 1-inch equals 200 feet was used to draw channels and landslides as they were interpreted from stereo aerial photographs and historic maps. The historic map of the drainage network was from Soulé (1875). The topographic projections of Soulé's 1875 base map were not compatible to present day cartographic or survey standards. The stream network, however, in most cases, seems to have a good representation of the number of tributaries and the relationship of one confluence to another. Because Soulé's map could not be digitized directly as an overlay, it was necessary to interpret his intent with regard to channel and spring mapping. This was accomplished by referring to predevelopment topographic maps shown in LBNL (2000) and by viewing stereo pairs of historical air photos, some of which predated development of the 1940's.

Different years of aerial photography were used to map landslides, landslide scars, and colluvial deposits. Three black and white photos were used for the earliest period that represented circa 1935. There were a few sections of stereo overlap in these photos, whereas all the newer photos had complete stereo coverage. The full stereo photo analysis included photos from 1939, 1946, 1947, and 1990. A distinction was made, when possible, to establish between deep-seated and shallow slides. Shallow slides were expected to be less than 30 feet deep, whereas deep-seated slides exceeded 30 feet. Source areas for shallow slides, called colluvial hollows, were also mapped. These source areas often contain scars of former landslides and in some cases have had recent sliding, but certainty was low from aerial interpretation. When there was a high certainty of activity occurring within the last century, the slides were delineated accordingly. Activity status of earthflows was not determined. However, at the very least, these slides should be expected to have higher than normal creep rates than the surrounding soils and they will probably continue to have renewed activity within their boundaries.

RESULTS AND DISCUSSION OF DATA COMPILATION
Drainage Network Mapping

Within the Lab site, two major east-west trending creeks, Strawberry and North Fork of Strawberry, have perennial flow that drains respectively through Strawberry and Blackberry Canyons toward the City of Berkeley and the San Francisco Estuary. North Fork of Strawberry Creek flows through the boundaries of LBNL. Mainstream Strawberry Creek is not within LBNL boundaries, yet seven of its north-south trending tributaries that flow southward, do drain from the LBNL. These tributaries, cited in the LBNL RFI, 2000 include Cafeteria Creek, Ravine Creek, Ten-inch Creek, Chicken Creek, No-name Creek, Banana, and Pineapple Creeks as shown in Figure 4. The latter two flow into Botanical Garden Creek, which is not within the LBNL boundary, but flows into the central reach of mainstream Strawberry Creek.

CMTW-27 cont.

The pathways of natural surface water runoff have been altered by years of land use activities in the Canyon, which have caused the natural topography to become highly altered by cut and fill activities, roads, impervious surfaces from buildings and parking lots, and by stormdrain and other infrastructure construction. Natural and land use-related landslides have also changed the flow pathways of both surface and groundwater. Numerous faults, deep-seated landslide failure planes, bedrock contacts, fractures, and joints compound the natural influences on groundwater. They can all strongly influence the direction and rate of subsurface flow.

However, the location of bedrock contacts and faults can be challenging to detect, especially in an unstable landscape where landsliding can mask the geomorphic signatures of faults and bedrock contacts. Overlaying surficial deposits from alluvial fans and colluvium can also obscure these features. Groundwater flow has also been artificially altered by spring development, wells, hydraugers, utility trenches, sewers, subsurface drains, and pumps installed to mitigate contamination, as well as to intercept hill water that historically has caused landslides at LBNL.

Campus Principal Engineer John Shively conceived of the idea of a vertical well to intercept hill-water that was causing landslides both inside and adjacent to LBNL in 1974. He retained Civil Engineer B. J. Lennert to install what is now known as the Shively well, located next to the UC Silver Space Sciences building. It should be noted that the major hill landslide of August 1974 (during a dry season) broke a lab building at LBNL, took out a portion of a laboratory road, and was threatening UC Berkeley's Lawrence Hall of Science.

At the same time another landslide was developing above the Lab's corporation yard, threatening the University's Centennial Drive. Lennert's attempts to stop the slides by dewatering the hill area with horizontal hydraugers weren't working. The Shively well apparently stopped both slides.

In 1984 Converse Consultants, Inc. conducted investigations in the eastern portion of the Strawberry Canyon. Their findings were published in a report titled "Hill Area Dewatering and Stabilization Studies" which defined the location of the Lennert Aquifer in the following:

> Dewatering measures instituted by Lennert were based on the belief that the main reservoir of deep ground water in the hill area is the volcanic flow (i.e., fractured) rocks of the Moraga Formation situated within a synclinal structure underlying the ridge extending from LBL Building 62 northward to Little Grizzly Peak. These flow rocks were thought to be bottomed in the syncline by less permeable Orinda Formation bedrock (although some permeable sandstone and conglomerate beds within the Orinda exist, they are interbedded with impermeable shales and siltstones). Lennert asserted that ground water was also controlled in the hill area by faults such as the University Fault and the New Fault, which acted as groundwater barriers or as conduits for water flow through cracks and voids along these faults. Lennert also asserted that surface water entered these "tension faults", entering directly and quickly into the groundwater regime.

CMTW-27 cont.

The location of the Shively well that drains the Lennert aquifer, hydraugers as well as sewers, and stormdrains at LBNL are also shown in Figure 4.

Little remains of the natural drainage network within LBNL boundaries, yet its natural pattern can been interpreted from historical photos and information from Soulé (1875), as shown in Figure 5. The drainage network does not depict differences in perennial versus intermittent or ephemeral flow; it simply indicates where well-defined channels are expected. The springs, however, do represent sites of presumed perennial wetness. Soulé indicated that several springs were developed for water diversion prior to his 1875 map. In Figure 5, the arrows represent where channels might have become non-distinct as they spread across their alluvial fans at the base of steep hillsides. Alluvial fans store bedload and often convert surface flow to subsurface flow over coarse-bedded, highly permeable alluvium.

Near the central and northern LBNL property, two areas show a particularly high density of channels per unit area. These correspond to two east-west trending valleys. The eastern valley is referred to as East Canyon and the central one is Chicken Ranch Canyon. The high density of channels in these valleys appears to be associated with large landslides

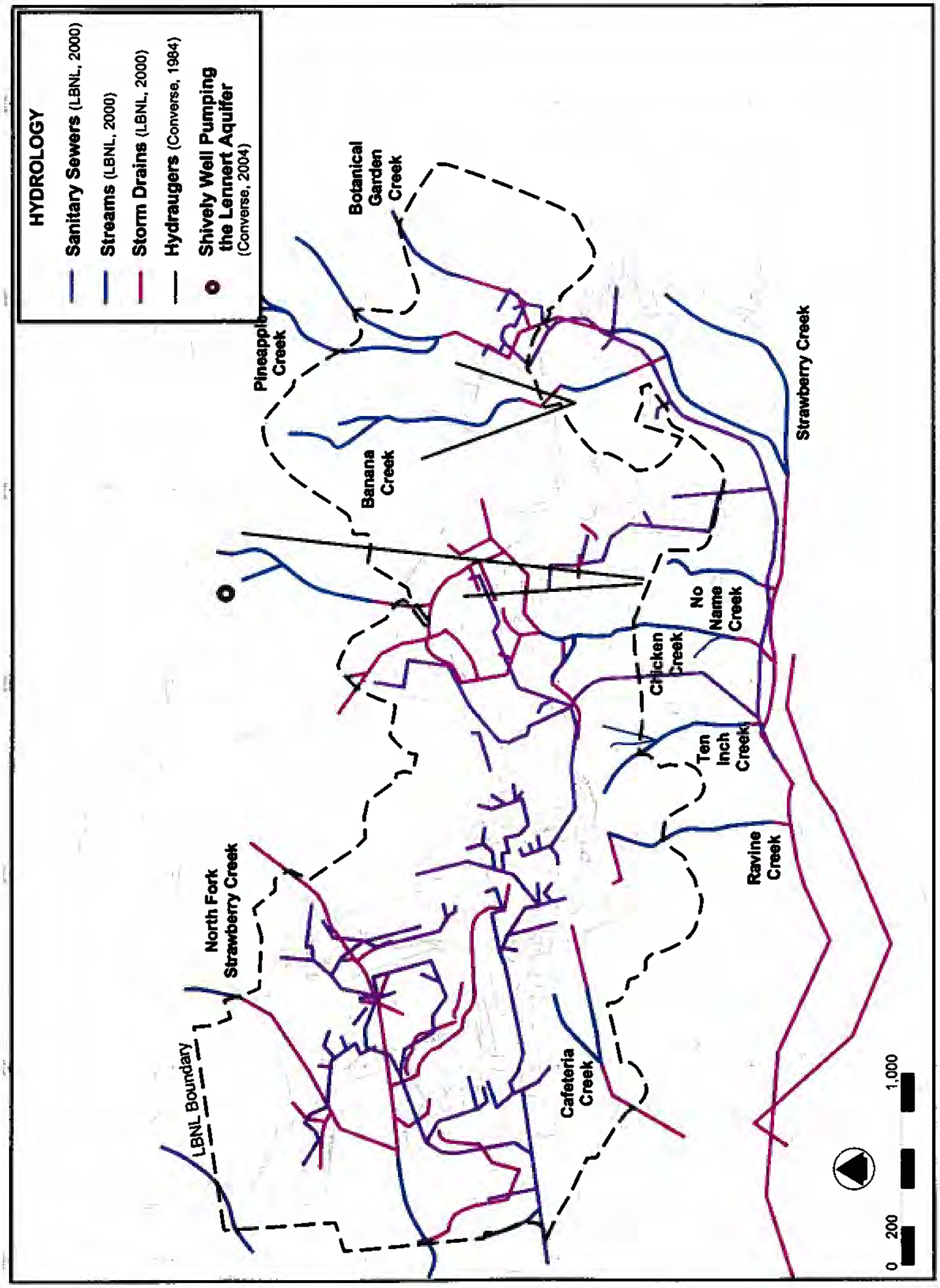

FIGURE 4. MODERN DRAINAGE NETWORK AT LBNL IN STRAWBERRY CANYON

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cont.

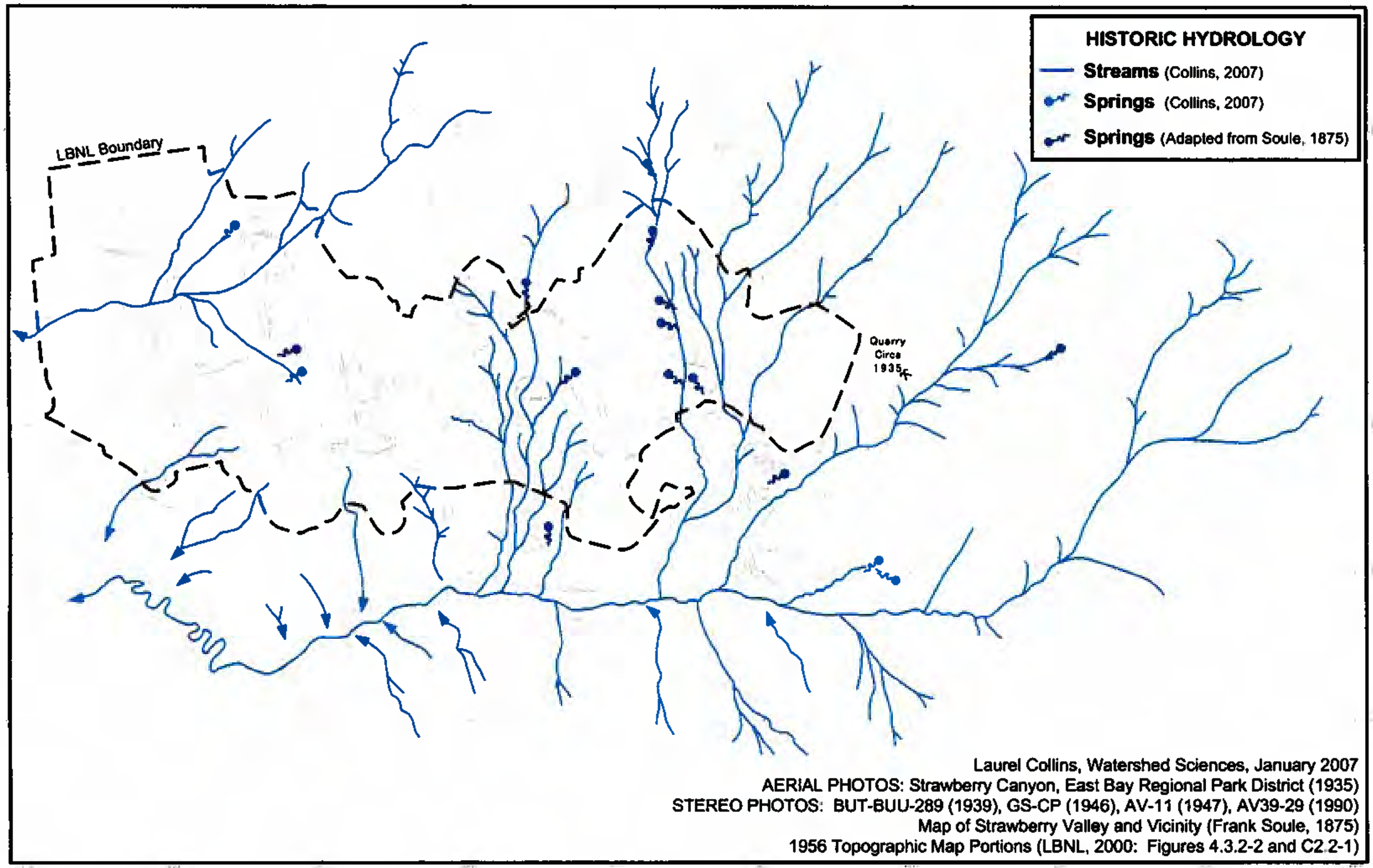

FIGURE 5. INTERPRETATION OF HISTORIC CHANNEL NETWORK AT LBNL IN STRAWBERRY CREEK WATERSHED

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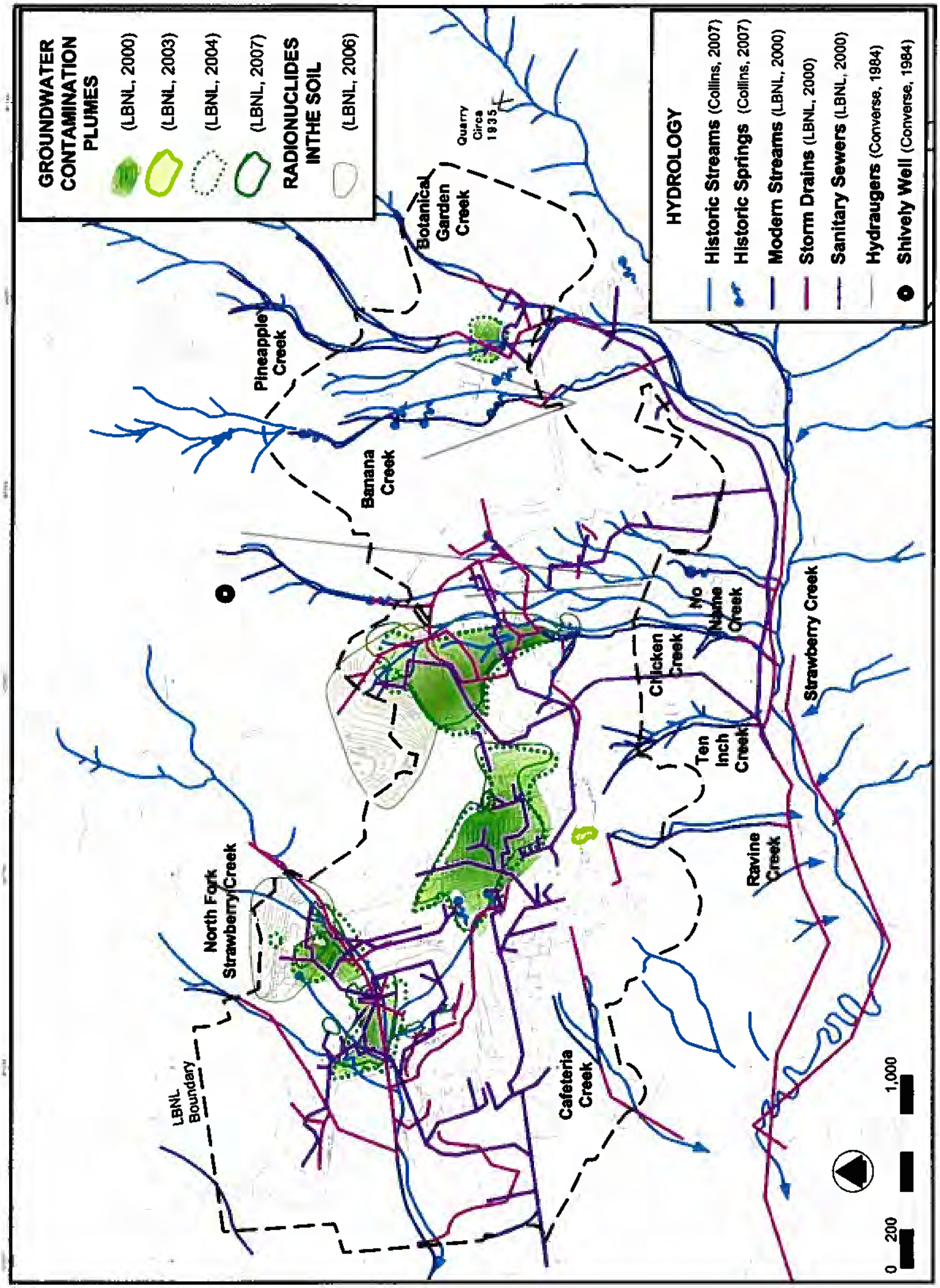

FIGURE 6. GROUNDWATER CONTAMINATION PLUMES IN RELATION TO THE MODERN AND HISTORIC DRAINAGE NETWORKS AT LBNL

CMTW-27 cont.

that occupy the valley floors (Figure 7a). It is likely that highly erosive soils exist in the valley because they have been mechanically disturbed by both landsliding and faulting. In addition, the clay-rich nature of the soils and landslide deposits in these valleys often leads to slow percolation rates, especially along failure planes of earthflows, which can create perched water tables. These factors contribute to increased runoff per unit area, which leads to increased drainage density.

The historic drainage network helps with interpretation of topographic features such as the landslides in East and Chicken Creek Canyons, but it is also useful for showing movement along fault lines such as the Hayward Fault. At the bottom left corner of Figure 5, over 1200 feet of right lateral channel offset has occurred on Strawberry Creek along the area that is now the UCB stadium. Historic channel mapping is also important for predicting potential migration pathways of contaminant plumes along alluvial soils that might have been buried by large deposits of artificial fill, such as in Blackberry Canyon.

A compilation of the current and historic drainage network relative to the 2000, 2003, 2004, and 2007 LBNL contaminant plume locations is shown in Figure 6. Areas shown in grey indicate the location of radionuclides (tritium and curium 244) in soil (LBNL 2006). All the plumes, except Building 37 VOC plume, are shown to intersect historic drainage channels. Storm drains intersect all contaminant plumes except Building 37. The hydraugers do not appear to intersect plume boundaries, although the Building 74 Diesel Plume is very close to the northernmost hydrauger. The contaminant plumes have a general pattern of downhill convergence into both the historic channel and modern storm drain network.

CMTW-27 cont.

Geologic Bedrock Mapping

The complex geology of Strawberry Canyon involves periods of volcanism, sedimentary deposition within fresh water and marine environments, tectonic uplift, folding, and significant shearing along fault zones that have offset different-aged terrains. LBNL (2000) describes the underlying geologic structure at the lab to be a northeast dipping faulted homocline. Generally, the oldest rocks occupy the lower portions of Strawberry Canyon, while youngest rocks are found toward the east along the ridge.

The middle of the Canyon is more complex with older bedrock formations faulted and offset against younger ones along the Space Science's fault, University fault, New fault, Strawberry Canyon fault, Lawrence Hall of Science fault complex and various un-named faults, as well as the Wildcat and East Canyon Faults. Bedrock of Jurassic to Cretaceous-aged Franciscan Assemblage is mostly to the west of the Hayward Fault, beyond Strawberry Canyon. In this area, these rocks are typically marine sandstones that are faulted against younger bedrock of the Great Valley Sequence along the Hayward Fault at the base of the canyon.

The Cretaceous-aged Great Valley Sequence also has a marine origin. It ranges from mudstone and shale to sandstone with occasional conglomerate. The Great Valley Sequence is in fault contact with the Late to Middle Miocene-aged Claremont and the Late Miocene-aged Orinda Formations in different parts of the Canyon. The Claremont Formation is primarily siliceous chert inter-bedded with shale that formed in a deep marine environment.

Locally the chert is commonly highly fractured, folded, and faulted. It tends to form erosion resistant outcrops along some ridges.

Conversely, the Orinda is primarily mudstones, sandstones, and minor conglomerates that formed in a non-marine environment. The predominantly clay-rich Orinda shale unit tends to be associated with topographic valleys and is particularly prone to deep-seated landslides. Orinda is stratigraphically overlain and occasionally inter-fingered with the Late Miocene Moraga Formation, which is volcanic in origin and locally tends to be highly fractured, jointed, brecciated, and commonly vesicular (LBNL, 2000). In some places, it has been faulted and offset against the Orinda, especially to the west of the Wildcat Fault.

Although both Orinda and Moraga Formations are highly fractured, the Moraga has hard volcanic flow rocks of andesite and basalt while the Orinda tends to have low strength and hardness. The Moraga Formation is overlain and in contact with the Late Miocene non-marine sedimentary deposits of the Siesta Formation along the northeastern ridgeline. Beyond the ridge, the volcanic rocks of the Late Miocene Bald Peak Formation overlay the Siesta Formation along the axis of a structural syncline (Graymer, 2000).

Figures 7a, 7b, and 7c show interpretations of the geology in Strawberry Canyon that are different. Although the maps also have slightly different spatial extents, they overlap through most of the LBNL property. All maps identify the Orinda, Moraga, and Claremont Formations, yet the location of the bedrock boundaries do not agree. There are also some slight naming differences for the Great Valley Group rocks identified by LBNL and Graymer versus the Panoche Formation identified by Borg. The Panoche Formation simply represents a part of the Great Valley Group and is therefore not a significant difference in interpretation. Dunn (1976) reported that with regard to slope stability, the worst building sites in Strawberry Canyon were along the Orinda, and the Orinda/Moraga contact zones. The principal formations shown to be intersecting the contaminant plume sites are the Orinda and Moraga Formations, Figures 8a and 8b.

CMTW-27 cont.

Figure 8a shows a compilation of the Moraga bedrock contacts as individually mapped by LBNL, Graymer, Collins, and Borg in the respective Figures 7a, 7b, 7c, and 7d. Figure 8b shows a compilation of bedrock contacts of the Orinda Formation. Note that the Building 51L and 61/64 plumes intersect rocks of the Great Valley Sequence. The location of bedrock contacts near the plume sites is particularly important because ground water can travel laterally along the contact zone rather than just move topographically downhill. This is particularly relevant when sharp reductions in permeability occur in the downhill bedrock. Soil permeability and transmissivity are much greater in the Moraga Formation because it has lower clay content than the Orinda.

When groundwater traveling from the Moraga Formation intercepts the Orinda Formation, positive pore pressures can build, forcing water to move along alternative pathways such as along a bedrock contact, through fractures, or toward the surface where it can cause landslides and/or springs. Interpretation of the size of each contaminant plume and its migration is constrained by the array and number of sampling wells. If water laterally.

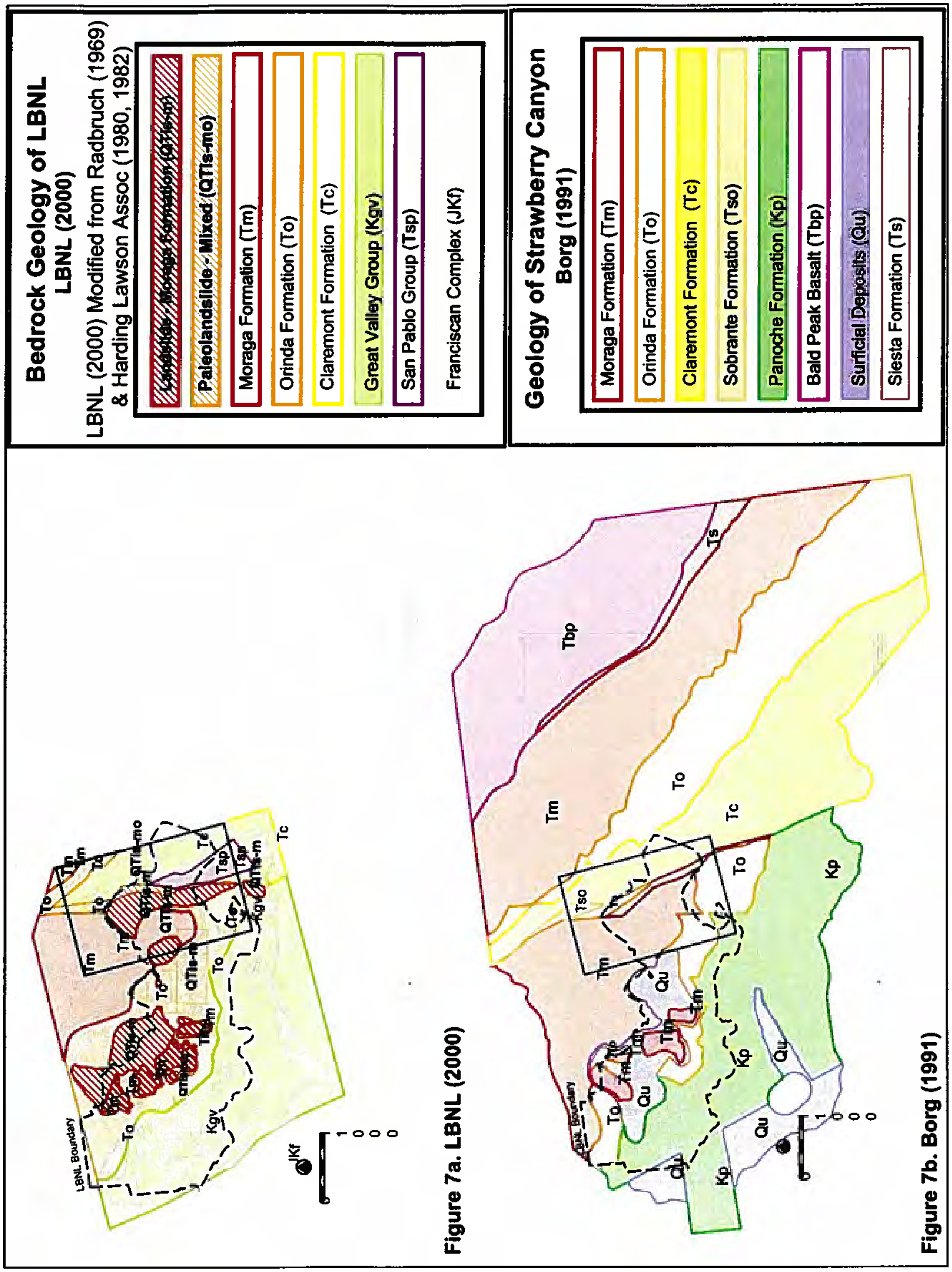

Figure 7a. LBNL (2000)

Figure 7b. Borg (1991)

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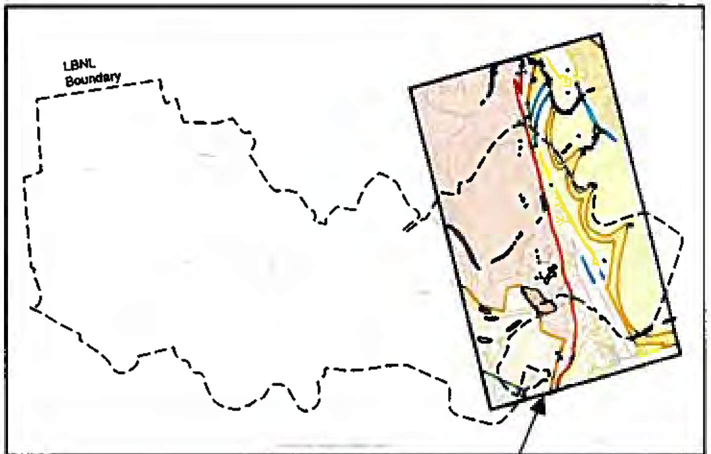


Figure 7c. Collins (1993)

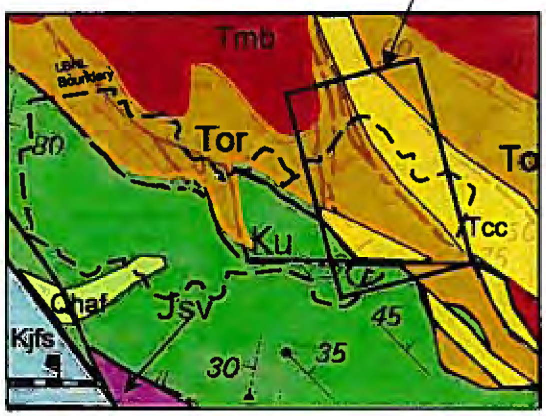


Figure 7d. USGS, Graymer (2000)

Geology of the East Canyon and the Proposed Hazardous Waste Handling Facility (Collins 1993)

- Moraga Formation (Tm)
- Orinda Formation (To)
- Claremont Formation - Chert Outcrop (Tc)
- Claremont Formation - Sandstone Outcrop (Tc-ss)
- Claremont Formation - Shale outcrop (Tc - sh)
- Miocene and Upper Eocene Sediments (Tm-e)
- Upper Cretaceous Sediments (Ku)
- Landslides (LBNL Plant Eng, 1981)

Geology in the LBNL Area USGS, Graymer (2000)

- Moraga Formation (Tm)
- Orinda Formation (To)
- Claremont Chert (Tcc)
- Holocene Alluvial Fan (Qhaf)
- Upper Cretaceous Sediments (Ku)
- Franciscan Complex Sandstone (Kjfs)

CMTW-27
cont.

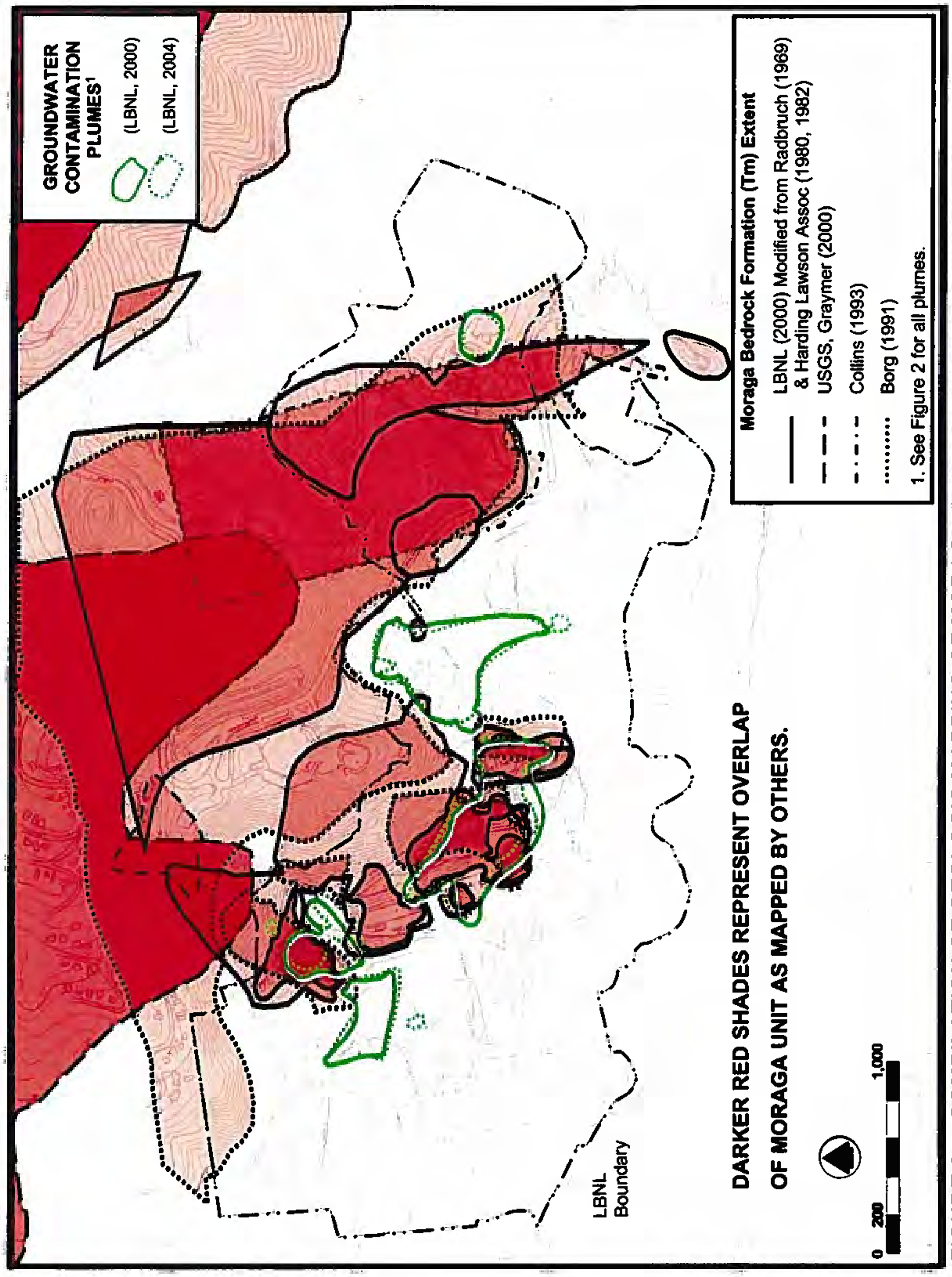


FIGURE 8a. COMPILATION OF GEOLOGIC MAPPING OF MORAGA BEDROCK FORMATION AT LBNL.

CMTW-27 cont.

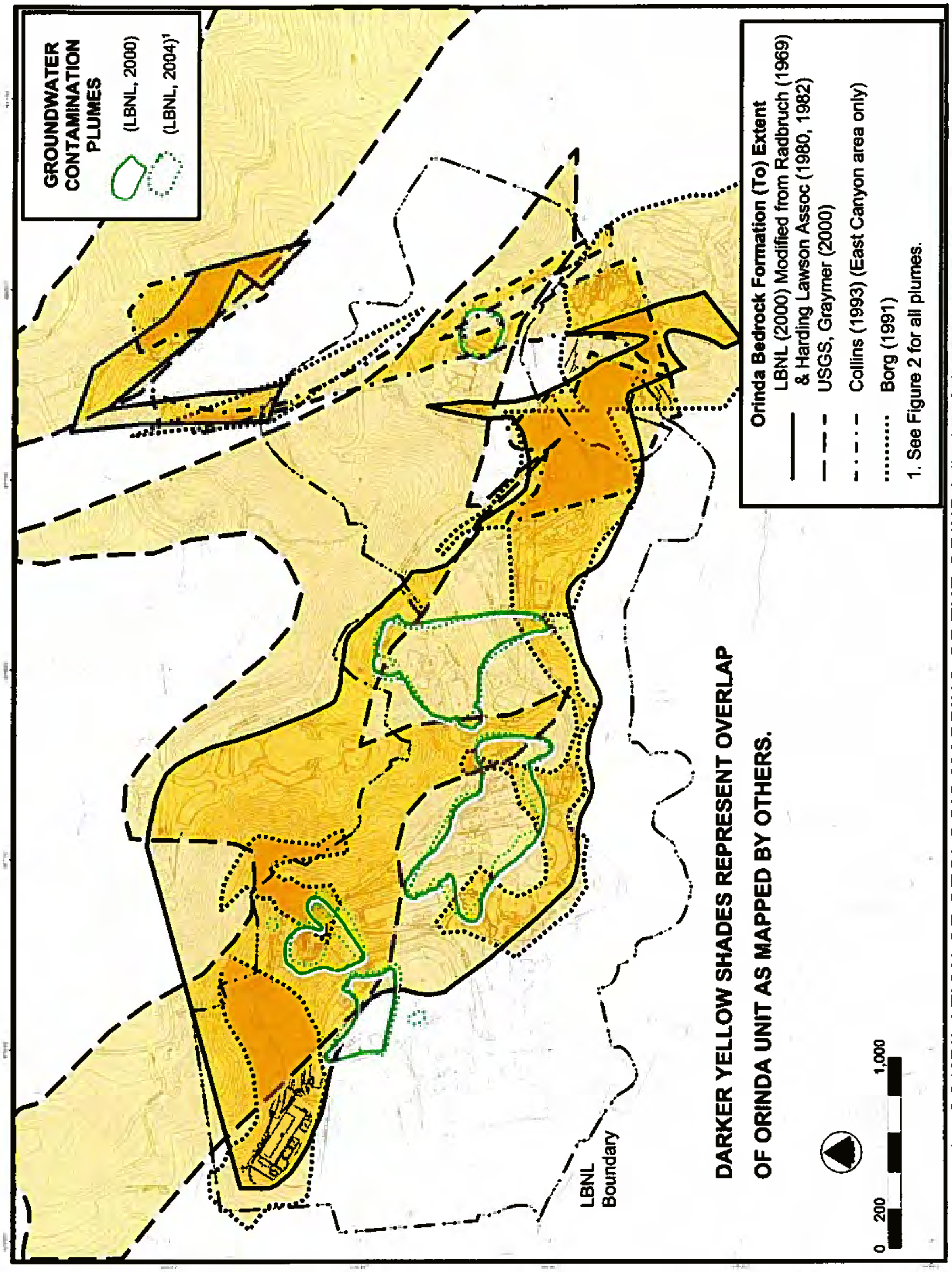


FIGURE 8b. COMPILATION OF GEOLOGIC MAPPING OF THE ORINDA BEDROCK FORMATION AT LBNL

CMTW-27 cont.

migrates along a bedrock contact and if monitoring wells are not placed in a sufficient array to detect these potential flow pathways, the extent and migration of a plume could be easily misinterpreted. Figure 8a and 8b show substantial differences in the interpretation of the location of the bedrock contacts at nearly every plume site.

During the past 60 years, UCB and LBNL have produced innumerable investigations and geotechnical reports for existing and proposed building sites in Strawberry Canyon. Yet, agreementon the position of faults, landslides, and bedrock contacts has not been consistent among these reports. The lack of continuity among the various reports has been noted by previous researchers who have called for a more comprehensive effort to produce a verifiable picture of landslides and geology (Dunn 1976; Collins, 1993; Collins and Jones, 1994).

For example, in 1976 J. Dunn stated that with regard to instability of hillsides near Buildings 46 and 77, most activity involved failure of material in the Orinda Formation or sliding of the Moraga Volcanics on the Orinda. Although borings had been completed, samples recovered, and tested, he reported that the results and conclusions had not been tied together in a workable package. An earlier report by Collins (1993), recommended that "raw" geological observations such as bedrock outcrops should be shown on future geological investigations and that such maps should be an essential component of an integrated, comprehensive, and computerized database for the LBNL site.

With LBNL producing a GIS-based three-dimensional view of their local geologic interpretations, much has been accomplished since 1993. Yet, a verifiable map showing locations of bedrock outcrops and exposures in excavations remains elusive. Hence, it still remains unclear what information has or has not been used as a foundation for LBNL's geologic map, and why their interpretations differ from reports by their previous consultants

CMTW-27 cont.

Fault Mapping

The Hayward Fault is part of the larger San Andreas Fault system. It is seismically active and falls within the Alquist Priolo Earthquake Fault Zone, Figure 2. Numerous secondary splay faults are also associated with the Hayward Fault, such as the Wildcat and East Canyon Faults that trend northwestward through East Canyon, Figure 9a. As shown in Figures 9b and 9c, these named faults, as well as the Space Science's Fault, University Fault, New Fault, Strawberry Canyon Fault, Lawrence Hall of Science Fault Complex and numerous un-named faults have been mapped by other researchers. Whether or not a fault has been named or identified within the Alquist Priolo Earthquake Zone does not mean that it is not imperative to show it on geologic maps, especially to relate its position to known contamination sites, especially when the information already exists in published reports.

With respect to plume migration, to identify whether a fault is active is not as important as identifying its potential influence on groundwater transport. Without sufficient understanding of fault locations, planning where to place monitoring wells for defining and constraining plume boundaries cannot be well founded. Fault mapping is also clearly important for identifying potential hazards to buildings and infrastructure, particularly because splay faults and other faults in close proximity to the Hayward Fault have potential to rupture during large magnitude quakes, especially those emanating nearby.

Figure 10 shows the plume locations and a compilation map of the faults shown by various researchers in Figures 9a, 9b, and 9c. As noted in Figure 10, we call the fault that runs along the Bevatron (Building 51a) and the Advanced Light Source (Building 6) the Cyclotron Fault. The compilation indicates that fault mapping by LBNL does not correspond well with faults mapped by USGS (2007), Converse Consultants (1984), Harding Lawson (1979), or Lennert Associates (1978). Although there is some general agreement about the Hayward, Cyclotron, and Wildcat Faults, there is poor agreement on the existence and location of many of the other faults mapped by others within the LBNL property boundary.

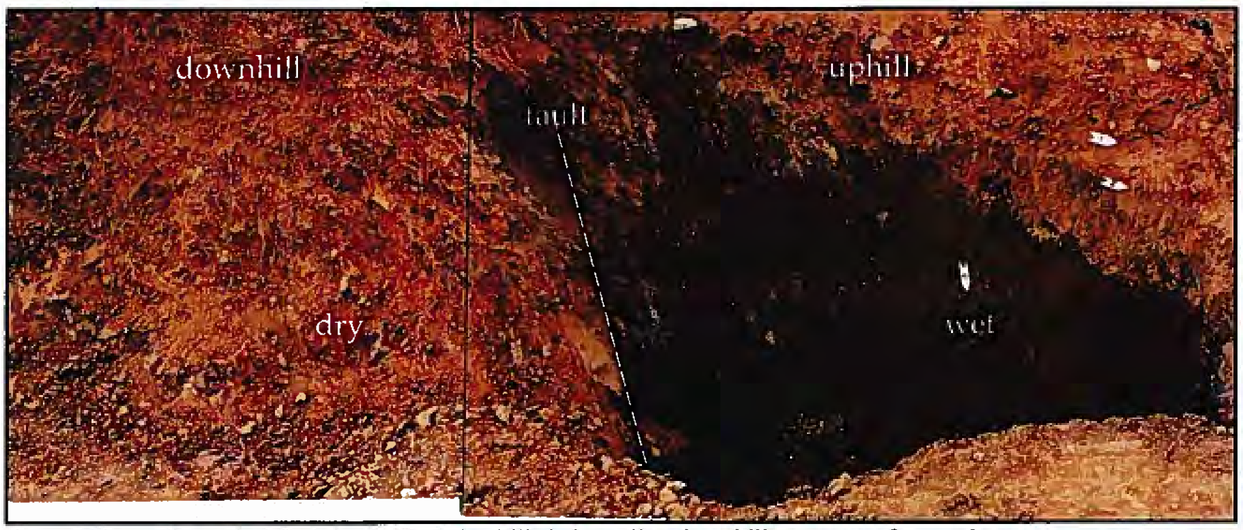


Photo 1. A nearly vertical fault in the Berkeley hills is impeding downhill transport of groundwater, causing it to flow laterally along the fault trace. Water is collecting in a pool at the base of the wet side of the excavation.

CMTW-27 cont.

During grading operations for the construction of the new LBNL Hazardous Waste Handling Facility and throughout many new excavations in the Berkeley hills, conducted during the 1993 Oakland Hills post-fire reconstruction, Collins and Jones (1994) stated that they made numerous observations of faults exerting strong control on groundwater movement and swale development. Photo 1 shows an example of one of the sites they observed in the Berkeley Hills where groundwater flow moved laterally along a fault plane that impeded downslope groundwater transport. They also observed that the location of crown scarps of several recently active earthflows in the Berkeley Hills corresponded to the location of fault traces. They suggested that fault traces in many areas of the Berkeley Hills are masked by younger deposits of sediment from landslides and streams.

It is important to consider that when excavations expose faults or when utility trenches intersect faults that also intersect contaminated groundwater, the excavations or trenches can become additional avenues for contaminant plume migration. Also important to consider is that zones of varying permeabilities in clay-rich fault gouge can provide traps and pathways for moving water, and in some cases, the traps can build enough pressure to initiate landslides and potentially convert the subsurface flow to surface flow.

Potential problems associated with the lack of definitive geologic mapping in Strawberry Canyon are increased by the proximity of the active Hayward Fault and related seismicity. According to Steinbrugge, et al, (1987) the maximum magnitude earthquake anticipated is 7.5, which has the potential of causing right-lateral horizontal offsets that could average 5 feet along the Hayward Fault. Hoexter (1992) reported that there was potential for secondary or splay faults in the East Bay to have triggered slip from quakes generated along the primary Hayward Fault. Wildcat Fault appears to be a likely splay from the Hayward Fault. Hoexter's survey of historical earthquakes indicated that triggered slip on splays have movement that is usually less than 20% of the primary offset. This suggests that 1.5 feet of horizontal offset on a splay fault from the Hayward Fault could be anticipated if the maximum magnitude quake occurred. Hoexter also reported that vertical displacements could accompany horizontal slip, although a much smaller percentage of total movement would be expected. Such projections of horizontal and vertical offsets along secondary faults should be sufficient to warrant more detailed mapping of fault patterns within Strawberry Canyon.

We believe that sufficient information is not available from the literature to confidently determine the activity status of the numerous faults that exist along the Wildcat Fault shear zone, which may be as much as 600 feet wide and includes the East Canyon Fault (Collins, 1993). Published USGS maps in this report are not of adequate detail or scale to delineate all the bedrock complexity of Strawberry Canyon, yet more detail is shown by USGS than that which LBNL represented on their Bedrock Geology Map, provided in their investigative RFI report (LBNL, 2000). This is perplexing because much geologic complexity has been demonstrated in previous reports and investigations conducted by LBNL's own geotechnical consultants. For example, Figure 11 shows a compilation map detail of faults mapped by various consultants and researchers for just the East Canyon (Collins, 1993). Figure 11 demonstrates general agreement that the Wildcat Fault exists, but poor agreement on its location or number of traces within its shear zone. This site is important because it is the location of the diesel fuel plume near Building 74, and is the proposed location for new buildings in the East Canyon described in the recent LBNL LRDP Report (2007).

CMTW-27 cont.

During the grading operations for the LBNL Hazardous Waste Handling Facility (Building 85), numerous northwest and east-west trending faults were exposed near the Wildcat Fault shear zone northwest of LBNL Building 74. So many faults were intersected that it brought into question whether the previous 1980 Harding Lawson report by Korbay and Lewis, called the Wildcat Fault Investigation (performed for Building 74), was actually sufficient to evaluate the Wildcat shear zone. The trench was located more than 1000 feet north of Building 74 and inconsistencies within the trench logs confounded interpretation of vertical displacements at the fault trace (Collins, 1993). Further concern arises about the activity status of Wildcat Fault because according to King (1984) and verbal communication from Curtis (1993), a disagreement occurred at the trench site between investigators Steve Korbay of Harding Lawson Associates and Dr. Garniss Curtis of UCB Department of Earth and Planetary Science. Curtis believed there was sufficient evidence in the trench site to designate the Wildcat Fault active, while Korbay did not.

LBNL does not show the Wildcat Fault as active (LBNL, 2000) and we are not presently aware of any additional trench investigations that have been conducted on the Wildcat Fault since 1980. Additional lines of evidence concerning fault activity in Strawberry Canyon, however, can be gleaned from maps showing the epicenters of local seismicity. In Figure 12a, we compiled the fault mapping by others from Figures 9a, 9b, and 9c and overlaid the epicenters of seismic events that have occurred in the Strawberry Canyon during the last 40 years. Over 57 earthquakes with Richter Magnitude between 1.8 and 3.0 have occurred in Strawberry Canyon. Such a high incidence of microseismicity within the mapped traces of Wildcat Fault and between the Wildcat and the Cyclotron Faults provides compelling evidence that additional faults other than just the Hayward should be considered as active in Strawberry Canyon. Indeed, recently during March 2007 two small earthquakes, magnitude 2.0 and 1.4, shook the Canyon along an un-named fault and the Hayward Fault, respectively (http://quake.wr.usgs.gov/recenteqs/).

During the 1991 excavation for Building 84 in the East Canyon, Collins, Jones, and Curtis observed bedrock contacts and numerous fault exposures in the excavated bedrock at the building site. Of particular significance was the discovery of an entire geologic bedrock unit, the Briones Formation, which had never before been mapped in Strawberry Canyon. The Briones outcrop, which was full of marine shell fragments, was interpreted as a tectonic block that has been dragged along the Wildcat Fault during the last 10 million years. Its displacement might exceed 9 miles, which is twice the amount previously considered possible along this fault (personal communication Dr. D. Jones, UCB Department of Earth and Planetary Science).

CMTW-27 cont.

Pat Williams (former LBNL staff Scientist Earth Sciences Division) speculated that a structural connection might exist between the active Hayward and Pinole Faults, and that the linkage might be associated with the Wildcat Fault (personal communication, 1992). Bishop (1973) documented evidence of active creep along the Wildcat Fault north of El Cerrito. During a 1971 survey of the East Bay Municipal Utility District water tunnel (between San Pablo Reservoir and the Kensington Filtration plant), vertical and right lateral displacements were documented near the Wildcat Fault shear zone. Taylor (1992) reports that the pattern of fault creep observed in the Montclair area (south of Berkeley) and elsewhere along the Hayward fault indicates that the broad fault zone might contain more than one Holocene active fault trace.

During the winter of 1992, another subsurface trench investigation was conducted on the East Canyon Fault. It was performed by Geo Resource Consultants and LBNL staff for LBNL. Evidence of both vertical and horizontal offset was discovered. This dual type of motion is probably typical for faults in the Canyon. Jones and Brabb (1992) suggest that significant displacement has occurred across the Berkeley Hills from combined strike-slip and thrust movements. Jones (1992) reports that most of the major strike-slip faults in the

FIGURE 9. SELECTED EXAMPLES OF FAULT MAPPING STUDIES AT LBNL IN STRAWBERRY CANYON

FAULTS

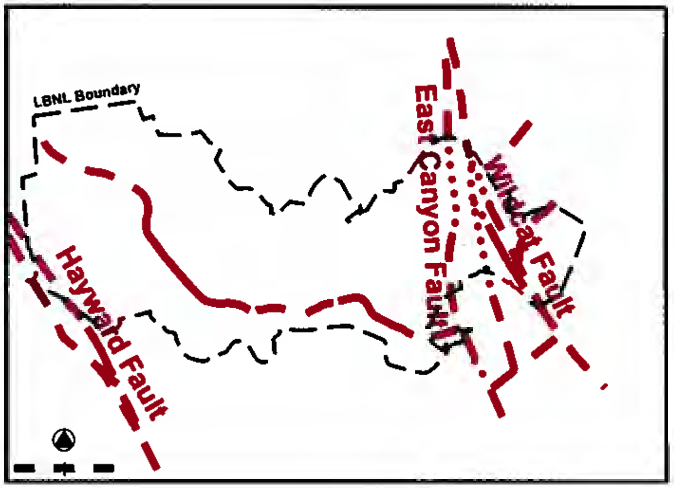


FIGURE 9a. LBNL (2000) Based on:
Harding-Lawson (1980, 1982), Radbruch (1969)

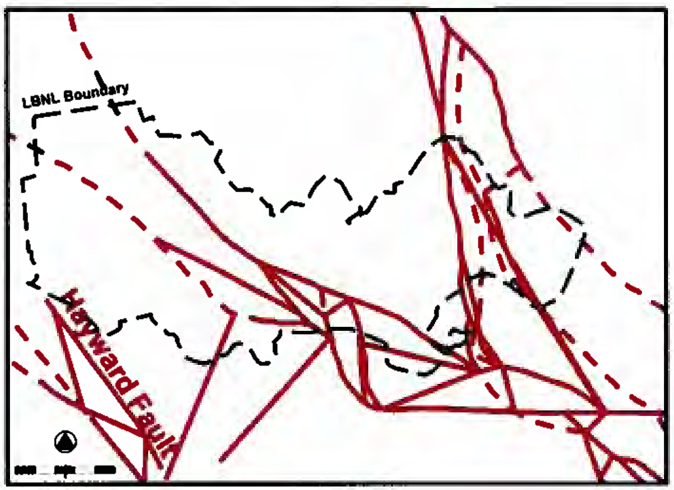


FIGURE 9b. USGS on Google Earth (2007)

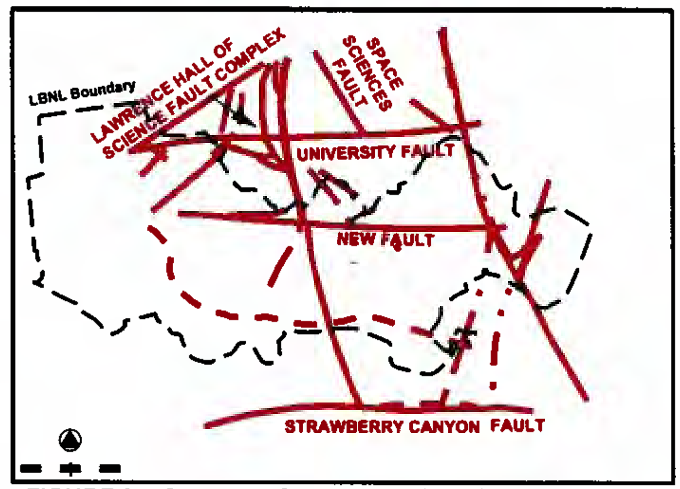


FIGURE 9c. Converse Consultants (1984) Based on:
Harding-Lawson (1979), Lennert & Associates (1978)
(Mapping does not include western portion of LBNL.)

CMTW-27 cont.

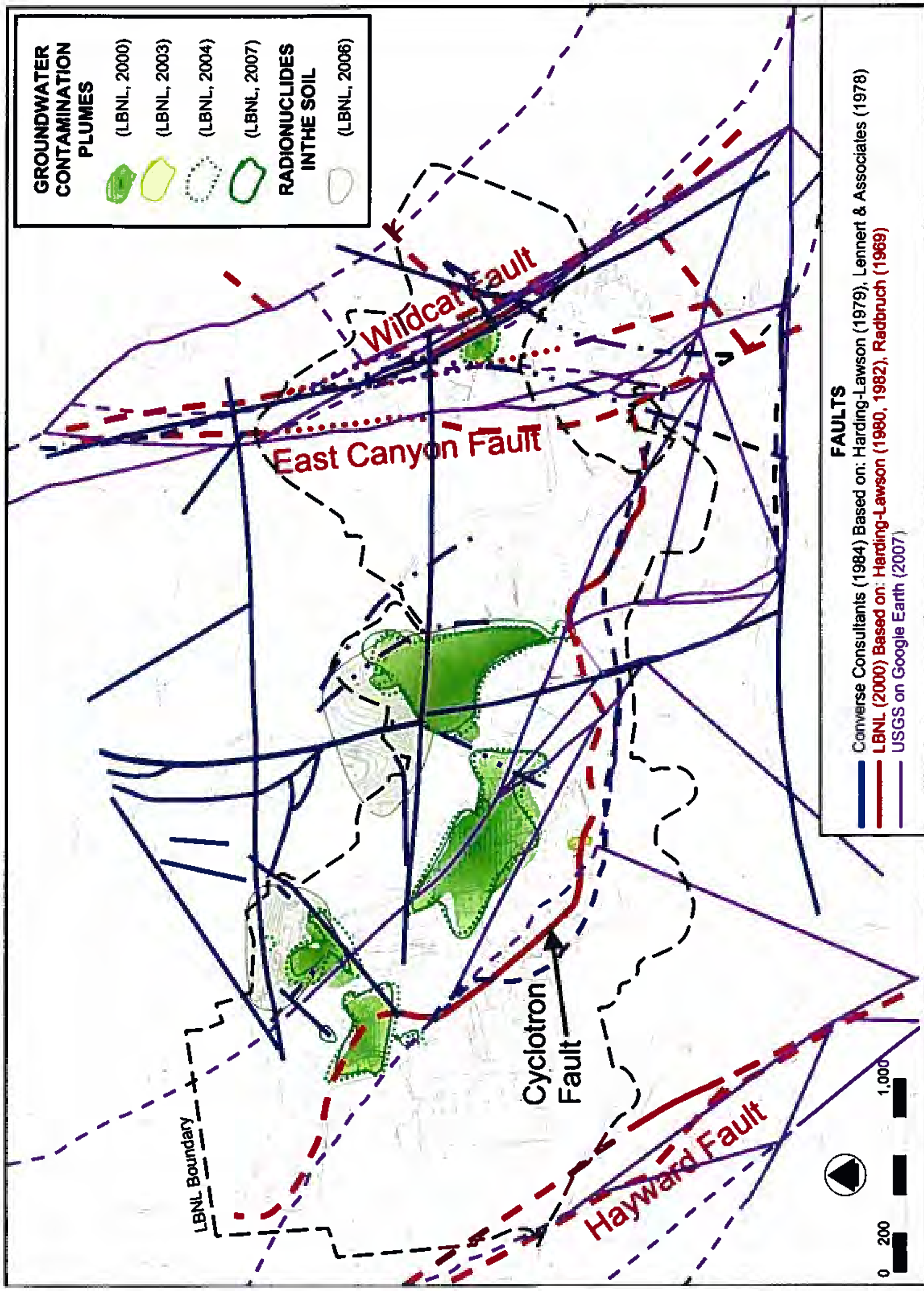


FIGURE 10. COMPILATION OF FAULT MAPPING AT LBNL IN STRAWBERRY CANYON RELATIVE TO SOIL AND GROUNDWATER CONTAMINANT PLUMES.

CMTW-27 cont.

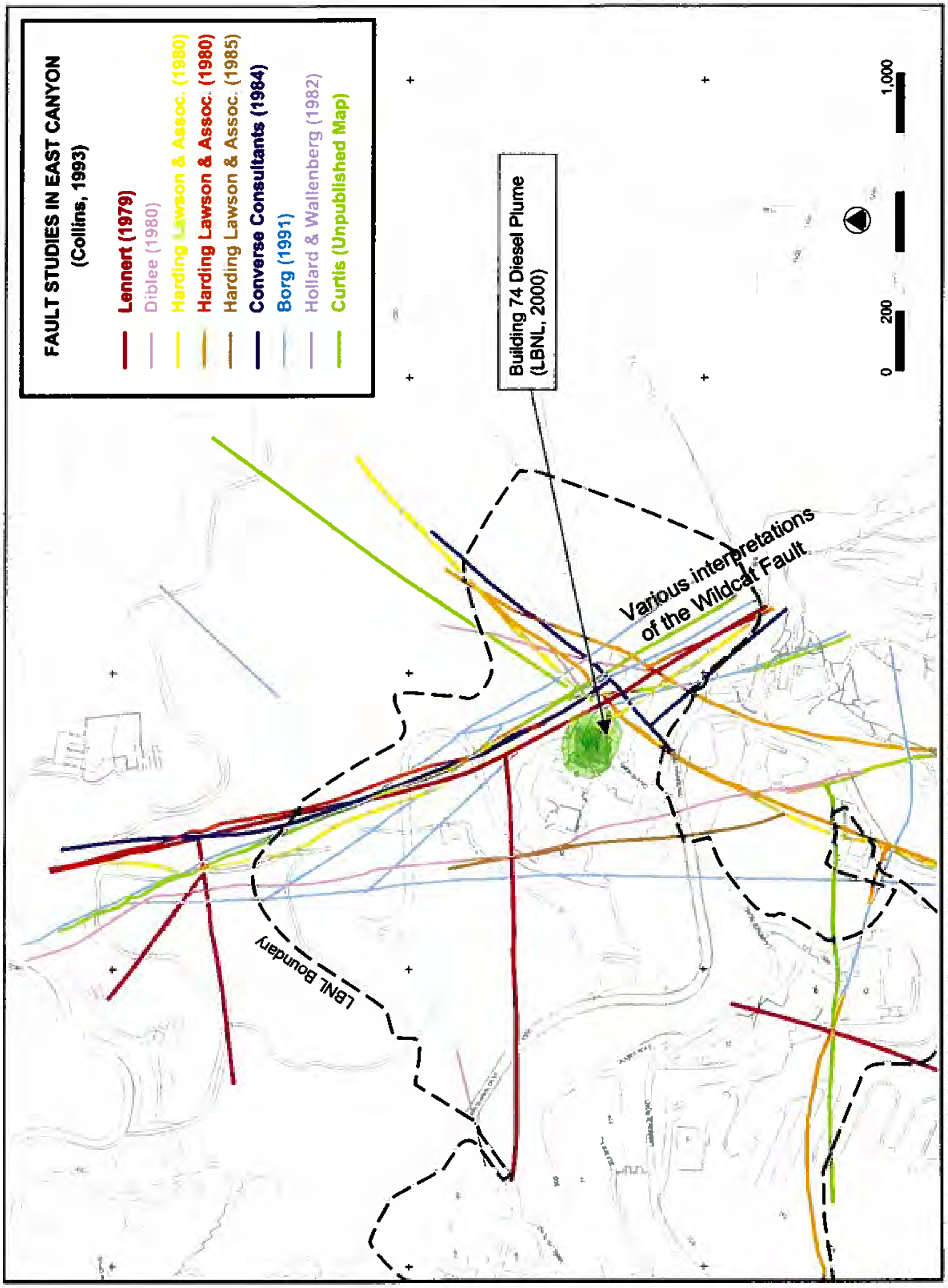


FIGURE 11. COMPILATION OF FAULT MAPPING AT LBNL IN EAST CANYON

CMTW-27
cont.

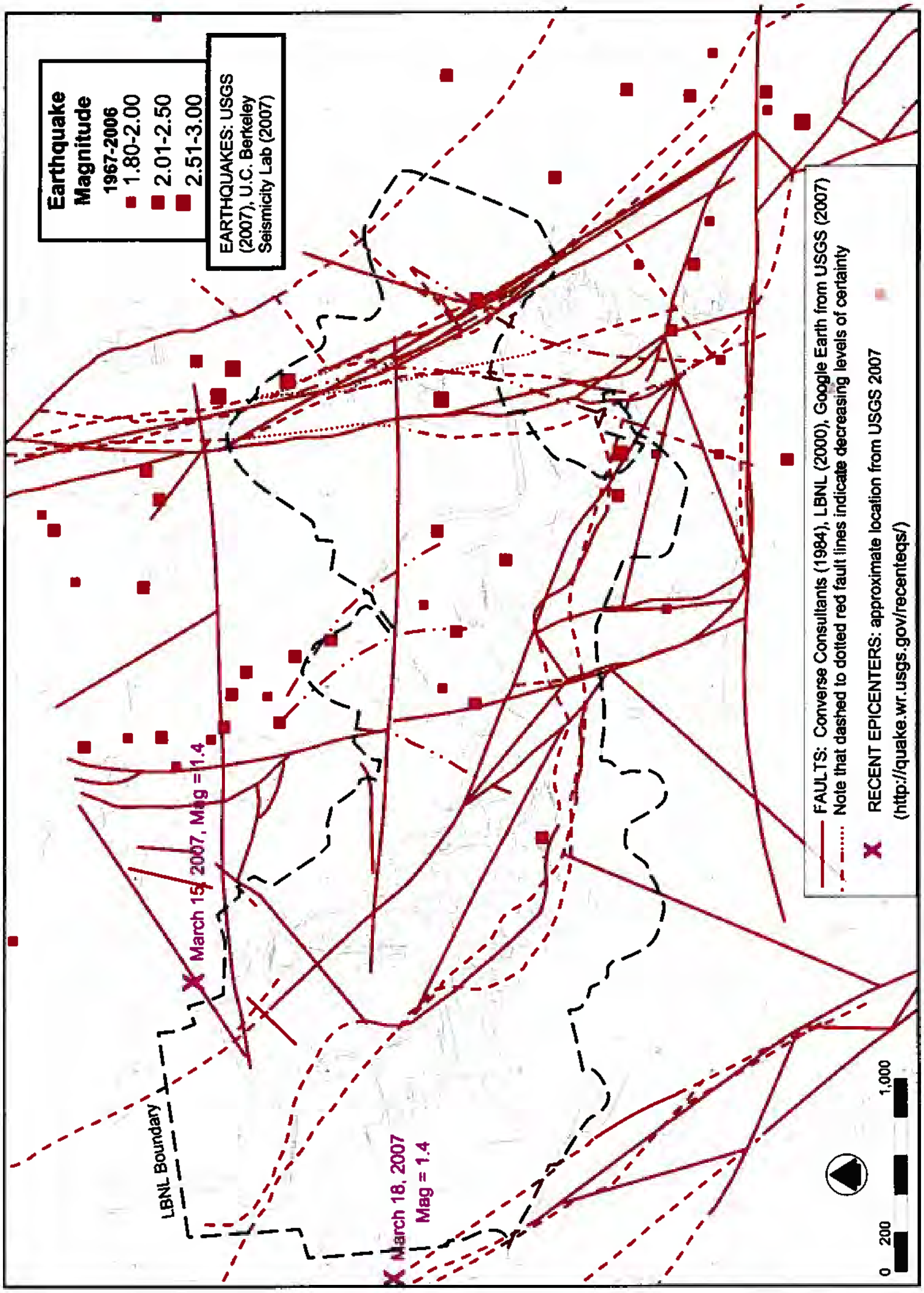


FIGURE 12a. EARTHQUAKE EPICENTERS AND FAULT COMPILATION AT LBNL IN STRAWBERRY CANYON 1967 - 2007

CMTW-27 cont.

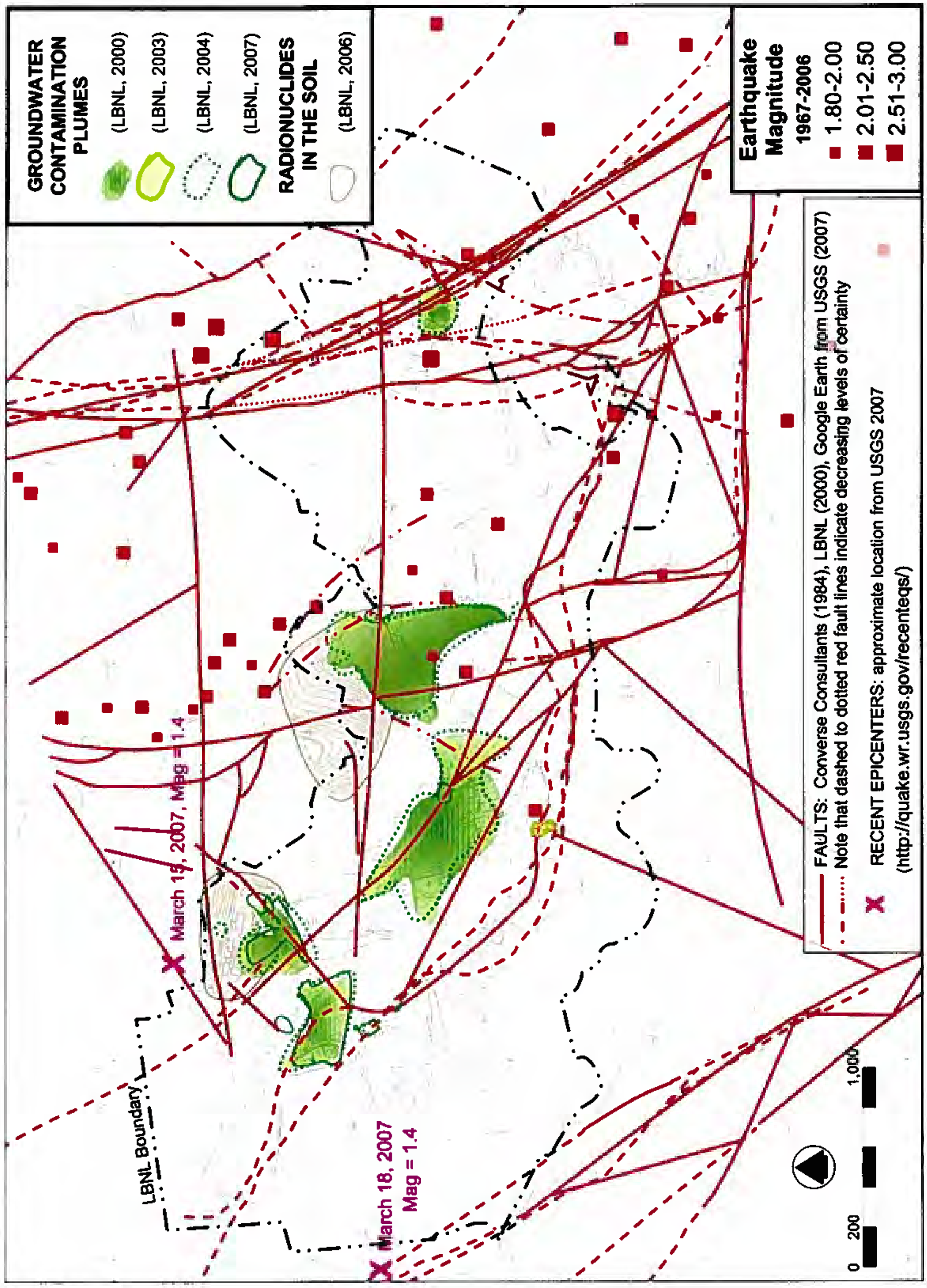


FIGURE 12b. GROUNDWATER CONTAMINATION PLUMES AND RADIOACTIVE CONTAMINATION IN SOIL RELATIVE TO FAULTS AND EARTHQUAKE EPICENTERS AT LBNL IN STRAWBERRY CANYON

CMTW-27 cont.

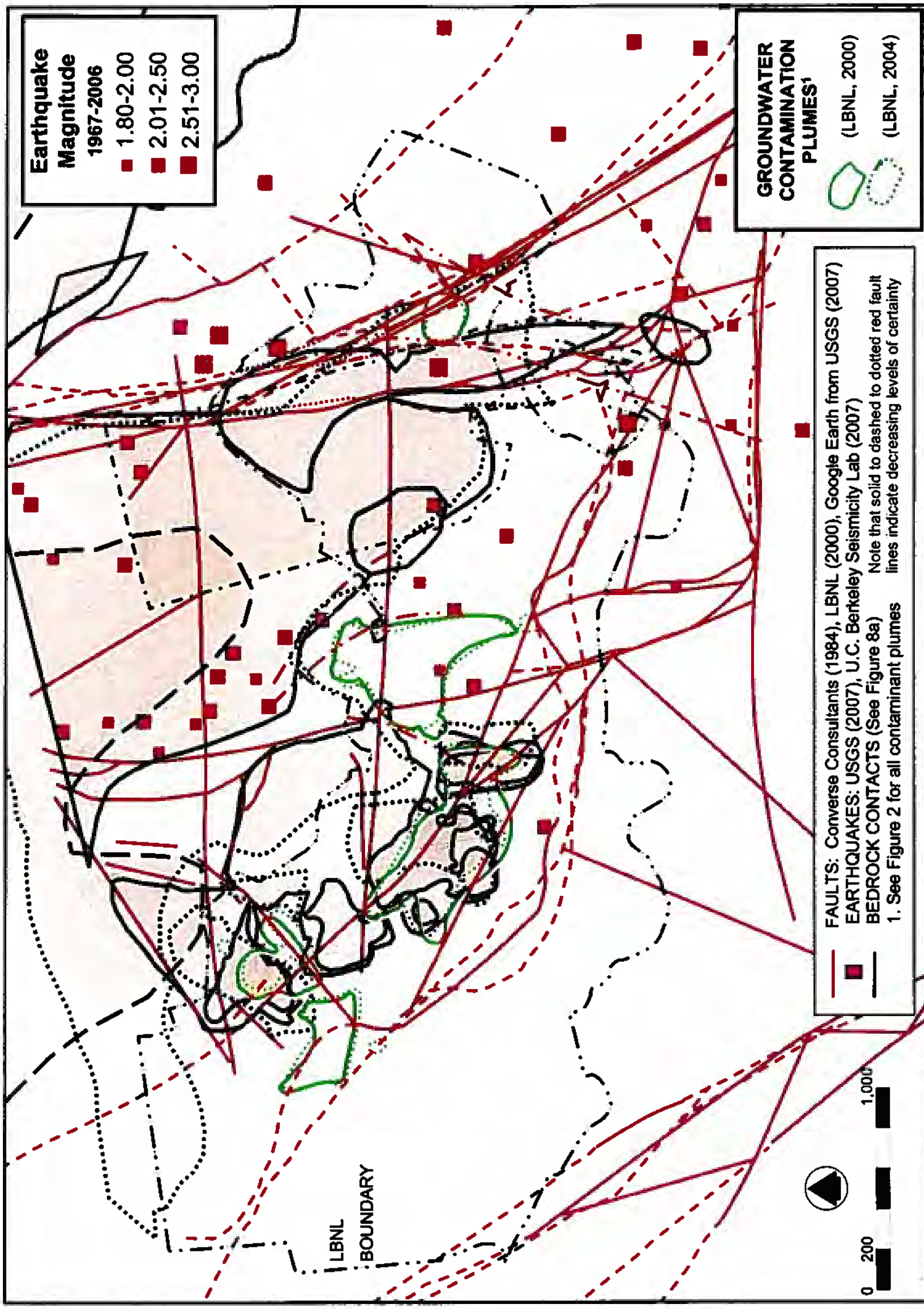


FIGURE 12c. COMPILATION OF GEOLOGIC MAPPING OF THE MORAGA BEDROCK FORMATION AND FAULTS IN RELATION TO CONTAMINANT PLUMES AT LBNL IN STRAWBERRY CANYON

CMTW-27 cont.

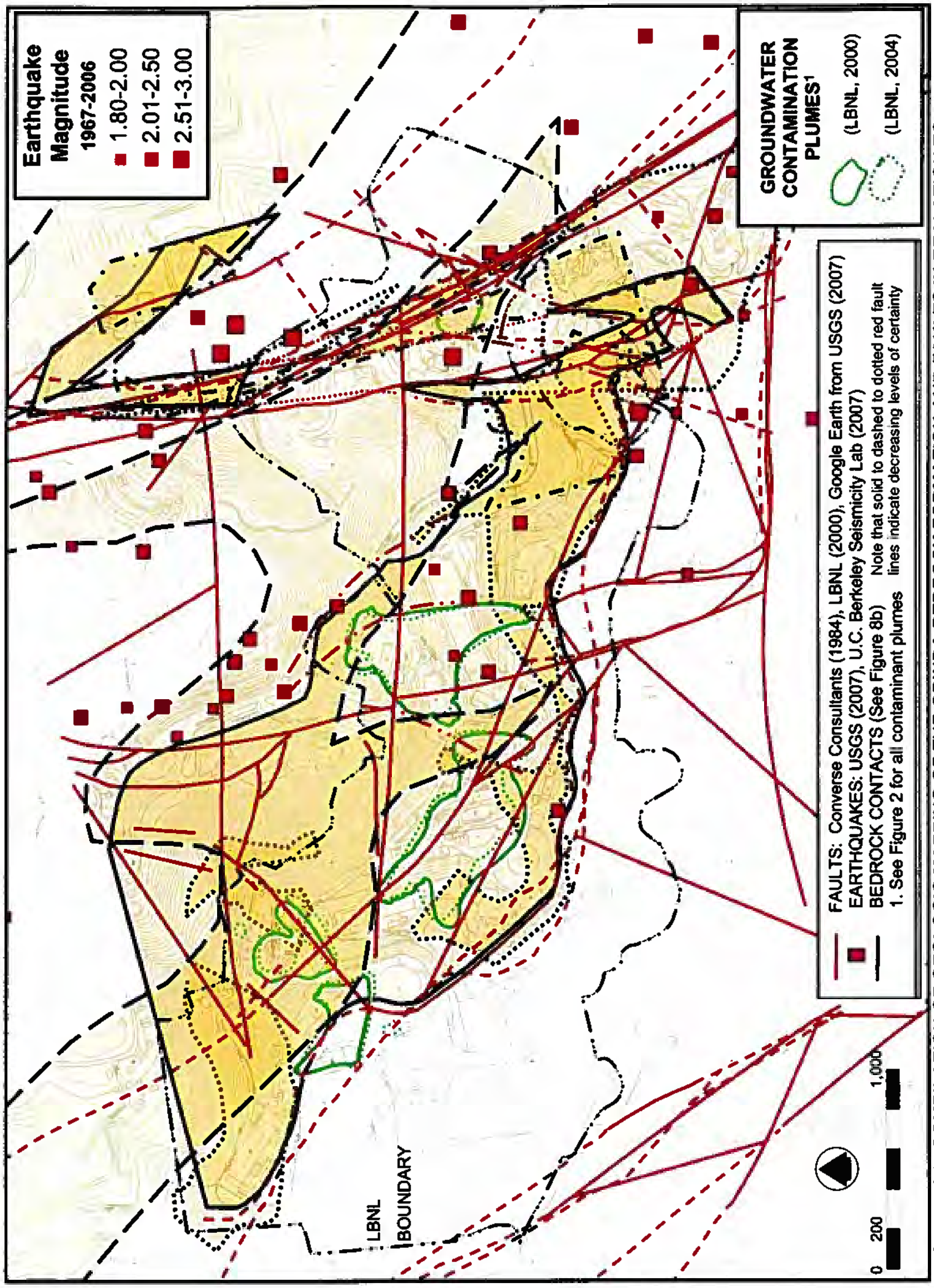


FIGURE 12d. COMPILATION OF GEOLOGIC MAPPING OF THE ORINDA BEDROCK FORMATION AND FAULTS IN REALATION TO CONTAMINANT PLUMES AT LBNL IN STRAWBERRY CANYON

CMTW-27 cont.

Coast Ranges have attendant parallel thrust faults rooted within primary strike slip faults. In particular, Jones' geometric model of kinematics and stress transfer through the crust indicates that many thrust faults are still active within the Bay Area. The implication of these findings is that more consideration should be given to assessing risks posed byvertical displacements of faults, as well as horizontal offsets. Faults with a principal component of vertical motion have been mapped by LBNL (2000) and others (USGS, 2007; Converse Consultants, 1984; Harding Lawson, 1979; and Lennert Associates, 1978), but little is known about their potential for thrust or down-dropping movements.

In Figure 12b, the location of the various faults shown previously in Figure 12a is shown relative to contaminant plume sites. As can be seen, every plume intersects at least one fault that has been mapped by either LBNL, its consultants, or by USGS (Figures 9a, 9b, 9c). When fault locations and the different bedrock contacts are shown in combination with the contaminant plume locations, as in Figures 12c and 12d, a complex picture emerges, showing that numerous influences could be affecting groundwater transport and contaminant plume migration. In the latter two figures, it can be seen that faults and bedrock contacts do not necessarily coincide. If the complexity of geologic conditions at the contaminant plume sites is oversimplified, the extent and potential contaminant dispersement could be underestimated because monitoring wells were not placed at key positions along fault lines.

Landslide Mapping

Deep-seated and shallow landslides occur throughout the Berkeley Hills including Strawberry Canyon. Both artificial and natural mechanisms have contributed to increased rates of landslide activity in many areas. Land use activities in the hills can decrease slope stability by the action of grading large cuts or filling deep canyons to create flat areas for roads and buildings. Such grading operations interrupt surface and subsurface flow, and create impervious surfaces that increase runoff. The cuts remove lateral hillside support and convert groundwater flow to surface flow. The fills can increase the loading of a hillside and can increase or decrease groundwater saturation depending upon whether they are capped by an impervious surface and whether they are properly drained.

CMTW-27 cont.

Triggers for initiating landslide movement can be artificial or natural. The natural triggering mechanisms can include intense or prolonged rainfall, greater than normal seasonal rainfall, earthquakes, or changes in mass balance from other landslides. Artificial triggers can include concentrated runoff from roads and other impervious surfaces, increased saturation from drain blockages, removal of root strength by deforestation, removal of lateral slope support, and increased loading of pre-existing slides by added weight of artificial fill.

Several landslide maps of Strawberry Canyon have been produced by different researchers, as shown in Figures 13a through 13f. All maps show that numerous landslides have been mapped within the LBNL boundary, yet not all researchers agree on location, size, or types of landslides. Nor do all maps necessarily depict the same comparable landslide category. For example, some maps show colluvial deposits and some show colluvial hollows as source areas for shallow slides and/or landslide scars, for example Figure 13b versus Figure 13c.

Additionally, some maps group colluvium with fill, such as Figures 13a and 13b. Nonetheless, we expect that the brown polygons on map Figures 13a through 13e and the brown and purple ones in map Figure 13f all represent shallow to deep-seated landslide failures. Using historical and recent aerial photographs, the landslide features in Figure 13f were specifically mapped for this project and the slides therefore, are mapped relative to the historical topography and channel network as per Figure 5.

Figure 14 shows a compilation of the contaminant plumes with all the landslides and surficial mapping shown in Figure 13a-13f. The compilation shows general agreement about the existence of large landslides in Chicken Creek basin and East Canyon but the boundaries of individual landslides have poor overlap. Because Figure 14 becomes overwhelmed by landslide features that cover more than 50% of the LBNL property, it is too difficult to read the numerous overlapping polygons. We have therefore reduced the number of map overlays in Figure 15 to just three interpretations, Nielsen, LBNL, and Collins (Figures 13a, 13b, and 13f.) We also eliminated the fill and colluvium shown in Figure 14, along mainstream Strawberry Creek that was mapped by Nielson and LBNL near of the UCB Memorial stadium in the southwest corner of the map.

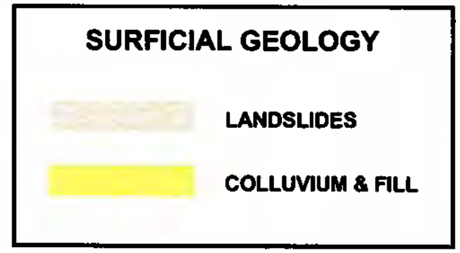
Figures 14 and 15 indicate that all the contaminant plumes either lie fully within or intersect the boundaries of landslides. This means that in addition to the complexities already demonstrated by bedrock contacts and faults intersecting the plume boundaries, there is also high probability that landslide failure planes could further influence groundwater movement. Moreover, the developing picture of complexity signifies that groundwater can transfer along any number of pathways (bedrock contacts, faults and landslide failure planes) and in any order of combination. In addition, future interpretation of contaminant plume migration could be complicated by continued earthflow creep movement or significant surges in slide activity.

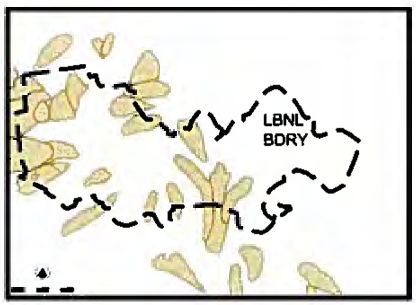
CMTW-27 cont.

The deep-seated slides in Strawberry Canyon, shown in Figure 13e and 15, in most cases tend to be slumps, earthflow, or complex earthflows that can involve movement of large intact blocks of bedrock and extend from ridge top to valley bottom. The complex slides can be characterized by multiple failure planes and zones of stability and instability that change after the mass balance is altered by renewed activity or by man-made changes during grading operations. In many cases, there is rotational movement near the crown scarp and the entire mass can slowly creep or move in sudden surges. These kinds of slides are often associated with clay-rich earth or bedrock. Perched water tables at the rotated head of the deposit can be common. Similarly, springs can typically be found where the failure plane near the toe of the slide verges toward the ground surface and converts its subsurface flow to overland flow. If contaminant plumes intersect landslides and travel along landslide failure planes, surface waters within seep gullies on the landslide or at the toe of the slide could also be at risk of contamination.

13a. Tor Nielsen, 1975 (USGS)

13b. LBNL, 2000





13c. Unpublished, Received from Kropp Assoc. (no author or date).

13d. Unpublished, Received from Kropp Assoc. (no author or date).

13e. California Geological Survey, 2003

FIGURES 13a-13e. MAPS OF LANDSLIDE STUDIES AND SURFICIAL DEPOSITS GEOLOGY

CMTW-27
cont.

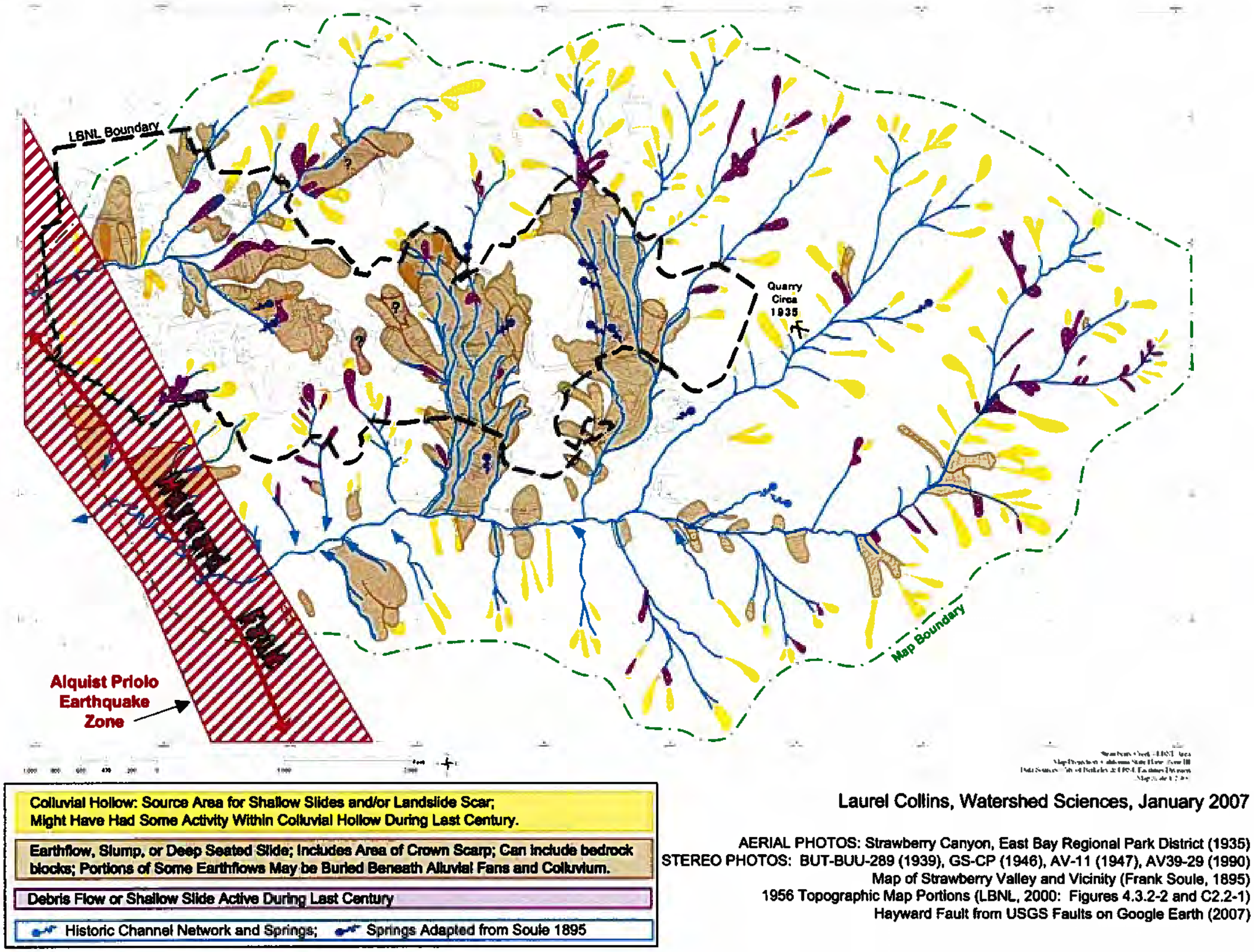


FIGURE 13f. INTERPRETATION OF HISTORIC CHANNEL AND LANDSLIDE NETWORK AT LBNL IN STRAWBERRY CANYON

CMTW-27 cont.

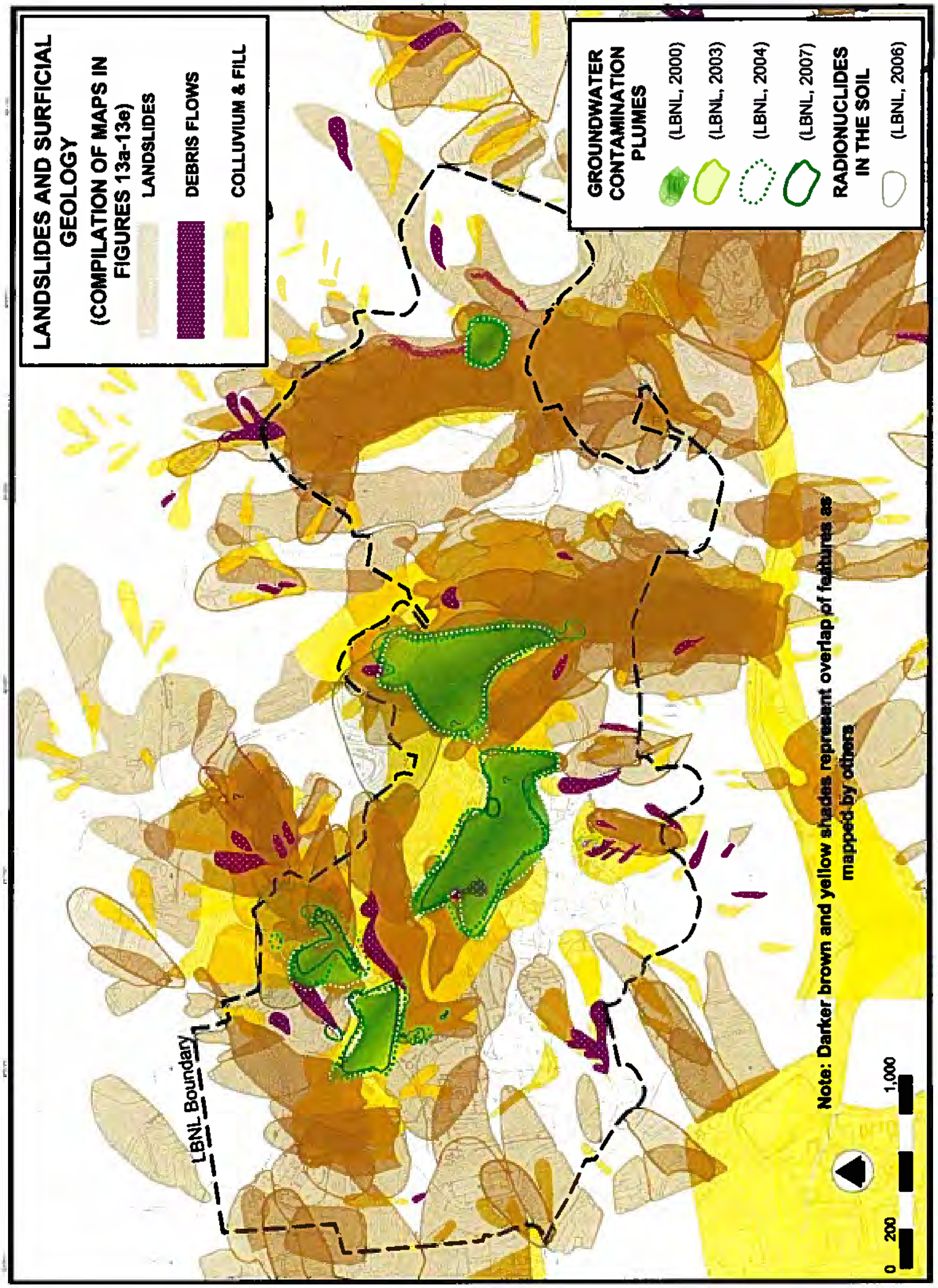


FIGURE 14. COMPILATION OF LANDSLIDE AND SURFICIAL GEOLOGY MAPS 13a-13f IN STRAWBERRY CANYON

CMTW-27 cont.

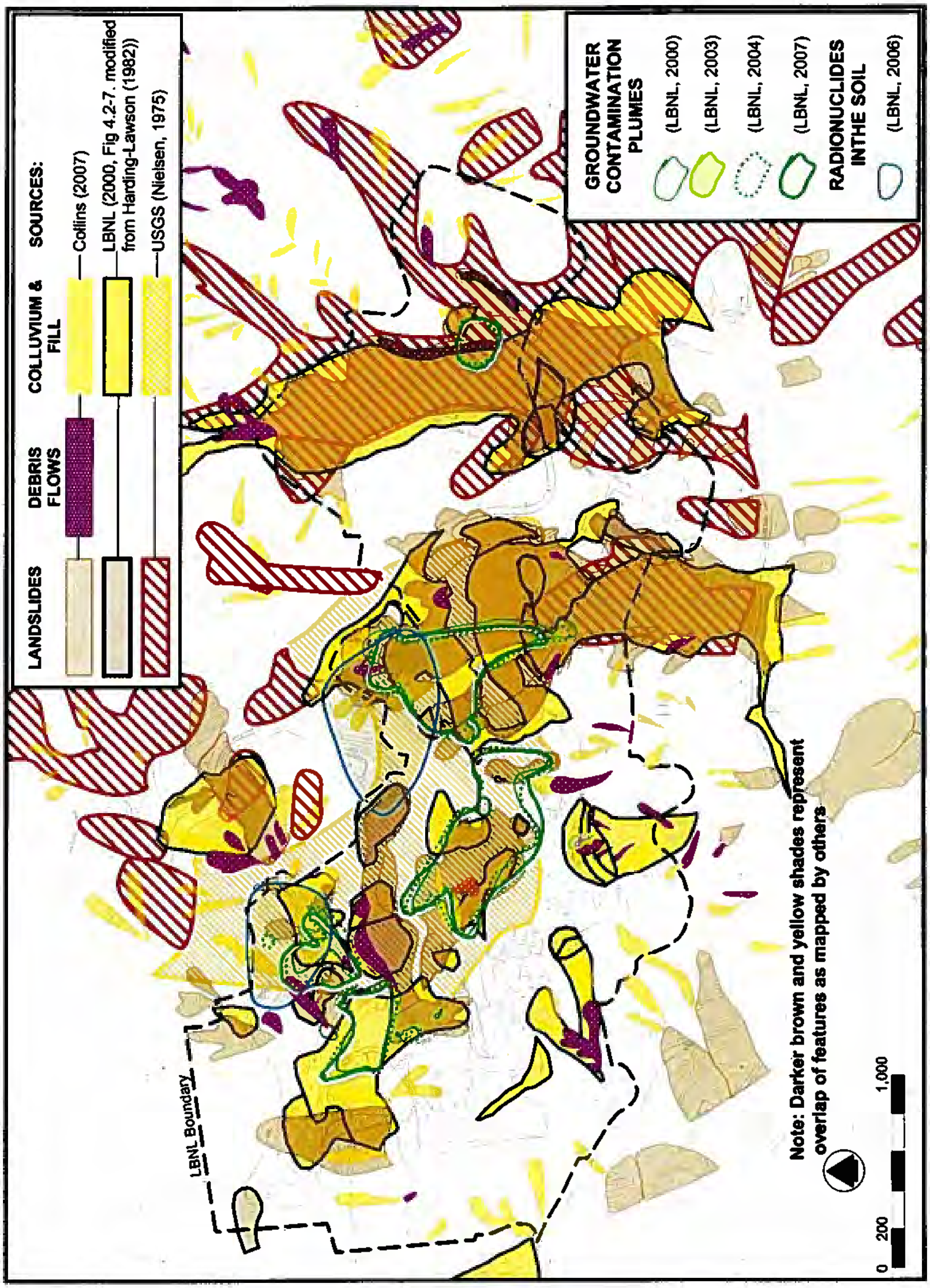


FIGURE 15. COMPILATION OF SELECTED LANDSLIDE MAPPING (FIGURES 13a,13b,13e) IN STRAWBERRY CANYON IN RELATION TO GROUNDWATER CONTAMINATION PLUMES

CMTW-27 cont.

Shallow landslides in Strawberry Canyon, shown in Figures 13e and 15, tend to be soil slips, debris slides, and debris flows, which typically occur on steep slopes and move typically at high rates of speed. They tend to be translational in movement and are often associated with soils or bedrock that is porous and not necessarily clay-rich. They often occur within colluvium-filled hollows. The debris flows can form alluvial fans at the base of their run-out pathways.

The head of East Canyon appears to have numerous alluvial fan deposits that might be overlaying a deep-seated earthflow within the Orinda Formation. The earthflow might be overlaying or obscuring fault traces. Alternatively, the earthflow might have been sheered by fault displacement. Interpretation of earthflow shear planes versus fault planes at the Wildcat Fault trench were an additional subject of contention between Garniss Curtis (UC Berkeley) and Steve Korbay (Harding Lawson Associates) during the investigation that was discussed earlier in this report. In 1993, Jones and Collins also had concerns about interpretations of earthflow failure planes versus faults in the Chicken Creek basin area when they observed road cut exposures together with UCB staff and geotechnical consultants.

Plume Monitoring Sites

A series of monitoring and water quality sampling wells were constructed at the plume sites during 1990s when contamination monitoring was first required by State of California Department of Toxic Substances Control as a condition of LBNL's Hazardous Waste Facility Operating Permit (issued in 1993). The criteria for establishing well locations came from historic data review for activities in each building at LBNL that could have potentially led, during normal operations, to dumping, spills and accidents prior to the existence of any environmental regulations and oversight. Figure 16 shows the location of all the wells, some of which LBNL has already closed, i.e. "properly destroyed" or is in the process of closing.

CMTW-27 cont.

Additionally, Figure 16 shows the location of the wells relative to the contaminant plume boundaries mapped by LBNL. Although numerous wells are located within the plume boundaries delineated by LBNL, the perimeters are not constrained by active sampling wells, especially along the potential migration pathways of faults, drainage courses, utility and sewer trenches, (and other engineered backfill) and landslides, as demonstrated in Figure 17a (map legend is Figure 17b). Bedrock contacts between Moraga and Orinda Formations (Figure 8a and 8b) are important, but were too complex to include in Figure 17a.

In order to adequately assess whether the monitoring wells are defining the actual contaminant plume boundaries, agreement on location of faults, bedrock contacts, and landslide boundaries is needed which is based upon well-founded information of what is actually known and what is hypothesized. Once improved mapping is accomplished at a higher resolution and accuracy than in the maps presented in this report, a strategy can then be developed to determine future locations of key sampling and monitoring sites. Until this is accomplished, there is reason for credible concern about contaminant plume boundaries and the groundwater monitoring program conducted to date by the LBNL.

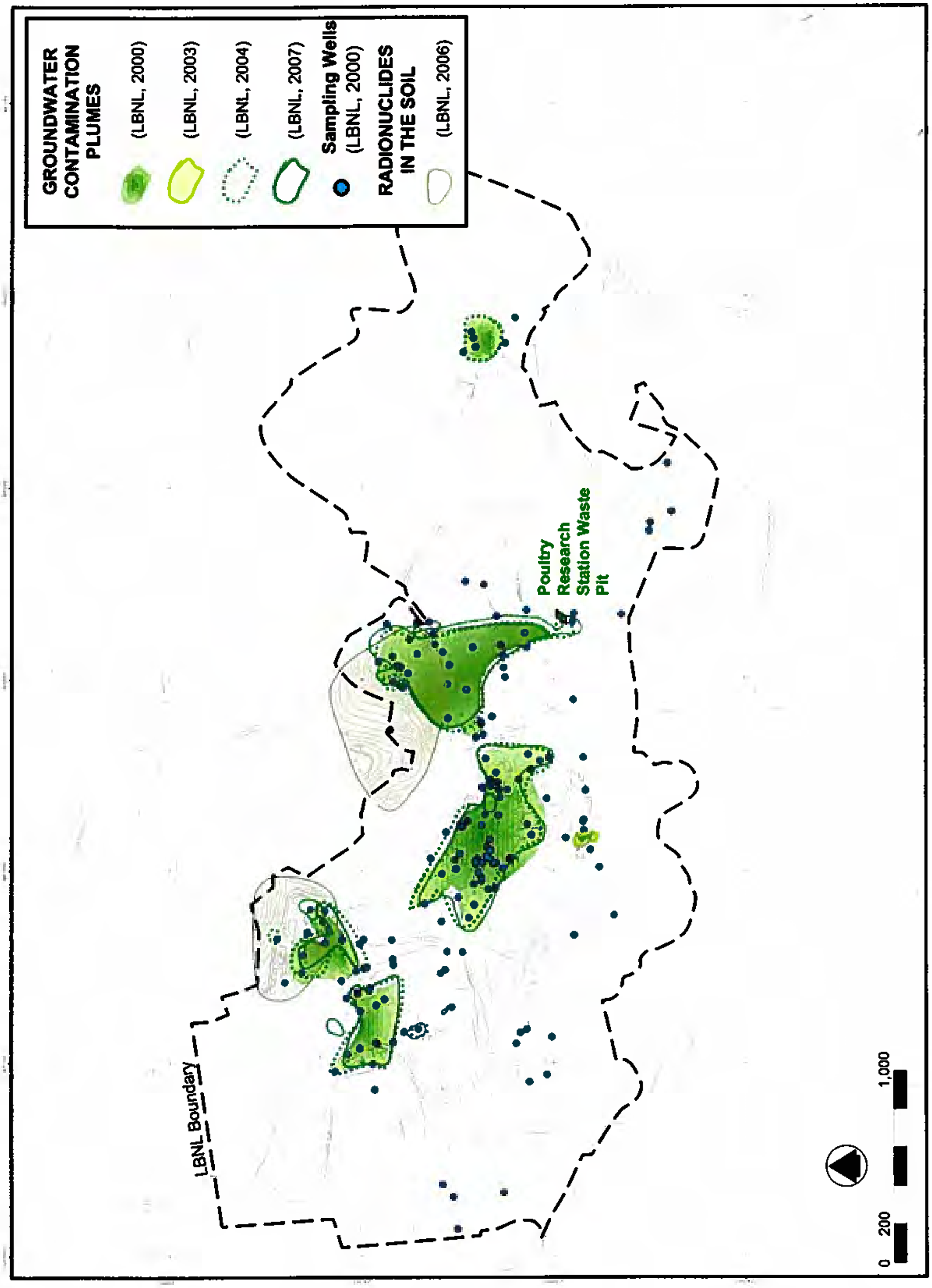


FIGURE 16. GROUNDWATER CONTAMINATION PLUMES AND SAMPLING WELLS

CMTW-27 cont.

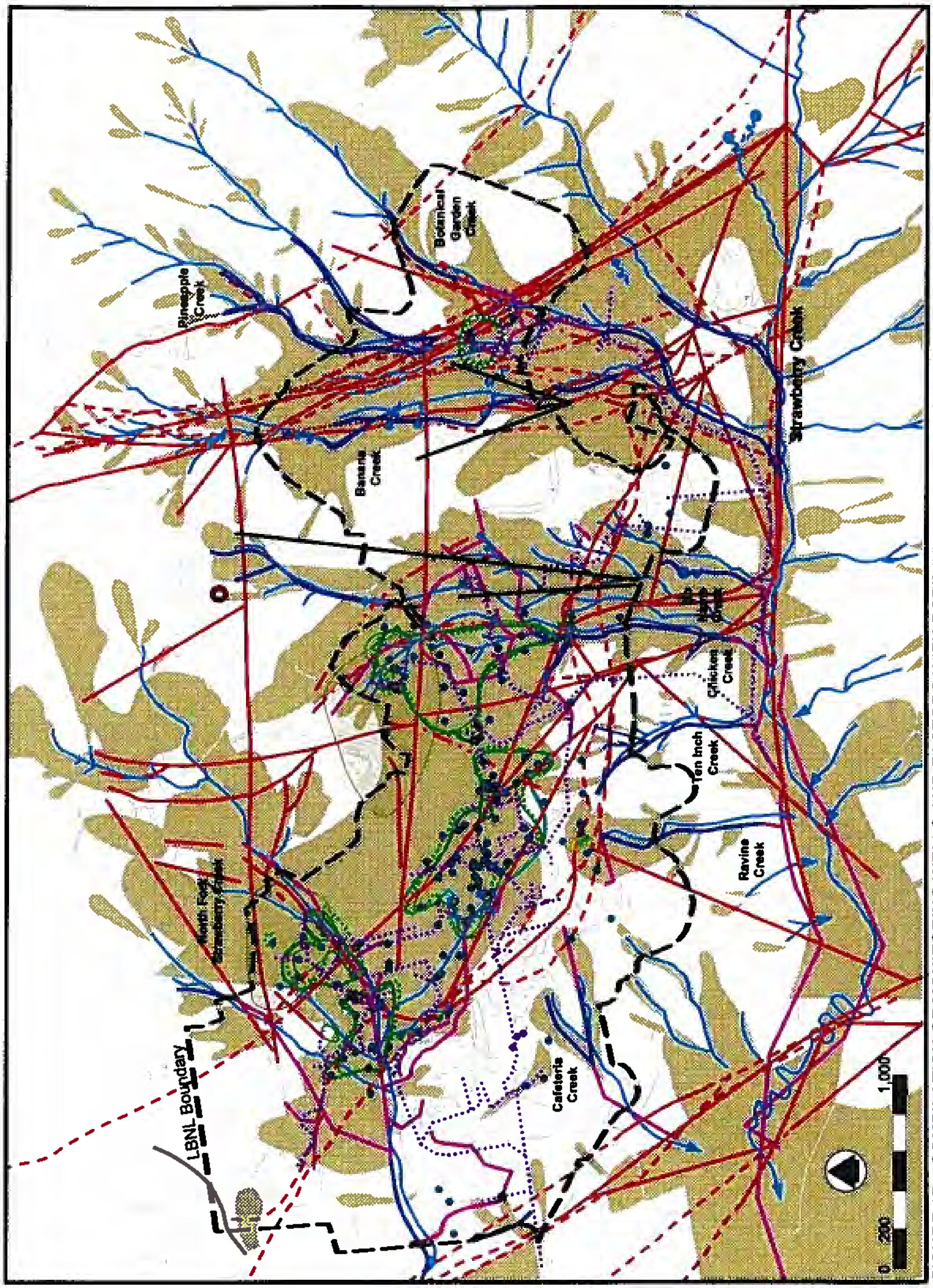


FIGURE 17a. COMPILATION OF MONITORING WELLS AND FACTORS WITH POTENTIAL INFLUENCES ON GROUNDWATER TRANSPORT AT LBNL. FOR BEDROCK CONTACTS VIEW FIGURES 8a AND 8b. SEE NEXT PAGE FOR MAP LEGEND.

CMTW-27 cont.

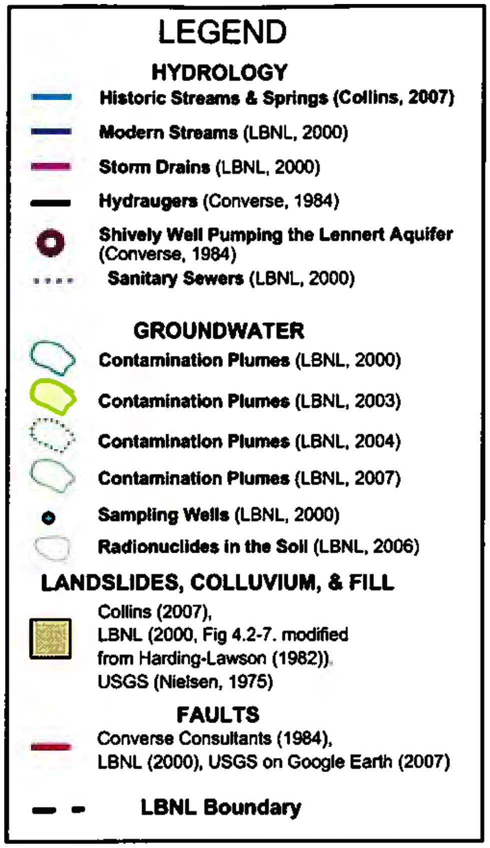


FIGURE 17b. LEGEND FOR FIGURE 17a COMPILATION OF FACTORS WITH POTENTIAL INFLUENCES ON GROUNDWATER TRANSPORT AT LBNL.

CMTW-27 cont.

Zones of Concern for Potential Plume Migration

Given the status of what is currently known, Zones of Concern for potential migration of contaminant plumes are delineated in Figure 18a (legend shown in Figure 18b). These are areas where contaminant migration might yet be undetected because of either insufficient placement of sampling wells or insufficient understanding and/or consideration of where bedrock contacts, faults, landslides, utility trenches, and current or historic drainages exist. These zones were based upon the compilations of many other researchers mapping of geology, and infrastructure. The compilation maps shown previously were used to define Zones of Concern because we do not have knowledge of which individual geology or landslide map is most accurate. Hence, the Zones of Concern should be considered suggestive of possible areas requiring further investigation.

The zones provide a graphic example of why either a better array of monitoring wells are needed and why a verifiable picture of the physical landscape is essential in Strawberry Canyon. Furthermore, potential surface water contamination is possible along drainages that intersect faults, landsides, and bedrock contacts that intersect contaminant plumes. An additional component of contaminant plume analysis not addressed in our project is the depth of contamination and subsurface geologic conditions. These require three

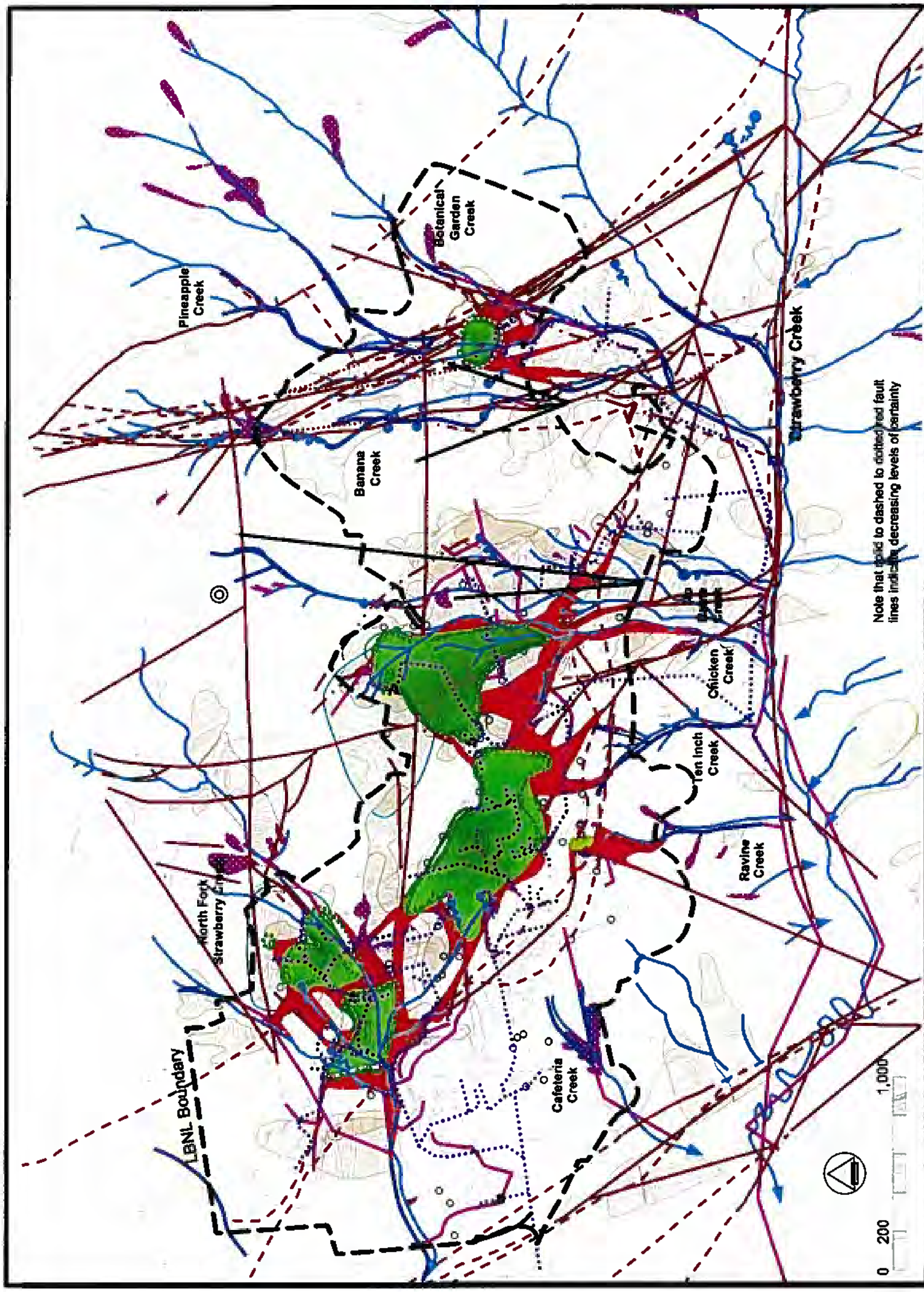


FIGURE 18a. ZONES OF CONCERN FOR GROUNDWATER PLUME EXPANSION ALONG COMPILED FAULTS, BEDROCK CONTACTS, LANDSLIDES, HISTORIC AND MODERN CREEKS. SEE NEXT PAGE FOR MAP LEGEND.

CMTW-27 cont.

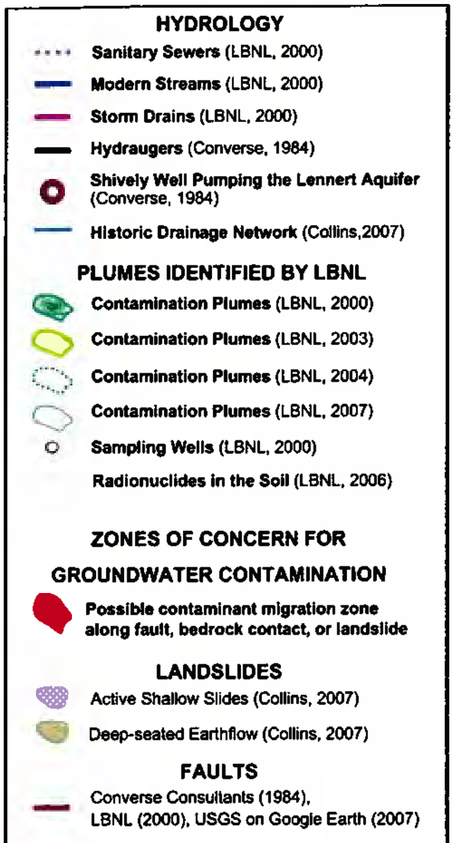


FIGURE 18b. LEGEND TO POTENTIAL FACTORS INFLUENCING CONTAMINATED GROUNDWATER PLUME EXPANSION

CMTW-27 cont.

dimensional analyses, which LBNL has shown on their GIS-based maps (LBNL 2000) that use as their foundation the geologic picture of Figure 7a and fault map of Figure 9a.

Future Development and Site Conditions

The LBNL presently occupies 202 acres, however by 2025 LBNL anticipates a net increase of occupied space of about 660,000 square feet, an increase of 1000 people, and up to 500 additional parking spaces (LBNL, 2007a). Figure 19 shows the tentative footprint of proposed future buildings in their Long Range Development Plan, which is available at www.lbl.gov/LRDP/. The map shows about 30 new buildings dispersed throughout their property boundary. Much of the new construction is planned for areas previously avoided because of stability or fault issues. For example, the majority of the new construction will be located in the Chicken Creek basin and the East Canyon where deep-seated landslides have been mapped.

Figure 20a (map legend shown in Figure 20b) shows landslide hazard risks (as mapped by LBNL) and deep-seated landslides (as mapped on the historic drainage network in Figure 13f by Collins). Interestingly, the deep-seated slides are not considered areas of high to medium risk even though large-scale landslide movement could be triggered by

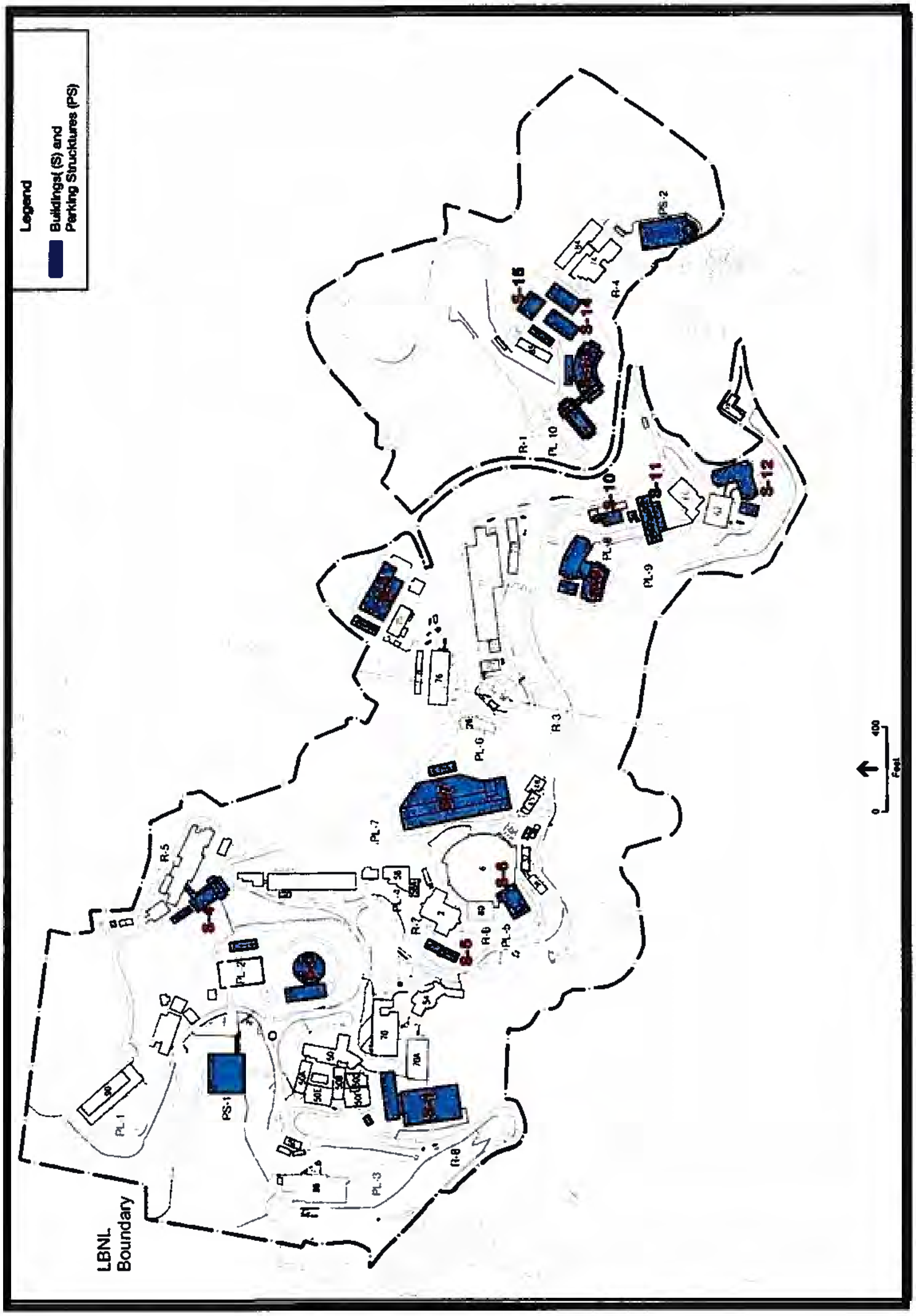


Figure 19. FUTURE BUILDING SITES AT LBNL ACCORDING TO LONG RANGE DEVELOPMENT PLAN (LBNL, 2007a).

CMTW-27 cont.

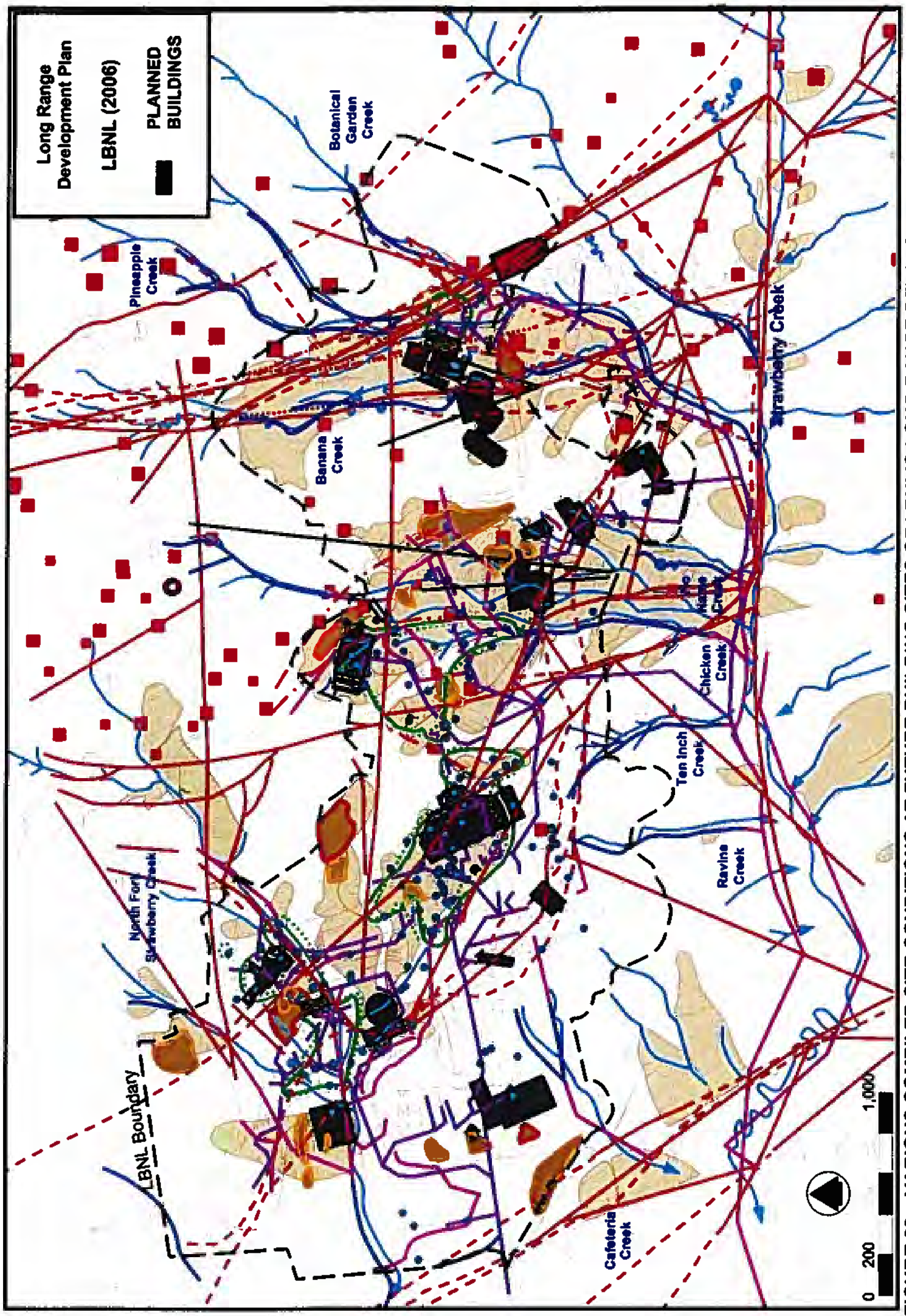


FIGURE 20a. VARIOUS COMPILED SITE CONDITIONS AT FUTURE BUILDING SITES OF LBNL'S LONG RANGE DEVELOPMENT PLAN. SEE NEXT PAGE FOR MAP LEGEND. NOTE THAT SOLID TO DASHED TO DOTTED RED FAULT LINES INDICATE DECREASING LEVELS OF CERTAINTY.

CMTW-27 cont.

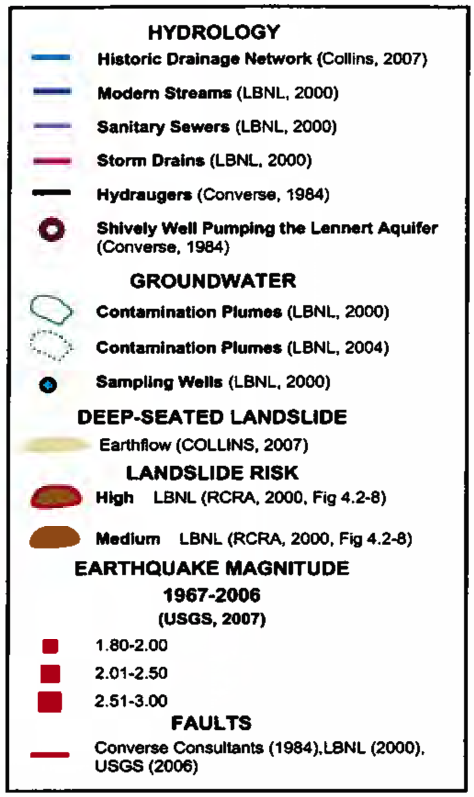


FIGURE 20b. KEY TO MAP 20a SITE CONDITIONS AND FUTURE BUILDING LOCATIONS

CMTW-27 cont.

large magnitude earthquakes on the Hayward Fault and many of the slides overlay or intersect faults. Many buildings are shown to straddle faults that occur on the deep-seated landslides. Various other compiled site conditions in Figure 20a are also shown at the proposed LBNL building sites including the known contaminant plume locations. Some of the new building sites would require grading within the plume locations, which could alter existing groundwater transport pathways, as well as require special handling of contaminated soils.

As planning proceeds, Environmental Impact Analyses will require geologic and environmental information. These required legal documents demonstrate additional future needs for integrated and comprehensive mapping efforts of geologic and environmental conditions in Strawberry Canyon. As more excavations and investigations are conducted, the opportunities will increase to make verifiable geologic maps showing actual bedrock, landslide, and fault exposures.

CONCLUSIONS AND GENERAL RECOMMENDATIONS

At the very least, it is important to identify where there is valid disagreement on geologic conditions, particularly at contaminant plume sites, to determine if these sites pose a threat to human health and safety. Specific investigations or well placed monitoring wells could be designed to resolve some of these issues. Without an improved understanding and portrayal of the geology in Strawberry Canyon, it is difficult to accept that the monitoring sites were specifically designed to detect potential movement of groundwater along intersecting faults, landslide failure planes, bedrock contacts, utility trenches, storm drains, and historic drainages.

If the complexity of geologic conditions at the contamination sites has been and continues to be oversimplified, and because monitoring wells were not placed at key locations along faults, utility trenches, old creek beds/seeps and other parameters that influence groundwater movement, the extent and dispersement of contaminants may have been, and will continue to be underestimated in the future. As development continues in the Strawberry Creek Watershed, and probabilities increase for more uncontrolled releases and contaminant spills, the need will also increase to have an improved and comprehensive base of understanding. Protection of human health and water quality should be a priority, requiring more than a conservative approach when trying to investigate the extent of toxic contamination in an urban environment.

- An outside scientific technical review group should be formed to oversee LBNL's plume monitoring strategy and evaluate interpretations of plume migration. **CMTW-27 cont.**
- The types of factors that influence groundwater flow that have been compiled on the maps in this report should be developed on a three dimensional GIS base map.
- Information from previous consulting reports should be compiled to show the locations of verifiable bedrock outcrops, landslide deposits, landslide failure planes, and fault trace locations.
- Confidence levels should be assigned to various features such as faults, bedrock contacts, landslides, and boundaries of plume contamination.
- Future geologic investigations and excavation work in Strawberry Canyon should be required to show verifiable geologic exposures on the same base map and assign confidence levels to future interpretations.
- Further investigation of the nature of faulting, geology, and landslides in Strawberry Canyon should be conducted.

ACKNOWLEDGMENTS

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CMTW-27 cont.

LBNL/SLS II/DEIR
COMMENTS/PART 2

Committee to Minimize Toxic Waste

DOE/SLSII/DEA
COMMENTS#5of5

Jeff Philliber
Environmental Planning Group
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 76-234 A
Berkeley, CA 94720

January 26, 2009

Comments on the Notice of Preparation (NOP)/Environmental Impact Report (EIR) under CEQA and Environmental Assessment (EA) under NEPA for Seismic Life Safety Phase 2B Project at the Lawrence Berkeley National Laboratory

Dear Mr. Philliber,

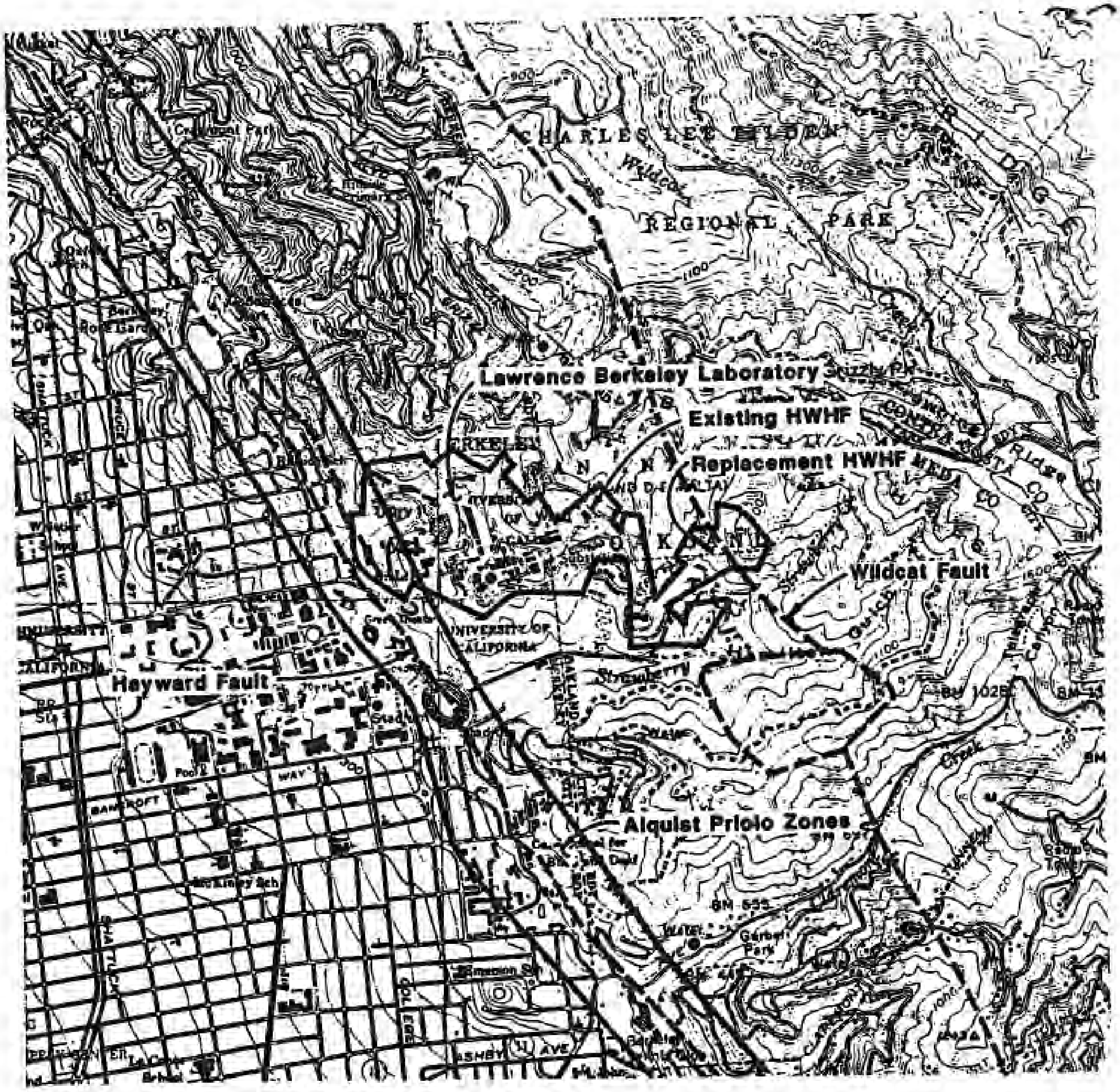
Again - another proposed project, this time with at least 17 (seventeen) individual components, in the treacherous Strawberry Canyon Caldera, the location of the Lawrence Berkeley National Laboratory (LBNL).

It will be impossible to adequately analyze the environmental impacts of these 17 individual projects in one EIR/EA as proposed.

At minimum we ask that the project be severed to its 5 major geographical components, as described in Figure 3 of the NOP's project information section, and that 5 separate, individual EIR/EA/EIS reports be prepared, for the reasons stated below. CMTW-27 cont.

The entire LBNL campus is situated in the HAYWARD EARTHQUAKE FAULT IMPACT ZONE (HEQFIZ), as seen in the 1992 USGS map (page 2), sandwiched between the Hayward Fault and the Wildcat Fault.

The inadvisability of any development/any new development in the Strawberry Canyon Caldera is very soberly described by UC Berkeley's Garniss H. Curtis, Professor Emeritus, Department of Earth and Planetary Science in his May 11, 2008 comment letter (pages 3-5). We ask that all these concerns be addressed in the EIR/EA/EIS reports' Geology and Soils section. It appears that, since the collapsed caldera is filled with unstable landslide materials, a major earthquake along the Hayward Fault will have Potentially Significant Impacts, that cannot be mitigated by anything other than not building in the canyon, i.e. a complete moratorium on new construction at LBNL and a gradual off-loading of facilities from the Hill to safer areas. We ask that this scenario be included in the scope of the EIR/EIS.



SOURCE: Base Map U.S.G.S.
California Division of Mines and Geology 1992

NORTH

0 1000 2000

SCALE IN FEET

FIGURE II-20
MAP SHOWING ALQUIST PRIOLO ZONES AND WILDCAT FAULT

Lawrence Berkeley Laboratory II-25

CMTW-27 cont.

SFO33214.AO 7.13.92E

2/19

Statement of Garniss H. Curtis, Professor Emeritus Department of Earth and Planetary Science, U.C. Berkeley

On Sun, May 11, 2008 at 2:10 PM, Garniss Curtis <gcurtis@berkeley.edu> wrote:

To: anne.shaw@ucop.edu
From: Garniss Curtis <gcurtis@berkeley.edu>
Subject: regarding certification of final environmental impact reports for the proposed computational research and theory facility and the Helios energy resource facility and project approvals. [*Please note that several typographical errors and misspellings have been corrected in the following text.*]

As the request for my geologic opinion on the advisability of constructing large buildings in the lower part of Strawberry Canyon and in the next canyon to the north known as Blackberry Canyon came to me on May 4th, I have to be brief and rely on my memory. I shall first say as strongly as I can "absolutely do not construct any buildings in those two canyons", then I shall go into the reason based on the work I did as consultant to Mr. Ben Lennart 25 to 35 years ago, who was contracted by the University to investigate a number of sites for possible constructions or for stopping landslides that were threatening buildings.

First, the geologic setting of the two areas: The active Hayward Fault goes across the mouths of both canyons. Further east, the Wildcat Canyon fault parallels the Hayward Fault behind the Botanical Gardens and northward joins the Hayward near the town of San Pablo. Southward the Wildcat Canyon fault can be easily traced to Sibley Park and beyond. A few small epicenters lie along this fault near its junction with the Hayward, but it does not seem to be active elsewhere to the south. However, in the past, the area between the two streams and the two faults (which includes the whole of the Lawrence Laboratory complex) lay four miles to the south next to Sibley Park. The volcanic rocks in both areas have potassium-argon dates of approximately 10 million years, and the rhyolite found in both of them is the same rhyolite. The volcanic rocks underlying most of the Lawrence Lab complex fill an old crater, a collapse caldera. The old volcano that once rose above these rocks collapsed after the expulsion of a very large amount of rhyolite ash, now largely removed by erosion. The volcanic rocks broke up as the collapse occurred and many show crushing and deformation and are mixed with large amounts of ash and volcanic fragmental debris. This material should never have been built on as it is so clay-rich and unconsolidated. The western rim of this caldera is easily traced from its arcuate shape which is cut off by the Wildcat Canyon Fault just south of the Botanical Gardens near the upper part of Strawberry Creek. It swings around very close to the old Cyclotron and continues north to join the Wildcat Canyon Fault in Wildcat Canyon not far from the Merry-go-Round in Tilden Park. The boundary rocks to the west are sandstones and shales thought to be of Cretaceous age, that is, they are older than 65 million years. Exposures of these

CMTW-27 cont.

3/19

sandstones and shales are good below Building 50 down to Bowles Hall, and they dip westward at angles of 20 to 25 degrees, about which more later. The Hayward Fault passes very close to the rear of Bowles Hall after going through the Stadium where it has caused major deformation of the support pillars and offset of the two sides of the stadium since its construction in 1927.

Behind Hearst Mining Bldg and a few feet to the east, is the Lawson Adit which is a tunnel going eastward. Begun in the 1920' or earlier, it was completed in 1938 when it reached the Hayward Fault. Professor George Louderback told me (Personal comm.) that it was not ordinary fault gouge that he found in the Hayward Fault zone but a peculiar mixture of serpentine and metamorphic rocks that also appear on the surface and underlie Stern Hall and part of Foothill Student Housing. Founders Rock near the corner of Hearst and Gayley Road is in this melange. Also in the tunnel are several exposures of the offset of Strawberry Creek as determined from the contained rounded cobbles of Strawberry Canyon origin . Thus this indicates a displacemeent of more than 600 feet north along the Hayward Fault.

Still further north along the Hayward all the way to San Pablo huge amounts of the melange similar to that in the Lawson Adit have been squeezed out of the Hayward Fault and are gradually sliding down the slope below the fault. Much of this melange has reached the bottom of the hill back of El Cerrito. Along the Arlington many houses built on this melange are sliding and have caused a great number of legal problems. Within the fault itself no movement can be detected in these deposits, some of which are more than 100 feet thick. Thus we believe that movement and expulsion of this melange takes place during major earthquakes on the Hayward Fault.

CMTW-27 cont.

A great deal of research has been done recently on the Hayward Fault by the USGS at Menlo Park which was reported in a talk on the last Thursday of this past April. They have established a return time of major quakes of 6.5-7 magnitude on the Hayward Fault of 130 years. The last major quake along the northern part of the Hayward Fault was 140 years ago, so we are over-due. They estimate that there is approximately a 65 percent chance a major quake will occur in the next 30 years.

Lennart was able to get survey notes from East Bay Municipal Utility District for the San Pablo Dam water tunnel to El Cerrito which crosses the Hayward Fault and shows that the right lateral horizontal movement of approximately one centimeter per year is matched by uplift of the east side of the fault of approximately one centimeter per year also. So, with the evidence of the horizontal displacement of the old Strawberry Creek of 600 feet horizontally along Galey Road, the Cretaceous sedimentary rocks east of the Hayward Fault there have also risen 600 feet. Building 50(?) sits on these Cretaceous strata which, as mentioned, dip westward 20-25 degrees. If an earthquake occurs when these beds are soaked with winter rains the chance of a major landslide are great along the slippage planes of shale dipping westward. Minor slides have already occurred in these beds behind Bowles Hall. Indeed, the Foothill Student Housing was planned to be built there until I called attention to the landslide. A major landslide would probably destroy all the buildings on both sides of Galey Road from the Stadium to the buildings on both sides of Hearst Avenue and would probably reach Dow Library, destroying everything in its path to that point and possibly beyond. Buildings in the lower parts of both Strawberry and Blackberry Canyons would be buried if not destroyed.

Major landslides of the type I have described here are not rare along the Hayward Fault as was shown to us during our study of the Hayward fault at the base of the hill behind the Clark Kerr Campus. We discovered that most of that campus was underlain by a large landslide that had originated in Claremont Canyon, and was gradually moved northward along the Hayward Fault. Trenches and drill holes showed this landslide to be up to 30 feet thick. It extends westward to and possibly beyond Piedmont Ave. Further south is a huge landslide that underlies most of the campus of Mills College and extends westward another quarter mile Still further south are more large slides that have originated in canyons and steep slopes east of the Hayward Fault. As the hills rise and become unstable, earthquakes cause them to break loose and slide. Very few large slides have occurred on the eastern slopes of the Berkeley Hills, hence the relationship to earthquakes of major landslides close to the Hayward Fault along the western slopes of the Berkeley Hills. Normal erosion rounds off unstable areas on the eastern slope of the Berkeley Hills before they break loose and slide.

CMTW-27 cont.

Most of the buildings of the Lawrence Lab. are on the unstable ground filling the old caldera, particularly the Bevatron and associated buildings. As the Cretaceous beds immediately west of these buildings have been eroded away there is nothing to keep these soft caldera-filled beds from sliding. The buildings on them will certainly move a few feet in a major earthquake if not hundreds of feet. Keep in mind the Loma Prieta quake of I989 of magnitude 6.9 which from a distance of over 60 miles destroyed a section of the Bay Bridge, a section of the overhead freeway in Oakland killing 63 people, and many houses on filled ground in the Marina of northern San Francisco some 70 miles from the quake!

No major buildings of any kind should be constructed in either of these canyons bordering this huge block of unstable rock.

Profesor Emeritus Garniss H. Curtis
Dept. Earth and Planetary Science
University of California, Berkeley, CA

Garniss H. Curtis
Berkeley Geochronology Center
E-Mail: gcurtis@uclink.berkeley.edu

LBNL is a nuclear-industrial complex and many of the 14 structures proposed for demolition have been potentially used for work involving radioactive and hazardous materials and are potentially located on contaminated soil and on top of known radioactive and hazardous waste contamination plumes.

The NOP document referred to these 14 structures as trailers, labs and shops without any specifics as to their past use.

LBNL's Site Environmental Reports provide the following names and descriptions:

Buildings

25 Mechanical Technology/Engineering Shop
25B Waste Treatment Facility
55 Research Medicine/Radiation Biophysics

(74 Research Medicine/Radiation Biophysics, Cell&Molecular Biology Laboratory)
74F Housing for animals used for research at facility above

4 Magnetic Fusion Energy (MFE)/ALS Support Facility
5 Magnetic Fusion Energy (MFE)/Accelerator and Fusion Research
14 Accelerator&Fusion Research&Earth Sciences
16 Magnetic Fusion Energy Laboratory/Accelerator and Fusion Research Laboratory
17 EH&S/Applied Sciences Lab

(71 Heavy Ion Linear Accelerator (HILAC/Center for Beam Physics, Ion Beam Technology)
71 C, D, F, H, J, P B-Factory associated with facility above

LBNL operates facilities which contain Radioactive Material Areas (RMAs) that are subject to radioactive air emissions regulations of NESHAPs (National Emission Standard for Hazardous Airborne Pollutants) and have the pontial to emit radionuclides into the atmosphere. Building 55 has at least 9 such sources.

We ask that the Hazards and Hazardous Materials sections of the EIR/EIS address/describe in detail the history of the uses of all the 14 buildings proposed for demolition and list all the equipment and radioactive/hazardous materials used at these structures and the various kinds of wastes generated there during their lifetime.

This will help to better assess the degree of contamination associated with each of the structures, lab equipment, waste water/sewer lines, sumps etc. Especially, as you know, almost 3 pounds of mercury was recently found in a Building 71Q storm drain sump, (pages 7-8) estimated to have been there from 10 to 40 years.

CMTW-27 cont.

impact Special categories	Cat OE – operational emergencies	Cat R - recurring

25. Description of Occurrence

On September 29th, while cleaning out a catch basin using a vacuum extractor, Facilities Labor Shop employees observed metallic mercury in the sediment at the bottom of the catch basin. Work was stopped and EH&S was contacted. The asphalt area around the catch basin was assessed for mercury and decontaminated, as subsequently was the vacuum truck. The extracted sediment was removed from the vacuum truck and stored in a 55-gallon drum; the drum was placed in a WAA. Waste materials from the cleaning were properly discarded. The catch basin itself was temporarily closed and sealed with polyethylene sheeting pending future clean up response planning and investigation.

On October 12th, Labor Shop personnel, under the supervision of site IH personnel, removed the rest of the contaminated sediment from the catch basin and placed it in a lined 30-gallon drum. The drum was placed in a WAA, and samples of the sediment inside this drum and the drum noted above (from the original effort to clean the catch basin) were collected on October 14th. Also that day a video camera was inserted into a 4-inch cast iron pipe leading to the catch basin and a 10-inch corrugated metal pipe leading out of it. This effluent pipe was corroded, and the camera could not be inserted very far into it. No mercury was observed in either of these two pipes. Additionally, six sediment samples were collected from a concrete structure at the outfall of the storm drain line to the North Fork of Strawberry Creek. Sampling results from the analytical laboratory were received Oct 21, 2005. They indicate that it is unlikely that any mercury had been released into the creek: two samples were non-detect at a detection limit of 0.13 and 0.16 mg/kg, respectively, and the maximum of the 4 other samples was 0.34 mg/kg, within the 0.5 mg/kg background concentration of mercury for Berkeley Lab soil and bedrock.

The two samples taken from the drums which contained catch basin sediment showed the following results for mercury: 7,900 mg/kg in the 30-gallon drum, and 2,400 mg/kg in the 55-gallon drum. Based on the actual weight of the sediment in the drums, the amount of mercury found in the catch basin was calculated to be 2.9 pounds. This exceeds the federal reportable quantity for mercury of 1 lb. Accordingly, on October 24th, LBNL notified the Office of Emergency Services, The City of Berkeley, the Regional Water Quality Control Board, and the Department of Toxic Substances Control (which had previously been informally notified).

CMTW-27 cont.

28. Operating Conditions of System/Building/Equipment: The pipe from the floor drain in the basement of building 71 which had led to this catch basin had been cut and capped in 1995 as part of the effort to eliminate illicit connections as required by the California industrial storm water permit held by Berkeley Lab. Mercury had been found in the floor drain and pipe at that time (see SAN-LBL-EHS-1995-0001). The effluent pipe is corroded and blocked, presumably crushed. The catch basin only drains the relatively small surface area around it. According to Laborers' records, this catch basin had been cleaned on 10/26/04, but only to a depth of 68 inches . The bottom of the catch basin has now been determined to be 79 inches. It is presumed that this mercury has been in the sediment of this catch basin for from 10 to 40 years.

CAUSAL INFORMATION

32. Description of Cause:

ISM DEFICIENCIES

35. ISM Deficiencies or Weaknesses (check all that are applicable):

Scope of Work LTA*	Analyzed Hazards LTA	Developed/Implemented Controls LTA
Performed Work Within Controls LTA	Feedback and Improvement LTA	X ISM not applicable

* LTA = Less Than Adequate

LBNL ORPS SHORT FORM WORKSHEET

Notes and instructions:

1. The ORPS Short Form is used for Significance Category 4 occurrences. Excluding corrective actions required to mitigate the problem, completion of the Short Form constitutes the sole requirement for reporting Category 4 occurrences.
2. Some fields in the DOE ORPS database are not applicable to LBNL operations, thus field numbers in this form are not sequential.
3. Electronic version of this form is available at the LBNL ORPS web site, . Other ORPS references and resources are available at the website or contact the Office of Assessment and Assurance (OAA) at 4046 / 7457 for additional assistance.

FACILITY / PERSONNEL INFORMATION

2. Name of Division / Department: Environment, Health, and Safety
3. Facility Function Code (check only one):

Explosive (03)	Tritium Activities (09)	Fusion Activities (10)
Environmental Restoration (11)	Solar Activities (14)	Accelerators (16)
Laboratory – Analytical (17A)	Laboratory – R & D (17B)	Balance-of-Plant – Offices (99A)
Balance-of-Plant – Machine shops (99B)	Balance-of-Plant – Site/outside utilities (99C)	Balance-of-Plant – Safeguard / security (99D)
Balance-of-Plant – Storage (99E)	Balance-of-Plant – Laundries (99F)	XBalance-of-Plant – Infrastructure (99G)

5. Name of Division Director/ Division ORPS Designee: Regina Lackner
6. DD / Designee Phone No.: (510) 486-7413 **7. Job Title of ORPS Designee:** Regulatory Compliance Eng.
11. Program / Project: Unknown (historic release)
12. DOE Secretarial Office (i.e., sponsoring DOE program; Office of Science [SC] is LBNL's default choice):

BV	EE	EH	EI	EM	FE
ME	NA	NE	NP	RE	X SC (default choice)
SE	SO	SW	UE	WA	

13. System/Building/Equipment involved in occurrence: Storm drain catch basin.
17. Plant Area (building & room location of occurrence): East of building 71Q.

CMTW-27 cont.

DATE AND TIME INFORMATION

	Date	Time
18. Discovery (when event or condition was first identified)	9/29/05	~ 10 am.
19. Categorization (when reportability and significance determined)	10/24/05	~ 9 am.
26. DOE Notification	10/11/05	~ 2 pm
27. Other Notification (person and organization contacted):	10/12/05	10 am
Dr. Waqar Ahmad, Department of Toxic Substances Control	10/24/05	12 pm
George Leyva, Regional Water Quality Control Board		
Dacia, Office of Emergency Services	10/24/05	12 pm
Nabil Al-Hadithy, City of Berkeley	10/24/05	1 pm

OCCURRENCE DESCRIPTION

20. Subject / Title of Occurrence: Mercury in Storm Drain Catch Basin
22. Significance Category (each reportable occurrence has a Significance Category. See .)
Cat 1 – significant XCat 2 – moderate impact Cat - 3 minor impact Cat 4 – some impact

To further illuminate our concerns we are enclosing a copy of CMTW's March 2007 Report titled:

Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California (as a CD).

We specifically ask you to review sections on CONTAMINANT SITES (Chemical and Hazardous Contamination and Radioactive Contamination), DRAINAGE NETWORK MAPPING, FAULT MAPPING, LANDSLIDE MAPPING, ZONES OF CONCERN FOR POTENTIAL PLUME MIGRATION and FUTURE DEVELOPMENT AND SITE CONDITIONS.

Figure 2. in our Report (page 10) shows a significant VOC (Volatile Organic Compound)groundwater plume associated with B 71 and its "trailer" area, surrounded by a radioactive tritium soil plume.

In the "Old Town" area buildings 4, 5, 14, 16 and 17 are all located on top of the huge Old Town VOC groundwater solvent plume.

In the East Canyon the B 74 Diesel plume is migrating into the area of the proposed General Purpose Lab.

Figure 18 a. shows the Zones of Concern at LBNL for Groundwater Plume Expansion along Faults, Bedrock contacts, Landslides, Historic and Modern Creeks. Please note and address in the EIR/EIS that all 5 areas of the proposed " Seismic Life Safety Phase 2B Project" are impacted by migrating groundwater contaminant plumes, earthquake faults and landslides. (page 11.)

CMTW-27 cont.

Figures 10 and 14 show the mapping of Wildcat Fault and the East Canyon Fault as well as the huge landslide area associated with these faults. It is quite incredible to observe that indeed LBNL/DOE (Department of Energy) knew of the presence of these earthquake faults and landslide areas, and yet proceeded with the construction of the Lab's Hazardous and Radioactive Waste Handling, Storage and Treatment Facility in this treacherous area in 1996, and now must attempt with seismic upgrades of the building (B 85), and the stabilization of the landslide beneath it. (pages 12-13)

Figure 20 a. (page 14) shows various site conditions at future sites of LBNL's Long Range Development Plan.

Please read carefully Garniss H. Curtis' comments: " Most of the buildings of the Lawrence Lab. are on unstable ground filling the old caldera... The buildings on them will certainly move a few feet in a major earthquake if not hundreds of feet."

We ask you to include a very serious analysis of the B 85 situation and instead of a Band-Aid, a plan for relocating these dangerous operations to a more stable and accessible area.

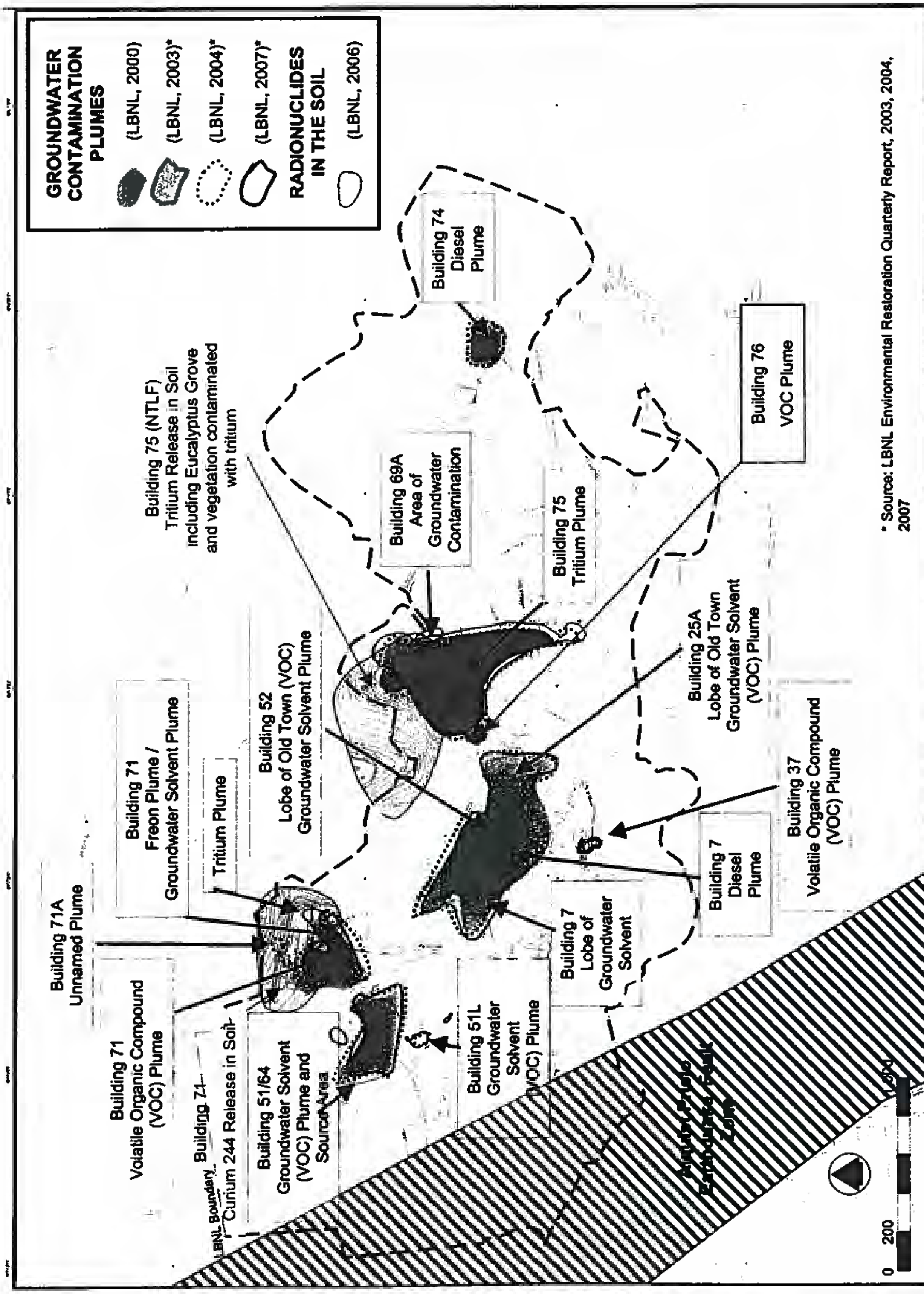


FIGURE 2. LBNL SITE MAP, GROUNDWATER CONTAMINATION PLUMES AND CONTAMINATED SOIL SITES.

CMTW-27 cont.

10/19

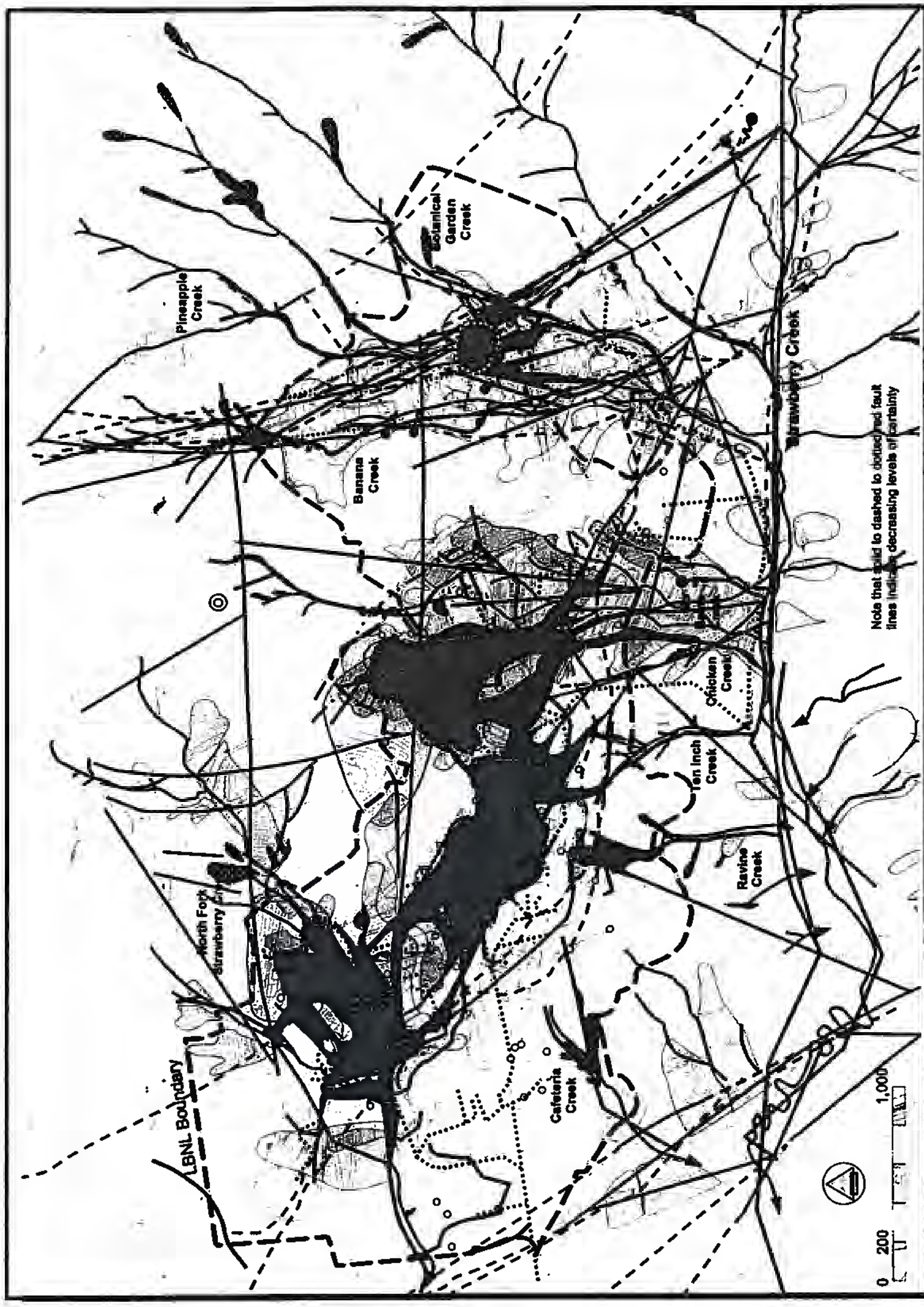


FIGURE 18a. ZONES OF CONCERN FOR GROUNDWATER PLUME EXPANSION ALONG COMPILED FAULTS, BEDROCK CONTACTS, LANDSLIDES, HISTORIC AND MODERN CREEKS. SEE NEXT PAGE FOR MAP LEGEND.

CMTW-27 cont.

11/19

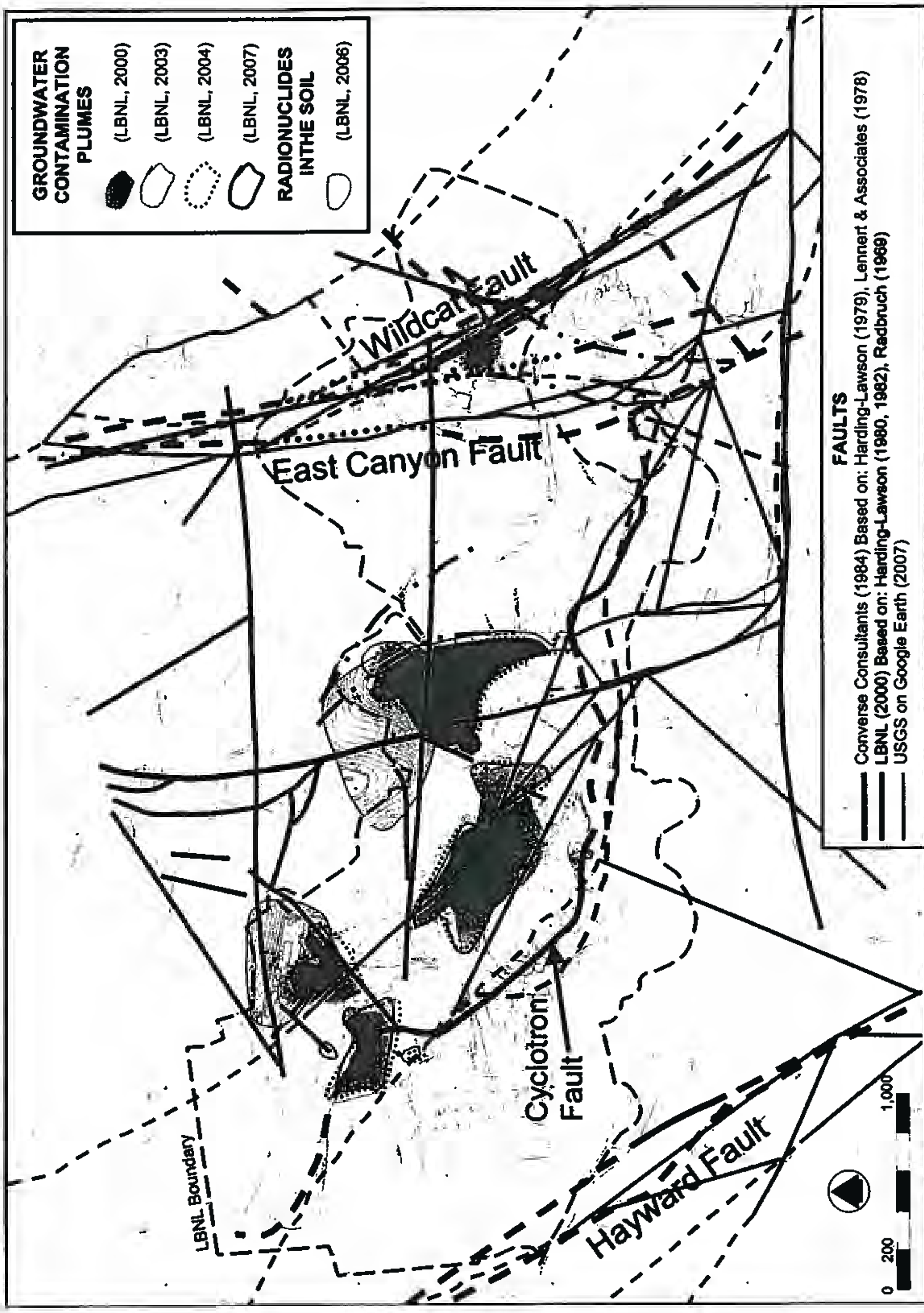


FIGURE 10. COMPILATION OF FAULT MAPPING AT LBNL IN STRAWBERRY CANYON RELATIVE TO SOIL AND GROUNDWATER CONTAMINANT PLUMES.

CMTW-27 cont.

12/19

FIGURE 14. COMPILATION OF LANDSLIDE AND SURFICIAL GEOLOGY MAPS 13a-13f IN STRAWBERRY CANYON

CMTW-27 cont.

13/19

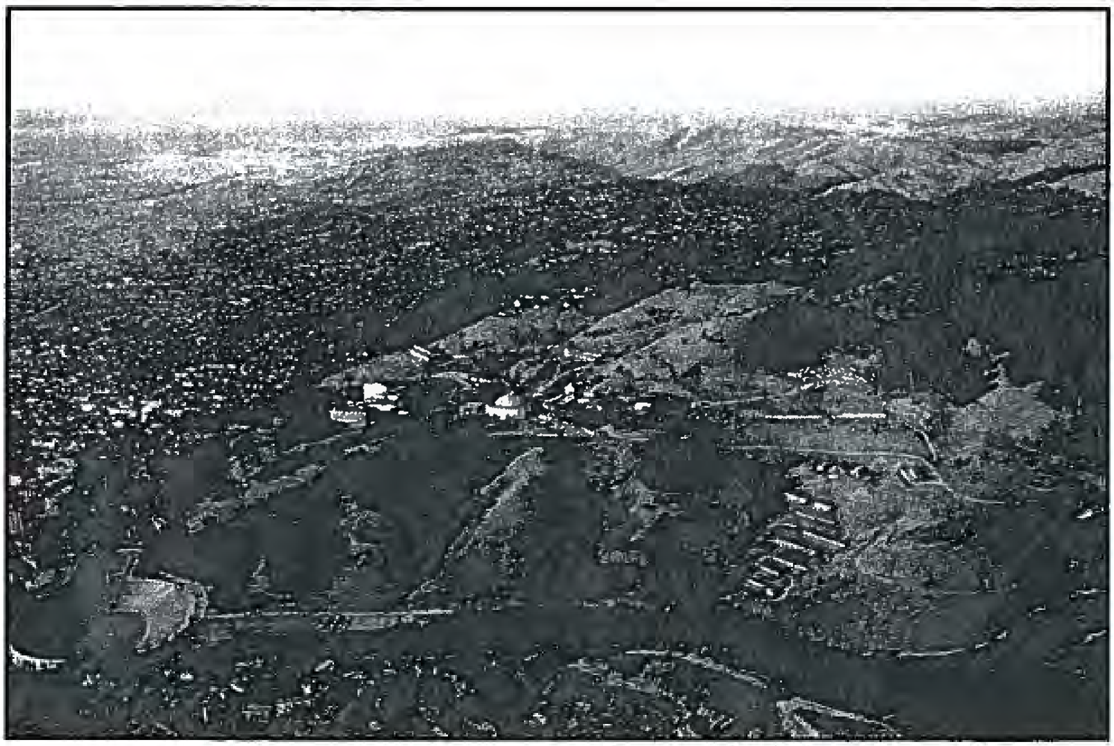
FIGURE 20a. VARIOUS COMPILED SITE CONDITIONS AT FUTURE BUILDING SITES OF LBNL'S LONG RANGE DEVELOPMENT PLAN. SEE NEXT PAGE FOR MAP LEGEND. NOTE THAT SOLID TO DASHED TO DOTTED RED FAULT LINES INDICATE DECREASING LEVELS OF CERTAINTY.

CMTW-27 cont.

14/19

CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRELATION TO FAULTS, LANDSLIDES, AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA

March 2007



Strawberry Creek Watershed ca. 1965

Laurel Collins, Geomorphologist
Watershed Sciences
1128 Fresno Ave
Berkeley, California 94707
collins@lmi.net

for

Pamela Sihvola, Project Manager
Committee to Minimize Toxic Waste
P.O. Box 9646
Berkeley, California 94709

15/19

CMTW-27 cont.

CMTW-27 cont.


PLUMES OF THE
NATIONAL LABORATORY
FAULTS, LANDSLIDES,
STREAMS IN
OAKLAND, CALIFORNIA

KENNETH R. SCHMITZ
Associate Director — Grounds Services
Physical Plant Operations

UNIVERSITY OF CALIFORNIA
Office of Physical Resources
2000 Carleton Street
Berkeley, California 94720
(415) 642-6338
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OFFICE OF PUBLIC INFORMATION

101 SPROUL HALL, BERKELEY, CA 94720
(415) 642-3734

5/9/84--McClendon--File #9070

RWW
WML

FOR IMMEDIATE RELEASE

Berkeley--Centennial Drive, connecting the "main" University of California-Berkeley campus to hilltop facilities, will reopen tomorrow (Thurs., May 10) after an eight-month closing.

The reopening restores convenient access to U.C.'s Lawrence Hall of Science in plenty of time for the public to take advantage of its summer programs.

The road has been closed from just beyond the U.C. Botanical Garden in Strawberry Canyon since last September 19 to repair damage caused by two years of heavy rains and run-off.

Officials had expected the closure to last only 12 to 15 weeks, but wet weather caused many delays in the work, which included rebuilding a section of the road that had become unsafe.

At the Lawrence Hall of Science, five sessions of summer courses will be offered in computers, biology, chemistry, physics and astronomy for various age levels, ranging from age two through adulthood.

Other activities, such as film series and exhibits, will also be offered.

For information on Lawrence Hall of Science summer activities, call 642-5133.

-agl-

17/19

CMTW-27
cont.

JOHN R. SHIVELY

CONSULTING ENGINEER

P.O. Box 7136
Berkeley, California 94707
(510) 531-1355

May 28, 1999

Dr. Charles Shank, Director
Lawrence Berkeley National Laboratory
1 Cyclotron Road, Mail Stop 50A-4119
Berkeley, California 94720

Re: City of Berkeley Fire Fighting System

Dear Dr. Shank:

Enclosed is a copy of my comments on the City of Berkeley's Draft Environmental Impact Report (DEIR) for the City's proposed Saltwater Fire Fighting System (SFFS). I propose an entirely different fire-fighting alternative, one that would be valuable to LBNL, referred to as the Hillwater Fire Fighting System. It would use a nearby existing source of hillwater rather than saltwater pumped from the Bay.

HFFS is of consequence to LBNL because it would enhance the fire fighting capability of the Lab's own fire protection. It would provide for reservoir impounded hillwater as a backup water source, should the normal water source fail during a major earthquake or a 1991 type conflagration. The HFFS alternative would utilize water from an existing hill area dewatering well located just south of the Space Sciences Laboratory. The water would be held in one or more large reservoirs.

I conceived of the idea of that vertical well, to intercept the hill-water that was causing the slides both inside and adjacent to LBNL, back in 1974.. I retained Civil Engineer B. J. Lennert to install this well. I was the Campus Principal Engineer in the campus Office of Architects and Engineers at that time. During August of 1974 a major hill slide had occurred inside LBNL. It broke a Lab building, took out a portion of a Lab road, and was threatening Lawrence Hall of Science. At the same time another slide was developing above the Lab's corporation yard, threatening the University's Centennial Drive. Lennert's attempts to stop the slides by dewatering the hill area with horizontal hydraugers weren't working.

CMTW-27 cont.

The well apparently stopped both slides. Presumably the campus continues to pump the well to prevent future slides. Later in the 70's, after I had left the A & E Office, the campus fire marshal had a large reservoir tank installed near the well, kept full by the well, to provide the primary source of water for fighting fires in the relatively inaccessible areas of upper Strawberry Canyon. Unfortunately, sometime in the late 80's, the campus removed that reservoir, to make way for the construction of a new laboratory building. Since then the water produced by the well has been dumped straight into Strawberry Creek.

The HFFS alternative would not only enhance the Lab's own fire protection capability, it could have reliability and cost savings advantages for the City, compared to the saltwater proposal. LBNL's support is requested to encourage the City to conduct a feasibility study of the hillwater alternative. Please contact me if you wish more information about the hillwater alternative or the history of hill area slides.

Sincerely yours,

John R. Shively

John R. Shively, P.E.

Enclosure:

The same seismic and landslide hazards that afflict the B 85 site are present at the proposed 43,000 sq.ft. Bio Lab (General Purpose Laboratory) location, just some 200 yards downhill to the SE, on top of the Wildcat Canyon Fault.

The massive East Canyon Slide (see Figure 14.) extends all the way down to the bottom of Strawberry Canyon and continually undermines the stability of Centennial Drive, the only public (and emergency access) road through the Canyon.

We ask that you abandon this new construction project at the proposed East Canyon site and instead very seriously consider the UC owned Richmond Field Station, as an alternative location.

Indeed, the RFS, a prime Bay View property, must be considered as the future site for all LBNL Bio Science (Life Science) facilities, as well as for the Helios/EBI and CRT projects, in order to avoid the potential catastrophic failures predicted for the Strawberry Canyon Caldera during the next major earthquake - and to save publicly funded facilities, equipment and some 5000 human lives!

Sincerely,

Pamela Sihvola/CMTW
P.O. Box 9646
Berkeley, CA 94709

CMTW-27 cont.

PS. Landslides in the Strawberry Canyon are triggered by heavy rains and underground water sources (during the dry season).

The attached UC Press release of May 9,1984 describes the closure of Centennial Drive for a period of eight months, due to heavy rains and run-off in one of the main landslide areas. (page 17)

Former UC Engineer John R. Shively describes a dry season landslide of August 1974, due to impounded hillwater of the Lennert Aquifer, as previous dewatering attempts by hydraugers had failed. (page 18)

The EIR/EIS reports must include rainfall data for at least the past 40 years for the highest LBNL locations/elevations as well as current data regarding the Lennert Aquifer and its impacts at LBNL.

APPENDIX D
RESPONSES TO PUBLIC COMMENTS

This Appendix includes responses to written public and agency comments received during the 30-day public comment period. Written comments are presented in their original format in Final EA Appendix C along with annotations that separate and identify each individual comment. A list of the comment letters and the order in which they are addressed is also shown in Appendix C. Responses to those individual comments are provided in this Appendix, alongside the text of each corresponding comment.

To allow for a more detailed response to an issue of particular concern to the public, this Appendix also includes "Master Response 1," which addresses the geological conditions underlying the LBNL site.

1. Master Response 1 – Geological Conditions Underlying the LBNL site

Many public comments on the Draft EA state or suggest that no more buildings should be constructed at Lawrence Berkeley National Laboratory (LBNL) due to the unstable geological conditions of the main hill site. Comments largely reiterate or mirror the hypotheses put forward by University of California Berkeley (UCB) Professor Emeritus Garniss Curtis in an article published in the Berkeley Daily Planet in the autumn of 2008. This master response has been developed to address comments from the public regarding the geology of the main hill site and to correct factual errors and misrepresentations presented in those public comments.

In his 2008 article, Professor Emeritus Curtis argued that LBNL is underlain by two geologic structures of concern: 1) a volcanic caldera containing material with low strength, and 2) west-dipping Cretaceous strata sub-parallel to the slope above Foothill student housing. He alleged that the latter feature could cause the slope to fail during a major earthquake on the Hayward Fault and destroy all the buildings from the western margin of the LBNL site to Doe Library on the UCB campus and beyond, a distance of over 1,000 feet west of Gayley Road. In January 2010, the organization Save Strawberry Canyon and one of its representatives sent a letter to UC LBNL, posted a video to the web featuring Professor Emeritus Curtis, and published a commentary in the Berkeley Daily Planet reiterating these concerns. The letter and video presented a geologic cross-section of the LBNL main hill campus, and the video also presented a geologic map of LBNL. These figures portrayed most of the LBNL site as underlain by volcanic rock filling a caldera, portray this caldera fill as hundreds of feet thick, and indicate this fill is in direct contact with Cretaceous strata to the west. Public comments on the Seismic Phase 2 project Draft EA make repeated reference to these submissions and to Professor Emeritus Curtis' hypotheses of 2008.

Figure 1 shows the most recent and comprehensive bedrock geology map of the entire LBNL site, which was prepared by Parsons Engineering Science, Inc. (PES) and UC LBNL. This mapping data was drawn from hundreds of borings as well as from trenches, outcrops, construction excavations, and road cuts (PES and UC LBNL 2000). This map indicates that, contrary to the assertions by some commenters, volcanic rocks do not underlie most of the LBNL site, but rather occur in various isolated to semi-isolated masses. Calculations from this map indicate that 46 acres of the 202-acre site, or 23 percent of the LBNL property, is underlain by volcanic rock, sedimentary rock intercalated with volcanic rock, and sedimentary rock including volcaniclastics. The majority of these 43 acres are currently not developed, and the LBNL 2006 Long Range Development Plan (LRDP) and EIR do not anticipate further development in these areas.

Figure 2 shows a geologic section through the LBNL site from PES and UC LBNL (2000), again based on data from many years of borings, outcrops, road cuts and construction excavations. In particular, the thickness of all the volcanic rock masses is less than 100 feet. None of these masses is in contact with Cretaceous strata, but rather are underlain by the Tertiary Orinda Formation.

The theory that volcanic rocks at LBNL originated in an alleged caldera collapse alluded to by some commenters is not borne out in the geologic observations of the LBNL site. Volcanic masses at LBNL do not contain the high proportion of tuff (consolidated volcanic ash) indicative of collapse synchronous with eruption that is a defining feature of collapsed calderas. Further, none of the breccias (coarse angular volcanic fragments) observed at LBNL exhibit the welding expected to occur in at least some of them had they been formed in a caldera coincident to eruption. In short, the geometry of the volcanic rock masses does not accord with a caldera collapse origin.

Some public comments characterize the volcanic rocks at LBNL as having little to no strength and are thus unsuitable to support structures. This is not consonant with the observation that these same materials underlie ridges and sidehill benches, and promontories, such as that occupied by the Lawrence Hall of Science. These geomorphic features indicate this material generally has higher strength and erosion resistance than the surrounding materials.[1]

Studies undertaken by PES and UC LBNL (2000), Fugro (2002), and Kleinfelder (2006) on the western slope of LBNL did not find west-dipping Cretaceous strata sub-parallel to the slope above Foothill student housing. These successive studies found these strata generally dip north between 20 and 50 degrees.

The mischaracterization of the attitude of these Cretaceous strata aside, the larger concern raised by public comments regards potential failure of this slope and damage to areas of the campus to the west during a strong-to-major earthquake (magnitude 6 to 8) on the Hayward Fault. The lack of terraces on this slope indicates it has risen over at least tens of thousands of years, during which time it is believed to have experienced hundreds of strong-to-major

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[1] This is corroborated by geotechnical studies demonstrating the strength of LBNL volcanic rock samples (comprehensive test results for the entire LBNL site are not available; these results are based on a sampling of several years of such studies that covered a broad swath of the LBNL site). High-blow counts recorded during sampling indicate that these underlying materials act more like rock than soil. These tests were conducted using a 2-inch diameter split spoon sampler driven with a 140-pound hammer dropped 30 inches. A wireline was used, as required, and samples were taken typically in excess of 50 blows per foot. Measurements from samples of these materials also indicate the breccias have an unconfined, undrained shear strength well in excess of 1,000 pounds per square foot, the threshold below which soils are considered "soft."

earthquakes on the Hayward Fault. Bedrock failure of this slope during any of these earthquakes would have deposited material derived from the Cretaceous strata at the toe of the slope, which is occupied by the Hayward Fault.

Fault and geotechnical investigations for Foothill Student Housing in this location did not encounter such landslide deposits. Rather, bedrock was encountered beneath a few feet of natural soils between two active strands of the Hayward Fault, indicating no significant burial of this location by landslides. In addition, an inactive shear zone located generally along Gayley Road to the west (the "Louderback trace") was overlain by only a few feet of natural soil deposits. The last movement on this shear zone was at least 11,000 years ago, indicating that any landslide deposits in this location are at least that old.

Consequently the geologic record indicates the western slope of LBNL is stable with regard to potential bedrock landslides impinging on areas beyond the toe of the slope posited in the public comments.

The potential for landslides in the Berkeley Hills exists whether or not the Department of Energy maintains a national laboratory on the LBNL site. LBNL development now and in the future provides the impetus for identifying and mitigating potential slope stability issues.

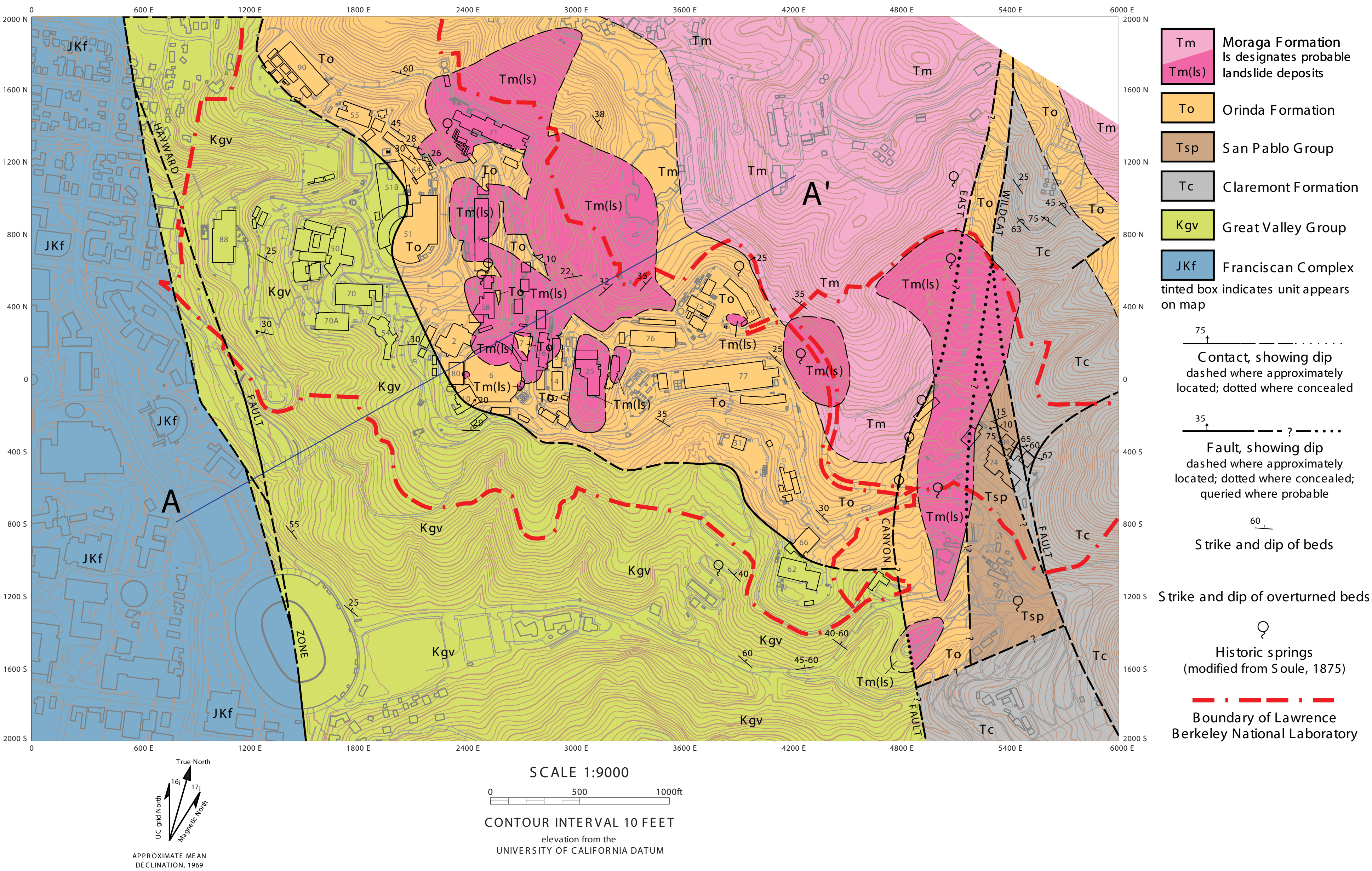
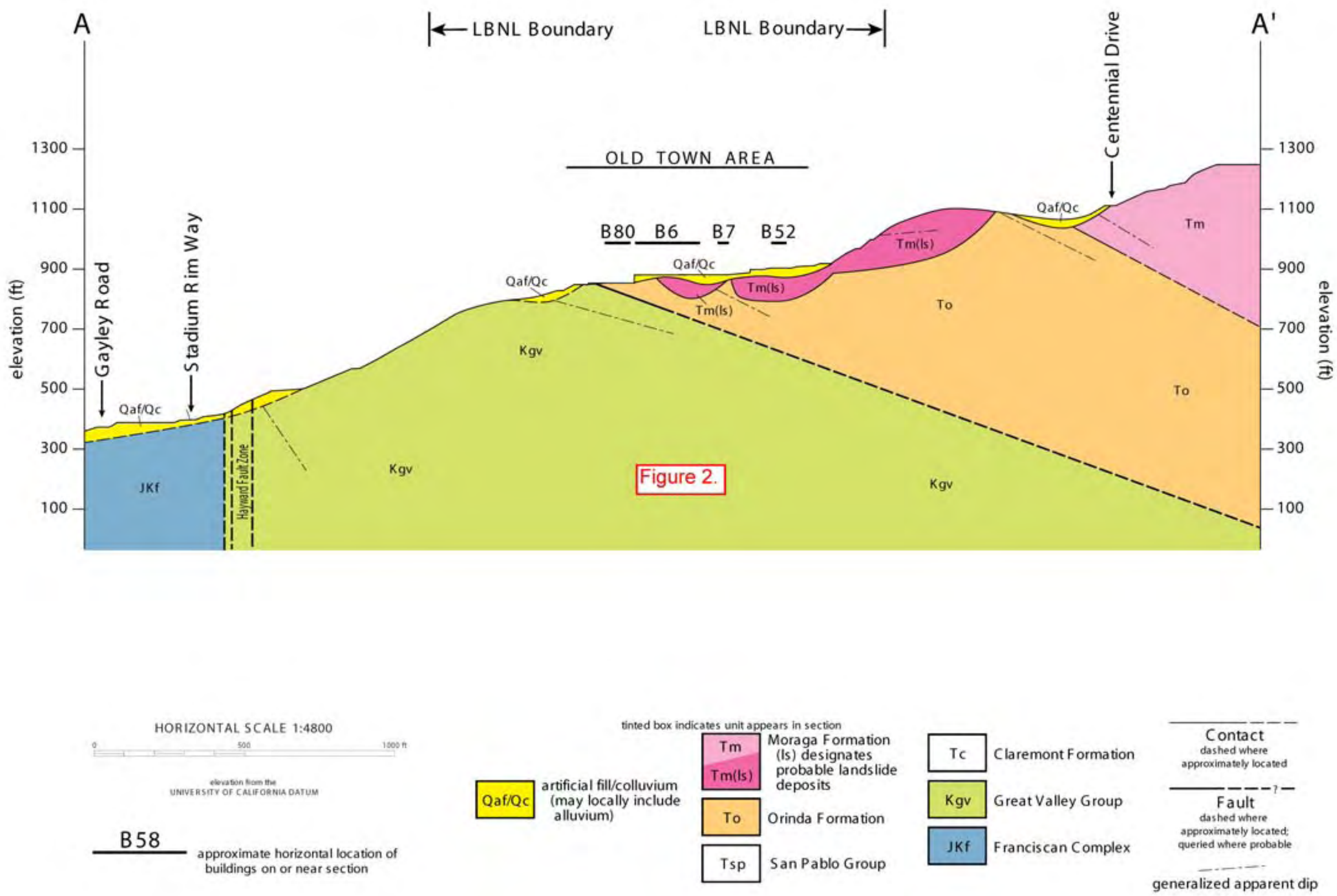


Figure 1. Bedrock geologic map of LBNL. (modified from Figure 4.2-1 of PES and LBNL 2000)

Figure 2. Cross Section A-A'



(Location Shown on Figure 1.) Near dip section through the Tertiary strata. Depth to the base of the lowest volcanic mass relative to the top of the Orinda Formation shown. (Figure 4.2-3 of PES and LBNL 2000.)

RESPONSE TO COMMENTS MATRIX

Comment ID	Commenter	Comment	Response
GL-1	George Leitmann	I write to you, after reading the proposal "Seismic Life-Safety, Modernization and Replacement of General Purpose Buildings, Pase 2B," to urge EPA to undertake an EIS rather just an EA. The proposal raises serious concerns, in the events of earthquake and fire, and these need serious consideration.	Comment noted. An EIS was not prepared because the Proposed Action is not among the classes of actions listed in Appendix D of the DOE NEPA Implementing Procedures (10 CFR Part 1021) that typically require preparation of an EIS. In accordance with CEQ and DOE regulations, DOE prepares an EA in order to assist agency planning and decision making, including a decision on whether to prepare an EIS. Based on the Final EA, DOE will decide whether to prepare a Finding of No Significant Impact (FONSI) or Environmental Impact Statement (EIS) depending on whether impacts are found to be significant.
TC-1	Terri Compost	I am very concerned about the future building plans and safety of current and future projects in the environmentally sensitive Strawberry Canyon. It seems essential that at the least, the DOE does a full Environmental Impact Study (EIS), not an Environmental Assessment (EA).	Please see response to Comment GL-1, above, in regard to the commenter's request for an Environmental Impact Statement.
TC-2	Terri Compost	Frankly I find it disturbing that hazards such as radioactive and other hazardous wastes, are being created and stored on land that is highly vulnerable to landslides, fires and earthquakes.	The Comment is noted. Potential project risks and effects related to hazards and hazardous materials, including radioactive materials, are identified and analyzed in Draft EA Section IV.C.2, Hazardous Substances and Human Health. Potential landslide and earthquake issues are evaluated in Draft EA Section IV.C.1, Geological and Seismic Hazards, and potential fire issues are evaluated in Section IV.C.11, Wildland Fires.
TC-3	Terri Compost	I am deeply disappointed that the canyon has already been contaminated with tritium and toxic underground plumes,	Comment noted.
TC-4	Terri Compost	(not to mention extensive invasion of the experimental erharta grass) a sign of the inability or lack of concern that prevents these labs from operating safely.	The commenter's assertion about an "extensive invasion of the experimental erhata grass" with respect to either the proposed GPL site or for the Lab Main Hill Site is not supported by expert biologist field observations made during field work conducted for the 2006 Long Range Development Plan Environmental Impact Report (2006 LRDP EIR).
TC-5	Terri Compost	Planning these labs in a precious ecosystem in the watershed above Berkeley and the San Francisco Bay is pure folly. Please don't allow these irreparable mistakes continue.	In accordance with CEQ and DOE regulations, DOE conducts an appropriate NEPA review to assist agency planning and decision making and this concern is fully addressed in this EA. See Section IV.C.
EBMUD-1	William R. Kirkpatrick	East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Draft Environmental Assessment (EA) for the	Comment noted.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		Lawrence Berkeley National Laboratory Seismic, Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2B Project. EBMUD provided written comments on the Draft Environmental Impact Report (EIR) to the Lawrence Berkeley National Laboratory in March 2010 which were subsequently incorporated into the Final EIR issued in June 2010. EBMUD has no additional comments on the Federal EA for this project.	
WB-1	Wanda C. Bronson	I strongly urge you have a full EIS performed on the site of the building being proposed to be erected in Strawberry Canyon. A number of potential environmental hazards have been identified by citizen groups such as the Save Strawberry Canyon organization; being a long- lived member of the neighborhood I share their concerns and believe we have the right to ask for proper and fact-based reassurance.	Please see response to Comment GL-1, above, in regard to the commenter's request for an Environmental Impact Statement. The Draft EA identifies and evaluates potential environmental impacts of the Proposed Action and alternatives in accordance with NEPA. DOE has responded to all comments received on the Draft EA.
ES-1	Emilie Strauss	As a long-time Berkeley resident and user of Strawberry Canyon, I am concerned about proposed construction of a General Purpose Lab in Blackberry Canyon and a retrofit of Buildings 85/85A.	The Building 25/25B site proposed for the General Purpose Laboratory (GPL) under the Proposed Action is not within the Blackberry Canyon. The seismic stabilization work proposed for Building 85/85A is designed to enhance the seismic stability of the building complex and does not alter the size, configuration, or operations.
ES-2	Emilie Strauss	There are a number of potentially significant impacts that triggers (sic) preparation of an EIS. *Additional analysis needed to determine if Blackberry Canyon is especially prone to soil movement during earthquakes	Please see response to Comment GL-1, above, in regard to the commenter's opinion about preparation of an Environmental Impact Statement. Although the GPL is not proposed for a location in Blackberry Canyon, the Draft EA nevertheless contains a detailed analysis of geological and seismic issues, including landslides (Section IV.C.1, Geological and Seismic Hazards). Futhermore, numerous geotechnical studies referenced in the geological and seismic hazards analysis are posted on-line at http://www.lbl.gov/Community/SeismicPhase2B/index.html.
ES-3	Emilie Strauss	*Contaminants may be released by grading that could damage the watershed/enter Strawberry Creek.	Standard project features and regulatory requirements would prevent release of contaminants during construction activities. Construction activities, surface water, and hazardous materials related issues are analyzed in the Draft EA (Sections IV.C.2, Hazardous Substances and Human Health; and IV.C.3, Water Resources and Soil Erosion. Excavation and groundwater remediation are analyzed in the former

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
			section. Water resources, erosion control, and project stormwater pollution prevention planning and permitting is discussed in the latter section.
ES-4	Emilie Strauss	*Proposed pier design will not prevent or protect the (85/85A) structures from slides generated by mudstone.	The 85/85A seismic strengthening includes drilled piers and tiebacks that extend into rock characterized as in-place (i.e. not landslide materials). The forces that landslide materials will exert on the below-grade restraint system were evaluated using methods contained in the official State of California guidelines that pertain to seismically-induced landsliding. The landslide restraint system itself was designed in accordance with the structural provisions of the California Building Code. Engineering analyses show that the Building 85/85A seismic strengthening systems will restrain and control landslide movement thereby protecting the facility from landslide-related hazards.
ES-5	Emilie Strauss	*Wildfires could release many toxic compounds into the air. If the fire was driven by west winds (as was true in the Oakland Fire) it would affect where I reside on Hearst Ave.	Please see responses to Comments LS-14, LS-15, and GW-15. As described in the EA, the General Purpose Lab would contain conventional laboratories with ordinary laboratory chemicals. Given the extensive measures taken by LBNL to prevent and control wildland fires on its site, and given the fire safety systems that would be included in the building, a wildland fire inundating the General Purpose Lab would not be a reasonably foreseeable event pursuant to NEPA Section 40 CFR 1502.22.
ES-6	Emilie Strauss	*All activities occur in or near habitat for the federally-threatened Alameda whipsnake.	The Proposed Action would neither take place in nor impact US Fish and Wildlife designated critical habitat for the Alameda whipsnake, nor would it create a substantial risk for individual "taking" of individuals or negatively impact recovery of the species. Almost all elements of the Proposed Action would take place on currently developed areas, and inclusion of "Standard Project Features" designed to avoid disturbance of Alameda whipsnake would further minimize such risk. Please refer to the analysis of this issue in EA Section IV.C.4 and Appendix A SPF BIO 5 (a)-(f) that specifically addresses the whipsnake issue.
ES-7	Emilie Strauss	In summary, due to a number of significant potential imacts, the Environmental Analysis for these two projects necessitates preparation of an EIS, not EA, as mandated by NEPA.	Please see response to Comment GL-1, above, in regard to the commenter's observation about preparing an Environmental Impact Statement.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
GW-1	Georgia Wright	Alan Kropp and Associates (AKA) reports for Building 25 or the General Purpose Laboratory, cited in the Final EIR on disc and on the web, were only added to the web after their absence was reported to LBNL. As they were used in the "matrix" of the FEIR to contest points made by several individuals, they would appear to be important.	As noted by the comment, the referenced Alan Kropp Associates reports are available for review on the LBNL website http://www.lbl.gov/ Community/SeismicPhase2B/index.html.
GW-2	Georgia Wright	AKA, May 29, 2009, a preliminary report, made in two weeks "to meet LBNL's objectives," lays out the problems and what additional work will be necessary to help solve them. 1) AKA's preliminary investigation of old boring logs are consistent with the presence of a paleolandslide under B25. 2) Orinda Formation under the Lawrence Road (south and downhill from 25), is potentially part of a palealandslide rather than in-place bedrock. 3) Offsets in the curbs are not sufficient to evaluate historic slides. [Evidently AKA was not given access to the files on historic landslides.] 4) The borings suggest very low factors of safety, although these may be based upon conservative measures. 5) Additional trenching is needed (to establish whether the paleolandslide has moved recently.) AKA, April 2, 2010. Trenches 1 and 2 are mentioned but only T-1 (southwest of 25, 8' deep) appears on the map. There are no photos of the trench nor is it discussed. The "general sketch" at the end of the report is indeed too general. Were there slickensides, indicative of movement?	Two trenches were excavated by Fugro William Lettis & Associates, Inc. to evaluate the geologic stability of the Building 25 site. Both were logged by a team of geologists that checked for slickensides and other types of deformation-related features. Notably, the eastern trench found the Moraga Formation and Orinda Formation in depositional contact, with no slickensides present.
GW-3	Georgia Wright	Historical borings around B25 indicate Moraga volcanics which "break into rubble during drilling." Gravity has moved colluvium downslope. Moraga Formation is highly permeable (although is it called "bedrock," which in common or dictionary definition means hard rock. Neither Moraga Formation nor Orinda Formation fit that definition.	Comment noted. It is well recognized that the Moraga Formation includes materials that are fractured, and that additional fracturing can occur during drilling and sampling operations. Historically, LBNL geologists/ geotechnical consultants have used the terms "rock" and/or "bedrock" to describe in-place Moraga and Orinda Formation materials. The terminology does not affect the analysis of the impacts.
GW-4	Georgia Wright	AKA, May 29, 2010 , supplemental report Boring log #1 (north of 25) has 8' of fill. Clay to 11.5', and silty clay below	The comment asserts that the Orinda Formation siltstone and claystone encountered in borings may "slump or flow" and therefore not be a

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		that. Boring 2 (south of 25) Moraga volcanics with weak rhyolite, then andesite down to 90' where Orinda claystone and siltstone are found. (Muds and mudstones give rise to manyu problems in civil engineering because they are weak and shrink or swell on being dried or wetted." Mudstones are siltstone, mud-shale, or claystone. "Muds are very reactive to physical disturbances or differential loading, and they slump and flow easily when subjected to stress." (*Oxford Companion to the Earth*, 2000, p. 715) A three-story General Purpose Laboratory would indeed exert differential loaking and stress.	suitable foundation material for the three-story General Purpose Laboratory building. LBNL consultants have evaluated the strength and stability of the Orinda Formation at the General Purpose Laboratory site using onsite data and established geotechnical and geologic analysis methods and found it to be stable and capable of supporting the building loads.
GW-5	Georgia Wright	Boring 3 (south of 2) Orinda Formation Boring 5 & 6 "southern side of proposed central plant site" (not on map): Atterberg Limits; Boring 5, (4-4.5' deep)Plasticity Index 56,; Boring 6,(6 – 6/5' deep), Plasticity Index 46. "Onsite soils having a PI of 15 or less are generally considered to have a sufficiently low expansion potential to be used as non-expansive fill." 5 and 6 are marked "Fat Clay" and not to be used for fill. AKA says these must be removed.	DOE agrees that soils with a PI of 46 and 56 are not suitable for direct re-use as engineered fill. Future work at the site will be in accordance with the recommendations presented in the geotechnical investigation report. Appendix A SPF GEO-2 requires a site-specific, design level geotechnical investigation for each LBNL building project.
GW-6	Georgia Wright	In effect after all these reports AKA has not come to a conclusion that the Moraga volcanics are a paleolandslide or in-place "bedrock".	The commenter is correct with respect to the General Purpose Laboratory site. The geotechnical analysis done in "*Palaeaeolandslide Investigation Building 25*," 2009 (footnote 16) determined that the GPL site is geologically stable in either case. The geotechnical and geologic investigation report for the Building 85 strengthening (AKA 2010) indicates that the paleolandslide deposits previously mapped within the East Canyon do not underlie Building 85 or 85A. These two buildings are underlain by much smaller landslides that will be restrained as part of the seismic strengthening project.
GW-7	Georgia Wright	AKA did not examine the trench for slickensides, nor did it dig a second trench.	Two trenches were excavated by Fugro William Lettis & Associates, Inc. to evaluate the geologic stability of the Building 25 site. Both were logged by a team of geologists that checked for slickensides and other types of deformation-related features. Notably, the eastern trench found the Moraga

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
			Formation and Orinda Formation in depositional contact, with no slickensides present.
GW-8	Georgia Wright	Moving or not, should you build on "weak volcanics that break into rubble during drilling"?	As discussed in EA Section IV.C.1 (Geologic and Seismic Hazards) and associated geotechnical studies, the General Purpose Laboratory site is atop a resistant block of Moraga Formation that geologic analysis has shown to be stable for thousands of years. From geologic and engineering perspectives, it is well suited for the planned General Purpose Laboratory building. Also please see response to Comment GW-6.
GW-9	Georgia Wright	Will spread footings do the trick when the earthquake strikes?	In accordance with the provisions of the California Building Code, spread footings are an appropriate foundation type and are very capable of supporting the design loads for both non-earthquake and earthquake conditions.
GW-10	Georgia Wright	What about the contact with Orinda mudstones?	See response to Comment GW-4.
GW-11	Georgia Wright	Both Buildings 85 and 85A are shown in the FEIR for CEQA to straddle two paleolandslides, characterized in several earlier consulting reports as potentially liable to move in a major seismic event and at different rates. Slickensides were prevalent throughout the area. In earlier reports 60% of the HWHF buildings (the southwestern parts) overlie the Orinda Formation clays. In the EA, however, AKA's plans show only QLS2 (or QLS4 on the colored map) crossing all but a small part of 85 and no characterization of the leftover area. AKA had declared in an earlier report that 10 feet of Moraga Formation lies under the northeast corner of the buildings, and below that 25 feet of Orinda Formation. What is under this area?	Boring AKA-11 was drilled east of the northern portion of Building 85. The upper portion of the boring encountered approximately 20 feet of fill comprised of soil mixed with Moraga Formation materials. Below the fill, AKA-11 encountered about a foot of natural Moraga Formation materials (i.e. not fill) over a clay seam. In-place Orinda Formation is logged starting at a depth of 22 feet and underlies this area. Details on the geologic characterization of the Building 85/85A area are presented in the geotechnical study posted on-line (http://www.lbl.gov/Community/SeismicPhase2B/index.html).
GW-12	Georgia Wright	AKA proposes drilling 21 piers around two sides of B85 and 9 piers around two sides of B85A, these to be 5 feet in diameter and 40 to 50 feet deep, TO STOP THE LANDSLIDE, evidently the top one of Moraga Formation (hard but fractured volcanics.) What will stop the building from being torn apart? Has anyone ever used piers to stop a landlside? Into what will those piers be drilled that is less expansionary and stronger than mudstones? (AKA 2006, a propos the Animal Care Facility nearby, suggested a mat under the building so that it might move integrally, a proposal AKA could	The piers and tiebacks comprising the below-grade landslide restrain system will be anchored in in-place Orinda Formation rock below the landslide materials. Geotechnical engineering analyses were performed to calculate the loads that the landslide restraint system would need to resist in order to limit earthquake deformations to so that the building would not be "torn apart." Drilled piers and tiebacks are commonly used, individually or in combination, to restrain landslides in California.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		not make, evidently, for 85, as it would entail rebuilding.)	See response to Comment ES-4.
GW-13	Georgia Wright	Missing from the reports are 9 boring logs, AKA 7 – 16. Where are these and their interpretations? They will be needed to determine the quality of the Moraga volcanics, the Orinda mudstones, and whatever lies beneath.	Appendix A of the Building 85/85A strengthening report (AKA 2010) includes logs of Borings AKA-8 through AKA-16. The log of Boring AKA-7 is in geotechnical report Appendix D. The referenced report is posted online at (http://www.lbl.gov/Community/SeismicPhase 2B/index.html).
GW-14	Georgia Wright	What does lie not far below the surface is water! In the EIR are tables recording water heights, taken from monitoring wells. The EA refers to them on p. 22. North of 85 the water measured from 16 to 12 feet below surface while south of 85 the range was from 40 to 35 feet.. Accounting for the difference in elevations the water table seems to be level there. But east of 85A at the same elevation as the well south of 85, the difference is huge—the level according to AKA ranges between 24 and 0.3 feet. This means that there is a "perched water table" or reservoir and that the other two wells may have penetrated a separate reservoir. This is just what one expects in the caldera of the volcano upon which the Lab has constructed its buildings. When such a reservoir breaks during a seismic event (the breaks in 1973 may have been caused by a series of small events), the landslides may be devastating as they were in 1973. The unpredictable reservoirs, springs, and aquifers mean that conatminants spread all over. Monitorying wells are seldom left open for long. See the report Contaminant Plumes of the Lawrence Berkeley National Laboratory... (2007)http://berkeleycitizen.org/lbnl/cmtw1.html	Water is accounted for in the analysis and the design recommendations. Water levels recorded shortly after drilling may differ from "stabilized" groundwater levels; consequently, differences in groundwater elevations shown on the borings logs do not necessarily mean there are perched conditions or a "reservoir" present. Please see Master Response 1 – Geological Conditions Underlying the LBNL Site regarding the Commenter's assertion of Caldera.
GW-15	Georgia Wright	Fire What are the plans in case of a wildlands firestorm? The East Canyon site is heavily wooded, with pines and eucalyptus, grasses and scotch broom, all flammable. The HWHF contains radioactive waste on the first floor and mixed solvents and volatile organic compounds on the second floor of 85. There are a number of storage sheds for liquid and dry combustible compounds. How are these protected from a fire like that of 1991 (2000 degrees, destroying concrete, "fireproof" safes, metals, etc.)?	As noted in the EA, the scope of work for the HWHF Building 85 is to seismically upgrade the building and does not change the operation of the building or extend its intended life. The EA therefore, only considered the impacts resulting from the construction identified in the EA. DOE Environmental Assessment DOE/EA-0423 Construction and Operation of the Replacement Hazardous Waste Handling Facility at LBNL considered the impacts of the construction and operation of the HWHF and found no significant impacts.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		During the 1991 fire, which reached the south wall of the next, Claremont canyon, Director Shank ordered all personnel to leave. Is this the plan today? How will people, air, water, and earth be protected when the fire reaches the East Canyon buildings or those generating the wastes? We are about due for another wildland fire, which come at 20 year intervals.	Wildland fires are addressed at Section IV.C.11 of this EA. According to the California Department of Forestry and Fire Protection (CDF) Natural Hazard Disclosure Map Images and Data for Alameda County, components of the Proposed Action are not located in an area that has a substantially high potential for wildland fires. For more information regarding the performance of Building 85 during a wildland fire, please refer to the HWHF EA. See responses to Comments LS-14, LS-15, GG-3, TC-2, ES-5, CMTW-11, and GW-16. In addition, UC LBNL has identified fire prevention and response measures in its 1994 Wildland Fire Evacuation/Relocation Plan which further reduce associated risks. Please refer to the plan for details of the evacuation procedure.
GW-16	Georgia Wright	There is a brief paragraph dealing with fire in the EA. In essence it says "trust us!" It says LBNL has been declared a site with "not a high potential for wildland fires." But FEMA was willing to grant a huge amount of money to ridding the Canyon of trees above the site, a project now on hold. . On EA p. 141, "In 1994, UC LBNL published a Wildland Fire Evacuation/Relocation Plan. The plan, which would apply to the Proposed Action, is based on a wildland fire scenario that would require rapid mobilization of resources, quick decision making and well-coordinated execution by emergency responders during a wildland fire." The footnote sends one to a website that is no longer operating. Have the plans also been abandoned? The 1994 plan was evidently motivated by the lack of a plan in 1991.	The 1994 Wildland Fire Evacuation/Relocation Plan can be found at: http://www.osti.gov/bridge/product.biblio.jsp?osti_id=10174461. Please also see http://www.lbl.gov/ehs/ep/ for the laboratory's emergency website which includes the Master Emergency Service Plan and evacuation plans. Please refer to response to Comment GW-15.
GW-17	Georgia Wright	At a "Community Advisory Group" meeting in June, someone asked about emergency plans. Evidently there were none!	There was no LBNL Community Advisory Group (CAG) meeting in June 2010. The comment appears to refer to a CAG meeting on April 28, 2010 where the issue of emergency planning was raised by a member of the public. Because the meeting was scheduled to focus on traffic issues, LBNL

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			emergency planning experts were not present to answer the participants' question regarding emergency planning. LBNL engages in extensive disaster and emergency planning at all levels of the organization. For more information on this topic, please refer to the 2006 LRDP EIR for an overview and to the Lab's EH&S website for information regarding the Lab's Emergency Response Organization and Master Emergency Program Plan (see http://www.lbl.gov/ehs/ep/).]
GW-18	Georgia Wright	There is no other building on Lab property which would fill the requirements for the HWHF, so this very dangerous site must remain exposed to fire and landslide with little reinforcing of the building itself. The interim storage of hazardous materials is impossible because they would need more than the 90 days permitted, while the HWHF has a special dispensation, over one year, to sort them out and to find permanent disposal sitse. Which buildings produce all of these radioactive wastes, volatile organic compounds, solvents, etc. that accummulate in 85 and the sheds? How are they protected?	Please see response to Comment GW-15 regarding the operations of the HWHF.
GW-19	Georgia Wright	How does LBNL rationalize the LRDP in an area so dangerously unstable, so close to the Hayward Fault, and so close to wildlands?	It is not clear to DOE what is intended by the commenter's assertion that "LBNL rationalize the LRDP in an area so dangerously unstable, so close to the Hayward Fault, and so close to wildlands." The Lab's Long Range Development Plan (LRDP) is a planning document that covers the entire LBNL main hill site. It appears the comment is referring to the HWHF, please refer to response to Comment GW-15.
GW-20	Georgia Wright	The best alternative for the LRDP is UC's Richmond Field Station, where there is plenty of room for both buildings and parking, construction would be much cheaper on the flat land, and the site is farther from the Hayward Fault.	Comment noted. It appears that the comment may be referring to the GPL or some other component of the project. The EA considers the Richmond Field Station as an alternative site.
GW-21	Georgia Wright	The only negative that LBNL is willing to mention is invalid. The hill site is NOT served by public transit but by Lab shuttle buses, just like Richmond! As bus and BART are to the present site, so BART is to Richmond with a stop one mile away. The RFS is 6 miles or 20 minutes	The EA describes access to the RFS by public transit, noting that bus connections to the RFS from either BART station in Richmond require travel times of more than 30 minutes. Additionally, the EA notes that many UC LBNL employees live in Berkeley and that consequently the

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		from UC campus.	commute to the LBNL main hill site is easier and quicker for them than a commute to the RFS would be.
GW-22	Georgia Wright	Evidently the problem lies elsewhere—"scientific adjacencies." This argument has never been explained. The scientists at LBNL, like those everywhere, find their natural colleagues all over the globe! One need only search LBNL personnel's publications! We suspect there is not all that much lab equipment sharing or conversations after work, The reasons for holding so tightly to this dangerous site appear to be that the view of the Bay plus the name "Berkeley" would attract more visiting scientists than "Richmond," although the latter has tremendous views and a sylvan setting!	In the 2005-2006 LBNL Annual Report, former LBNL Director Steve Chu explained the concept of scientific adjacencies, saying: in "a culture of interdisciplinary problem-solving," it is beneficial to have the opportunity to "spontaneously" form "research partnerships over lunch in the cafeteria, after seminars, and in social events." Chu further explained that, in a light of LBNL's history of maintaining a collaborative approach to science, he viewed a "major" part of his job was making the "collaborative environment even better." Accordingly, increasing efficiency of LBNL research operations and promoting scientific adjacencies by offering modern, cost-effective consolidated space at the LBNL main hill site has been set as an objective of the Seismic Phase 2B project. Please see EA Section Purpose and Need which cites need for scientific adjacencies and collocation. The LRDP EIR describes the merit and value of these adjacencies, a position which was sustained at the trial and appellate level by the California courts.
GW-23	Georgia Wright	We hope that the Department of Energy will be more wary of approving dangerous projects after the miserable performance of the Minerals Management Services. The least the Department can do is to perform an EIS with many more logs of trenches and borings and fewer desperate "solutions" for building over landslides!	Comment noted. Please see response to Comment GL-1 regarding the preparation of an EIS.
LS-1	Laurie Sarachan	Several years ago I participated in submitting comments re: the Draft Environmental Impact Report for the LBNL Computational Research and Theory Facility building proposed to be built on the ridge above Cyclotron Road. This was before the court established that the CRT merited federal environmental review. I believe it is fortunate for everyone concerned that the CRT facility, planned to intrude upon a natural and precarious landscape, has not been built at that site. In the instance of the "Seismic Life-Safety, Modernization and Replacement of General Purpose	Comment noted. Please see response to Comment GL-1 regarding the preparation of an EIS.

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		Buildings, Phase 2B" it seems obligatory that a full EIS be prepared.	
LS-2	Laurie Sarachan	I have reviewed the EA for the Phase 2B project. I discovered immediately that the title of the project is misleading. Both "seismic" and "life-safety" appear to be misnomers for a project that cannot actually "fix" existing unfavorable conditions for large industrial type buildings on the slopes of Strawberry and Blackberry Canyons.	Comment noted.
LS-3	Laurie Sarachan	In addition to the existing environmental risks, this project has the potential to increase future environmental risks and to cause further degradation of significant natural resources.	The Draft EA identifies and analyzes potential risks associated with the Proposed Action in 20 resource categories as required under NEPA.
LS-4	Laurie Sarachan	First, it is incredible that there is a Hazardous Waste Handling Facility located in Strawberry Canyon. Because I live in the adjacent Claremont Canyon to the south, I know that Strawberry Canyon is an irresponsible site to place any industrial building, but especially a building that houses contaminated, toxic, and/or radioactive materials. Information regarding the operations and reason for the Hazardous Facility needs to be more complete. What exact materials and quantities are taken there? From where? From which other facility? How are the materials taken there? What is meant by "storage?" How long is each material stored there? What physical barrier is constructed in the facilities that gives the public assurance that the hazardous/radioactive waste "would not be released to the environment?" Why is this the *best* site for handling, placement, and/or storage? Would it not be more financially prudent to take or store all waste materials in a non-seismically challenged site? If, in fact, certain waste materials are required to stay on the LBNL site for a required amount of time, then is this not one of the most compelling reasons to *move all of LBNL 's research out of the Canyons*? I urge that it is essential to discuss fully in an EIS the whys and wherefores of an appropiate alternative site other than the current LBNL location.	Comment noted. Please see response to Comment GW-15 regarding the operations of the HWHF. Please see response to Comment GL-1 regarding the preparation of an EIS. Please refer to EA Section III.D.3 for discussion of relocating the HWHF.
LS-5	Laurie Sarachan	The EA also ignores, by definition, a respectful discussion of the Hazardous Facility presence within a significant natural park resource. How does the Hazardous Facility affect the aesthetic and cultural value of Strawberry Canyon? Re-establishing high-tech, waste management	Please see response to Comment GW-15 for HWHF issues unrelated to the scope of the Seismic Phase 2B Proposed Action. NEPA Section 101(b) stipulates that the Federal Government use all

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		buildings and the associated diesel truck traffic into a valued landscape corridor seems contrary to NEPA Section 101(b) which makes it the responsibility of the federal government to: *assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings ... attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences ... [and] preserve important historic, cultural, and natural aspects our national heritage ...* How the Hazardous Facility will further impact the irreplaceable physical assets of the Canyon and its social benefits to the adjacent university and urban community must not be overlooked. Any overriding reason to justify seismically strengthening the Hazardous Facility at this site, rather than removing it to an alternative site for the purpose of protecting a beneficial natural environment, merits comprehensive information and discussion.	"practicable means" to achieve the goals paraphrased by the commenter, and that their attainment be "consistent with other essential considerations of national policy..." The EA analysis shows that the Proposed Action is consistent with and not contrary to NEPA Section 101(b). Specifically, the EA demonstrates that seismic improvements to the HWHF would not create impacts that would noticeably diminish or impact "the irreplaceable physical assets of the Canyon and its social benefits to the adjacent university and urban community." In addition, the Proposed Action specifically meets the intent of NEPA Section 101(b) by improving Federal "functions, programs, and resources," by assuring safety and productivity (101(b) provision #2), and by enhancing "the quality of renewable resources (101(b) provision #6) while not substantially impacting the environment. Please refer to EA Section III.D.3 for discussion of relocating the HWHF.
LS-6	Laurie Sarachan	Due diligence in compliance with NEPA would seem to indicate that the Hazardous Waste Handling Facility merits a stand alone EIS, independent of the other proposed actions in the Phase 2B proposal.	Please see response to Comment GL-1 regarding the preparation of an EIS. The Draft EA provides a full analysis of potential impacts resulting from the proposed seismic strengthening of the HWHF. Please see response to Comment GW-15 regarding the operations of the HWHF.
LS-7	Laurie Sarachan	The LBNL objective to establish the General Purpose Laboratory as a modern research and office space within the Blackberry Canyon area also raises many questions that should determine an EIS is in order. The GPL design, its footprint and height, 43,000 sq. ft., with 3 stories and two exhaust stacks, is inappropriate for the hillsides of Berkeley.	Comment noted. The potential aesthetic impacts of the Proposed Action and alternatives are identified and analyzed in the EA. With regard to the location of the Proposed Action, please see responses to Comments ES-1 and ES-2. With regard to the need for an EIS, please see response to Comment GL-1.
LS-8	Laurie Sarachan	It seems obvious that LBNL's Long Range Development Plan to develop a 21st Century research "park" within what was once a clean watershed source, defined by oaks, bays and buckeyes, is short-sighted and a risk. No "seismic" bracing or concrete footing can secure such a building, as well as	The comment refers to the LBNL 2006 LRDP which is beyond the scope of this EA. The performance standards for GPL and the seismic strengthening of Building 85/85A are discussed in the EA. Additionally, for a discussion of Geological Conditions Underlying the LBNL Site,

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		additional buildings, in this unstable location.	please see Master Response 1.
LS-9	Laurie Sarachan	The building design itself (might be termed in this location as "green wash") and the planting of a non-native industrial park landscape (after removing 2 coast live oak trees) with surrounding parking spaces belongs elsewhere. Please refer to NEPA Section 101 (b), as quoted above, to reassess the wisdom of building any laboratory and office facility such as the GPL in Blackberry Canyon.	The comment refers to the construction of the GPL on the site of Building 25/25B under the Proposed Action. At this location, essentially no undeveloped land would be disturbed for construction of the GPL or the associated parking lot. As described in the EA, the trees removed would be replaced at a ratio of 1-to-1. Please see response to Comment LS-5 regarding consistency with NEPA Section 101(b).
LS-10	Laurie Sarachan	The description of the GPL project and proposed alternatives raises more questions. How would private/corporate participation be defined at such a laboratory? How would the LBNL staff be linked to any private/corporate investment or research? Should there be a disclosure of private investment in regards to conflict of interest (BP comes to mind)? Is the financing of the facility only from federal sources? What federal sources? Is there a time-frame that is mandatory in relationship to the availability of federal financing?	These comments go beyond he scope of this EA. However, the GPL would be a federal funded facility engaged in implementing the U.S. Department of Energy's research mission at the Lawrence Berkeley National Laboratory. One aspect of DOE's mission is to make the scientific and technical expertise and resources of the DOE's National Laboratory system available to other federal agencies and domestic and international academic and industrial concerns. Under this so called Work for Others program, DOE laboratories perform research work for the above mentioned sponsors under a cost reimbursement arrangement. It is likely that some research work conducted by researchers housed in the GPL would fall under the Work for Others program. The intellectual property rights that attach to WFO program work are defined in the Management and Operating Contract between DOE and The Regents of the University of California for the management and operation of LBNL.
LS-11	Laurie Sarachan	What is meant by offices? If the 3-story GPL is designed to provide 60% office use, then why is an urban setting, such as Richmond accessible to Highway 80, not more suitable? How will the office and wet-lab research address the Congressional initiative to stimulate economic recovery? Why would not a location such as Richmond be a location that would comprehensively stimulate	"Offices" are intended to be conventional enclosed rooms, partitioned cubicles, or open work spaces that support clerical, desk, meeting, paperwork, and other typical "office" type uses. The office space in the GPL would be used to support the research taking place in the adjacent laboratory space. Please refer to the discussion of project "purpose and need" on EA for major factors that would influence

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		economic recovery, involving broad community needs, create a new center for research with a civic profile, while also being linked to a University research center?	siting of the proposed GPL. In addition, please see EA project alternatives analysis in chapter 5, which includes an analysis of the Richmond Field Station.
LS-12	Laurie Sarachan	I am concerned especially that the EA lacks detailed information regarding what will take place in the proposed wet-lab multi-program of the GPL. The EA description of the kinds of research seems to leave nothing out in the form of a general listing, but gives no specifics about potential environmental impacts of any of the kinds of research. The EA is too vague about the kinds of waste.	The EA includes a general description of the types of laboratory chemicals -- including equipment and very low level radioactive substances -- that are expected to be used in the General Purpose Laboratory building. Section IV.C.8 includes an analysis of laboratory TAC emissions. Further discussion of potential laboratory-related human health risks from chemicals, substances, and equipment is included in EA Section IV.C.2 (Hazardous Substances and Human Health).
LS-13	Laurie Sarachan	In particular, it is unclear how extensive the scientific research will be to create and use man-made nanoparticles. The Molecular Foundry, dedicated to state of the art nanosceince was built by LBNL and DOE without the benefit of environmental review. Now it would be irresponsible not to ask about the potential for the cumulative presence of man-made nanoparticles in the atmosphere due to LBNL activities. There is increasing concern about man-made nanoparticles in the atmosphere. This subject deserves serious detailed discussion in an EIS. What is the volume of man-made nanoparticles at LBNL? Has there been any location-site testing of man-made nanoparticles at LBNL surrounding the Molecular Foundry? Could there be a release of nanoparticles through a cooling system? The exhaust stacks? Into the water and waste system? What about potential release into the Strawberry Creek watershed and, thus, into the Bay? What about the wind patterns extending across the Bay to Marin?	The General Purpose Lab is not expected to support research efforts involving nano-particles. The LBNL Molecular Foundry did undergo full environmental review pursuant to NEPA, CEQA, and all other applicable requirements. A NEPA Environmental Assessment and FONSI (DOE/EA-1441) and a CEQA Initial Study/Negative Declaration (SCH #2002122051) were both prepared and circulated for public and agency review and comment. Both were approved in 2003. The Commenter's questions about general nano-particle related research at LBNL is outside the scope of this EA, but information on that topic can be found in the above-mentioned Molecular Foundry documents and also in the 2006 Long Range Development Environmental Impact Report.
LS-14	Laurie Sarachan	I lived through the terror of the Oakland Firestorm of 1991. We had to evacuate our home and for a time we believed that Claremont Canyon had been consumed. It was only a miracle that it was not. A historic fire in 1923 beginning along the ridge of the East Bay Hills consumed all of North Berkeley, stopping just north of Blackberry Canyon. Urban wildland fires are devastating and promise to return to the Oakland-Berkeley Hills. The EA fails to reflect the reality of the dangers. How can the EA minimizes [sic] the threat of urban wildland fires? It is a stated danger for all of Califomia. How can there be a serious discussion of the issue when	The EA includes a full analysis of potential wildland fires in Section IV.C.11 (Wildland Fires). Following the 1991 East Bay Hills fire cited by the commenter, the DOE and University embarked on an intensive site-wide program to reduce wildland fire risks at the LBNL site. Measures included creating a firebreak through vegetation management (e.g., removing eucalyptus and annually managing grasslands); "limbing" trees and controlling ground vegetation to remove "ladder" fuels and to reduce calculated flame heights; adding a third

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		Alameda County map in the EA rationalizes the non-threat of urban wildfires by portraying non-incorporated areas. What about the East Bay Park ridgelands? The Canyons? What about the urban and residential areas adjacent to the wildlands? The potential for urban-wildland fires alone is reason to move all of LBNL elsewhere.	200,000-gallon water storage tank to provide continuous fire-suppressing water pressure even in the event of earthquake; contracting with Alameda County to staff the Lab's on-site fire station; ensuring automatic gas shut-off valves to the Lab's main gas lines; and instituting extensive emergency planning. These activities are not project-specific to the Proposed Action but have long been Lab-wide practices. Information sought by the commenter concerning areas distant from the Proposed Action and that are not on the LBNL site or under DOE control would not be affected by the Proposed Action and are not warranted for discussion in this EA.
LS-15	Laurie Sarachan	Finally, if a fire occurred, possibly due to a seismic event, how would fire and life-safety be managed at LBNL? The potential for disaster is reason enough to reconsider the LBNL LRDP, in particular the Hazardous Waste Handling Facility and the General Purpose Laboratory.	Please refer to responses to Comments LS-14 and GW-15 for additional information on wildland fire safety at LBNL. A scenario where a large seismic event might trigger a fire and simultaneously impair conventional abilities to fight such fires is specifically addressed in detail in LBNL's 2006 Long Range Development Plan EIR (Section IV.F.3.5). LBNL is uniquely situated to address such fires, in part because it maintains three 200,000-gallon water tanks designed to provide pressurized water for fire suppression, even in the event that an earthquake disrupts EBMUD water service to the region, but also because it has an around-the-clock manned fire station on site, along with automatic gas shut-off valves (in the event seismic events rupture gas mains), emergency procedures and planning, etc.
CS-1	Carole Schemmerling	The Strawberry Creek Watershed Council wishes to comment on the EA for the Seismic Safety projects Phase 2B. We approve the plans for the removal of buildings 25/25B, 55 and the trailers at building 71. This plan is welcome, up to a point.....but there are serious issues being overlooked.	Comment is noted.
CS-2	Carole Schemmerling	The plans to "strengthen" building 85/85A are so ill- conceived that it is hard to believe that this is a serious proposal. You claim that your upgrades "would prevent movement of the underlying slide in an earthquake" is a perfect example of Wishful Thinking!	Please responses to Comments GW-8 and GW-12. See EA Sections III.B.4.a and III.B.4.b.
CS-3	Carole Schemmerling	Therefore we insist that a separate EIS be done for this facility.	Please see response to Comment GL-1, above, in regard to the commenter's request for an Environmental Impact Statement.

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CS-4	Carole Schemmerling	Buildings 85/85A are on an old landslide, there is No bedrock and it has so much water below, that this project stands alone as one that should be removed all together ASAP.	The geotechnical and geologic investigation report for the Building 85/85A strengthening (AKA 2010) includes the logs of four borings (AKA-10 through AKA-13) drilled in the area of Building 85. Geologic analysis of the core samples shows all four of the borings extended into in-place Orinda Formation materials. Subsurface water was considered in the engineering analyses used to develop recommendations for the landslide restraints (drilled piers and tiebacks). Also please see response to Comment GW-12.
CS-5	Carole Schemmerling	Your plans for the 25/25B site, are also of great concern. According to the "Bedrock" geological map of LBNL which you sent to us, has No indication of where this Bedrock might be, shows that the 25/25B site is an area of landslide deposits.	See response to Comment GW-3 regarding the location of bedrock.
CS-6	Carole Schemmerling	And that this is an area that is an active ground water remediation site. Where is the logic in paving over a site when you don't know how much contamination is there? How do you prevent detected contamination from migrating through the ground water? Have you ever accomplished that at LBNL?	Please refer to response to Comment ES-3, and EA Sections IV.C.2 and IV.C.3 for discussion of groundwater remediation issues. As a result of this project, there would be an opportunity to conduct further investigation and improve the existing groundwater remediation system.
CS-7	Carole Schemmerling	You certainly have not done so with the tritium plume.	Please refer to response to Comment CS-6. Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
CS-8	Carole Schemmerling	To construct the GPL on the 25/25B site is another very bad idea. All of the issues mentioned above are rational obstructions to the development of this site. There are other sites than LBNL available for new construction. It is totally irrational to construct any new buildings on a hill that is contaminated with huge amounts of toxins, on the Hayward Fault, on the headwaters of 12 tributaries of Strawberry Creek, in the fire zone and believe it or not, the northern end of the Sibley Volcanic Caldera Complex. Maybe LBNL thinks there is no limit to the funds available for this very costly project, but if public funds are going to be used, we believe it that it is incumbent on the lab to construct on a site that is cost effective!	Comment noted. Please refer to the EA for a discussion of off-site alternatives to constructing the GPL building, and for a discussion of hazardous material contamination on the site, geotechnical conditions, wildland fire, and water quality. Please refer to Master Response-1, Geologic Conditions of the LBNL Site.

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CS-9	Carole Schemmerling	The nearly 20 million gallon a year Gorilla missing from the plans is the WATER. Without acknowledging the huge amount of water that is there, the Lab will never understand how irrational their plans are. If their magical thinking allows them to continue to ignore the natural hazards of the site, as well as those they have placed there, then just as has happened in the Gulf, we will all pay dearly.	Comment noted. See response to Comment GW-14 regarding water.
JMP-1	Jennifer Mary Pearson	While the Seismic Life Safety Modernisation and Replacement of General Purpose Buildings Phase 2B lumps together disparate projects, all involve disturbing once again the hilly terrain at LBNL, and a brings to the fore a host of interconnected leftover situations.	Comment noted.
JMP-2	Jennifer Mary Pearson	Thus, this commentary is underlain with concern for our scarce public water asset value, our most precious resource that is stored beneath the LBNL and East Bay Regional Parks--at times referred to as the pure geologic water of the Lennert Aquifer, discovered over 30 years. I SUSTAINABLE DEVELOPMENT at LBNL-- HYDROGRAPH - WATER ASSETS The Brundtland Commission Report of 1987 stated we must " meet the needs of the present without compromising the ability of future generations to meet their own needs". Simply stated, rather than building by building demolition and construction at LBNL, the entire hydrograph of LBNL campus and beyond requires a full study. With respect to embracing the principles of sustainable development aren't we compelled to preserve our scarce public trust water for future generations? Thus, a full Environmental Analysis is called for; the alternative site of Richmond Field Station may be far more sustainable, more secure and have less impacts on sustainable water assets, not threatening downstream, downhill residents as it fronts on marshlands. One can argue that this planned construction can hinder progress toward	The EA includes a discussion of potential impacts to water resources. The EA also notes that groundwater is not currently used as a supply of potable water at LBNL, nor is it likely to be used for drinking water in the future. Further, the EA explains that a Stormwater Pollution Prevention Plan (SWPPP) would be prepared for the project. Additionally, the Lennert Aquifer, to which the commenter refers, is inferred to be the permeable volcanic unit that underlies the ridge northeast of Building 77 and northwest of Building 85/85A. The presence of this feature is well-recognized and has been accounted for in the Building 85/85A seismic strengthening design component of the Seismic Phase 2B Project. This feature is not close to and would not be impacted by the proposed General Purpose Lab. A study of the entire hydrograph of the entire LBNL Site and beyond is outside the scope of this EA.

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		sustainable development. The narrative justifies that safety of human life from seismic threats can be met by developing a General Purpose Lab, retrofitting the Waste Facility and building out 10 more facilities for a complex research campus on the Hill. The GPL building and the concepts of the research projects that it will house may narrowly work towards meeting the needs of the present goal of sustainability--a safer work environment and good research on sustainable energy innovations. However the siting of this building perched on hilly terrain up hill and upstream from where we live and work does not address the needs of the future for the larger community who share the hydrograph beneath us--in short our future drinking water resources asset will be threatened. Again, those of us who live and work close-by in the same bioregion as LBNL share the local hydrograph--in the global hydrological cycle that is a significant and inseparable component of the water cycle, of the climate, of the basis of life forms. In short the local water footprint is significant for the needs of the present and for our future. Water that sheds from rainfall permeating the ground along with seeps of upsurges of geologic water abound in the Berkeley Oakland Hills --some flows downhill 900 feet to the SF Bay in open creeks following the basins carved by seismic and water movement; most flows beneath the ground (groundwater in hidden creeks) and permeates into perched water retained below us in the water table, in larger bodies of water as aquifers, which will soon be explored for our drinking water recharge opportunities, These future water sources for human sustainability--for our children and grandchildren deserve fierce consideration. We are facing water scarcity now.	
JMP-3	Jennifer Mary Pearson	Although the present Phase 2B Project has stimulated some progress in selected borings for geologic engineering or goeengineering design, it has not met the goal of the Bruntland Commission.	Comment noted.
JMP-4	Jennifer Mary Pearson	II THE DEPARTMENT OF ENERGY THEMES; and LBNL LEADERSHIP VALUES On current DOE web-pages, the post Cold-War mission of the Department of Energy for Federal Scientific Laboratories sets forth three	Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.

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		themes: the stockpiling of weapons of mass destruction; environmental cleanup; and, technical development and research. In late 2009, after 20 years at the Lab, Dr. A. Paul Alivisatos took over steering a new course as Director of the Berkeley Lab. The new imagery of the lab describes research across a wide range of scientific disciplines with a strong commitment to sustainable energy innovations and cites: BERKELEY LAB VALUES are: Overarching commitment to pioneering science Highest integrity/impeccable ethics Uncompromising safety Diversity in people and thought Sense of urgency It is most significant that in 2010 the Director has elevated the Lab's community outreach efforts, hiring staff who listen and inviting community partners to meet with himself and the major decision makers in a friendly Community Advisory Group. Given the above, we encourage the Director to put out a call in confidence to past employees and long time community members to work up an All Hazards Vulnerability List for the goal of uncompromising safety. Such could enable his management to address the 'dark secrets' that remain underground from past years of classified research using radionucleides, volatile organic chemicals, biological organisms and much that we do not yet know about that were 'stealthily buried' in the softer soils. Further reading on DOE pages, states that there are scattered patches of radionucleides or toxic chemicals embedded in the land and buildings on national laboratory sites that can serve as TESTBEDS for pioneering cleanup techniques.	

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
JMP-5a	Jennifer Mary Pearson	III LBNL HAS TESTBEDS: The challenge of pioneering environmental waste cleanup technologies for identified underground contaminant plumes: The LBNL was once listed to be designated as a Superfund Site to receive funding for environmental cleanup under CERCLA (Comprehensive Environmental Response and Liability Act (1980). Unfortunately, LBNL was de-listed administratively/politically with no explanation while Lawrence Livermore Laboratory which had military base legacy contaminants receives robust funding to the present day. Following the first six years, the Federal Government enacted SARA, Superfund Amendments Research Act (1986) to add a focus on innovative research for hazardous waste cleanup.	The comment is noted. Because it does not address the scope or impacts of the Proposed Action, its alternatives, or the Environmental Assessment, no further response is warranted. The Commenter is incorrect in asserting that LBNL was once "listed to be designated a Superfund site," and that LBNL was "de-listed ... with no explanation." LBNL was, in fact, investigated by the US Environmental Protection Agency (EPA) in the late 1990s at the request of local concerns. At that time, LBNL was designated as "potentially eligible" for the federal National Priorities List (NPL) until the EPA investigation could be concluded. "After reviewing extensive environmental sampling data," EPA concluded in a public statement issued in 2002, it would not list LBNL on the NPL and no further Superfund program involvement was needed, because Tritium levels at LBNL (the subject of the investigation) were far below federal health thresholds.
JMP-5b	Jennifer Mary Pearson	We learned recently, that UC Berkeley Engineering Professor Lisa Alvarez-Cohen received a SARA, Superfund Research Program grant. Her team leads in the discovery and application of novel micro-organisms and biochemical pathways for microbial degradation of environmental contaminants to improve bioremediation of superfund contaminants. Perhaps, there are other researchers working on cleaning water, cleaning soils of hot and cold contaminants who receive SARA funding?	Comment noted. Because it does not address the scope or impacts of the Proposed Action, its alternatives, or the Environmental Assessment, no further response is warranted.
JMP-6	Jennifer Mary Pearson	If such funded research projects allow experimental work on testbed sites that are not designated Superfund sites, then it begs the obvious question: Is anyone at LBNL researching improved cleanup methods for the celebrity, Tritium and other radionucleides, and the synergized toxic chemicals that have been identified in the 'hot zones' of ground, soils, rock layers, creeks, perched water pockets or vaults, and underground waterways, identified in LBNL documents? Is any effort underway to interest scientists to work pioneering cleanup	Comment noted. Because it does not address the scope or impacts of the Proposed Action, its alternatives, or the Environmental Assessment, no further response is warranted.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		techniques at any of these plume testbed? Given that Tritium has such a long life, and we hear of traces of tritium found all over the country, it would be consistent with the DOE mission of technical development and research for safe methods of environmental cleanup. These hot zones provide an opportunity! And we learned from previous employees that there are the 'cold zones' of decomposing biological waste.	
JMP-7a	Jennifer Mary Pearson	1V SEISMIC LIFE SAFETY; THE GENERAL PURPOSE LAB AND SAFE WASTE HANDLING BUILDINGS--SAFETY FIRST! There is so much that we don't yet know of what lies beneath the LBNL, and what has flowed downhill beneath the UCB Campus, and further downhill deep beneath our homes and businesses in Berkeley.	Subsurface characterization is provided in EA Chapter IV.C.2 (Hazardous Substances and Human Health). This EA addresses known hazards and state of the art engineering and cannot predict further engineering or testing developments.
JMP-7b	Jennifer Mary Pearson	And we don't know how and where the earth will open up when the Hayward Fault faults. We don't know what will happen to contaminated plumes; we don't know if the splays that lace the Berkeley hills between the many identified faults will zig zag open, that plentiful geologic water from the Lennert Aquifer beneath the Lab will surge up, or contaminated waste water wil spring up in old traces of springs and seeps in our gardens downhill at our homes.	The project is not in an Alquist Priolo Earthquake Fault Zone. Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
JMP-8	Jennifer Mary Pearson	While geotechnical engineers can assure us that sample borings and soil studies indicate what they assert IS beneath the LBNL, their studies are shallow nor do they apply to every square foot beneath existing buildings. Thus, an expert engineer in 2010 can design a geoenginered foundation for a new facility where he believes can be safely anchored over earthquake fault splays, underground streams, perched water ponds and layers of rock which sometimes is referred to as 'solid ground'. In earthquake country solid ground is questionable. Ten years hence, in 2020, another geotechnical engineer may throw out that analysis and design and provide a stricter set of standards of construction, Or, he may recommend no construction whatsoever at that	This EA addresses known hazards using state of the art engineering and cannot predict future engineering or testing developments.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		site as he has subsequently learned of a Pandora's Box of warning alerts that cumulatively strike him as an unsustainable site for future generations of humans.	
JMP-9	Jennifer Mary Pearson	The forces of nature elude forecasters who presume stationarity when using risk analyses. Climate changes of excessive rainstorms, droughts, killer heatwaves, volcanic ash clouds, earth fault movements, firestorms, impact landslides, sinkholes, underground aquifers depletions or floods, dissolved rock, landslides--all manner of dynamic changes from largely natural forces are risks. The cumulative risks of more and more disturbances of the steep hills at the LBNL site when more and more construction begins, have yet to be discovered and established for NEPA staff to review. The standards of development set by DOE Facility Safety Office Of Health, Safety, and Security to protect Lab personnel to work in a safe, healthy, and environmentally sound manner will change as future scientists pioneer research. V ERNEST LAWRENCE CHOSE AN ALTERNATIVE SITE FOR THE SAFETY OF COLLEAGUES AND TEAM Ernest Lawrence never imagined the Lab he founded would move soil, build, demolish, and rebuild filling out the land he choose as an alternative site to protect the health and safety of his academic colleagues. Ernest Lawrence moved his high energy physics research unit from the UCB Campus to the alternative hill site creating the Radiation Laboratory and in two canyons east of UCB. The land was empty, quite inaccessible for the public; he theorised that the slopes could absorb radioactivity from the accelerator experiments. VI WOULD LAWRENCE TODAY CONTRIBUTE TO AN ALL HAZARDS VULNERABILITY INDEX COMMUNITY PROCESS? Lawrence never imagined the range of classified research that took place in the "hot" zones and the problems of "hot" waste which for years were	Comment noted. The EA examines, as directed in NEPA 40 CFR 1502.22, "reasonably foreseeable adverse effects" that are "supported by credible scientific evidence, (are) not based on pure conjecture, and (are) within the rule of reason." In the list of hypothetical risks posed by the Comment, the comment does not present evidence that there is credible information that has not been considered by DOE in this analysis.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		buried in pits in the ground--some forgotten-- and now ly beneath buildings that may soon be demolished or retrofitted. Had he lived until today, he likely would have learned of the high seismic risk and perhaps, even have contributed to an All Hazards Vulnerability Index. People following the new course of values for the LBNL say it is time now to stop and follow the legacy of Lawrence to not compromise safety. Embrace the Bruntland sustainability: to not comprise the needs of the future generations by present use of resources. VII A SATELLITE CAMPUS? Let LBNL revered and feared! become LBNL revered! We request all readers to commit to a smart satellite campus for upcoming facilities development where no humans lives downhill, downstream.	
JMP-10	Jennifer Mary Pearson	Compare costs of changing the construction of the General Purpose Lab site to Richmond Field Station. A new GPL at a safe, modern, high accuracy research facility suitable for co-located and co-ordinated research at Richmond Field Station Add a lounge and indoor/outdoor cafe space for teams of individuals with different expertise to share knowledges. Scientists from UCSF who presently research at RSF could join in conversations. Clean Bay air, a beautiful view and ample parking with a a10 minute shuttle ride to the UCB main Campus.	The EA includes an analysis of off-site alternatives for the Proposed Action, including a Richmond Field Station alternative.
JMP-11	Jennifer Mary Pearson	Just imagine Physicist Steven Hawkings coming to visit in his wheelchair and the lack of American Disabilities Act access at the current Lab as opposed to a lovely scenic new laboratory campus on flat Richmond Field Station?	LBNL provides reasonable accommodations pursuant to ADA. Further, the General Purpose Laboratory would be fully accessible and ADA compliant.
JMP-12	Jennifer Mary Pearson	VIII ALTERNATIVE WASTE HANDLING FACILITY AT RFS Entertain constructing a new state of the art Waste Handling Facility at RFS and then abandoning the current facility. If the building as planned and a satellite campus starting with the GPL is developed at RSF, another waste handling facility will be needed. Templates abound on DOE websites for safe waste facilities; indeed the nearby State Department of Health secure facility or Bayer Labs can provide tours that may assist in realising	The comment is noted; DOE acknowledges the Commenter's suggestion for the HWHF. Please see response to Comment GW-15.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		that the site of the present WHF is far too vulnerable.	
JMP-13	Jennifer Mary Pearson	IX CURRENT SHODDY PERIMETER SECURITY AT LBNL The responses on page 54 Section IV.B.7. Intentional Destructive Acts states an UNTRUTH. We can easily see a rusty falling down fence with holes that we could crawl through in many steep slopes or follow the creeks uphill from the roadway by the Strawberry Canyon Recreation Facility or the creek in Blackberry Canyon. These old rusty fences are not secure. The hills above the lab are accessible by car and foot. Homes are within a few hundred feet of the weak fencing. We do not see any walls, lighting, cameras, etc... "The Proposed Action is not expected to require additional security for the LBNL site The entire LBNL site is fenced, and controlled access is available only at three entry gates. Card Keys would be used for building access." And, "The building would have a guard on the door during normal business hours and card key access." " If the GPL were to be built at the RFS, the security configuration would be similar..." This last statement is doubtful. Would DOE permit a skimpy security design for a new asset, a laboratory worth millions of dollars with research projects that are priceless?	As described in EA Section III.B.5, the administrative and scientific activities that would be conducted in the proposed GPL would be typical of current LBNL laboratories located on- and off-site. Consequently, they are not anticipated to require additional security measures for the LBNL site. The security configuration at the RFS would be similar to the Proposed Action.
JMP-14	Jennifer Mary Pearson	Aside from Lawrence Berkeley and classified Livermore, that lack a perimeter buffer zone to insulate surrounding civilian communities--is there any other Federal Lab that lacks a state of the art secure perimeter?	Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
JMP-15	Jennifer Mary Pearson	X WHAT ARE DOE SECURITY STANDARDS? A 200 feet no private vehicle perimeter? A blast standoff area? Perimeter lighting of complex? An access control center and security plan that can override key controls to all doors and gates?	DOE security standards can be found at DOE G 413.3-3 which references DOE 470 series of Orders and Manuals on this topic. The Proposed Action is designed to meet all applicable federal and state standards, including for security.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		loading docks outside footprint of main building? (There is much more available on the internet.) We continue to request that staff look at asset values and geographic range of threats related to this ICONIC government facility in concert with local law enforcement leadership who know the terrain.	
JMP-16	Jennifer Mary Pearson	XI FEARED 'COLD' BIOHAZARD LEGACY WASTE ? An in confidence call to the larger community to partner with the management at LBNL to produce an ALL HAZARDS VULNERABILITY INDEX would allow recognition and future pioneering research on not only the 'hot' waste, but could flesh out the legacy of biological organisms waste that was secretly dumped and buried--the 'cold' biohazard waste of decomposing bodies of experiments with animals. Years and years ago, when the Lab was still the Rad Lab and highly secretive it was called the "Stealth Lab". We recall the caged hyenas (from above Strawberry Canyon that were screaming when we took our children to swim at the University's pool--i.,e., until their vocal chords were severed); the frightened beagle dogs that barked all night long that we could hear for miles--other animals used in classified research including the radioactive chickens we saw in the poultry facility adjacent to Chicken Creek just up the road from the pool. Much is still there that we don't see or know about. Some organic bio-agents may still be alive. Metaphorically, one can imagine a 15th Century nightmare illustration of evil sinister chimeras lurking below ground awaiting a time to arise and plague the living with 'the sins of our fathers.'. This may not be likely; however it could serve for another testbed research project for SARA funding.	Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
JMP-17	Jennifer Mary Pearson	XII HOPE FOR FUTURE GENERATIONS If we could work together towards an open transparent knowledge process, commit to the best possible clean-up, protect our reserve drinking water bank, and support a beautiful modern secure satellite campus at more stable	Comment noted.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		land of Richmond Field Station perhaps the LAB will no longer be feared, it will be highly revered and attract even more of the best scientists for pioneering research for sustainable practices for all peoples worldwide.	
ST-1	Stephanie Thomas	I am writing to strongly request that this project, Seismic Life- safety, Modernization and Replacement of general Purpose buildings- Phase 2B undergo a full environmental review. Because of the many hazards and dangers of the area an Environmental Impact Study (EIS), not an Environmental Assessment (EA) is needed so that all of these risks can be discussed as well as how to protect the watershed lands and the cultural heritage of this area.	Please refer to response to Comment GL-1 regarding the preparation of an EIS
ST-2	Stephanie Thomas	I have attended lectures and seen films of the area and the problems and dangers of putting buildings in that area. These dangers include the unstable earth below which is made up of mudstone and other material that will move in when the expected major quake occurs on the Hayward Fault.	Please see Master Response 1 – Geological Conditions Underlying the LBNL Site.
ST-3	Stephanie Thomas	Also The committee to Minimize Toxic wastes has shown that the site is full of contaminants that will be disturbed when graded during construction.. This is a volatile area and too dangerous to disturb near the UC Campus and the neighborhoods nearby as well as the entire area.	Please refer to responses to Comments ES-3, GW-7, GW-11, and GW-12.
ST-4	Stephanie Thomas	In addition Building 85 and 85A have radioactive waste and VOCs. They straddle 2 old landslides, The solution of the piers will not be sufficient.	Please refer to responses to Comments ES-3, GW-7, GW-11, and GW-12.
ST-5	Stephanie Thomas	I have learned that there is a new issue of what will happen if fire in that area should come down into these proposed facilities, potentially burning and dispersing radioactive and VOCs into the air and watershed into the bay.	The EA includes a full analysis of potential wildland fires in Section IV.C.11 (Wildland Fires). Additionally, please see response to Comment GW-15.
ST-6	Stephanie Thomas	As I am sure you are aware these are serious issues to consider and they require the fullest study and chance for all experts to testify. It would be a serious mistake to allow this to proceed and possibly have this community suffer an inevitable calamity of several sorts. If you had a son or daughter who attends school there or if you or a family member lived near by, i am sure you would want this to have a full assessment. I have lived in Berkeley over 40 years, have walked the hills in Strawberry	Comment noted. The EA identifies and analyzes impacts to biological resources and aesthetics. See EA Sections IV.C.4 Biological Resources and IV.C.5 Aesthetics.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		Canyon enjoying the views and the wildlife. I have attended walking lectures about this special watershed area and it's importance to the wildlife and the culture of the area. It has quite a history.	
ST-7	Stephanie Thomas	This is not the place for such buildings- too much risk- too much disruption to what we should preserve. there are alternatives- in Richmond and in Oakland and elsewhere. This is why this drastic proposal need an EIS.	The Proposed Action would take place entirely on or adjacent to previously disturbed land and would not result in the development of undisturbed land. Additionally, the EA analyzes alternatives which would see the project implemented in part on sites in Richmond or in the area such as Potter Street in West Berkeley. Please see response to Comment GL-1, above, in regard to the comment about preparation of an Environmental Impact Statement.
CMW-1	Charlene M. Woodcock	I write to express my strong objection to LBL's building plans for the very sensitive areas in Strawberry and Blackberry Canyons above Berkeley in an area of earthquake faults, fire danger, mudslides, and generally unstable terrain. In addition, the proposed site around Building 25 is proven to be contaminated with toxic wastes, Buildings 85 and 85A have radioactive waste contamination and are also on unstable ground.	The EA includes a discussion of geological and seismic hazards, wildland fires, and hazardous substances and human health. The discussion identifies and analyzes the potential risks as required under NEPA. Additionally, please see response to Comment GW-15. Please also see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMW-2	Charlene M. Woodcock	This area is obviously very inappropriate for the existing Hazardous Waste Facility above the botanical garden and the campus. How can a serious plan be put forth to add to the dangers already existing by planning another building in such an unstable area, with so much potential for disaster?	Please refer to response to Comment GW-15 concerning the HWHF. Please also see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMW-3	Charlene M. Woodcock	At the very least, an objective, scientifically sound Environmental Impact Study is essential. Citizens of Berkeley should not have the watershed above our city threatened by these ambitious LBNL building projects without a very thorough examination of the risks and safer alternatives, that would not require extraordinary efforts and costs to ensure safety.	Please see response to Comment GL-1. The EA evaluates water resources and alternatives.
MLN-1	Mary Lee Noonan	I trust that the Department of Energy will insist that a full federal environmental review be conducted for the projects currently in the planning stages at the Lawrence Berkeley National Laboratory. The risks of soil instability and the potential dispersal of contaminants are significant at the sites, for example, of both the proposed General Purpose Laboratory and the Hazardous Waste Facility. The legacy of the ancient caldera	A federal environmental review pursuant to the National Environmental Policy has been conducted by the Department of Energy. The EA prepared as part of that review analyzes issues concerning soil stability (Section IV.C.1), and potential contamination (Section IV.C.2 and IV.C.8). The issue as to whether an ancient caldera underlies the LBNL site is addressed in Master Response 1 Geological Conditions Underlying the

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		cannot be ignored.	LBNL Site.
MLN-2	Mary Lee Noonan	Even my cleaning lady has spoken up on the hazards. Many years ago she was the university's gardener at the Lawrence Hall of Science. She can remember vividly conversations with a seismologist who had been brought in from Texas as a consultant on various ground water problems which they had been experiencing. "When the Hayward Fault goes," he told her, " this will all be down at Center and Shattuck." LBNL minimizes these perils at its own risk - and at ours as residents of Berkeley.	See Master Response 1 Geological Conditions Underlying the LBNL Site.
GG-1	Gale E. Garcia	Full compliance with the National Environmental Protection Act (NEPA) is necessary for the LBNL Plan to build new research facilities in the hills above the University. The area is an earthquake zone and a landslide zone, and is difficult to access. The "Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project", includes a major bioresearch building and a toxic waste building. It therefore needs full disclosure and discussion in a Environmental Impact Statement.	This EA has been prepared in full compliance with NEPA. Additionally, please see response to Comment GL-1, above, in regard to preparation of an Environmental Impact Statement. Please also see Master Response 1, Geological Conditions Underlying the LBNL Site.
GG-2	Gale E. Garcia	I believe that the Environmental Assessment (EA) is very superficial. It is not persuasive that the natural setting of the Berkeley-Oakland hillsides is worth sacrificing for large glass and steel research and waste buildings. The EA has no serious discussion of the importance of the Strawberry Creek watershed or the connection of the hills to Tilden Park and the East Bay Regional Parks.	Comment noted. The EA addresses environmental impacts of the Proposed Action and reasonable alternatives. The Proposed Action would take place entirely on or adjacent to previously disturbed land and a Stormwater Pollution Prevention Plan (SWPPP) would be prepared for the project. The EA also includes a discussion of potential impacts to water resources and a discussion of potential impacts to biological resources.
GG-3	Gale E. Garcia	It is significant that the EA ignores discussion of disaster preparedness and safety issues. Also, the burden upon our residential population on a daily basis or in the event of a disaster is ignored. Here are some quotes from City and University officials that can be found in a June, 2005 article on the California Planning & Development Report website: http://www.cp-dr.com/node/415. 1.) '''It's a built-out environment. Every piece of land has a use of some kind on it,' O'Banion said. For new buildings and facilities, campus	The Seismic Phase 2B project is predicated on improving the safety of workers and guests at LBNL. The EA cites a number of LBNL documents related to emergency preparedness and safety, including the Hazardous Materials Business Plan, which identifies appropriate procedures for emergency training and response procedures to address the accidental release of hazardous materials; the Self-Assessment Summary Report and the Site Environmental Report prepared annually to aid in compliance with environmental laws and regulations governing hazardous materials, and worker safety, emergency response, and environmental protection; the

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		planners are eyeing places that are underused, obsolete or seismically questionable ... " (Emphasis added).	LBNL EH&S Manual, Pub 3000; and the 1994 UC LBNL Wildland Fire Evacuation/Relocation Plan. The O'Banion quote applies to the University of California Berkeley Campus and not LBNL.
GG-4a	Gale E. Garcia	2.) 'The third issue is money, specifically fees for municipal services that the city provides. City officials say the city provides $13.5 million worth of services to UC every year, a tab that will increase by $2 million annually under the LRDP. The city's lawsuit argues, 'The university does not commit under the LRDP to pay for the impacts on city services used by the university or to lessen those impacts through effective mitigation.'"	The 2005 article pertains to the University of California at Berkeley and its 2020 Long Range Development Plan. It is not pertinent to LBNL, and moreover, to the scope of the Proposed Action, alternatives, or the Environmental Assessment.
GG-4b	Gale E. Garcia	3.) '''For example,' added DeVries, 'we provide the entirety of the university's fire protection and ambulance services. We essentially provide a fire department for a community of 50,000 people at no charge.'" (Mr. DeVries was employed at that time in the City of Berkeley Mayor's office).	Please see response to Comment GG-4a.
GG-5	Gale E. Garcia	Also, I am attaching two pages from the City of Berkeley General Plan about disaster preparedness and safety issues. They can be found at: http://www.ci.berkeley.ca.us/ContentPrint.aspx?id=496.	Comment noted.
GG-6	Gale E. Garcia	The Department of Energy must take full responsibility for all impacts & liabilities at the LBNL site. I believe that a full EIS is mandatory under NEPA for this project because it will "significantly affect the quality of the human environment" and cause cumulative risk in the event of a disaster.	Please see response to Comment GL-1.
GG-7	Gale E. Garcia	Attachment: Two pages from the *General Plan - Disaster Preparedness and Safety Element – City of Berkeley, CA* (http://www.ci.berkeley.ca.us/ ContentPrint.aspx?id=496)	The EA identifies and analyzes potential impacts related to geological and seismic hazards. Please also see Master Response 1, Geological Conditions Underlying the LBNL Site.
GB-1	Gene Bernardi	My comments are directed to·the Seismic Strenghtening of the Hazardous Waste Handling Facility (HWHF) consisting of buildings 85, 85A, 85B, a yard and prefabricated units. To be be brief, the Seismic Life Safety of the HWHF is likely also brief. In 1989 it was predicted "The Big One" will occur on the Hayward Fault within 30 years; that's just 9 years to go! The replacement HWHF should never have been built in its present	As noted in the EA, the scope of work for the HWHF Building 85 is to seismically upgrade the building and does not change the operation of the building or extend its intended life. The EA therefore, only considered the impacts resulting from the construction identified in the EA. DOE Environmental Assessment DOE/EA-0423 Construction and Operation of the Replacement Hazardous Waste Handling Facility at LBNL considered the impacts of the construction and operation of the HWHF and found no

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		location, situated behind Lawrence Berkeley Lab's Strawberry Canyon gate in Oakland on the East Canyon "Feature", a branch of the Wildcat Fault. In order to build the Non-Nuclear Facility, for the storage and treatment of radioactive and hazardous waste, it was necessary to do at least 4 things: 1. Ignore the Wildcat and East Canyon Faults and any branch "Features" upon which the Hazardous Waste Handling Facillty now sits. 2. Ignore the safety implications of slope stability problems. The Lab ignored slope stability problems despite: a) its own revelation in "Response to Public Comments" IS-7 (LBNL, April 1997) which indicated that a slide 50 feet long by 100 feet wide occurred along the access road to the site of the replacement HWHF in the Winter of 1994/95. (Not an ancient slide !) b) the knowledge provided in Public Comment, of a UC Berkeley press release which reported that Centennial Drive, which connects to the access road to the HWHF, was closed for 8 months in 1983/84 due to a huge slide. (Press release enclosed).	significant impacts.
GB-2	Gene Bernardi	3. Fail~ to do a Supplementary ElR when 2 major changes were made to the Original EIR: a) First: building a Non-Nuclear Facility for storage and treatment of radioactive waste and hazardous waste because Department of Energy's (DOE) Western Division "determined that the benefits of constructing a Nuclear Facility do not Justify the additional costs," (April 5, 1994 memo to Joe Boda from Alex Dong - enclosed). Surely a Nuclear Facility has more safety features than a Non-Nuclear Facility. Is safety not worth the cost? In order to fall below the threshold for a Category 3 Non-Reactor Nuclear Facility, the one the original EIR Indicated was to be built, theTritium	Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

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		Focus Group was actually able to get the DOE to change the threshold from 1000 Curies (Ci) to 16,600 Cil (U.S. Dept. of Energy, DOE Standard "Hazard Categorization and Accident Analysis... DOE STD-1027-92, Dec. 1992, Change Notice no.l, September 1997 - See Attach. I pp A-10, for Isotope H3, and A 12 footnote * - enclosed)	
GB-3	Gene Bernardi	b) Second: moving the fence-line a considerable distance from the then existing fence-line around the HWHF in order to declare they are not exceeding the allowable radiation dose to the public. This would not be possible without a public hearlng and eminent domain proceedings if private property, rather than UC Regents' property were located outside the existing fence-line. (See enclosed: 7/21/99 letter to Watson Gin, DTSC from G. Bernardi CMTW: 2/20/96 memo from G. Weinstein to. D.Balgobin, LBNL: 7/14/94 letter to G. Bernardi from T. Powell, LBNL; 3/28/96 memo to H. Mitchell, UC and K. Berkner, LBNL from L. Bean, UC and R. Camper, LBNL).	Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
GB-4	Gene Bernardi	I don't find it strange that the safety of the public and employees was not the paramount concern, and that CEQA was violated and radiation thresholds were changed to fulfill the headstrong plans and cost saving motives of the HWHF decision makers as this was done under the tutelage of the University of California, the manager of the Lab. One can see parallels to UC's actions regarding the Memorial Stadium, wherein UC claimed it could dispense with the supporting concrete pier footing tied into the stadium, when the Judge ruled it violated the Alquist-Priolo law. Next, UC saw to it that the Stadium and other State buildings be totally exempted from Alquist-Priolo through the Omnibus Bill (2009). Such amendments are required to be non-controversial!	Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
GB-5	Gene Bernardi	LBNL has expressed concem (DEIR Vol. I. 1/29/10 - p. 3-17) that the HWHF (Bldg 85/85A and 85B) is in the area of the official State of California Earthquake Induced Landslide Hazard Zone and that presents a hazard to the HWHF in case a landslide wae mobilized in the event of a major earthquake. A sincere concern would mean compliance with the Alquist-Priolo Act.	As stated in the EA, Section IV.C.1.a.ii, none of the Proposed Action components are located in the AP zone.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		Do the cost and specifications of the system of concrete pier foundations and tiebacks to stabilize Bldgs. 85/85A comply with Alquist-Priolo? If not, does this mean safety conscious members of the public and potential employees need to avoid both State and Federal government buildings in California?	
GB-6	Gene Bernardi	Attachments (15 pages).	Comment noted. The attachments do not pertain to the scope of the Proposed Action and are outside the scope of the EA.
BR-1	Barbara Robben	First I want to thank you for mailing me a copy of the draft Environmental Assessment document. It is essential to have the document in hand, in order to be able to read it and to comment on it. When the final Environmental Assessment is published, I will need to have a copy of that, as well. Thank you in advance for sending it. Apologies if I have inadvertently mis-named any of the agencies involved. I know that the University of California, the Lawrence Berkeley National Laboratory, the Department of Energy and perhaps others interact in their functions and responsibilities there on the Hill. I have included comments that I made for the Draft Environmental Impact Report, General Purpose Buildings, Phase 2 project, submitted on March 15, 2010.	Comment noted.
BR-2	Barbara Robben	Ground Water. In the final EIR of this project, dated June 21, 2010, I had made some comments on the toxic contamination of the groundwater by LBNL, noting that the U.C. site originally was selected because of its abundant fresh water springs suitable for drinking water. (5-280) Your response to my comment (BR-26) is: "As for groundwater contamination, UC LBNL is cleaning up the groundwater under the regulatory authority of California Dept. of Toxic Substances Control. The long term goal is to restore all groundwater at the site to drinking water standards, if practicable, even though the	EA Section IV.C.2., (Hazardous Substances and Human Health), discusses contamination issues pertinent to this project. The Comment concerning the Livermore Laboratory is not pertinent to the scope of the Proposed Action, alternatives, or the Environmental Assessment. See response to Comment CS-6.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		groundwater is not used as a source of drinking water." There are several things wrong here. There is the admission that toxic contamination has taken place, and that the site is under the supervision of the California Dept. of Toxic Substances. This suggests that damage has been done at the site in the past. Logic suggests that the site be cleaned up. This should be accomplishes before any thoughts of future building at the site. Step #1 should always be to remedy one's mistakes before considering any other desired outcomes. "If practicable" is such a hedge. Once the Lab gets its desired buildings, what incentive does it have to remember its promise to "restore groundwater at the site to drinking water standards?" And then the site would be covered with the building(s). Let's examine your sister lab at Lawrence Livermore National Laboratory, my understanding of this site is that it is a "superfund" site. Remedial work done at this site is not done "if practicable". It is a national priority to clean up this site. Hundreds of wells and over a thousand bore-holes have been drilled to monitor the contamination. Now that it's known where the contaminates are the problems are to clean up, capture the water, prevent migration. 37 treatment facilities are on site. There are constant new problems and unexpected costs. There is regulatory oversight at all times.	
BR-3	Barbara Robben	My question is: was LBNL ever considered for a "superfund" site designation? When was this and what was the outcome? Community members could be rightly nervous about the toxic legacy of the Lab even if it was not a designated site. Is LBNL a 'second-tier toxic site,' and what went into the decision?	Please refer to response to Comment JMP-5a.
BR-4	Barbara Robben	In any case, it is awkward to imagine the basement of a new General Purpose Lab being drilled for bore-holes and wells to monitor the contamination. The common sense conclusion is inescapable: clean up the toxics at the Lab before any consideration of future building. This should not be a 'long-term goal". It should be an immediate goal. The long term goal should be to keep it free of toxics ever after.	See EA Sections IV.C.2.b.i and III.B.1.d.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
BR-5	Barbara Robben	If the Lab is under the regulatory authority of the California Dept. of Toxic Substances, how does this conform with regulatory agencies at national level?	The Department of Toxic Substances Control is implementing the Federal Resource Conservation and Recovery Act (RCRA) at the LBNL Site.
BR-6	Barbara Robben	The public was invited to comment on LBNL's Draft EIR, and we received the outcome of that in a document dated June 21, 2010, the final EIR, a State of California document: CEQA: California Environmental Quality Act. One week later, however, on June 28, 2010, a second opportunity appeared for citizen comment: a draft Environmental Assessment from the Dept. of Energy, a national document: NEPA: National Environmental Policy Act.	Comment noted.
BR-7	Barbara Robben	Will the toxic substances regulation become more strict at the national level? What agency will be supervising the future clean-up?	It is not known whether toxic substances regulation will become stricter at the national level. It is anticipated that DTSC and DOE would continue to supervise any future cleanup.
BR-8	Barbara Robben	And finally I would like to comment on LBNL's response, "even though the groundwater is not used as a source of drinking water." Groundwater by its nature is a shared resource. LBNL may possibly choose not to drink the groundwater from a well on its property, but the neighbors of the Lab may drill a well into that same aquifer with the expectation of being able to drink it. The underground reservoir of water does not stop at the LBNL fence-line. The same applies to Strawberry Creek. It is a shared resource with those downstream. Strawberry Creek flows through the City of Berkeley. People--and animals--should be free to use the creek without threat of contamination in the water. When the water reaches the Bay, and subsequently the ocean, it must be free of LBNL contamination.	The Proposed Action would comply with applicable regulatory requirements related to groundwater and surface water. Please refer to Section IV.C.2 (Hazardous Substances and Human Health) and IV.C.3 (Water Resources and Soil Erosion).
BR-9	Barbara Robben	[Attachment: Map of Strawberry Valley and Vicinity] Included is a map of Strawberry Valley, 1875, "Showing the Natural Sources of the Water Supply of the University of California" prepared by Frank Soule', Jr., Prof. Eng. This map has been photocopied, probably many times, so that it is somewhat difficult to pin-point each of the springs shown on the map, so I have marked as many as I could find in red. No doubt the original may be	Please refer to Sections IV.C.1 (Geological and Seismic Hazards), IV.C.2 (Hazardous Substances and Human Health), and IV.C.3 (Water Resources and Soil Erosion).

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		found in U.C. archives. Unfortunately the U.C. Berkeley "water resources center archives" seems to be in the process of being dispersed to various locations statewide, to its detriment. My point is that it has been known for a long time that there exists plentiful amounts of fresh water in the aquifers, springs and creeks of Strawberry Canyon, and it should come as no surprise that buildings placed there would have hydrologic issues. Underground water will be affecting the stability of buildings; add costs to construction; contribute to landslides, soil creep, erosion; and thru fissures in the bedrock, allow toxic substances known to be present at LBNL, and in the soil, to enter into the aquifer and the surface drainage system as well.	
BR-10	Barbara Robben	Please include either my copy of Soule's map in your Environmental Assessment report, or a more superior version from your archives. I am also including two recent newspaper articles about the water archives and the University's attempts to conserve water by installing aerators and shower timers on campus. These articles point up the fact that there are gaps in the way that the University of California is managing its water resources and its usage. You may eliminate these two newspaper articles from your E.A., since they pertain to the campus. Yet, as is stated in the D.O.E Document: "LBNL is operated by the University of California..." and, "drinking water is supplied to LBNL and the cities of Berkeley and Richmond by the East Bay Municipal Utility District (EBMUD)." The survival of humans on this planet may hinge on whether we <u>are able to understand Earth's natural systems</u> and not abuse them. All of Earth's systems--plants, animals, humans, weather, oceans, marine life--we all rely on water. We must be good stewards of water if we are to survive.	The comment is noted. The Commenter's materials have been included in this Final EA.
BR-11	Barbara Robben	I would like to see a more thorough discussion of the hydraugers and storm water mentioned in IV.C.3. Please include facts about the landslides that triggered the need for the hydraugers. Do the hydraugers solve the imminent landslide problem?	As stated in the EA (see Footnote 44), Hydraugers are in-hill drainage pipes installed at locations throughout the Lab to draw groundwater out of the hillside and prevent saturation of the soil that otherwise could lead to slumps and landslides.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
			Master Response-1, Geological Conditions Underlying the LBNL Site, addresses landslides at LBNL. Because the Proposed Action would not alter the Hydrauger system, the discussion in the EA is adequate.
BR-12	Barbara Robben	I would also like you to include information on the well or wells that were subsequently drilled. What is the flow from drilled well(s)? What use is made of that water? Please include results of water quality tests.	The information about wells is available at the Public Library in environmental restoration reports and online at http://www.lbl.gov/ehs/erp/html/documents.shtml.
BR-13	Barbara Robben	It is important that a map of the hydrology of the canyon be included. It should include the location of hydraugers, wells, storage tanks, pipes, culverts, storm drains, sanitary sewers, inlets etc.: all of the infrastructure that has been installed since the time of Soule', in fact. This is particularly important in the light of the fact that water runs downhill. At the base of LBNL lies the Hayward fault... and of course, most of the City of Berkeley. Any of LBNL's pipes, culverts, storm drains, and sanitary sewers that cross the fault will likely be severed and rendered inoperative by a major rupture of the fault. What are LBNL's emergency plans in this regard? Please be specific.	This EA addresses hydrology, hydraugers, wells, storage tanks, pipes, culverts, storm drains, sanitary sewers, inlets, etc relevant to the Proposed Action. None of the project components cross the Hayward fault.
BR-14	Barbara Robben	The Use, Hazards, and Demolition of Trailers. III.B.3 What was the justification of bringing trailers to the Lab? Was there a plan to utilize trailers on the Hill or was it more of an expedient measure to house a particular experiment, or to accommodate a prestigeous professor, or because funding suddenly became available. My point here is that if the trailers appeared suddenly and randomly, and if their arrival was not well thought out, then when LBNL is thinking of demolishing then and replacing them with large, modern and expensive	Comment does not address the Proposed Action, its alternatives, or the adequacy of the EA. See also Executive Summary regarding the rationale for removing the trailers.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		buildings, it might be at least wise to examine the origin of the initial trailers. If the reasons for bringing in the trailers was somehow flawed, the idea of replacing the trailers with permanent buildings would be like building on a flawed foundation. Have you a historical summary of the dates and uses of the various trailers? Likely there were no permits involved but LBNL could at least discuss this in the Environmental Assessment. Regarding the use of trailers at LBNL: In some respects trailers might be the ideal 'building' on the Hill. They are low-lying, a single story, with escape exits near at hand. If the trailer should happen to slide down hill in a landslide, the whole trailer would probably slide as a unit. Are you able to find documentation of this type of thinking in your archives? The reason for trailers?	
BR-15	Barbara Robben	A large, glassy, modern building such as the proposed General Purpose Lab seems so out-of-character with the environment of the canyon. This is not to say that experiments of the 2000's must be housed in trailers but only that it would be wise to consider alternatives to the traditional generic large glassy building: if LBNL prefers this type of construction, then it would be prudent to look at other building sites. (Your alternatives III.C.2 and 3.)	Potential aesthetic impacts from the Proposed Action are identified and analyzed in the EA. As described in the EA, the proposed GPL would be heavily screened by existing vegetation and topography. Additionally, as noted in the document, incorporation of SPF VIS-4 (a) through (c), from Appendix A, would minimize light and glare from the building through design standards that preclude or limit reflective exterior wall materials. The EA also considers two off-site alternatives to the construction of the GPL on the LBNL site.
BR-16	Barbara Robben	Since the inception of the Lab on the Hill in the 1940s, had only a few small experiments been done in a few small trailer-like facilities, there would likely not be the community objections that are the result of LBNL's enormous ever-increasing activities and building projects in a highly un-suitable location. It is the location, the scale, and in some cases the nature of the experiments being done, that worries the citizens and neighbors.	Comment noted. The history, location, mission, and scale of the Lawrence Berkeley National Laboratory is not pertinent to the scope of the Proposed Action, its alternatives, or the Environmental Assessment.
BR-17	Barbara Robben	IV.B.6 Soils This section should be removed from IV.B, "Issues Determined Not to	The concerns mentioned by the commenter (erosion, run-off, slope, landslides, shrinking and swelling etc.) are addressed in the EA, the

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		Warrant Further Consideration," and moved to IV.C, "Issues Determined to Warrant Further Consideration," where there is an opportunity to consider erosion, run-off, slope, landslides, etc. With clay soil there will be shrinkage and swelling. The "attachment to bedrock" that you mention sounds substantial, but that bedrock is actually weak.	geotechnical investigation report for the project, and/or the project design.
BR-18	Barbara Robben	IV.B.7 Intentional Destructive Acts This section should similarly be moved to IV.C. to allow for further consideration. Since LBNL activities seem to require constant surveillance and guarded perimeters these activities also expose residents outside of the fence to danger should something untoward happen. Your document claims that Phase 2B projects "would not result in a change to the risk of intentional destructive acts." But by substituting a large modern building for trailers commits LBNL far into the future...and terrorism seems to be on the rise.	Please see response to Comment JMP-13.
BR-19	Barbara Robben	V.C.3. Water Resources. (Comments also applicable to other sections) LBNL seems to put great emphasis in its Environmental Assessment documents on the supposition that the new G.P.L. project will not further damage the environment: "previously developed land... no changes in run-off or groundwater infiltration... would not contribute to loss... no increases....". A large part of what the community is objecting to is the damage that has already been done! To say that any new project won't make it worse is to miss the point entirely. The actuality is that building a large state-of-the art structure as a 'replacement' for some small falling-apart structures escalates the problems, and commits everyone involved to a certain course of action for a long, long time.	Comment noted.
BR-20	Barbara Robben	"Minimal impact... only 8% added impervious surface.... removal of 9.5 acres of habitat... removal off 5 acres... loss of 3.14 acres..." These are <u>cumulative impacts</u>. Page 158 lists additional projects, huge projects, quite nearby. All of the many projects that have been added to the Hill since 1940 to the present are accepted as "baseline." As in "oh, all those other buildings and projects, well, we don't make it any worse, so it's ok."	Chapter 5 of the EA considers potential cumulative impacts from the Proposed Action. Pursuant to NEPA, a cumulative impact is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions." The EA has considered impacts resulting from the combination of existing conditions, the Proposed Action, and the foreseeable projects listed in

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
			Chapter 5 of the EA. Therefore, the EA has considered cumulative impacts as required under NEPA.
BR-21	Barbara Robben	V.C and Alternatives This report states that tritium, radio-active materials, V.O.C.s etc. have been released in the area in the past, and yet asks us to believe that there is nothing to worry about at present. It basically asks concerned citizens to trust the agencies that caused the contamination to be the agencies that will determine our safety now. This is inadequate. The alternative chosen must thus be a “no project” alternative, or else, a full environmental impact study: E.I.S.	Comment noted. Please refer to EA Section IV.C.2 (Hazardous Substances and Human Health). Please refer to response to Comment GL-1.
BR-22	Barbara Robben	As to the “reduced project” alternatives, it has been stated in the E.A. that those alternatives do not meet modern research program needs. The point is exactly that. Haphazard building was allowed on the hillside for over 60 years, and now, because it was done, LBNL believes that we as a nation, as a state, or as a university, must rebuild the mess to a higher standard. I would argue for the opposite conclusion: the Lab as it is, has been built in helter-skelter fashion as opportunities presented themselves, and that if it does not meet modern needs, it should be gradually phased out, and removed from its basically unsuitable hillside location. At the very least, a full Environmental Impact Study is called for.	Comment noted. The history, location, mission, and scale of the Lawrence Berkeley National Laboratory is not pertinent to the scope of the Proposed Action, its alternatives, or the Environmental Assessment. See also response to Comment GL-1 in regard to the request for an EIS.
BR-23	Barbara Robben	Attachment: "Universities to obtain UC Berkeley water archive," Bay Area News Group, July 23, 2010.	Comment noted. The attachment does not pertain to the scope of the Proposed Action and is outside the scope of the EA.
BR-24	Barbara Robben	Attachment: "Obstacles Remain in Campus Efforts to Conserve Water," Daily Cal, July 26, 2010.	Comment noted. The attachment does not pertain to the scope of the Proposed Action and is outside the scope of the EA.
BR-25	Barbara Robben	A comment on the Errata of June 29, 2010 Final Environmental Impact Report: I had requested a geologic cross-section for the area in question. It was added as a notice of errata.	Comment noted. The Master Response-1, Geological Conditions Underlying the LBNL Site, contains maps that identify the underlying rock formations in the area. Historically, LBNL geologists/geotechnical consultants have used the

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		I much prefer my own drawings (enclosed) made when a student at U.C. Berkeley in geology and soil science. I believe the information is presented in a more helpful and visual way. Perhaps you could do something similar to help readers understand the underlying rock formations of the area. To many people, “bedrock” means “solid.” That is not the case in much of the material that underlies the Lab buildings. [2 drawings attached]	terms "rock" and/or "bedrock" to describe in-place Moraga and Orinda Formation materials.
BR-26	Barbara Robben	Attachment: Comments on the Draft Environmental Impact Report, General Purpose Buildings, Phase 2 Project, for University of California, Lawrence Berkeley National Laboratory, Berkeley, CA. Submitted by Barbara Robben, 15 March 2010.	The comment is noted. The attached material is commentary on an Environmental Impact Report (EIR) prepared by the University of California pursuant to the California Environmental Quality Act (CEQA). The University of California responded to those comments as part of the CEQA process in its ensuing Final EIR, which was certified by the University in July 2010. The subject Environmental Assessment is prepared by DOE pursuant to National Environmental Policy Act (NEPA), an entirely different report and process.
SSC-1	Georgia Wright	Having reviewed the EA for the Lawrence Berkeley National Laboratory (LBNL) Phase 2 Project, Save Strawberry Canyon (SSC) urges the Office of Science to determine that an Environmental Impact Statement (EIS) is required in order to be in compliance with the National Environmental Policy Act (NEPA). SSC, a non-profit organization with some 400 members, believes that the Canyon lands are a significant environmental resource of unique geological character, deserving of protection and preservation. As LBNL continues to proceed in its efforts to implement its 2006 Long Range Development Plan (Plan), intending to build major research facilities on the Canyon hillsides, defined by unstable soils and a complex watershed, our concerns continue. Without a Site-wide EIS, the EA for the Phase 2 Project fails to adequately describe the affected environment, to assess the existing and potential environmental impacts and risks, and to consider a range of alternative choices that could fulfill the project building(s) purposes.	Please see response to Comment GL-1. The comment request for an EIS to consider the impacts of the UC LBNL 2006 LRDP is beyond the scope of the Seismic Phase 2B project.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
SSC-2	Georgia Wright	Undertaking further federal action to implement the proposed Phase 2 Project, including the General Purpose Laboratory (Building 25) in Blackberry Canyon and the Hazardous Waste Handling Facility (Building 85 and 85A) in Strawberry Canyon, should not proceed without detailed analysis of the geological conditions of each site. In a glaring omission, the EA ignores the fact that the hill campus is encompassed by the western edge of a collapse caldera, formed after a volcanic eruption some 10 million years ago. The caldera presents geological dangers that deserve comprehensive assessment.	The EA identifies and analyzes potential impacts related to geological and seismic hazards. Please see Master Response 1, Geological Conditions Underlying the LBNL Site.
SSC-3	Georgia Wright	It is troubling, furthermore, that the EA relies solely upon the LBNL California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) and the Phase 2 Project EIR for background information and analysis regarding the geology of the area. (Please see attachments #1, Letter, March 15,2010, #2, Letter, July 9, 2010) le [sic] this reliance has led incorrectly to a conclusion that no significant impacts are likely. It is critical to note that the EA conclusions neither stand on their own merit, nor are they substantiated by the incomplete information in the Phase 2 Project EIR. Based on the lack of geotechnical analysis in the EA alone, the EA is an insufficient agency action.	The analysis of geological and seismic hazards included in the EA relies on geological and geotechnical reports prepared for the Seismic Phase 2B project. The reports are equally applicable to the NEPA and CEQA processes. They include the following reports cited in the EA: Geotechnical Investigation Report, GPL at B25 Site (April 2010) and Summary Report: Initial Landslide Study, Building 85 (2006). Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.
SSC-4	Georgia Wright	SSC refers to the Phase 2 Project EIR materials and in particular the Alan Kropp and Associates (AKA) reports: *The AKA reports for Building 25 or the General Purpose Laboratory, cited in the Final EIR on disc and on the web, were only added to the web after their absence was reported to LBNL. As they were used in the" matrix" of the FEIR to contest points made by several individuals, they would appear to be important.	Comment noted.
SSC-5	Georgia Wright	* AKA, May 29, 2009, a preliminary report, made in two weeks “to meet LBNL’s objectives,” lays out the problems and what additional work will be necessary to help solve them. 1) AKA’s preliminary investigation of old boring logs are consistent with the presence of a paleolandslide under B25. 2) Orinda Formation under the Lawrence Road (south and downhill from	Please see response to Comment GW-2.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		25), is potentially part of a paleolandslide rather than in-place bedrock. 3) Offsets in the curbs are not sufficient to evaluate historic slides. [Evidently AKA was not given access to the files on historic landslides.] 4) The borings suggest very low factors of safety, although these may be based upon conservative measures. 5) Additional trenching is needed (to establish whether the paleolandslide has moved recently.) * AKA, April 2, 2010. Trenches 1 and 2 are mentioned but only T-1 (southwest of 25, 8' deep) appears on the map. There are no photos of the trench nor is it discussed. The "general sketch" at the end of the report is indeed too general. Were there slickensides, indicative of movement?	
SSC-6	Georgia Wright	Historical borings around B25 indicate Moraga volcanics which "break into rubble during drilling." Gravity has moved colluvium downslope. Moraga Formation is highly permeable (although is it called "bedrock," which in common or dictionary definition means hard rock. Neither Moraga Formation nor Orinda Formation fit that definition.	Please see responses to Comments GW-3, GW-7, and GW-8.
SSC-7	Georgia Wright	* AKA, May 29, 2010, supplemental report Boring log #1 (north of 25) has 8' of fill. Clay to 11.5', and silty clay below that. Boring #2 (south of 25) Moraga volcanics with weak rhyolite, then andesite down to 90' where Orinda claystone and siltstone are found. (Muds and mudstones give rise to many problems in civil engineering because they are weak and shrink or swell on being dried or wetted." Mudstones are siltstone, mud-shale, or claystone. "Muds are very reactive to physical disturbances or differential loading, and they slump and flow easily when subjected to stress." (*Oxford Companion to the Earth*, 2000, p. 715) A three-story General Purpose Laboratory would indeed exert differential loading and stress.	Please see responses to Comments GW-3, GW-4, and GW-5.
SSC-8	Georgia Wright	Boring #3 (south of 2) Orinda Formation Boring #5 & 6 "southern side of proposed central plant site" (not on map): Atterberg Limits;	Please see responses to Comments GW-5.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		Boring #5, (4-4.5' deep) Plasticity Index 56; Boring #6, (6 – 6/5' deep), Plasticity Index 46. "Onsite soils having a PI of 15 or less are generally considered to have a sufficiently low expansion potential to be used as non-expansive fill." 5 and 6 are marked "Fat Clay" and not to be used for fill. AKA says these must be removed.	
SSC-9	Georgia Wright	In effect after all these reports AKA has not come to a conclusion that the Moraga volcanics are a paleolandslide or in-place "bedrock". AKA did not examine the trench for slickensides, nor did it dig a second trench. Moving or not, it is critical to ask whether building on "weak volcanics that break into rubble during drilling" is responsible. And, to ask whether spread footings will do the trick when the earthquake strikes. Or, what will be the affect of contact with Orinda mudstones.	Please see response to Comment GW-6 through GW-10.
SSC-10	Georgia Wright	Both Buildings 85 and 85A are shown in the EIR to straddle two paleolandslides, characterized in several earlier consulting reports as potentially liable to move in a major seismic event and at different rates. Slickensides were prevalent throughout the area. In earlier reports 60% of the HWHF buildings (the southwestern parts) overlie the Orinda Formation clays. In the EA, however, AKA's plans show only QLS2 (Moraga landslide) crossing all but a small part of 85 and no characterization of the leftover area (please see attachment #3: Figures 1 and 2). AKA had declared in an earlier report that 10 feet of Moraga Formation lies under the northeast corner of the buildings, and below that 25 feet of Orinda Formation. It is significant that what is under the area is unknown.	Please see response to Comment GW-11.
SSC-11	Georgia Wright	AKA proposes drilling 21 piers around two sides of B85 and 9 piers around two sides of B85A, these to be 5 feet in diameter and 40 to 50 feet deep, TO STOP THE LANDSLIDE, evidently the top one of Moraga Formation (hard but fractured volcanics.) What will stop the building from being torn apart? Has anyone ever used piers to stop a landslide? Into what will those piers be drilled that is less expansionary and stronger than mudstones? (AKA 2006, a propos the nearby Animal Care Facility, suggested a mat under the building so that it might move integrally, a proposal AKA could	Please see response to Comment GW-12.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		not make, evidently, for 85, as it would entail rebuilding.)	
SSC-12	Georgia Wright	Missing from the reports are 9 boring logs, AKA 7 – 16. Where are these and their interpretations? They will be needed to determine the quality of the Moraga volcanics, the Orinda mudstones, and whatever lies beneath.	Please see response to Comment GW-13.
SSC-13	Georgia Wright	What does lie not far below the surface is water! In the EIR there are tables recording water heights, taken from monitoring wells. The EA refers to them on p. 22. North of 85 the water measured from 16 to 12 feet below surface while south of 85 the range was from 40 to 35 feet.. Accounting for the difference in elevations the water table seems to be level at that point. But east of 85A at the same elevation as the well south of 85, the difference is huge—the level according to AKA ranges between 24 and 0.3 feet. This means that there is a “perched water table” or reservoir and that the other two wells may have penetrated a separate reservoir. This variance is just what one expects in the caldera of the volcano upon which LBNL has constructed its buildings. When such a reservoir breaks during a seismic event (the breaks in 1973 may have been caused by a series of small events), the landslides could be devastating as they were in 1973. The unpredictable reservoirs, springs, and aquifers mean that contaminants may have spread all over. Monitoring wells are seldom left open for long. See the report *Contaminant Plumes of the Lawrence Berkeley National Laboratory*... (2007)http://berkeleycitizen.org/lbnl/cmtw1.html.	Please see response to Comment GW-14.
SSC-14	Georgia Wright	The EA notably has only a brief paragraph dealing with fire and concludes that there is no significant finding of an existing or potential hazardous fire impact. Again, in essence it says "trust us!" relying on the Plan EIR that has declared the site to be "not a high potential for wildland fires." This is an obvious oversight as LBNL is located in an area that already has a history of being threatened by the one of the most damaging California urban/wildland fires on record. The Oakland Firestorm of 1991, in fact, reached the south wall of the adjacent Claremont Canyon. At that time LBNL Director Charles Shank ordered all personnel to leave the LBNL site.	The EA includes a full analysis of potential wildland fires in Section IV.C.11 (Wildland Fires). Additionally, please see responses to Comments GW-15 and GW-16.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
SSC-15	Georgia Wright	In particular, The Hazardous Waste Handling Facility site in Strawberry Canyon is in a heavily wooded location, with pines and eucalyptus, grasses and scotch broom, all flammable. Building 85 contains radioactive waste on the first floor and mixed solvents and volatile organic compounds on the second floor. There are a number of storage sheds for liquid and dry combustible compounds. How are these highly flammable and environmentally detrimental structures to be protected from a fire like that of the 1991 Firestorm (2000 degrees, destroying concrete, "fireproof" safes, metals, etc.)?	For information concerning the location, design, and operation of the HWHF, please see response to Comment GW-15.
SSC-16	Georgia Wright	This is another oversight that has led incorrectly to a conclusion that no significant impacts are likely. It is, in fact, not congruent that a sizable Federal Emergency Management Agency grant has been proposed to rid the Canyons of trees because of potential urban/wildland fires and is currently under NEPA review. Please note p. 141 of the EA, "In 1994, UC LBNL published a Wildland Fire Evacuation/Relocation Plan. The plan, which would apply to the Proposed Action, is based on a wildland fire scenario that would require rapid mobilization of resources, quick decision making and well-coordinated execution by emergency responders during a wildland fire." The footnote sends one to a website that is no longer operating. Have the plans been abandoned? The 1994 plan was evidently motivated by the lack of a plan in 1991. At a "Community Advisory Group" meeting in June, someone asked about emergency plans. Evidently there were none!	Please see responses to Comments GW-15 and GW-16.
SSC-17	Georgia Wright	In closing, for the above reasons and others not enumerated, SSC urges the Office of Science to determine that an EIS is required for the Phase 2 Project in order to be in compliance with NEPA.	Please see response to Comment GL-1.
SSC-18	Georgia Wright	Attachments: #1. Letter from Garniss Curtis, Georgia Wright, and John R, Shively to Jeff Philliber, LBNL, March 15,2010, with attachments #2. Letter from SSC to Russell Gould, Chairman Board of Regents, July 9,2010, with attachments #8. Figure 1: From Alan Kropp & Assoc; Inc 2006A Geotechnical Investigation Report: Animal Care Facility, and Figure 2: From Phase 2	Comment noted. Because the attachment material appears to be informational only and/or because the material does not address the Proposed NEPA Action, its alternatives, or the Environmental Assessment, no response in this Final EA is warranted.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		Project EA, p. 20	
CMTW-1	Pamela Sihvola	Landslides at LBNL have created havoc at the site since the inception of the University of California Radiation Laboratory (UC Rad Lab) in the 1940s. Attachment 1. "Chronology of the Campus Hill Area Development and Slope Instability through 1984" is especially noteworthy, since it shows how major slides started occurring immediately after and as a result of construction on the hill.	The EA, including Master Response 1, Geological Conditions Underlying the LBNL Site, addresses landslides.
CMTW-2	Pamela Sihvola	The Department of Energy (DOE) has not fulfilled its obligation under the National Environmental Policy Act (NEPA) to adequately describe, analyze and consider the natural and man-made hazards at each of the sites of the proposed Seismic Life-Safety Phase 2B project (the Project). Indeed, the 43,000 square foot General Purpose Laboratory (GPL) building is proposed to be constructed in the Old Strawberry Canyon landslide Area on top of the most contaminated soils and groundwater contamination plumes extending under the entire B25/GPL site. In the East Canyon. B85 Complex, the lab's Hazardous Waste handling, Storage and Treatment Facility is undermined by the East Canyon Slide and is yet unknown, undetermined impacts/influences and transport paths of the millions of gallons of perched groundwater along the Wildcat Fault; And in the Blackberry Canyon B55 and B71 sites are impacted by the Blackberry canyon slide, radioactive and chemical contamination in soil and groundwater and the influences of springs. Earthquake faults and the North Fork of Strawberry Creek.	The EA identifies and analyzes potential impacts related to hazardous substances and human health, and to geological and seismic hazards. Please also see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-3	Pamela Sihvola	In an article "Geologist reveals nature's plan in Berkeley hill walk" (Hills Publication/Berkeley Voice February 24, 1994) retired geologist Hal Wel1enberg states: "One plant engineer said this is the last place to build a national laboratory", about the unstable ground (Attachment 2.) And yet, the projects continue with deficient analysis fueled by the seemingly unending taxpayer funded ARRA monies. (Attachment 3 A & B)	Comment noted. The history, location, mission, and scale of the Lawrence Berkeley National Laboratory is not pertinent to the scope of the Proposed Action, its alternatives, or the Environmental Assessment.
CMTW-4	Pamela Sihvola	Attachment 1: Chronology of the Campus Hill Area Development and Slope Instability	Comment noted. The attachment does not pertain to the scope of the Proposed Action and is outside the scope of the EA.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		Through 1984	
CMTW-5	Pamela Sihvola	In addition to the information above, by 1987 LBNL had mapped some 30 landslides within the lab's Strawberry and Blackberry Canyons, and by 2008 the number of slides was up to 40, including LBNL's East Canyon landslide area. Regarding Building 46 slide (see above), notes from a site visit by Robert Dunn and Professor Richard Goodman (October 18, 1976) states: Building 46 was "first founded on what was thought to be solid basalt-actually was LARGE BLOCKS." See also attached figure of the collapsed caldera (after Garniss Curtis, Professor Emeritus) at LBNL.	See Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-6	Pamela Sihvola	Attachment 2 (1 page) Attachment 3A (1 page) Attachment 3B (1 page)	Comment noted. The attachment does not pertain to the scope of the Proposed Action and is outside the scope of the EA.
CMTW-7	Pamela Sihvola	Again. DOE has failed to follow NEPA regulations regarding communicating with the public the most important information pertaining to the LBNL site, including, but not limited to the critical significance of the CURTIS CALDERA, inside which LBNL buildings are located, including all the components of this Project on the unconsolidated mélange of volcanic fragmental debris left behind when the caldera collapsed. (Attachment 4 A & B) In fact LBNL is located in the northwestern crater (Curtis Caldera) of the Sibley Volcanic Cluster, connected to the Sibley Volcanic Regional Preserve at the East Bay Regional Park District. Information provided by the Sibley Volcanic Preserve states the Following: 10 million years ago volcanic eruptions began near what is now Round Top Volcano in Sibley Park. The magma may have risen through a fractured zone now known as "Wildcat Fault". Two volcanic centers developed here, a larger volcano rose to the west, a smaller cone (Round Top Volcano) formed on the eastern flank of the larger. The two eruptive	See Master Response 1, Geological Conditions Underlying the LBNL Site.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		centers were separated by the Wildcat Fault. a branch of the large Hayward Fault System. 9 million seven hundred thousand years ago a violent eruption blew the lid off the larger volcano. Rhyolite ash spread over 3 counties. Ash deposits have been traced many miles to the east and south - and can be found today 40 miles north at Sears Point. Following this great eruption, the volcano collapsed to form a crater or "caldera" 2 miles long and a mile wide. The Lawrence Berkeley Laboratory is now located on the deeply eroded remains of this volcanic caldera. The Sibley Volcanic Preserve's informational brochure further states: "How many volcanos? Round Top is the obvious one. There are smaller ones outside the Preserve to the north and southeast. Another, of rhyodacitic composition (rather like the ash from Mount St. Helens), underlies the Lawrence Berkeley Laboratory and Little Grizzly Peak in Tilden Regional Park. About 9.8 million years ago it was erupting beside Round Top. Subsequently it was shifted about 3.5 miles northwest by movement along Wildcat Fault. That makes a total of 4 volcanoes." (Attachment 5, 2 pages).	
CMTW-8	Pamela Sihvola	The proposed Project does not assure, as required by NEPA, "safe, healthful surroundings", due to the UNMITIGABLE nature of the site itself. Elevated Life-Safety Risks will continue at the lab as long as LBNL operates at the current site on the unconsolidated soils of the collapsed caldera. The DEA projects a false sense of security/safety as it ignores the fact that seismic upgrading of buildings does not remedy the instability of the site. Indeed, CONDITIONS OF LAND ARE THE DOMINANT HAZARD FEATURES, NOT BUILDINGS ALONE.	The EA identifies and analyzes potential impacts related to geological and seismic hazards. Please also see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-9	Pamela Sihvola	Attachment 4A (1 page) Attachment 4B (3 pages Attachment 5 (2 pages each in color and black/white)	Please see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-10	Pamela Sihvola	The Curtis caldera at LBNL is like a giant bowl, basin, syncline holding millions of gallons of water, perched groundwater, at various elevations	Please see Master Response 1, Geological Conditions Underlying the LBNL Site.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		causing instability in the hillside soils, landslides. Groundwater moves along the many earthquake faults at the lab site, comes up to the surface from springs, associated with the faulta continually causing havoc. (Attachment 6.) Of special interest is the presence and movement of groundwater along the Wildcat Fault in the East Canyon at LBNL's Hazardous Waste Handling Facility site, B85 complex. We understand that a project/study, titled NUMO, funded by the Japanese Nuclear Waste interests, is presently investigating the movement of water along the Wildcat Fault. The DEA is extremely deficient in addressing concerns related to soils and groundwater. Indeed, the DEA completely excluded the analysis of soils (IV.B.6./p.49/53), and the importance of groundwater, its impacts on soils and movement along faults IV.C.3./p.79) We therefore request that a full-scale EIS (Environmental Impact Statement) be prepared to address these and other concerns. We also ask that the findings of the NUMO Study, including the analysis of → the two 500 feet deep soil borings, taken at the HWHF site be included in the EIS. As Attachment 7, we are enclosing the HYDROGEOLOGIC INVESTIGATION section (#5) of the Converse Consultants, Inc. 1984 HILL AREA DEWATERING AND STABILIZATION STUDIES, illustrating the continuing nature of slope stability problems at LBNL.	Soils are addressed in Section IV.C Issues Determined to Warrant Further Consideration in the EA, the geotechnical investigation report for the project, and the project design. Please see response to Comment GL-1 in regards to an EIS. The commenter refers to groundwater movement along the Wildcat Fault in the East Canyon at LBNL's Hazardous Waste Handling Facility site; however the Wildcat fault does not intersect the HWHF as they are on opposite sides of the canyon.
CMTW-11	Pamela Sihvola	Another glaring omission of the DEA was the total exclusion of analysis of Hazards from Wildfires under Cumulative Effects (V.B.I .160). LBNL is located in a High Risk Wi1d1and Fire Zone/Critical Fire Area (California Fire Hazard Severity Zone. In 1991 when some 4000 structures burnt in the Berkeley-Oakland Hills Firestorm, just 3/4 miles from LBNL, one canyon away, the entire lab was evacuated. The lab director gave orders to the 2 remaining firefighters at the lab's fires station to evacuate, all LBNL firetrucks had already been sent	Please refer to response to Comment GW-15. LBNL has in place adequate fire protection plans in place to protect its assets and surrounding areas. See e.g. LBNL PUB-3000 Chapter 12, Fire Protection and Prevention located at http://www.lbl.gov/ehs/ pub3000/CH12.html.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		to Oakland, and thus the Nuclear-Industrial Complex, in the middle of a residential neighborhood, during a historic firestorm was left alone, unprotected. What indeed are LBNL's plans to fight a radioactive fire? What plans are in place to protect the surrounding residential neighborhoods from radioactive fallout? Are there any coordinated efforts to evacuate surrounding residents, some only some 100 meters from LBNL's fence1ine? The more laboratory buildings in the canyon, the more chemical and radioactive materials and waste will result, all of this needs detailed analysis in a full-scale EIS:	
CMTW-12	Pamela Sihvola	Attachment 6 (1 page) Attachment 7 (25 pages)	Attachments 6 and 7 are referred to in Comment CMTW-10.
CMTW-13	Pamela Sihvola	We also ask that the EIS include the entire transcript from LBNL's July 8, 2010 Community Advisory Group (CAG) meeting. The agenda included presentations and discussions related to LBNL geology and geotechnical status of the Berkeley Lab site, as well as comments from concerned members of the public. (Attachment 8) Many conflicting statements were made by LBNL geotechnical experts.	Please refer to response to Comment GL-1 in regard to whether an EIS would be prepared. The CAG is an open forum discussion and not intended as a public comment forum for NEPA. There was a NEPA Public Meeting on July 15, 2010 specifically to address the Proposed Action and Alternatives and to solicit public input. Attachment 8 also references the scope of the CAG meeting did not relate to the Proposed Action.
CMTW-14	Pamela Sihvola	Also, after reviewing some of LBNL's geotechnical reports associate with the DEA projects, it appears that extreme time pressure was put on contractors. For instance Alan Kropp &Associates (AKA) Memorandum of May 29, 2009 regarding B25 Slide Investigation, states: "The preliminary study was conducted over a two week-period in order to meet LBNL schedule objectives. For this reason, the scope of our investigation and analyses were limited to what could be reasonably completed within the targeted timeframe." The study, contained data sheets for 3 test borings first numbered as WLA-B 1 to 3 (William Lettis &Associates), then changed to AKA 1 to 3, with a notation that AKA-3 was AKA-4 (?), there were references to 25 photos, which were not included in our copy, and a	Geotechnical and geologic studies are often conducted in phases and AKA's preliminary study of the Building 25 site was followed shortly thereafter by a detailed geologic evaluation.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		page titled Soil Boring Locations Near Bldg's 25&48, without any map showing the boring locations.	
CMTW-15	Pamela Sihvola	An other report by Furgo William Lettis &Associated, dated December 10, 2009 regarding LBNL B25-Core Review for the GPL Geotechnical Study makes the following statements:" ...samples appeared to be missing ...samples were not readily found by FWLA in the core library. According to LBNL staff, logs for soil borings SB25-95-1 through SB25A-95-1 are not available ...evaluating physical properties (e.g. stiffness and plasticity) is difficult to impossible because the samples are on the order of 10 to 15 years old and thus, the original moisture content in unknown...some key samples were not located in the core library (borings W25-95-26) and thus we are unable to evaluate the quality of these boring logs...etc."	The comment is noted. The report cited in the comment discloses that the library of existing core samples taken 10 to 15 years ago was not usable for this EA analysis due to the age-related loss of core sample moisture content. In addition, a small number of those 10 to 15 year-old samples were not located in the library. Accordingly, new core sampling was conducted at the site in the past year to provide geotechnical data that is complete and appropriately recent. This data was used to support the geotechnical studies conducted for the Proposed Action and EA analysis.
CMTW-16	Pamela Sihvola	Furthermore, Appendices attached to AKA's April 2, 2010 Report regarding geotechnical investigations GPL at B25 Site, included Logs of Borings by AKA/WLA, Logs of Borings from Previous Geotechnical Reports by Others and Logs of Previous Environmental Borings by LBNL but excluded all reports and conclusions. We therefore ask that all these reports be included in their entirety as Appendices to the EIS!	Please see response to Comment GL-1. Geotechnical reports utilized in the Seismic EA can be found at: http://www.lbl.gov/Community/SeismicPhase2B/index.html.
CMTW-17	Pamela Sihvola	We also ask that a Report by Laurel M. Collins titled "Geology of the East Canyon and the Proposed Hazardous Waste Handling Facility, LBNL" be included as an Appendix to the EIS. (A Draft of April 1993 is enclosed as Attachment 9)	Please see response to Comment GL-1. Geotechnical reports utilized in the Seismic EA can be found at: http://www.lbl.gov/Community/SeismicPhase2B/index.html. LBNL geotechnical experts considered the Collins paper in their investigations.
CMTW-18	Pamela Sihvola	Also statements such as: "The recommendations presented herein are not intended to stabilize the site or mitigate the potential for landslide type movement", by AKA (April 8,2010, Geotechical Investigation, B7l BELLA) reflect the limitations of geotechnical experts regarding the uncertainties associated with sites, such as LBNL.	The BELLA project involves localized improvements at an existing LBNL building (Building 71). The referenced statement simply means that the localized improvements at the building will have no effect upon slope stability; it does not mean that the Building 71 site has been found to be unstable, or that slope stability hazard is known to exist. The stated limitation applied to a particular scope of work during a particular phase; it cannot be extrapolated to reflect the limitations on LBNL geotechnical

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
			studies as a whole.
CMTW-19	Pamela Sihvola	Attachment 8 (1 page) Attachment 9 (33 pages)	Please see responses to Comments CMTW-13 and CMTW-17.
CMTW-20	Pamela Sihvola	In 1998 the US Environmental Protection Agency declared LBNL eligible for listing on the National Priorities List (NPL) for Superfund clean-up. The legacy contamination at LBNL is significant and a couple of pump and treat operations do not adequately deal with the contamination issues. LBNL has never mapped the site's hydrostratigraphic units (HSUs) to better understand the hydraulic connection between various permeable layers of the HSU's sedimentary sequences to facilitate a more accurate construction of groundwater flow and contaminant fate-and-transport model. We ask that DOE fund a rigorous mapping of all the HSUs associated with the Project sites and that this mapping be included in the EIS. Section IV.C.2 was superficial and did not adequately address the serious contamination present at LBNL. As a reference to groundwater cleanup we include a presentation by Lawrence Livermore National Laboratory's Site Restoration Program Leader, available at UC later Resources Center Archives' website. (Attachment 10.)	Please see response to Comment JMP-5a. This EA including Section IV.C.2 adequately addresses contamination issues associated with the components of the Proposed Action. The remainder of the comment is outside the Proposed Action of this EA.
CMTW-21	Pamela Sihvola	After 70 years in Strawberry Canyon, it is time for LBNL to move offsite to better facilitate the vision of its current director Alivisatos (Attachment 11. p.2) to reorganize the lab's physical layout and create a second campus. The lab's antiquated concept of co-locating research (buildings) should be changed to embrace a modern "Global Network University" concept with "Portals" (campuses not just in different cities but countries, which is the cutting edge trend among universities (NYU) and other institutions of higher learning.	The comment is noted. An analysis of reasonable alternatives, including off-site alternatives, is included in the EA.
CMTW-22	Pamela Sihvola	To exercise the principle of co-locating research in every day lab life is impossible, based on the DEA's description (IV.B.7/p.54) of lab practices to prevent Intentional Destructive Acts. "The entire LBNL site is fenced, and controlled access is available only at three entry gates. Card keys would be used for building access... The building would have a guard on	Security measures at LBNL would not constrain authorized visitors and personnel from scientific collaboration.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		the door during normal business hours and card key access. " Indeed, no one from the outside, even from labs next door can casually walk in and "exchange ideas", as is continually purported by LBNL officials. In fact access to any building/lab/office is strictly controlled and available only on a "need to know" basis.	
CMTW-23	Pamela Sihvola	For the reasons stated above, we ask that LBNL very seriously consider expanding the co-location concept to the entire Bay Area, i.e. consider alternative locations for the second campus in Richmond (Richmond Field Station), Vallejo (Mare Island), Oakland (former Navy Base), Alameda (former Naval Station) and in Fremont (former NUMMI plant/See attachment 12.) to avoid continuing logistical, environmental., geotechnical constraints and legal challenges, currently crippling LBNL and its future:	Please see response to Comment CMTW-21, above.
CMTW-24	Pamela Sihvola	Attachment 10 (1 page) Attachment 11 (4 pages) Attachment 12 (1 page)	Comment noted. The attachments do not address the Proposed Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
CMTW-25	Pamela Sihvola	Since the Project is so huge, expensive and controversial we are submitting all of our 3 previous comment letters*to the CEQA process to be considered (and responded to) as comments to the NEPA DEA process. Especially we ask you to review our report titled. "Contaminant Plumes of the Lawrence Berkeley National Laboratory and their interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, Ca1ifornia", specifically sections dealing with Contaminant Sites, both regarding chemical and hazardous contamination and radioactive contamination, Drainage Network mapping, Geologic "Bedrock" (Formation) Mapping, Fault Mapping, Landslide Mapping, Plume Monitoring Sites and Zones of Concern for Potential Plume Mitigation, as well as Future Development and Site Conditions and in conclusion our General Recommendations warrant careful consideration in the full-scale EIS, as they deal with concerns related to Project sites, i.e. B85 complex, B25 complex (GPL) and B 71/55 sites of the DEA. (Attachment 13).	Comment noted. The 3 previous comment letters are attached to the EA and have been considered. The responses to comments identified in Comments Letters 3 of 5, 4 of 5, and 5 of 5, can be found in the table below entitled DOE's Response to CMTW DEIR Comments.
CMTW-26	Pamela Sihvola	Inadequacies of the DEA are blatant, uncertainties associated with these sites enormous, "Detailed information concerning significant environmental impacts" (required by NEPA were glaringly missing, thus	See response to Comment GL-1.

RESPONSE TO COMMENTS MATRIX (CONTINUED)

Comment ID	Commenter	Comment	Response
		denying decision makers the ability to adequately assess all potential and existing environmental risks associated with the Project. THUS A FULL SCALE EIS IS REQUIRED, especially since significant amounts of public, taxpayer funds under ARRA are proposed to be committed to this ill conceived Project with extreme risks inherent at the site.	
CMTW-27	Pamela Sihvola	Attachment 13A (1 page) Attachment 13B (95 pages)	Please see response to Comment CMTW-25.

DOE's Response to CMTW DEIR Comments

DEIR Comment ID	Comment	UC EIR Response	DOE Response
CMTW-1	The [subject] Project consists of the demolition of Buildings 25, 25B and 55, six modular trailers associated with Building 71, the construction of an approximately 43,000 gross square foot General Purpose Laboratory (GPL), and the seismic strengthening of the Building 85 complex - LBNL's Hazardous Waste Handling, Treatment and Storage Facility, all located in the Strawberry Creek Watershed's Strawberry and Blackberry Canyons. Our comments are provided in two (2) parts. Since all the project components (areas associated with B85 complex, B25 and B71) are located site-wide at LBNL, in areas of great concern to the community, i.e. on top of earthquake faults, active landslides, radioactive and chemical contamination plumes (both soil and groundwater), creeks and networks of creeks etc., Part 1 of our comment letter is titled: Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California, and cover our concerns in the following areas evaluated in the DEIR: Biological Resources, Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Transportation and Traffic, Utilities and Service Systems - and we ask that you respond to our concerns in a comprehensive and serious manner.	The location of the project is described in Chapter 3 of the Draft EIR, and Figure 4.8-1 of the Draft EIR shows a delineation of Strawberry Canyon Watershed and Blackberry Canyon Watershed. The comment is noted. No further response is needed.	Comment noted.
CMTW-2	Part 2 of our comment letter on DEIR consists of all the comments we provided on the Notice of Preparation (NOP) of the above referenced document, as these comments and concerns were largely ignored in the preparation of DEIR .The only changes that occurred between the NOP and the NOA (Notice of Availability) of the DEIR related to the demolition of several buildings and structures in the Old Town area, i.e. Buildings 4, 5, 14, 16,	Please refer to response to Comment PH-41.	Comment does not address the Proposed NEPA Action, its alternatives, or the adequacy of the EA, thus no further response is warranted.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
	and 17, possibly some of the most contaminated buildings at LBNL, and Building 74F in the East Canyon, which were all removed from the EIR process, escaped all public and agency comment as they were secretly included into the Old Town Demolition Project, ... for which a Categorical Exclusion under NEPA was filed in December 2009, without any notice to the public. Please, explain why?		
CMTW-3	We also ask that a full blown EIS under NEPA be prepared for the Old Town Demolition project.	The comment is noted. The Department of Energy is the federal decisionmaker for NEPA issues concerning the Old Town demolition project.	Please see response to comment GL-1.
CMTW-4	Every single structure evaluated in the DEIR is located in a landslide area, as officially defined by the State of California, as being in an Earthquake Induced Landslide Hazard Zone, i.e. landslides will be mobilized in the event of a major earthquake - expected to happen any day now on the active Hayward Fault! (See attachment 1).	For a discussion of earthquake induced landslide hazards, please see pages 4.5-19 through 4.5-22 of the Draft EIR and Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	The EA discusses earthquake induced landslide hazards. See also Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-5	Furthermore all the components of this Project are located in areas of LBNL where legacy chemical and radioactive contamination is present in the soil and groundwater, due to operations during the last 70 years, which the DEIR failed to describe in the kind of detail that the site and its history warrants!	As directed by CEQA, Section 15125, the DEIR must include a description of the physical environmental conditions in the vicinity of the project as they exist at the time the notice of preparation is published, so as to establish a baseline for determining whether an impact is significant. The description shall be no longer than is necessary to an understanding of the significant effects of the proposed project and its alternatives. Pages 4.7-17 through 4.7-22 of the DEIR provide a description of the presence of chemical and radioactive contamination in relation to the project sites, as well as a description of the processes by which these issues have been addressed in the past, are currently addressed, and would be addressed in the event that contaminants are disclosed during the site demolition process.	The EA discusses legacy contamination and radioactive contamination.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
CMTW-6	The DEIR is deficient, inadequate, misleading and in sections erroneous. For instance a claim is made that the new proposed location of the GPL is not located in Strawberry Canyon, when indeed Figure 4.8-1 of the DEIR shows the Strawberry Creek Watershed divisions into Blackberry Canyon and Strawberry Canyon, indicating clearly that the entire Building 25 site, the proposed location of the GPL, is in Strawberry Canyon, in the middle of the Building 25 slide and Building 25A Lobe of the Old Town Groundwater Solvent (VOC) Plume! (See attachment 2, A and B)	Please see the delineation of the Strawberry Canyon Watershed and the Blackberry Canyon Watershed in Figure 4.8-1 of the Draft EIR. Building 25/25B and Building 85/85A are located in the Strawberry Canyon Watershed, however, Building 55 and Building 71 trailers are not. The Draft EIR has been revised to clarify the location of project components, as shown in Chapter 3 of this Final EIR. Regarding groundwater contamination at the LBNL main hill site, please see response to Comment CMTW-5 and pages 4.7-17 through 4.7-22 of the Draft EIR.	The comment is regarding the DEIR and no response is required under NEPA.
CMTW-7	In conclusion, LBNL, DC and the Department of Energy (DOE) continue to willfully ignore and exclude the most significant, fundamental facts related to the Lab site, i.e. the unconsolidated nature of the volcanic rocks, mud and water that fill an old crater, a collapsed caldera, on which LBNL facilities were built starting in 1940!	Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site, and responses to Comments PH-17, GC-5, GC-10, GC-11, GC-12, GC-14, GC-17, GC-24, and GC-27.	Please see Master Response 1, Geological Conditions Underlying the LBNL Site in the NEPA EA.
CMTW-8	What is the use of drilling 35-50 foot deep holes for piers into this unconsolidated melange of volcanic fragmental debris, without ever reaching bedrock, to attempt to tieback the Lab's Hazardous and Radioactive Waste Treatment and Storage Facility (B85 complex), further wasting taxpayer funds!	As discussed in responses to Comments PH-15, PH-32, PH-35, all of the pier holes will extend into in-place bedrock. Regarding Geology and Soils, please also refer to Ch. 4.5 of the Draft EIR and Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	Please see Response to Comment ES-4.
CMTW-9	The landslide on which the Hazardous Waste Handling Facility (HWHF) was built is over 2200 feet (7+ football fields) long, between the East Canyon Fault (with its numerous springs already identified by UC in 1875) and the Wildcat Fault.(See attachment 3, A and B).	Attachment 3 is from the "Initial Landslide Characterization Study, East Canyon – Buildings 85 and 85A" by Alan Kropp & Associates (AKA), which is dated July 31, 2006. This report and the referenced figure are superseded by the "design-level" geotechnical investigation report for the Building 85 seismic strengthening project, which is dated April 2, 2010. The design-level report includes onsite geologic data that was not available in 2006, much of which was	Attachment 3 is from the "Initial Landslide Characterization Study, East Canyon – Buildings 85 and 85A" by Alan Kropp & Associates (AKA), which is dated July 31, 2006. This report and the referenced figure are superseded by the "design-level" geotechnical investigation report for the Building 85 seismic strengthening project, which is dated April 2, 2010. The design-level report includes onsite geologic data that was not available in 2006, much of which

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
		obtained through geologic explorations conducted in 2009. These data were obtained through borings, test pits, and an exploratory rock cut, all of which were performed to resolve geologic ambiguities that remained at the end of the previous "initial" landslide characterization study. As a result of this additional work, we now have a better understanding of the geologic conditions within the East Canyon and, specifically, in the area of the HWHF. Notably, the work performed in 2009 included drilling four borings in the upper and lower yards of the HWHF as well as three borings and three test pits in the vicinity of the old quarry downslope and southeast of the HWHF. A new Site Geologic Map (Figure 9) is presented in the April 2, 2010 design-level report that supersedes the previous "initial" geologic map of Attachment 3. The 2010 Site Geologic Map differs from the 2006 geologic map in the following ways: ♦ The large masses of landslide deposits that occupy much of the floor of the East Canyon do NOT underlie the HWHF buildings (Buildings 85 and 85A), or the quarry southeast of the HWHF. The landslide deposit mapped as Qls-1 on Figure 9 of the April 2, 2010 report is therefore smaller (about 1100 feet long by 300 feet wide) and is oriented such that sliding would cause it to slide past or move away from the planned below-grade seismic strengthening elements located east of the HWHF buildings. ♦ Much smaller masses of landslide deposits exist beneath the HWHF buildings that generally trend northwest-southeast, the direction of maximum slope coming off of the ridge that flanks the western side of the East Canyon. These landslide deposits mapped as Qls-3 and Qls-4 on Figure 9 of the April	was obtained through geologic explorations conducted in 2009. These data were obtained through borings, test pits, and an exploratory rock cut, all of which were performed to resolve geologic ambiguities that remained at the end of the previous "initial" landslide characterization study. As a result of this additional work, we now have a better understanding of the geologic conditions within the East Canyon and, specifically, in the area of the HWHF. Notably, the work performed in 2009 included drilling four borings in the upper and lower yards of the HWHF as well as three borings and three test pits in the vicinity of the old quarry downslope and southeast of the HWHF. A new Site Geologic Map (Figure 9) is presented in the April 2, 2010 design-level report that supersedes the previous "initial" geologic map of Attachment 3. The 2010 Site Geologic Map differs from the 2006 geologic map in the following ways: The large masses of landslide deposits that occupy much of the floor of the East Canyon do NOT underlie the HWHF buildings (Buildings 85 and 85A), or the quarry southeast of the HWHF. The landslide deposit mapped as Qls-1 on Figure 9 of the April 2, 2010 report is therefore smaller (about 1100 feet long by 300 feet wide) and is oriented such that sliding would cause it to slide past or move away from the planned below-grade seismic strengthening elements located east of the HWHF buildings. Much smaller masses of landslide deposits exist beneath the HWHF buildings that generally trend northwest-southeast, the direction of maximum slope coming off of the ridge that flanks the western side of the East Canyon. These landslide deposits mapped as Qls-3 and Qls-4 on Figure 9 of the April 2, 2010

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
		2, 2010 report are about 15 and 20 feet, respectively. It is these smaller landslides that would be retained by the planned below-grade seismic strengthening elements located east of the HWHF buildings. The East Canyon fault, Wildcat fault, and the historic springs shown on the referenced 1875 map (Attachment 3B) are shown on the geologic maps presented in both the "initial" (2006) and design-level (2010) reports. In 2008, William Lettis & Associates (WLA) excavated a continuous exploratory trench south and southwest of the HWHF that demonstrated that the East Canyon fault does not exist, as mapped. Also in 2008, WLA excavated exploratory trenches on the opposite side of the East Canyon (southeast of Building 74) that showed the Wildcat fault is not Holocene-active (i.e. active within about the last 11,000 years). The springs shown on the 1875 map exist near the depositional contact between the more permeable Moraga Formation volcanic rocks and the underlying less permeable rocks of the Orinda formation. This location provides a reasonable explanation for the alignment of these natural springs. In summary, the East Canyon fault, Wildcat fault, and springs referred to by the commenter have been investigated, considered, and accounted for in the design of the proposed seismic strengthening project.	report are about 15 and 20 feet, respectively. It is these smaller landslides that would be retained by the planned below-grade seismic strengthening elements located east of the HWHF buildings. The East Canyon fault, Wildcat fault, and the historic springs shown on the referenced 1875 map (Attachment 3B) are shown on the geologic maps presented in both the "initial" (2006) and design-level (2010) reports. In 2008, William Lettis & Associates (WLA) excavated a continuous exploratory trench south and southwest of the HWHF that demonstrated that the East Canyon fault does not exist, as mapped. Also in 2008, WLA excavated exploratory trenches on the opposite side of the East Canyon (southeast of Building 74) that showed the Wildcat fault is not Holocene-active (i.e. active within about the last 11,000 years). The springs shown on the 1875 map exist near the depositional contact between the more permeable Moraga Formation volcanic rocks and the underlying less permeable rocks of the Orinda formation. This location provides a reasonable explanation for the alignment of these natural springs. In summary, the East Canyon fault, Wildcat fault, and springs referred to by the commenter have been investigated, considered, and accounted for in the design of the proposed seismic strengthening project.
CMTW-10	The same danger is present at the B71 and B25 sites, as both are on top of active landslides (See attachment 1).	The referenced figure shows hypothesized "paleolandslides" and not "active landslides," as they are referred to by the commenter. Recent trenching near Building 25/25B exposed volcanic rock in depositional contact with underlying older sedimentary rock and not the volcanic paleolandslide body shown on the attachment referenced by the	The referenced figure shows hypothesized "paleolandslides" and not "active landslides," as they are referred to by the commenter. Recent trenching near Building 25/25B exposed volcanic rock in depositional contact with underlying older sedimentary rock and not the volcanic paleolandslide body shown on the attachment referenced by the

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
		commenter. Geologic review and analysis shows that the Building 25/25B (GPL) site has been geologically stable for thousands of years as indicated on page 4.5-20 of the Draft EIR.	commenter. Geologic review and analysis shows that the Building 25/25B (GPL) site has been geologically stable for thousands of years as indicated in Section IV.C.2.b.ii of the EA.
CMTW-11	We therefore ask that LBNL/DOE/UC immediately issue a site-wide MORATORIUM to any new construction and immediately assemble an international, worldclass, independent group of geotechnical experts to perform all-encompassing, site-wide geological investigations and excavations regarding faulting, geology and landslides in the Strawberry and Blackberry Canyons, and that these experts be paid by some of the $ 264 million of ARRA (American Recovery and Reinvestment Act) funds, already received by LBNL! (See attachment 4, A and B)	The comment is noted.	Comment noted.
CMTW-12	We also ask that at the same time, during the moratorium, a comprehensive Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) be prepared for this Project!	The comment is noted. The Department of Energy is the federal Lead Agency and decision maker for NEPA issues concerning the Seismic Phase 2 Project.	See Response to Comment GL-1.
CMTW-13	Attachment 1: LBNL Geologic Map from the RFI (Parsons, 2000) Report	The comment is noted.	The Attachment is included in the EA.
CMTW-14	Attachment 1A: Wright, George. January 28-February 3, 2010. The Volcano Beneath. The Berkeley Daily Planet. pp 1, 26.	The comment is noted. Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	The Attachment is included in the EA. Please see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-15	Attachment 2A: Lawrence Berkeley National Laboratory, Seismic Phase 2 Project EIR. Storm Water Pollution Prevention Plan. Attachment 2B: Site Environmental Report for 1997. Section 5.6. E. Stormwater.	The comment is a photocopy of Figure 4.8-1 from the DEIR showing the proposed GPL located in the Strawberry Canyon Watershed. The comment is noted. Please see response to Comment CMTW-6. The comment is a photocopy from the 1997 Site Environmental Review which includes the source map	Attachments 2A and 2B are included in the EA. Attachment 2A, LBNL Seismic Phase 2 Project EIR Storm Water Pollution Prevention Plan Figure. Attachment 2B: Site Environmental Report for 1997. Section 5.6. E. Stormwater.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
		for Figure 4.8-1 from the DEIR showing the boundaries of the Strawberry Canyon and Blackberry Canyon Watersheds. The photocopy includes an underlined passage explaining the subdivision of the Strawberry Creek Watershed into the Strawberry Canyon and Blackberry Canyon Watersheds. The comment is noted. Please see response to Comment CMTW-6.	
CMTW-16	Attachment 3A: Geological Map of the East Canyon Area. Attachment 3B: Map of Strawberry Valley and Vicinity.	The comment is noted.	Attachments 3A and 3B are included in the EA.
CMTW-17	Attachment 4A: Marcaret, Cristian. Tuesday, February 2, 2010. Berkeley Lab Reaps Benefits of Stimulus. The Daily Californian. Attachment 4B: Chen, Christine. Monday, March 3, 2010. Lawrence Berkeley Lab Gains Federal Funds. The Daily Californian.	The comment is noted.	Attachment 4A and 4b are included in the EA.
CMTW-18	Since 1940, land use and planning at LBNL has been sporadic, haphazard, initially due to the secret nature of the Manhattan Project and later, during the cold war, the culture of secrecy continued under the Atomic Energy Commission and Department of Energy. If indeed UC considers this site to be a viable Hill Campus - now is the time to finally determine that fact, ...	Issues related to the long term planning and development of LBNL at the LBNL main hill site are identified in the 2006 Long Range Development Plan (LRDP).	Comment does not address the proposed action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
CMTW-19	... and if the unconsolidated soils of the collapsed caldera are deemed unsuitable for future development, it is critical that no more taxpayer funds be wasted into this landsliding, fault fractured sinkhole, but instead in the future of a new LBNL, campus in Richmond or Oakland!	The comment is noted. Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	Please see Master Response 1, Geological Conditions Underlying the LBNL Site in the NEPA EA.
CMTW-20	What is the total estimated cost of the Project? Please list projected costs per each Project component.	This comment does not raise an environmental issue, and no response is required.	Comment does not address the proposed action, its alternatives, or the adequacy of the EA, thus no further response is warranted.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
CMTW-21	How much of the Project is funded by LBNL's $ 264 million ARRA funds? Please list ARRA funded portions, in dollar ($) amounts per each Project component.	This comment does not raise an environmental issue, and no response is required.	Comment does not address the proposed action, its alternatives, or the adequacy of the EA, thus no further response is warranted.
CMTW-22	Attachment: Collins, Laurel, Geomorphologist. Contaminant Plumes of the Lawrence Berkeley Laboratory and Their interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California. [refer to attachment for full text]	The comment, as well as the reference supplied by the commenter, is noted. The Seismic Phase 2 EIR includes analysis of potential hazards and hazardous materials (Section 4.7), geologic conditions and soils (Section 4.5), and water issues (Section 4.8). These analyses are based on recent as well as long-term investigations, and include results from geotechnical borings and other sampling methods, by independent, qualified geotechnical experts, other independent environmental scientists and consultants, and LBNL Environmental Health and Safety specialists. The Draft EIR analysis has identified its methodology for these analyses and has produced the reports prepared to support the EIR analyses referenced herein. The extents of groundwater contamination plumes at the LBNL main hill site have been determined using information collected from more than 300 wells. Based on this information, which is available both on line and in the public library, none of these plumes extends beyond the LBNL site boundary. Extensive cleanup efforts carried out at LBNL during the last decade have reduced the contamination level in groundwater several orders of magnitude. In fact, at this time the quality of groundwater in one of the plumes is very close to the drinking water standard. LBNL Environmental Restoration Program's Quarterly Progress Reports are available online at: http://www.lbl.gov/ehs/erp/html/documents.shtml.	

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
CMTW-23	Comments on the Notice of Preparation (NOP)/Environmental Impact Report (EIR) under CEQA and Environmental Assessment (EA) under NEPA for Seismic Life Safety Phase 2B Project at the Lawrence Berkeley National Laboratory. Again - another proposed project, this time with at least 17 (seventeen) individual components, in the treacherous Strawberry Canyon Caldera, the location of the Lawrence Berkeley National Laboratory (LBNL). It will be impossible to adequately analyze the environmental impacts of these 17 individual projects in one EIR/EA as proposed. At minimum we ask that the project be severed to its 5 major geographical components, as described in Figure 3 of the NOP's project information section, and that 5 separate, individual, EIR/EA/EIS reports be prepared, for the reasons stated below.	The five components of the proposed project are evaluated in a single EIR because they all address seismic strengthening and are therefore related.	The EA fully addresses the environmental impacts of the Proposed Action. The comment is noted.
CMTW-24	The entire LBNL campus is situated in the HAYWARD EARTHQUAKE FAULT IMPACT ZONE (HEQFIZ), as seen in the 1992 USGS map (page 2), sandwiched between the Hayward Fault and the Wildcat Fault. The inadvisability of any development/any new development in the Strawberry Canyon Caldera is very soberly described by UC Berkeley's Garniss H. Curtis, Professor Emeritus, Department of Earth and Planetary Science in his May 11, 2008 comment letter (pages 3-5). We ask that all these concerns be addressed in the EIR/EA/EIS reports' Geology and Soils section. It appears that, since the collapsed caldera is filled with unstable landslide materials, a major earthquake along the Hayward Fault will have Potentially Significant Impacts, that cannot be mitigated by	The Draft EIR Geology and Soils section (Section 4.5) analyzes geotechnical issues of constructing the proposed GPL. Please also see the Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	The EA, including Master Response 1, Geological Conditions Underlying the LBNL Site, adequately addresses geotechnical issues. See also, Response to Comment GL-1.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
	anything other than not building in the canyon, i.e. a complete moratorium on new construction at LBNL and a gradual off-loading of facilities from the Hill to safer areas. We ask that this scenario be included in the scope of the EIR/EIS.		
CMTW-25	Figure 11-20. Map Showing Alquist Priolo Zones and Wildcat Fault. Lawrence Berkeley Laboratory.	The comment is noted. Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	The referenced attachment is included. Please see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-26	Statement of Garniss H. Curtis, Professor Emeritus, Department of Earth and Planetary Science, U.C. Berkeley. May 11, 2009. [refer to statement for full text]	The comment is noted. Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	The referenced attachment is included. Please see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-27	LBNL is a nuclear-industrial complex and many of the 14 structures proposed for demolition have been potentially used for work involving radioactive and hazardous materials and are potentially located on contaminated soil and on top of known radioactive and hazardous waste contamination plumes. The NOP document referred to these 14 structures as trailers, labs and shops without any specifics as to their past use. LBNL's Site Environmental Reports provide the following names and descriptions:	LBNL is a non-nuclear facility. The Seismic Phase 2 project will demolish Buildings 25/25B, 55, and the Building 71 trailers. Specific histories of each of the buildings proposed for demolition, and descriptions of any hazards expected to be found therein, are included in the Draft EIR, particularly in Chapter 3, Project Description; on pages 4.4-8 through 4.4-10 (Cultural Resources Section); and in the discussion of impacts in Section 4.7 (Hazards and Hazardous Materials). There are eight locations (not nine) in Building 55 where researchers are authorized to use radioactive materials, as reported in the "Radionuclide Air Emission Report for 2008" (available online at http://www.lbl.gov/ehs/esg/Reports/tableforreports.shtml). This number stayed the same in 2009. These annual reports are available online going back 10 years to 1998 and provide information on all locations where radioactive materials have been used during that time. The Draft EIR is a stand-alone CEQA document and is not paired with a NEPA document (i.e., it is not an EIR/EIS). Draft Section 4.7 (pages 4.7-16 and 17)	LBNL is a non-nuclear facility. The Proposed Action will demolish Buildings 25/25B, 55, and the Building 71 trailers. Hazards expected to be found in the buildings proposed for demolition are included in Sections III.B and IV.C of the EA.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
		describes in overview the history and uses of the buildings proposed for demolition, and the types of hazards and wastes expected in those facilities. Pages 4.7-17 through 4.7-22 describes subsurface contamination known to exist from or around those facilities. SP2 Impact HAZ-2 (pages 4.7-25 through 4.7-32) discloses and describes the results of surveys to identify hazardous materials in the buildings proposed for demolition. In addition, the Draft EIR identifies that "to address the hazardous materials issues identified during the survey as well as other safety issues, a Hazardous Analysis Report (HAR) was prepared for the proposed project in 2009." This HAR is referenced in the Draft EIR and is made available as part of the public record for this project.	
	Buildings 25 Mechanical Technology/Engineering Shop 25B Waste Treatment Facility 55 Research Medicine/Radiation Biophysics (74 Research Medicine/Radiation Biophysics, Cell&Molecular Biology Laboratory) 74F Housing for animals used for research at facility above 4 Magnetic Fusion Energy (MFE)/ALS Support Facility 5 Magnetic Fusion Energy (MFE)/Accelerator and Fusion Research 14 Accelerator & Fusion Research & Earth Sciences 16 Magnetic Fusion Energy Laboratory/Accelerator and Fusion Research Laboratory 17 EH&S/Applied Sciences Lab (71 Heavy Ion Linear Accelerator (HILAC/Center for Beam Physics, Ion Beam Technology) 71 C, D, F, H, J, P B-Factory associated with facility above LBNL operates facilities which contain Radioactive Material Areas (RMAs) that are subject to radioactive air emissions regulations of NESHAPs (National Emission Standard for Hazardous Airborne Pollutants) and have the		

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
	pontential to emit radionuclides into the atmosphere. Building 55 has at least 9 such sources. We ask that the Hazards and Hazardous Materials sections of the EIR/EIS address/describe in detail the history of the uses of all the 14 buildings proposed for demolition and list all the equipment and radioactive/hazardous materials used at these structures and the various kinds of wastes generated there during their lifetime. This will help to better assess the degree of contamination associated with each of the structures, lab equipment, waste water/ sewer lines, sumps etc. Especially, as you know, almost 3 pounds of mercury was recently found in a Building 71Q storm drain sump, (pages 7-8) estimated to have been there from 10 to 40 years.		
CMTW-28	Attachment: CAT OE-Operational Emergencies, B71 Occurrence Report, discovery date 9/25/05. [refer to report for full text]	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-29	To further illuminate our concerns we are enclosing a copy of CMTW's March 2007 Report titled: Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California (as a CD). We specifically ask you to review sections on CONTAMINANT SITES (Chemical and Hazardous Contamination and Radioactive Contamination), DRAINAGE NETWORK MAPPING, FAULT MAPPING,LANDSLIDE MAPPING, ZONES OF CONCERN FOR POTENTIAL PLUME MIGRATION and FUTURE DEVELOPMENT AND SITE	UC LBNL has reviewed the commenter's supplementary materials. The Draft EIR has addressed contamination and plumes (Section 4.7), drainage (Section 4.8), and seismic and soils issues (Section 4.5). "Site conditions" are identified and addressed throughout the entire Environmental Evaluation chapter (Section 4). Future development is addressed in the Draft EIR cumulative impacts discussion (Section 4.D and throughout each of the environmental resource discussion areas, and in the Lab's 2006 Long Range Development Plan (LRDP) and LRDP EIR. Please also refer to Master Response 1, Geological Conditions Underlying the LBNL main hill site.	The referenced attachment is included in the EA. The EA has addressed contamination and plumes, drainage, and seismic and soils issues. "Site conditions" are identified and addressed in the EA. Future development is addressed in the EA cumulative impacts discussion. Please also refer to Master Response 1, Geological Conditions Underlying the LBNL Site.

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
	CONDITIONS.		
CMTW-30	Figure 2. in our Report (page 10) shows a significant VOC (Volatile Organic Compound) groundwater plume associated with B 71 and its "trailer" area, surrounded by a radioactive tritium soil plume. In the "Old Town" area buildings 4, 5, 14, 16 and 17 are all located on top of the huge Old Town VOC groundwater solvent plume. In the East Canyon the B 74 Diesel plume is migrating into the area of the proposed General Purpose Lab.	Concentrations of VOCs are well below the drinking water standard under B71 and its trailer area. UC LBNL disagrees that a radioactive tritium soil plume is present in the B71 area or that the Building 74 diesel plume is migrating. Please see pages 4.7-16 to 4.7-17 of the Draft EIR regarding the current use and management of hazardous materials at the Project Site. Quarterly reports prepared by the UC LBNL Environmental Restoration Program and submitted to the Department of Toxic Substances Control confirm this conclusion. Please see page 4.7-28 of the Draft EIR.	Concentrations of VOCs are well below the drinking water standard under B71 and its trailer area. DOE disagrees that a radioactive tritium soil plume is present in the B71 area or that the Building 74 diesel plume is migrating. Please see Section IV of the EA regarding the current use and management of hazardous materials at the Project Site. Please see also Response to Comment BR-12.
CMTW-31	Figure 18 a. shows the Zones of Concern at LBNL for Groundwater Plume Expansion along Faults, Bedrock contacts, Landslides, Historic and Modern Creeks. Please note and address in the EIR/EIS that all 5 areas of the proposed "Seimic Life Safety Phase 2B Project" are impacted by migrating groundwater contaminant plumes, earthquake faults and landslides. (page 11.)	The comment references Figure 18a of a report appended to the comment letter submitted in January 2009 and requests that the DEIR address the zones of concern for groundwater plume expansion shown on the figure. Chemical contamination at the proposed project site from historical hazardous materials uses is described and analyzed on pages 4.7-1 through 4.7-36 of the DEIR. UC LBNL notes that there are four – not five – general areas where Seismic Phase 2 activities would take place at the LBNL main hill site. The LBNL RCRA Facility Investigation, Corrective Measures Study and subsequent quarterly progress reports provide data showing that the groundwater contaminant plumes at LBNL are not currently spreading, but are either stable or shrinking. The Draft EIR is a stand-alone CEQA document and is not paired with a NEPA document (i.e., it is not an EIR/EIS).	Chemical contamination at the proposed project site from historical hazardous materials uses is described and analyzed in Section IV of the EA. There are four – not five – general areas where Seismic Phase 2B activities would take place at the LBNL site. The LBNL RCRA Facility Investigation, Corrective Measures Study and subsequent quarterly progress reports provide data showing that the groundwater contaminant plumes at LBNL are not currently spreading, but are either stable or shrinking. See also Response to Comment BR-12.
CMTW-32	Figures 10 and 14 show the mapping of Wildcat Fault and the East Canyon Fault as well as the huge landslide area associated with these faults. It is quite incredible to observe	Please see response to comment PH-13, below. Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	Comment does not address the proposed action, its alternatives, or the adequacy of the EA, thus no further response is warranted.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
	that indeed LBNL/DOE (Department of Energy) knew of the presence of these earthquake faults and landslide areas, and yet proceeded with the construction of the Lab's Hazardous and Radioactive Waste Handling, Storage and Treatment Facility in this treacherous area in 1996, and now must attempt with seismic upgrades of the building (B 85), and the stabilization of the landslide beneath it. (pages 12-13)		See also Response to Comment GW-15 and Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-33	Figure 20 a. (page 14) shows various site conditions at future sites of LBNL's Long Range Development Plan.	The diagram provided by the Commenter is noted. Please see the 2006 Long Range Development Plan EIR for UC LBNL information on constraints and conditions related to the LBNL main hill site as well as to the Illustrative Development Scenario which is depicted on the Commenter's diagram. Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	Comment does not address the proposed action, its alternatives, or the adequacy of the EA, thus no further response is warranted. See also Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-34	Please read carefully Garniss H. Curtis' comments: " Most of the buildings of the Lawrence Lab. are on unstable ground filling the old caldera... The buildings on them will certainly move a few feet in a major earthquake if not hundreds of feet."	Please see Master Response 1, Geological Conditions Underlying the LBNL Main Hill Site.	Please see Master Response 1, Geological Conditions Underlying the LBNL Site.
CMTW-35	We ask you to include a very serious analysis of the B 85 situation and instead of a Band-Aid, a plan for relocating these dangerous operations to a more stable and accessible area.	The purpose of the proposed project is to create seismically safe, modern research facilities for UC LBNL programs and personnel. As described in the Draft EIR, a key objective is to remedy high seismic life safety risks in general purpose research facilities and lab-wide resource buildings. The Draft EIR includes an analysis of seismic hazards associated with Building 85/85A and a discussion of the seismic strengthening activities proposed to address them. The seismic safety rating of Building 85/85A would be "good" under the UC Seismic Rating System after completion of the proposed improvements. Also, please see Master Response 1, Geological Conditions	The purpose of the proposed project is to create seismically safe, modern research facilities for LBNL programs and personnel. As described in the EA, a key objective is to remedy high seismic life safety risks in general purpose research facilities and lab-wide resource buildings. The EA includes an analysis of seismic hazards associated with Building 85/85A and a discussion of the seismic strengthening activities proposed to address them. The seismic safety rating of Building 85/85A would be "good" under the UC Seismic Rating System after completion of the proposed improvements. Also, please see Master Response 1, Geological Conditions Underlying the

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
		Underlying the LBNL Main Hill Site. For a discussion of alternatives to the proposed project, please see Chapter 5 of the Draft EIR.	LBNL Site. For a discussion of alternatives to the proposed project, please see Chapter III of the EA.
CMTW-36	Attachment: Figure 2. LBNL Site Map, Groundwater Contamination Plumes and Contaminated Soil Site.	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-37	Attachment: Figure 18a. Zones of Concern for Groundwater Plume Expansion Along Comp8led Faults, Bedrock Contacts, Landslides, Historic and Modern Creeks.	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-38	Attachment: Figure 10. Compilation of Fault Mapping at LBNL in Strawberry Canyon Relative to Soil and Groundwater Contaminant Plumes.	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-39	Attachment: Figure 14. Compilation of Landslide and Surficial Geology Maps 13a-13f in Strawberry Canyon.	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-40	Attachment: Figure 20a. Various Compiled Site Conditi0ons at Future Building Sites of LBNL's Long Range Development Plan.	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-41	Attachment: Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California. March 2007.	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-42	Attachment: Picture. Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California. March 2007.	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.
CMTW-43	Attachment: Announcement for Immediate Release. 5/9/84. Berkeley-Centennial Drive, connecting to "main" University of California-Berkeley campus to hilltop facilities, will reopen tomorrow (Thurs., May 10) after an eight-month closing. [refer to announcement for full text]	The commenter's materials have been received and reviewed. Because they do not address the adequacy of the EIR, no further response is warranted.	The referenced attachment is included in the EA.

DOE's Response To CMTW DEIR Comments (CONTINUED)

DEIR Comment ID	Comment	UC EIR Response	DOE Response
CMTW-44	Attachment: Letter from John R. Shively, Consulting Engineer. 5/28/99. Subject: City of Berkeley Fire Fighting System. [refer to letter for full text]	The commenter's referenced materials -- a 1999 letter from John Shively regarding the City of Berkeley fire fighting system -- has been reviewed but does not address the adequacy of the EIR. However, as general information for the commenter, the Hillwater Fire Fighting System described in Shively's letter was not pursued by UC LBNL. In the 11 years since Shively wrote his letter, LBNL has seismically retrofitted its two existing 200,000 gallon water storage tanks and has added a third. These tanks are fed by EBMUD water and not local well water.	The referenced attachment is included in the EA.
CMTW-45	The same seismic and landslide hazards that afflict the B 85 site are present at the proposed 43,000 sq.ft. Bio Lab (General Purpose Laboratory) location, just some 200 yards downhill to the SE, on top of the Wildcat Canyon Fault. The massive East Canyon Slide (see Figure 14.) extends all the way down to the bottom of Strawberry Canyon and continually undermines the stability of Centennial Drive, the only public (and emergency access) road through the Canyon. We ask that you abandon this new construction project at the proposed East Canyon site and instead very seriously consider the UC owned Richmond Field Station, as an alternative location.	The comment requests that construction of the proposed GPL at the Richmond Field Station be considered seriously as an alternative site, due to the seismic and landslide hazards that exist at the Building 74 SE Parking Lot site originally proposed for GPL construction. On pages 2-2 through 2-3, the DEIR notes that the project has been revised since the NOP and the location proposed for the GPL is no longer at the Building 74 SE Parking Lot site. Further, the Richmond Field Station is analyzed as an alternative site for GPL construction on pages 5-18 through 5-25 of the DEIR. The question of developing further facilities offsite was considered in the EIR prepared for the UC LBNL Long Range Development Plan. Based on that EIR, the Regents decided not to adopt an offsite alternative for the long range development of the Lab. That decision of the Regents was upheld in Jones v. Regents (2010) 183 Cal.App.4th 818.	The EA adequately addresses Seismic and landslides hazards and has analyzed the Richmond Field Station as an alternative location.

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

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CMTW-46	Indeed, the RFS, a prime Bay View property, must be considered as the future site for all LBNL Bio Science (Life Science) facilities, as well as for the Helios/EBl and CRT projects, in order to avoid the potential catastrophic failures predicted for the Strawberry Canyon Caldera during the next major earthquake - and to save publicly funded facilities, equipment and some 5000 human lives:	The Richmond Field Station is considered as an alternative in the Seismic Phase 2 EIR. See EIR Chapter 5. Also, please refer to response to Comment JMP-1-16. See response to comment CMTW-45.	The Richmond Field Station is considered as an alternative to the Proposed Action.
CMTW-47	PS. Landslides in the Strawberry Canyon are triggered by heavy rains and underground water sources (during the dry season). The attached UC Press release of May 9,1984 describes the closure of Centennial Drive for a period of eight months, due to heavy rains and run-off in one of the main landslide areas. (page 17) Former UC Engineer John R. Shively describes a dry season landslide of August 1974, due to impounded hillwater of the Lennert Aquifer, as previous dewatering attempts by hydraugers had failed. (page 18) The EIR/ElS reports must include rainfall data for at least the past 40 years for the highest LBNL locations/elevations as well as current data regarding the Lennert Aquifer and its impacts at LBNL.	The comment, originally submitted in January 2009 and resubmitted in March 2010, states that landslides in Strawberry Canyon are triggered by heavy rains and underground water sources. The commenter thereby requests that rainfall data for the past 40 years at the proposed project site be included in the Final EIR. It is well known that small landslides have been triggered in the past by heavy rains at locations within the Berkeley Hills, including at LBNL. The landslide referred to in the commenter's 1984 article occurred on University land outside of LBNL. No LBNL buildings exist in the area proximate to this particular landslide. The landslides that occurred in 1974 were located in the general area of LBNL Building 77. These areas have subsequently been repaired and improved. No significant landsliding has occurred in this general area since that time despite multiple back-to-back wet winters and many subsequent storm events and incidents of heavy rainfall. The Lennert Aquifer is inferred to be the permeable volcanic unit that underlies the ridge northeast of Building 77 and northwest of Building 85/85A. The presence of this feature is well-recognized and has been accounted for in the Building 85/85A seismic strengthening design component of the Seismic Phase 2 Project. This feature is not close to and would have no effect upon	It is well known that small landslides have been triggered in the past by heavy rains at locations within the Berkeley Hills, including at LBNL. The landslide referred to in the comment's 1984 article occurred on University land outside of LBNL. No LBNL buildings exist in the area proximate to this particular landslide. The landslides that occurred in 1974 were located in the general area of LBNL Building 77. These areas have subsequently been repaired and improved. No significant landsliding has occurred in this general area since that time despite multiple back-to-back wet winters and many subsequent storm events and incidents of heavy rainfall. The Lennert Aquifer is inferred to be the permeable volcanic unit that underlies the ridge northeast of Building 77 and northwest of Building 85/85A. The presence of this feature is well-recognized and has been accounted for in the Building 85/85A seismic strengthening design component of the Seismic Phase 2B Project. This feature is not close to and would have no effect upon the proposed General Purpose Lab. Please see Section IV in the EA.

DOE'S RESPONSE TO CMTW DEIR COMMENTS (CONTINUED)

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		the proposed General Purpose Lab. Please see Chapter 4.5 in the Draft EIR for a discussion of the Geology and Soils.	