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VIA HAND DELIVERY

June 18, 2013

Hon. Edward P. Reyes, Chair
Hon. Jose Huizar
Hon. Mitchell Englander
Planning & Land Use Management Committee
City of Los Angeles
200 N. Spring Street, Rm. 395
Los Angeles, CA 90012

Re: Objections To Millennium Hollywood Project;
Appeals of VTTM-71837-CN-1A and
CPC-2008-3440-VZC-CUB-CU-ZV-HD; ENV-2011-0675-EIR

Dear Chair Reyes and Members of the PLUM Committee:

Appellant Communities United for Reasonable Development ("Appellant") respectfully appeals the April 27, 2013 Determination Letters and approvals of the City Planning Commission related to the Millennium Hollywood Project ("Project").

Appellant is a broad coalition of Los Angeles community organizations (and the individuals they represent) in the Hollywood area including, but not limited to: Beachwood Canyon Neighborhood Association, Argyle Civic Association, Hancock Park Homeowners Association, Hollywood Dell Civic Association, Hollywoodland Homeowners Association, Los Feliz Improvement Association, The Oaks Homeowners Association, and Whitley Heights Civic Association. Appellant's position herein is supported by a wide array of Neighborhood Councils and many other associations from across the City representing more than 250,000 residents, all of which oppose the Project. (See **Exhibit 1** for a more complete listing of groups which are either a part of Appellant or are on record as opposing the Project.)

As discussed more fully below, Appellant is aggrieved because the City Planning Commission ("CPC") erred and abused its discretion in approving the Project EIR and all related Project entitlements. This body should grant the instant appeals and reject the EIR for the Project.

I. THE ENVIRONMENTAL IMPACT REPORT IS LEGALLY DEFICIENT AND DOES NOT SUPPORT THE TRACT MAP OR CPC PROJECT APPROVALS.

a. The City And EIR's Failure To Require The Developer To Specify A Stable, Accurate, and Finite Project Description Violates the Most Basic Mandate of CEQA.

The City's proposed Land Use Equivalency Program and Millennium Project Development Regulations grant so much "flexibility" that City decision makers and the public have been deprived of participating in a meaningful environmental review process. "An EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 405.

The Project's Draft Environmental Impact Report ("DEIR") describes one project "concept", two "scenarios," and six project alternatives, but the DEIR fails to specify which of the concepts or scenarios, if any, is proposed for construction. An "accurate, stable, and finite project description is the *sine qua non* of an informative and legally sufficient EIR." San Joaquin Raptor Rescue Center v. County of Merced (2007) 149 Cal.App.4th 645, 655, quoting County of Inyo v. City of Los Angeles (1977) 71 Cal.App.3d 185, 193. Accordingly, this EIR is defective because the use of an unconstricted Land Use Equivalency Program, with an infinite number of possible mixed use combinations, fails to objectively demonstrate substantial evidence that all possible significant environmental impacts have been identified and disclosed, much less mitigated to the greatest extent possible.

Significantly, a rebuttal letter from the Millennium Developer's attorney dated May 31, 2013 weakly and falsely asserts that "the project description in the Draft EIR is flexible, but it is also accurate, stable, and legally adequate." Apparently, even counsel for the Developer cannot bring himself to claim that an infinite number of possible combinations of mixed uses granted under the Land Use Equivalency Program is "finite," as required by language in controlling case law.

b. The Lack Of A Stable, Accurate and Finite Project Description Results In A Cascade Of Failures Throughout The EIR To Identify And Mitigate Potential Significant Impacts.

Various comment letters submitted to the City in response to the DEIR and other administrative appeals filed against the tract map approvals raised significant deficiencies with the DEIR's project description. The vague and ever-changing project description combined with other refusals of the Project Developer and the City to disclose and mitigate the Project's significant, adverse impacts have been extensively documented in objection letters attached to our initial appeal documents filed with the City, and incorporated again by reference herein.

These objection letters and the exhibits previously submitted into the record demonstrate that the City, as lead agency, failed to adequately analyze at least the following EIR subject areas: aesthetics, air quality, climate change, cultural resources, geology/seismology, land use, noise, open space, parks, parking, public services, traffic, utilities/service systems, vibration, cumulative impacts, growth-inducing impacts, and alternatives. Appellant adopts all of the objections set forth in the letters attached to the appeals filed with the City, and directs the City Council's attention to all of the data and evidence attached to the DEIR comment letters in the Final EIR.

In addition, Appellant adopts each objection letter and administrative appeal submitted to the City during the environmental review process and the hearings before the Advisory Agency, Hearing Officers, and the City Planning Commission. Specifically, Appellant directs the City Council's attention to the administrative appeals of the Vesting Tentative Tract Map No. 71837-CN by the AMDA College and Conservatory of the Performing Arts, Annie Geoghan, Argyle Civic Association, Beachwood Canyon Neighborhood Association, Hollywood Dell Civic Association, and Hollywoodland Homeowners Association including all of the data and evidence attached to those administrative appeals.

c. The Lack Of A Finite Project Description Appears Intended To Obscure What The Project Is Until After Expiration Of The CEQA And Planning Act Statutes Of Limitations.

The Land Use Equivalency Program and Millennium Development Regulations eviscerate the required CEQA review for this Project. Multiple comments on the DEIR noted that the Project Developer has failed to commit to any particular project. But more ominous than just the inconsistency with CEQA is the very idea that City of Los Angeles officials, led by City Councilmember Eric Garcetti in whose district the Millennium Project sits, would allow a developer to essentially write its own Development Regulations that would apply only to its property, and to pair it with a Land Use Equivalency Program that allows the developer to wait until after CEQA and Planning Act statutes of limitation expire before requiring public revelation of what the Project is. As such, the refusal to commit to a particular Project proposal using the pretense that somehow the real estate market is "uncertain" is a gross breach of the City's mandatory, good faith duty under CEQA to fully disclose the proposed Project, its impacts and feasible mitigation as part of the environmental review process. A good faith effort by the City as lead agency would have prevented the Millennium Developer from wasting everyone's time trying to review an EIR which lacks a legally sufficient project description.

Such a bait and switch is illustrated by the recent Wilshire Grand Redevelopment Project in Downtown. In that case, the EIR described a project with two towers. However, once the applicable statutes of limitation expired, the developer, with great fanfare and press releases, announced that it was combining the two towers together to create a super tower that will become the tallest building west of the Mississippi River. CEQA does not permit the use of an ill-defined project description to postpone announcing what the project will really be. The Millennium Developer was required to specify its project so that the impacts could be intelligently assessed and mitigated. Having failed to do so, the Project must be rejected and sent back for environmental review based upon a stable and finite project description.

d. **The EIR Omits Disclosure Or Analysis Of The Land Use Impact From Violating The City Advisory Agency Requirement Of 2.5 Parking Spaces For Each Condominium Unit.**

As set forth in more detail in the appeal of Annie Geoghan, the City failed to disclose or analyze in the EIR the land use impact of essentially granting a variance from the Advisory Agency's requirement that a developer provide 2.5 parking spaces for each condominium unit. The failure to disclose and analyze this land use impact is a fatal flaw.

The City treats the Millennium Developer with impermissible favoritism by refusing to require this Project to seek, justify, and obtain a variance from the Advisory Agency's requirement. This is especially true when in connection with the nearby

Hollywood Gower Project,[1] the City's EIR disclosed the existence of the 2.5-parking-space requirement and analyzed the impacts of seeking and obtaining a variance from the requirement. (**Exhibit 2**.)

The EIR is fatally flawed and must be recirculated with proper analysis of land use impacts from all variances sought from City land use laws and policies.

e. The EIR Fails To Adequately Analyze Impacts On Emergency Response Times And/Or Relies Upon Response Time Data That LAFD Now States Is Unreliable.

The EIR purports to analyze the impact of the Project on the demand for fire services and concluded there is no significant impact. The EIR fails to fully and correctly analyze the time to respond to emergencies at the top of the Project's proposed towers, and improperly relies upon data regarding response times by the Los Angeles Fire Department (Table IV.J.1-3, Average Response Times July 5, 2011-December 14, 2011) that have been officially declared unreliable.

As indicated in the report of the Fire Department attached at **Exhibit 3**, page 3, "all prior reporting data should not be relied upon until they are properly recalculated and validated with the new recommended changes." (Emphasis added.) In other words, due to serious problems with the manner in which the Los Angeles Fire Department had reported emergency and fire response times, all prior data before implementation of the recommendations of the November 2, 2012 Task Force on Information and Data Analysis Report are not to be relied upon. That means that the Project EIR used demonstrably

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[1] This firm successfully challenged the City Council's certification of a Final EIR and approval of various land use entitlements for the formerly proposed, 20-story Hollywood Gower project. La Mirada Avenue Neighborhood Association of Hollywood v. City of Los Angeles and Los Angeles City Council, et al., Los Angeles County Superior Court Case No. BS132533. At trial, this firm proved that the City had violated CEQA and had also violated the due process and fair hearing rights of this firm's community group client. A writ of mandate from the Court issued invalidating the City's certification of the Hollywood Gower EIR and invalidating the City's approval of all land use and other entitlements for that project. Although the Hollywood Gower project has been successfully challenged and invalidated, what is relevant for purposes of this objection letter is the City's admissions and actions in that case.

false – and now officially repudiated – data for analyzing and mitigating impacts. Recirculation is required, utilizing correct reporting data.

Emergency response times are a matter of life and death and must be based upon accurate data, especially when merely arriving at the front gate of a 1.1-million-square-foot complex with two possible 585-foot towers will result in significant further delays in reaching persons in need of emergency services. The time consumed to reach a stricken person in the upper floors would be significantly longer than the Fire Department's time to merely arrive at the site. The EIR completely failed to analyze the amount of additional time to respond to emergencies at the top of the towers, including to a possible restaurant/bar, and how those possible scenarios will be addressed though mitigation measures.

The EIR's analysis of the new proposed "Twin Towers West" options with up to two, 585-foot-high towers as an attractive terrorist target, and the consequent impacts on fire and police services, is nonexistent. Something as unprecedented as dual sky scrapers in Hollywood must be analyzed in terms of these potential environmental impacts. The failure to do so is a failure to proceed in the manner required by law. See Mani Bros. Real Estate Group v. City of Los Angeles (2007) 153 Cal.App.4th 1385, 1405 ("we find, as did the trial court, that the conclusory assertion in the 2005 Addendum that the Modified Project will have an insignificant impact on the provision of police services is not supported by substantial evidence").

"[A] significant impact would occur if the implementation of the Proposed Plan would . . . require the unplanned upgrading or improvements of existing fire protection equipment or infrastructure due to proposed land use designation changes." Given the intensity and density of the proposed Project and its attraction to possible terrorist attack, by failing to tie the conclusion with the analysis (in fact, there was no analysis) the City has again violated the law by failing to disclose the "analytic route the . . . agency traveled from evidence to action." Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 404.

Because the Millennium EIR failed to analyze the impact of emergency response times to the tops of the proposed towers, and because it relied upon demonstrably faulty Fire Department response time data that has since been declared to be unreliable, the EIR has no substantial evidence to establish that the Project will not have significant impacts on fire and safety protection for the City or the occupants/users of the Project site. There simply has been a failure of proper disclosure and analysis. The DEIR must be recirculated with proper disclosure and analysis of impacts related to fire, police and emergency response times, and fire, paramedic, and police facilities and resources, including related to potential terrorist attacks.

f. The 500-Foot Radius From The Hollywood Freeway Shown In The EIR Is Inaccurate; 500 Feet From The Freeway Encompasses More Of The Project Site Than Disclosed By The City In The EIR.

The EIR contains an inaccurate map of the Project site that claims to delineate areas that are within (and outside of) 500 feet of the Hollywood Freeway. (**Exhibit 4**, Figure 3 from the Draft EIR Air Quality Report using Bing mapping). Using the 100-foot scale shown on Figure 3 of the EIR and making a ruler with 5 times the 100-foot scale, the EIR's map visibly depicts a sweep of the 500-foot boundary that is **less than** 500 feet, as would be indicated by the same map's scale. (**Exhibit 4**, Figure 3 from the Draft EIR with ruler comparison.) A similar result appears when using data from Google Earth mapping. (**Exhibit 5**, Google Earth Map with similar scaled comparison.)

Accordingly, the Draft EIR's map and conclusion of the percentage of the Millennium Project within 500 feet of the Hollywood Freeway are incorrect. An accurate depiction of the proximity of the building site to the 101 Freeway might result in a conclusion that no residential or hotel uses can be built on the East Site. But the decisionmakers and the public cannot presently know whether that is so based upon the false depiction in the EIR. If the EIR's misrepresentation is off by as little as 20-30 feet as it visually appears, the percentage of the East Project site within 500 feet of the Hollywood Freeway is significantly understated in the EIR. This means that the EIR presents false information, upon which the PLUM Committee cannot engage in informed decisionmaking.

A decisionmaker such as the City Planning Commission or the City Council does not know if the 500-foot boundary from the Freeway sweeps within the design envelope of any proposed building podium or the tower for the East Site. Without exact and correct identification of the 500-foot boundary, it is impossible for the City's decisionmakers or the public to know that all feasible mitigation measures have been imposed to protect the health and lives of sensitive receptors that may occupy the increased portion of the Project site within 500 feet of the Hollywood Freeway.

For this reason, the EIR's analysis and proposed mitigation measures, relying on false and inaccurate maps and percentage calculations, are inadequate to protect the occupants and users of the Project site. Recirculation with proper disclosure and analyses is required.

g. The CPC's Precedent That Multi-Family Units Should Not Be Located Within 500 Feet Of A Freeway Should Mandate Denial Of The Project.

Many of the air quality concerns that have been raised by other commenters were addressed recently by the CPC during consideration of another project, the Casden West project, near the 405 Freeway in West Los Angeles on February 28, 2013. While the CPC ultimately recommended approval of that project, the CPC did so only after imposing a condition requiring the applicant to move all residential units outside of 500 feet from the freeway. (**Exhibit 6** [April 4, 2013 Determination letter, pp Q-6, F-44].) The findings noted health risk impacts, and specifically identified outdoor air quality as a basis for the condition. (Id. [pp. F-114-116].) During the course of the February 28 hearing, the CPC expressed numerous health risk concerns, which are equally applicable here. These included:

- The general health concerns of putting residential units within 500 feet of a freeway;
- The difficulty in relying on a HEPA filter of Merv-13 to achieve 0.1 micron diameter filtration, the particulate matter that poses the greatest health risk, according to the air quality consultant who testified at the hearing; and
- The reduction in the effectiveness of any filter with windows (and, as here, balcony doors) that open.

The City should demand of the Millennium Project no less than it demanded of Casden West. Granting exceptions to increase the height, FAR and density of residential units – or hotel rooms – within 500 feet of the Hollywood Freeway is contrary to established CPC policy, contrary to recent precedent, and is in disregard of significant health and safety issues which the CPC extensively addressed in its consideration of the Casden West project and its rejection of new multi-family dwelling units within 500 feet of a freeway. We have transcribed a portion of the CPC hearing of February 28, 2013 and have attached it as **Exhibit 7**.

To the extent that the Project proposes or may potentially allow under any "flexibility" scenario residential or hotel uses within 500 feet of and/or within the known dust plume of the Hollywood Freeway, the Project should be denied on this additional ground. The City and Millennium Developers should not place human lives at risk by locating sensitive receptors so close to the 101 Freeway, especially when maps in the EIR inaccurately depict the 500-foot distance from the 101 Freeway.

h. The Project Is Inconsistent With The Freeway Adjacent Advisory Notice For Sensitive Uses.

The basis of these concerns can be found in the City's Zoning Information (ZI) No. 2427, Freeway Adjacent Advisory Notice for Sensitive Uses, adopted in November 2012, and attached hereto at **Exhibit 8**. The EIR must be recirculated to properly grapple with the Project's conflicts with the ZI. It is clear from the ZI that the Project is inconsistent with standard conditions and design alternatives, in particular building orientation and reduction in operable windows. Increasing density and FAR on the Project site so close to the Freeway is inconsistent with the intent of the ZI.

i. The Project Is Inconsistent With The General Plan Air Quality Element.

The ZI also shows the Project's inconsistency with General Plan Air Quality Element Policy 4.3.1, "revise the City's General Plan/Community Plans to ensure that new or related sensitive receptors are located to minimize significant health risks posed by air pollution sources." (Id.) Granting significant exceptions to the Community Plan in order to substantially increase the density and number of units in the Project does the exact opposite of minimizing significant health risks posed by air pollution sources.

We also note the findings of the Casden West project include the following Land Use Planning significant impact, "Land Use Planning (Conflict with Land Use Plan, Policy, or Regulation) It is located in close proximity to the San Diego Freeway, which may result in health risk impacts. Specifically outdoor air quality impacts…." (**Exhibit 6** [p. F-114].) These impacts result in additional inconsistencies with relevant land use plans and policies. (Id. ["impacts related to the inconsistencies with General Plan policies, including the health risk impacts discussed above will remain significant and unavoidable"].) The same applies with full force for this Project, yet the Project EIR has failed to adequately disclose, analyze and mitigate these significant air quality impacts.

j. Air Quality Issues Prevent The Necessary Findings To Be Made For Approval Of A Vesting Tentative Tract Map.

There is no substantial evidence in the record that the Project will not result in residents and hotel guests being exposed to significant, unmitigable air quality impacts and effects. This is in part because no enforceable mitigation measure prohibits development of the site with sensitive uses within 500 feet of the Hollywood Freeway. In fact, Project conditions B.1.5, B.1.6, and B.1.7 are so vaguely written that they fail to meet the City's mandatory obligation to implement all feasible mitigation, as outlined in the Health Risk Assessment at pages 18-21. (**Exhibit 9**.)

Having failed to provide for definite and enforceable Project conditions that not only prohibit any sensitive uses and receptors within 500 feet of the Hollywood Freeway but also implement prohibitions of balconies and operable windows for all sensitive uses facing the Freeway, the City has failed to implement all feasible mitigation measures to protect the Project's occupants from significant, negative exposure to carcinogenic air toxics.

Recent studies and articles regarding health risks from adjacent freeway pollutants demonstrate that the risks are serious. (**Exhibit 10**.) Further, it appears that the EIR underestimated exposure to toxics. A UCLA/CARB study published in December 2012, following completion of the Health Risk Assessment for the Millennium Project, shows markedly higher concentration of freeway pollutants in the early morning hours, when people are more likely to be at home, than had previously been believed. (**Exhibit 11**.) See also the April 17, 2013 Los Angeles Time article, "Freeway Air Pollution Travels Farther In Early Morning." (**Exhibit 12**.) Thus, there is even more evidence that the Health Risk Assessment improperly understated the risk of exposure and the number of feet from the Freeway where sensitive receptor exposures must be limited in order to avoid toxic air exposures.

Finally, with this evidence of magnitude of risk associated with the entire building site, the necessary findings for approval of a Vesting Tentative Tract Map cannot be made with respect to any land use that includes sensitive receptors. See Govt. Code §§ 66474.61(d), (f).

k. The City Has Violated CEQA By Refusing To Study The Project And Its Impacts Per Caltrans' Requests And Requirements.

The reason that CEQA requires a consultation process with responsible and trustee agencies is to ensure that the lead agency performs the necessary studies for the EIR in conformity with requirements imposed by the consulted agencies. In this case, the California Department of Transportation required the City, *inter alia*, to conduct an analysis of potential impacts on the adjoining Hollywood Freeway using particular study models, data input and related criteria.

Over Caltrans' objections, the City and the EIR have failed to do so. As further set forth in the report of traffic engineer Herman Basmaciyan (**Exhibit 13**), the City failed to use the Caltrans-demanded traffic model for analyzing the potential Project impacts on the adjacent Hollywood Freeway, and instead purported to study impacts using alternative methods – which actually resulted in no study of the Project's impacts to the 101 Freeway. When Caltrans officials objected that the DEIR was deficient because the City refused to perform studies as sought by Caltrans, the City unlawfully claimed that it was not required to do so. This is a violation of the City's mandatory duties under CEQA. The City's study approach failed to provide complete or accurate information. The City's use of the CMP methodology did not provide sufficient information related to the Project's impacts on the freeway system, and therefore did not adequately consider the potential significance of the Project's impacts on the freeway system.

The City appears to seek to shift the cost of correcting the negative freeway impacts from the Millennium Developer to the taxpayers of California. The City may not ignore its duties owed to a responsible agency and, by extension, to the public. The Los Angeles Department of Transportation "tail" does not wag the Caltrans "dog."

l. The EIR's Traffic Study Is Deficient For Other Reasons.

The EIR's traffic, circulation and parking analyses are legally deficient on numerous other grounds, as set forth in Mr. Basmaciyan's report, mandating recirculation of a new DEIR to address the significant gaps and/or errors in the current EIR. (**Exhibit 13**.)

m. <u>The City's Deficient Related Projects List For The Millennium Project Omits Major Projects Disclosed And Analyzed In Other Recent EIRs For Hollywood Projects Certified By The City, Thus Rendering The EIR's Cumulative Impacts Analysis Defective.</u>

As noted by Caltrans in its December 10, 2012 letter at page 2, comment 3, the June 2012 Traffic Impact Study failed to include a cumulative traffic analysis for U.S. 101 (the Hollywood Freeway). The omission of the cumulative impacts analysis on a major adjoining freeway, as specifically called out by the responsible agency, is a fatal omission requiring recirculation of the EIR.

The EIR's cumulative impacts analysis is further deficient and therefore defective because it has omitted numerous related projects that should have been disclosed and analyzed. As shown in the: (1) Target at Sunset and Western; and (2) Hollywood Gower EIRs in Hollywood which were recently certified by the City of Los Angeles (**Exhibit 14**), various other projects were included on those related projects lists which must be included in the Project EIR. To omit them not only denies the public and decisionmakers the information they need for informed decisionmaking, but also is arbitrary and capricious by the City, and an abuse of discretion on that additional ground.

As stated in <u>Bakersfield Citizens for Local Control v. City of Bakersfield</u> (2004) 124 Cal.App.4th 1184: "Proper cumulative impacts analysis is absolutely critical to meaningful environmental review" (<u>id.</u> at 1217), and "questions concerning . . . cumulative impacts constitute important issues of broad public interest that are likely to reoccur." <u>Id.</u> at 1203.

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." CEQA Guidelines § 15355. "The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects." CEQA Guidelines § 15355(b).

As the Supreme Court has stated, without proper consideration of cumulative impacts, this critical issue may be "submerged," with potentially "disastrous consequences" to the environment. <u>Bozung v. Local Agency Formation Com.</u> (1975) 13 Cal.3d 263, 283-284.

As set forth in **Exhibit 14**, there are a multitude of new projects underway in the Hollywood area, and in the vicinity of the Project. In addition, there are several other projects which are reasonably foreseeable, although not necessarily in the formal planning stage.

Citizens Assn. for Sensible Development of Bishop Area v. County of Inyo (1985) 172 Cal.App.3d 151, made it clear that consideration of cumulative impacts must reach beyond those projects currently under environmental review: "Related projects currently under environmental review unequivocally qualify as probable future projects to be considered in a cumulative analysis. [Citation.] In addition, even projects anticipated beyond the near future should be analyzed for their cumulative effect." Id. at 168, citing Bozung v. Local Area Formation Committee (1975) 13 Cal.3d at 284.

"A cumulative impact analysis which understates information concerning the severity and significance of cumulative impacts impedes meaningful public discussion and skews the decisionmaker's perspective concerning the environmental consequences of the project, the necessity for mitigation measures, and the appropriateness of project approval." Citizens to Preserve the Ojai v. County of Ventura (1985) 176 Cal.App.3d 421, 431. All of those failings are present with regard to the Project's EIR.

If it is "reasonable and practical" to include other projects in a project's cumulative impacts analysis, then the lead agency is required to do so. San Franciscans For Reasonable Growth v. City and County of San Francisco (1984) 151 Cal.App.3d 61, 77. "While foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can." CEQA Guidelines § 15144 (emphasis added). It was "reasonable and practical" for the City to have included these other projects in the Project's current cumulative impacts analysis – especially since they were included in other recent Hollywood project EIRs – but the City has failed to do so. Until a complete list of related projects is disclosed in a recirculated DEIR, the critical issue of cumulative impacts has not been properly analyzed or mitigated. The Project EIR is defective on this additional ground.

The Project EIR must be recirculated to include a proper and complete related projects list so that a proper and complete cumulative impacts analysis can be performed. In its present state, the EIR fails at this basic informational level.

n. The EIR Falsifies The Proximity Of The Project Site To The Fault Rupture Study Zone And Improperly Omits Any Reference To The Actual Location Of The Strands Of The Hollywood Fault That Have Been Mapped On The Project Site.

The Alquist-Priolo Act was enacted "to provide policies and criteria to assist cities, counties, and state agencies in the exercise of their responsibility to prohibit the location of development and structures for human occupancy across the trace of active faults." Public Resources Code § 2621.5.[2] When a proposed development project is within an Earthquake Fault Zone established by the State under the Alquist-Priolo Act, the City must require "prior to the approval of a project, a geologic report defining and delineating any hazard of surface fault rupture." Public Resources Code § 2623(a). Similarly, the City of Los Angeles in its Safety Element of the General Plan has established broader Earthquake Fault Rupture Study Areas (these are broader and different from the Alquist-Priolo Earthquake Zone Areas) (**Exhibit 16**; City Safety Element Map) where it has undertaken to automatically require a fault investigation report for projects located within those areas.

When a geologic report is required by a governmental unit, it is required to meet certain content and recommendation requirements set by the State Mining and Geology Board. Public Resources Code § 2624(c). In determining whether or not to require a fault investigation report for a particular development proposal, Special Publication 42 – Fault-Rupture Hazard Zones in California (Interim Revision 2007), advises that "[l]ocal governmental units must require developers to have project sites within the Earthquake Fault Zones evaluated to determine if a potential hazard from any fault, whether heretofore recognized or not, exists with regard to proposed structures and their occupants." Id. at p. 9. Moreover, having a project site outside of an Earthquake Fault Zone does not exempt a major development from avoiding such critical investigation. "Active faults may exist outside the Earthquake Fault Zones on any zone map. Therefore, **fault investigations are recommended for all critical and important**

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[2] A history of the Alquist-Priolo Act published in 2010 by the California Geological Survey in February 2010 is attached at **Exhibit 15** for a more complete summary of how the Act is implemented.

developments proposed outside the Earthquake Fault Zones." Id. (emphasis added.) Relevant portions of Special Publication 42 are attached hereto at **Exhibit 17**.)[3]

The substantive mandates of the Act are carried out in adopted regulations if an active fault trace is found on a project site regardless of whether or not it is within an Earthquake Fault Zone. California Code of Regulations, Title 14, Division 2, Section 3603(a) states:

> "No structure for human occupancy, identified as a project under Section 2621.6 of the Act, shall be permitted to be placed across the trace of an active fault. Furthermore, as the area within fifty (50) feet of such active faults shall be presumed to be underlain by active branches of that fault unless proven otherwise by an appropriate geologic investigation and report prepared as specified in Section 3603(d) of this subchapter, no such structures shall be permitted in this area."

Under the Guidelines for Evaluating the Hazard of Surface Rupture, this observation is particularly relevant to the Millennium Project: "A more detailed

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[3] The following passage from the City's EIR prepared in connection with the recently adopted Hollywood Community Plan Update confirms that the City knows and understands the state law and regulatory requirements, including that a property need not be located strictly within an Alquist-Priolo Zone to trigger close investigation of seismic hazards from potential fault rupture:

"Alquist-Priolo Earthquake Fault Zoning Act: The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act) signed into law in December of 1972, requires the delineation of zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture and to **prohibit the location of most structures for human occupancy across these traces**. Cities and counties must regulate certain development projects within the zones, which include withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement. **Surface fault rupture is not necessarily restricted within an Alquist-Priolo Zone**." (**Exhibit 18**; Hollywood Community Plan Update Final EIR at page 4.8-9 [emphasis added].)

investigation should be made for hospitals, high-rise buildings, and other critical or sensitive structures than for low-occupancy structures such as wood-frame dwellings that are comparatively safe." (**Exhibit 17**; [Publication 42 at p. 29].)

The record in this case establishes a shocking lack of compliance with the Alquist-Priolo Act/Regulations and CEQA by professionally-licensed experts hired by the Millennium Developer and by City personnel who oversaw and are required by law to exercise independent judgment regarding the adequacy of both environmental review under CEQA and compliance with the minimum content requirements of a fault investigation report. The magnitude of these deficiencies is fatal to approval of the Millennium Project.

Strong evidence exists that the Millennium Developer's geological firm prepared two materially misleading reports which make false claims that the Hollywood Fault is 0.4 miles from the Project Site, when strands of it actually run through the entire Millennium Project Site. These reports include graphical depictions of the Project Site in relation to both the Hollywood Fault and the City's Safety Element's Earthquake Fault Rupture Study Zone that attempt to mislead the public and City officials into believing that no earthquake faults are nearby or on the Millennium Project Site.

Additionally, strong evidence exists that City staff conducted perfunctory and passive review of the reports and allowed the Millennium Developer's EIR consultant to prepare false responses to public comments on the Draft EIR regarding the existence of faults on-site, including failing to disclose the existence of a November 30, 2012 Fault Investigation Report or circulation of it for public comment as part of the critical public participation requirements of CEQA. An outline of the evidence now follows:

At the hearing before the CPC on March 28. 2013, Hollywood resident Brian Dyer called to the CPC's attention the extensive work of James Francis Dolan, Professor of Earth Sciences at the University of Southern California, regarding the location and documented active status of the Hollywood Fault. (**Exhibit 19** [Wilson Report, Exhibit B].) Professor Dolan, one of the most recognized experts on the location of the Hollywood Fault strands, has described in his scholarly work the existence of a strand or strands of the Hollywood Fault south of Yucca Street within both the East and West Sites of the Millennium Project. (**Exhibit 19** [Report, Exhibit B].) Professor Dolan's work is specifically listed as associated with the Hollywood Fault (Number 392) by the California Geological Survey in its Explanatory Text to Accompany the 2010 Fault Activity Map of California:

> "392
> HOLLYWOOD FAULT
> Holocene
> Clark and others, 1984 (4,000-6,000 yrs)
> Dolan and others, 1997
> Weber and others, 1980 (p. A-3 and Plate 1)
> Ziony and Jones, 1989
> Ziony and Yerkes, 1985 (p. 57)"
> (**Exhibit 19** [Report, Exhibit D at p. 33].)

Additionally, Professor Dolan's work in connection with the Hollywood Fault is officially recognized by the United States Geological Survey – an agency of the federal government. The online USGS map shows one strand of the Hollywood Fault running through or immediately adjacent to the Millennium Project Site. (**Exhibit 20.**)

Professor Dolan's work builds upon earlier detailed studies nearby for the Red Line Subway. Those studies at Figure 2a, by Crook and Proctor (1992), show two strands of the Hollywood Fault running through the Millennium Project Site. (**Exhibit 19** [Report at p. 4 & Exhibit B, Crook and Proctor Study at p. 234].)

Further, the Fault Rupture Study Zone boundary runs across large portions of the southerly portion of the Millennium Project Site. (**Exhibit 19** [Report at p. 5].)

According to the MTA Redline Subway EIR, there is a 5% chance of a magnitude 7 earthquake on the Santa Monica-Hollywood fault within the next 100 years, which is the expected duration of a building. (**Exhibit 21.**) In 2010, Professor Dolan's students prepared a presentation that included pictures of the scarp of the Hollywood Fault running across Vine Street along Yucca Street. (**Exhibit 22** [presentation pictures].) Therefore, the public record is filled with public and authoritative data on the location and active status of the Hollywood Fault – all information readily available to the Millennium Developer's geologic experts and the City.

Given that the location of the Hollywood Fault is called out on the most basic fault location maps of the United States and California governments as being on the Millennium Project Site, and that a Fault Rupture Study Zone boundary of the City's Safety Element bisects the Project Site, one would expect detailed mapping of these possible risks and a detailed discussion in the EIR because these conditions could expose human occupants of the Millennium Project to catastrophic injury or death in the event of a surface rupture affecting the proposed 585-foot-high towers.

If an active fault trace runs through any portion of the Millennium Project site, the presence of the fault would require serious modifications to the proposal or even make it impossible to approve or construct with the California State-mandated 50-foot minimum setbacks from fault traces. Thus, a great deal of financial interest of the Millennium Developer rode on the conclusions of the geologist it hired to prepare the geological investigation of the Project Site – analysis incorporated into the EIR.

Following is the entire analysis of the fault rupture issue contained in the EIR prepared by the City of Los Angeles and drawn from the Millennium Developer's May 2012 preliminary geotechnical report prepared by Langan Engineering & Environmental Services under the supervision of Dan Royden Eberhart, a California licensed Professional Geologist and Rudolph P. Frizzi, a California licensed Professional Engineer, Geotechnical:

> "**Fault Rupture.** The Project Site is not located within a designated Alquist-Priolo Earthquake Fault Zone. A portion of the East Site is adjacent to the boundary of a fault rupture study zone included in the Safety Element of the City of Los Angeles General Plan published in 1996 (Safety Element). The California Geologic Survey (CGS) and the City of Los Angeles ZIMAS system show the closest fault to the Project Site with the potential for fault rupture is the Santa Monica/Hollywood Fault. It is located approximately 0.4 miles from the Project Site. Also, data published in the CDMH (2002) indicates that the Puente Hills and Elysian Hills blind thrust faults are present more than one mile beneath the Project Site." (DEIR, Page IV.D-3.)
>
> "**Impacts Under the Concept Plan. The Project would not expose people or structures to potential substantial adverse effect, including the risk of loss, injury, or death involving earthquake fault rupture**....
>
> "The Project Site is not located in an area delineated on the Alquist-Priolo Earthquake Fault Zoning Map. Likewise, as

> discussed above, the Project Site is not located within a fault rupture zone. The Safety Element of the City of Los Angeles General Plan, published in 1996, indicates that a portion of the East Site is adjacent to, but not within, the boundary of a fault rupture study zone. Figure 4 in the Geotechnical Report illustrates the proximity of the Project Site to the fault rupture study zone.
>
> "Also, the California Geological Survey (CGS) and the City of Los Angeles ZIMAS system (http://zimas.org/map.asp) show the closest fault to the Project Site with the potential for fault rupture as the Santa Monica/Hollywood Fault. It is located approximately 0.4 miles from the Project Site. In addition, data published by the CDMG (2002) indicates that the Puente Hills and Elysian Hills blind thrust faults are present more than one mile beneath the Project Site. Based on the facts that the Project Site is not within a mapped fault rupture study zone, there are no identified surface faults with rupture potential on the Project Site, and the identified blind thrust faults are deep beneath the surface, the potential for surface rupture at the Project Site is considered unlikely and less than significant." (DEIR, Page IV.D-7.)

Relevant portions of the DEIR and the May 2012 Langan Engineering Report are attached hereto at **Exhibit 23**.

Figure 5 of the geology technical report constitutes the only purported evidence in the EIR showing the location of the Hollywood Fault in relation to the Project Site, and it is meaningless. (**Exhibit 23**.) Anyone could place the Project Location "dot" on Figure 5 and show it below the Hollywood Fault. However, that does not make it accurate or substantial evidence of anything factual. The EIR contains no substantial evidence demonstrating that the Hollywood Fault is 0.4 miles from the Project Site. Graphic artistry does not constitute geologic investigation or accurate reporting by a licensed professional.

In addition, the EIR geology report's Figure 4 purports to depict the Project Site in relation to the Fault Rupture Study Zone. (**Exhibit 23**, EIR Figure 4.) The City's Safety Element Map, which the Notes on Figure 4 of the Geology Report claim is the basis of

Figure 4, clearly depicts the study zone line passing somewhere above the intersection of Hollywood and Vine Streets. (**Exhibit 16**, Safety Element map.) As shown on the map in Figure 1 from the Langan May 2012 Report supporting the Draft EIR, the Project's East Site is only 200 feet north of the intersection, thus the EIR's Figure 1, created by the Millennium Developer's engineer/graphic artist, yet miraculously depicts the boundary of the City's Safety Element Fault Rupture Study Zone as adjacent to, but not within, the Zone.

Appellant retained the services of Professional Geologist and Certified Engineering Geologist Kenneth Wilson to review the geologic analysis of the Draft and Final EIR, and all supporting geologic reports prepared by Langan Engineering (May 2, 2012 and November 30, 2012 Reports). (**Exhibit 19**.)

Mr. Wilson took Langan's Figure 4 and layed it over a scale map of Hollywood Streets. In doing so, Mr. Wilson discovered that Langan's graphic artist not only deleted the location of Yucca Street from Figure 4, but actually slid the outline of the Project Site about 850 feet north of their actual location south of Yucca Street, up to Franklin Avenue. (See **Exhibit 19** [Wilson report, Figure 2].) When viewed on a scaled map, the Draft EIR Figure 4 actually shows the Project Site on top of the Hollywood Freeway – which will be news to Caltrans. This is nothing short of fraud on the public (and the City decisionmakers) by the Millennium Developer and Langan Engineering.

The City's Earthquake Rupture Study Zone boundary traverses a great deal of the Millennium Project Site. The true location of the Project should have automatically triggered a fault investigation report, but did not because the City passively accepted the falsified assertion that the Project Site was not within the City's Earthquake Fault Rupture Study Zone.

Even more alarming, the City neglected its duty to investigate, precisely measure, and determine the location of the Fault Rupture Study Zone, which bisects the Project Site. Again, graphic artistry is no substitute for proper investigation and full disclosure of the precise location of the Zone on an appropriately scaled neighborhood map, instead of a regional map that lacks substantial detail.

The analysis in the Draft EIR and the Figures drawn by a graphic designer at Langan Engineering, supported by a Professional Geologist's stamped report certifying its reliability and accuracy (because the lives of human beings depend on it being reliable and accurate), is also demonstrably false with respect to the claim that the Hollywood

Fault is 0.4 miles (2,112 feet) away from the Project Site. While it might be true that portions of the Hollywood Fault lie .4 miles away whether measured to the east or the west, the clear implication of the language used in the EIR is that the Hollywood Fault comes no closer than 0.4 miles. That contention is simply false.

The work of Professor Dolan not only disproves the May 2012 geological report by Langan Engineering, but it establishes substantial evidence that any geology student could find in the public record showing strands of the Hollywood Fault cutting through the center of the Project Site. Yet the EIR and the May 2012 Langan Report are bizarrely silent about these critical issues. Professor Dolan himself in an email to representatives of Appellant made this observation:

> "In response to your questions, please find attached our 1997 paper on the Hollywood fault. Figure 4 is a detailed map of the area of your concern. This peer-reviewed paper has been widely known and cited for the past 15 years, so everybody in the southern California geological/earthquake hazard community should certainly be aware of it.
>
> "I would also suggest that you peruse the California Geological Survey website to get a copy of their active fault map of the area.
>
> "Note that in the figure from our paper we are mapping fault scarps (shaded in gray), cliff-like features associated with fault movements. The prominent north-side-up scarp north of the Capitol Records building is the most prominent of these (easy to see if you stand a[t] Hollywood and Vine and look North). But there is another, more southerly strand in this area that is shown on the map that is based on scarps to the east and west, separated by younger material coming out of the Cahuenga drainage, as well as by a groundwater barrier near Cahuenga and Yucca. The presence of at least two strands in this area is common along major faults like the Hollywood fault, which are not typically just a single strand, but rather zones of faulting that can encompass several different strands.

> "Looking at our mapping of these scarps from the perspective of almost 20 years later, I am not completely convinced that the southern strand shown in the figure has that pronounced change in orientation at Vine Street (shown swinging North right at Vine Street). This looks as if it could have at least partially been caused by deposition of young material and/or erosion associated with the small south-flowing drainage just east of Vine Street, as well as by construction of Vine Street itself.
>
> "In any event, the only way to sort out the exact locations and states of activity of faults in this area would be through extensive subsurface exploration (boreholes, trenching, seismic reflection, etc.), which I assume is being done for this project as a matter of course? (Email of James Dolan dated June 3, 2013.) (**Exhibit 24.**)

When informed that the EIR described no detailed examination of this issue, Professor Dolan was incredulous:

> "I will try to give you a call later this morning. But the fact that the Hollywood fault is not yet zoned under the State's Alquist-Priolo Act doesn't mean that it isn't an active fault zone (it is). It just means the State hasn't gotten around to zoning it yet, even though I've been asking them to do so since 1992, when I first mapped the Hollywood-Santa Monica fault system. The California Geological Survey moves at a glacial pace with zoning faults. Moreover, **the fact that it is not yet zoned in no way obviates the requirement that one not build structures designed for human occupancy directly atop active faults.**
>
> "Given the scope of this project, I would assume that the developers must have done a detailed subsurface geological investigation to look for possible active faulting beneath their site. Do you know what they have (or have not) done in this regard? There must be a geological report that includes a detailed discussion of the potential for active faulting at their

> site. The Hollywood fault is one of the best known active faults in California, and that 1997 paper has been publicly available in a widely circulated mainstream peer-reviewed journal for many years. Plus, I've led dozens of field trips along the Hollywood fault over the years that have included many dozens (if not hundreds) of consulting geologists, as well as LA City and County geologists. So **it's not as if anyone could *credibly* plead ignorance of the existence and approximate location of the Hollywood fault in that area.**
>
> "Bottom line: Based on our mapping back in the 1990s, supplemented by the consulting geologists reports we discuss in that paper, **it looks as if there is at least one strand of the Hollywood fault extending approximately through the middle of that block**, but to determine its exact location and state of activity would require extensive subsurface fault investigations (boreholes, trenching, seismic reflection, etc.). **They MUST have done the detailed subsurface fault investigations necessary to determine the exact locations and states of activity of fault strands in that area. I can't believe that they wouldn't have done this as part of due diligence for developing the site.** If they didn't, it would seem from my perspective that they should be required to do so by the City and/or County and/or CGS geologist (whoever is charged with this issue for that area). **To undertake a development of this scale (or indeed any development) in that area of known active faulting without doing detailed subsurface fault investigations just doesn't make any sense.**" (Email of James Dolan dated June 4, 2013, 8:09 a.m.) (**Exhibit 24**; emphasis added.)

Later, Professor Dolan expressed shock about the claim that the Hollywood Fault is 0.4 miles from the Millennium Site:

> "Do you know the name of the geological consulting company that did the site investigation? Do you have a copy of their report? Can you get one? If so, can you send it to me? Please fill me in with what you know. I'm always in search of new

> data on faulting in the LA region, and this sounds as if it could be a rich source.
>
> "I don't see how there is any way that their proposed building is 0.4 miles from that southern strand of the Hollywood fault. Is that what they said? Maybe they mean distance to the northern strand? Even that isn't 0.4 miles away, if I understand where they are proposing to build. Do they mean E-W distance to previous study sites? If so, that doesn't really mean anything in terms of proximity to a fault that extends E-W. I'd be very much surprised if at least some part of their proposed building wasn't much closer to that southern strand in the block north of Hollywood and west of Vine. But I await getting a look at their report on the subsurface investigations before saying anything beyond that." (Email of James Dolan dated June 4, 2013, 12:08 p.m.) (**Exhibit 24**.)

When Professor Dolan looked over the EIR and the location of the few boreholes performed to investigate the Millennium Site's geology, he was stunned:

> "Thanks for sending the draft EIR. I've taken a quick look, and I'm honestly not quite sure what to say. **I want to be circumspect, but trying to find an E-W fault with an E-W (i.e., fault-parallel) transect of four incompletely sampled (18" of core every 5' of depth) boreholes is simply ... well, stunning. So stunning that I would suspect that they weren't looking for a fault at this location, as this study could not possibly have been designed to look for potential E-W-trending strands of the Hollywood fault system.** Puzzling, as my mapping shows the fault either through [or] right next to their site, and the CGS website shows the northern strand of the Hollywood just north of Yucca at the very prominent scarp.
>
> "**In any event, this subsurface analysis, if this is all that has been done, is completely inadequate in terms of a fault-investigation report. There's no way that they could ever**

> **hope to determine where faults are (or aren't) at their proposed building site from just these four boreholes.**
>
> "Is that really all there is? At some point along the line, somebody associated with this development project MUST have done a more detailed subsurface analysis to check for faulting." (Email of James Dolan dated June 4, 2013, 1:27 p.m.) (**Exhibit 24**; emphasis added.)

Thereafter, Professor Dolan contacted the City's geologist, Dana Prevost, and asked for access to any further study of the Project Site for active faults. He recommended to Appellant's representatives that they ask the City for a copy of the report, which request was made by a representative of Appellant on or about June 4, 2013, when Appellant became aware of the existence of the November 30, 2012 Langan Report. (A copy of the November 30, 2012 Fault Investigation Report prepared by Langan Engineering is attached at **Exhibit 19** [Wilson Report at Exhibit A].)

This was the first time that Appellant became aware that the City required the Millennium Developer to conduct a Fault Investigation Report for the Project Site. Appellant then retained the services of Mr. Wilson to review the Draft and Final EIR for the Project, as well as the Langan May 2012 geotechnical report ("May Report") and the hitherto undisclosed Langan November 30, 2012 Fault Investigation Report ("November Report").

Mr. Wilson's investigation concluded that neither the Draft nor Final EIR contains substantial evidence to support the contention that one or more strands of the Hollywood Fault do not traverse the Project Site. In fact, his interpretation of boring data contained in the November Report, but inexplicably not discussed by Langan, suggests evidence of a fault running between Borings B1 and B2 on the Millennium Project West Site. Mr. Wilson also concluded that water table locations in one of the four original bore holes from the May Report was additional evidence of a water barrier on the East Site just south of the most southern boring. (See **Exhibit 19**.)

Even more disturbing is the sequence of events that led to the City failing to revise and re-circulate the Draft EIR. While the Langan preliminary geology report was completed on May 2, 2012, shortly thereafter, on July 2, 2012, the City required the Langan November Report to investigate for faults. The new borings were conducted only on the West Site, and not up in the vicinity of Yucca Street from July 16-21, 2012.

No new borings, no trenching, and no seismic reflection were performed at all on the East Site.

When the B2 drilling core sample revealed evidence that might support a conclusion of faulting on the Project Site (older materials on top of younger carbon-dated materials), on October 11, 2012, two additional boreholes were drilled (B5 and B6) on either side of B2. Data from boreholes B5 and B6 also showed older material lying over younger material. These three of six boreholes suggest a need for further investigation through the techniques Professor Dolan stated: trenching on both sites, in a manner actually designed to attempt to locate and transect the faults, more complete sampling of the borehole materials, and seismic reflection studies. None of this was done and, strangely, the City's geologist required nothing further.

The inconsistent data was explained away with Langan Engineering asserting that B2 samples "were likely due to sample contamination from portions of the fill stratum falling into the core from shallower depths during coring." No fact is cited as a basis to believe that such amateurish professional negligence could be a valid explanation, or if that really was the belief, why new, more carefully conducted borings did not occur.

For the B5 sample, which also shows older material over the top of younger materials, Langan opined that groundwater borne acids made "[t]he age of the analyzed sediment [to be] understood [as] older than the apparent age." For the B6 sample, Langan Engineering had a different explanation for why it also had older materials deposited over younger materials: "The reported apparent age of the sample from approximately 22 feet below ground surface was likely complicated by fluctuations in carbon content of sediments as carbon cycles through the subsurface profile during reworking, incorporation, and redeposition of older sediment into younger sediment." Despite Langan making excuses for the anomalies, Appellant's geologist Wilson pointed out significant evidence of a fault that Langan failed to discuss at all in the November Report. (**Exhibit 19.**)

The City's geologist merely filed the November Fault Investigation Report away, and its existence was hidden from the public by City Planners. Given Langan's grossly incorrect assertion that the Hollywood Fault was 0.4 miles away, the City failed in its duty to assure reliable and accurate data by removing Langan from work on the Fault Investigation team. How could City officials, knowing that the 0.4 mile claim was unbelievable and inaccurate, allow Langan Engineering to conduct the Fault Investigation?

Perhaps it was because certain City Hall partisans wanted the Millennium Project to be heard and decided by the City Council before Councilmember Eric Garcetti left office on July 1, 2013. On October 25, 2012, **before the November Report was completed**, the City released the Draft EIR for public comment from October 25, 2012 to December 10, 2012. City staff had to know that the claim that the Hollywood Fault was 0.4 miles from the Project Site was false because the City had ordered the Fault Investigation on July 2, 2012.

Knowing that there might be an earthquake fault on the Project Site, someone in the City nonetheless decided to release the materially misleading Draft EIR for public comment. No mention of a Fault Investigation Report was added to the Draft EIR before it was released for public comment. In fact, because such a critical study affecting the safety of human beings was not yet complete, the City violated its duty of good faith disclosure of known facts by prematurely releasing the Draft EIR with such a glaring deficiency. In doing so, the public was deprived of knowing about or participating in the evaluation of the Fault Investigation Report. The Draft EIR is incomplete and thus fatally flawed on this additional ground.

The November Report was completed November 30, 2012, yet City staff did not pull back the Draft EIR for revision and recirculation, even though **Plate 1 at the rear of the completed November Report (which was not disclosed to the public or made part of the EIR) depicted two possible fault lines running through both the East and West Sites of the Millennium Project.** This also violated the City's mandatory duties under CEQA regarding a good faith effort at FULL disclosure of potential significant impacts. CEQA Guidelines § 15151.

On February 8, 2013, the City issued a Notice of Completion of the Final EIR. In the Final EIR, despite the existence of the November Report known to City staff, the City: (1) failed to disclose the existence of the November Report containing two fault lines crossing both East and West Sites; (2) failed to correct the Draft EIR's statements that the Hollywood Fault was 0.4 miles away from the Project Site; and (3) failed to allow the public to evaluate the credibility of the Langan Engineering Fault Report and comment on the reasoning why the results in half of the boreholes were ignored in the conclusions of the report.

Additionally, in responding in the Final EIR to public comments 24-4, 44-4, 45-9, 63-5, 64-10 and 70-5 raising concerns about the existence of nearby earthquake faults or danger of earthquakes, the City affirmatively misrepresented that the Hollywood Fault was 0.4 miles from the Project Site in its response to Comment 24-4 and repeatedly referred the public to this false response over and over.

Nowhere in the Final EIR did City Planners state the correct location of the Hollywood Fault, or report to the public the results of the November Report. Also, the November Report was not released as a supporting appendix to the Final EIR, nor has it been released to any member of the public until Appellant obtained a copy when it learned of its existence. All of these actions are a gross violation of the City's mandatory duty under CEQA to make a good faith effort at full disclosure, to analyze potential significant impacts, and to impose all feasible mitigation measures.

In the absence of substantial evidence to support the conclusion that the entire site is free of active fault traces, the Project cannot be lawfully approved. All the evidence (including much that was suppressed or buried by the City and Millennium) supports the conclusion that: (1) there are active fault traces on or at the site; and (2) the City and Millennium deliberately failed to conduct a legitimate inquiry and investigation. CEQA Guidelines Section 15151 requires "a good faith effort at **full** disclosure." (Emphasis added.)

In fact, City staff's failure to correct any of these glaring misrepresentations must be interpreted as a failure of the City to review the Final EIR responses prepared by the Millennium Developer's CEQA preparer, which not only violates CEQA's duty to exercise independent judgment, but shocks the conscience that City staff would act so cavalierly regarding a matter of life and death.

In 2004-2005 – coincidentally also called the Millennium project (at Sunset and La Cienega in West Hollywood) – a then-proposed condo/hotel tower project was shown to potentially have active fault traces traversing the project site. The West Hollywood Planning Commission, to its great credit, ordered the whole process stopped until the project site was trenched, geologists from all sides went in and studied the fault, and took soil samples for independent testing. Why is it so difficult to get City of Los Angeles officials to require similar studies for a much larger and more dangerous project, one with compelling and authoritative evidence of active fault traces across the Project site, including from the California Geological Survey's 2010 Fault Activity Map showing the Hollywood Fault passing through the Millennium Project Site – which is readily available to anyone who is actually looking for it? The CGS's 2010 Fault Activity Map can be accessed and enlarged/zoomed in at this link:

http://www.conservation.ca.gov/cgs/cgs_history/Pages/2010_faultmap.aspx, and is incorporated herein by this reference.

Due to the City's failure to disclose and analyze the location of the Hollywood Fault and the Fault Rupture Study Zone boundary on or at the Millennium Project Site, the EIR fails as the information disclosure document it is required to be.

o. The City Unlawfully Delayed Full Investigation Of The Project Site Geology Until After Discretionary Approval.

Mitigation Measure D-1 states that "Prior to the issuance of building or grading permits, the Project Applicant shall submit a final geotechnical report prepared by a registered civil engineer or certified engineering geologist to the written satisfaction of the Department of Building and Safety." The condition goes further to describe the purposes of the report, none of which is to fully investigate whether or not faults exist near Yucca Street or on the West or East Sites.

As discussed above, and given the Millennium Developer's willingness to hire geologists who have made documented material misrepresentations of facts about the geologic conditions of the Project Site, City staff must reject the work of Langan Engineering as a breach of professional responsibility.[4] Instead, the City must now hire a truly independent and qualified firm to investigate the presence of Hollywood Fault strands and assure a complete investigation using bore holes, trenches and other modern methods of investigation for the presence of fault lines on both sites **that have not yet been performed by anyone**.

The magnitude of this issue is so large, and the risk to human life so great, that it would violate CEQA to postpone or ignore the issue. The final geological report must be completed and included in a recirculated DEIR made available for pubic review and comment before any discretionary approvals are made.

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[4] Indeed, Business and Professions Code Section 7860(b)(2) lists misrepresentation, fraud, or deceit by a geologist or geophysicist in his or her practice as cause for revocation or suspension of a professional license. B&P Code Section 7872(h) makes a knowing violation of 7860 a misdemeanor criminal offense.

p. **Conclusion: The Millennium EIR Is Fatally Flawed And Cannot Be Approved.**

For all of the foregoing reasons, the Project's EIR is grossly flawed and cannot be used as an environmental clearance document to support approval of any part of the Millennium Project.

II. **WILLIAM ROSCHEN AND HIS FELLOW CITY PLANNING COMMISSION MEMBERS VIOLATED GOVERNMENT CODE 1090 IN APPROVING THE CITY'S ENTRY INTO MULTIPLE MASTER COVENANT AND AGREEMENTS WITH THE MILLENNIUM PROJECT DEVELOPER, AND THUS, ALL ENTITLEMENTS ARE VOID, AS IS THIS CITY COUNCIL PROCESS.**

The Millennium Developer applied for variances, conditional use permits, reductions in parking, a tract map and a development agreement in connection with the Project surrounding the historic Capitol Records building on Vine Street in Hollywood. After the City Advisory Agency approved the tract map, six community groups filed appeals of that decision. Both the appeals and additional City Project entitlements, for which the CPC was the initial decision maker, came on for hearing before the CPC on March 28, 2013.

In the week leading up to the CPC hearing, the City Attorney made it known that CPC President William Roschen's architectural firm, Roschen Van Cleve Architects, had been retained by the Project Developer for professional architectural services in connection with the Project, including having already prepared the Aesthetic Impacts Report attached to the DEIR appendices. (**Exhibit 25.**) In addition, the mitigation measures recommended in the Historic Resources Technical Report include a proposed measure that the design team "will consult with a preservation architect or other qualified professional regarding compatible design and siting of new construction." Because the City Attorney failed to release for public inspection a copy of the Roschen Van Cleve Architects/Millennium Developer contract, it is unknown whether William Roschen's firm is proposed to provide further services after the Millennium Project Developer may receive its requested City Council approvals.

At the beginning of the CPC meeting, Assistant City Attorney Adrienne Khorasanee announced that because Roschen had a personal services contract with the

Millennium Developer, under Government Code Section 1090, the City Attorney determined that Roschen had a prohibited financial conflict of interest in the proposed Development Agreement for the Project. On this basis, Roschen and the entire CPC was barred from considering or approving the proposed Development Agreement.

Ms. Khorasanee then stated twice before the hearing that the Millennium Developer had decided to withdraw its request for the Development Agreement. Khorasanee then said that because the Development Agreement had been withdrawn, the CPC was free to consider the remaining City entitlements being sought for the Project.

During the hearing, Daniel Wright of The Silverstein Law Firm objected to the CPC hearing the matter because if Roschen had a disqualifying interest in the Development Agreement, then he likely had a similar disqualifying interest in the remaining entitlements. This objection and others made by members of the public during the hearing were ignored by the CPC and City Attorney. At the conclusion of the hearing, the CPC unanimously voted to approve the Project entitlements, minus the Development Agreement.

There are other key facts regarding the remaining CPC entitlements considered and approved on March 28, 2013. The CPC considered and denied the six appeals of the Advisory Agency's tract map approvals. The tract map approval is conditioned upon (emphasis added):

> "Prior to recordation of the final map the subdivider shall prepare and execute a **<u>Covenant and Agreement</u>** (Planning Department General Form CP-6770) in a manner satisfactory to the Planning Department, binding the subdivider and all successors to the following:"

And then the tract map approval determination letter lists approximately 45 pages of project conditions and obligations that the Project Developer must promise to implement in exchange for the City granting discretionary approval of the tract map. The tract map determination letter, dated February 22, 2013, was executed on behalf of the City by "Michael Logrande, Advisory Agency By Jim Tokunaga, Deputy Advisory Agency." The CPC letter of determination granting approval of the tract map and its overruling of the appeals filed by the community groups is substantially the same and is dated April 27, 2013.

The other CPC entitlements are included in an April 27, 2013 Determination Letter issued by the CPC. Q Condition 33 states (emphasis added):

> "Covenant. Prior to the issuance of any permits relative to this matter, **an agreement** concerning all of the information contained in these conditions shall be recorded in the County Recorder's Office. The agreement shall run with the land and shall be binding on any subsequent property owners, heirs or assigns. The agreement shall be submitted to the City Planning Department for approval before being recorded. After recordation, a copy bearing the Recorder's number and date shall be provided to the Department of City Planning for attachment to the file."

Additionally, at multiple locations in the staff recommendation report, the usual City Planning Department language that obligates a developer to execute the Covenant and Agreement Form is relied upon as a means to reduce the agreed upon Project conditions and alleged environmental mitigation measures to an enforceable agreement between the City and the Millennium Project Developer.

Based upon the foregoing, both the Advisory Agency determination letter and the CPC determination letter include multiple provisions that effectively require, as a condition of the Project Developer's acceptance of the benefits of the City's approvals, that the Developer must accept the burdens imposed by the Project conditions.

The City's determination letters present offers to enter into covenants and agreements that contain the Project conditions and impose them as permanent covenants running with the land against the Developer and successors in title. The process also involves the Millennium Project Developer's acceptance of those covenants and conditions. In other words, offer, acceptance and consideration create a contract (the "CPC Entitlement Contracts") which the CPC Commissioners participated in making through their approval of the CPC entitlements and issuance of the letters of determination under their approval authority.

The relevant Government Code provisions are Sections 1090 and 1091:

Govt. Code § 1090. Conflicts of interest contracts, sales and purchases:

> "Members of the Legislature, state, county, district, judicial district, and city officers or employees shall not be financially interested in any contract made by them in their official capacity, or by any body or board of which they are members. Nor shall state, county, district, judicial district, and city officers or employees be purchasers at any sale or vendors at any purchase made by them in their official capacity.
>
> As used in this article, "district" means any agency of the state formed pursuant to general law or special act, for the local performance of governmental or proprietary functions within limited boundaries."

Govt. Code § 1091. Remote interest of officer or member:

> (a) An officer shall not be deemed to be interested in a contract entered into by a body or board of which the officer is a member within the meaning of this article if the officer has only a remote interest in the contract and if the fact of that interest is disclosed to the body or board of which the officer is a member and noted in its official records, and thereafter the body or board authorizes, approves, or ratifies the contract in good faith by a vote of its membership sufficient for the purpose without counting the vote or votes of the officer or member with the remote interest.
>
> (b) As used in this article, "remote interest" means any of the following:
>
> [Subdivisions (1) to (10) omitted]
>
> (11) That of an engineer, geologist, or architect employed by a consulting engineering or architectural firm. This paragraph applies only to an employee of a consulting firm who does not serve in a primary management capacity, and does not apply to an officer or director of a consulting firm.

> [Subdivisions (12) to (16) omitted]
>
> (c) This section is not applicable to any officer interested in a contract who influences or attempts to influence another member of the body or board of which he or she is a member to enter into the contract.
>
> (d) The willful failure of an officer to disclose the fact of his or her interest in a contract pursuant to this section is punishable as provided in Section 1097. That violation does not void the contract unless the contracting party had knowledge of the fact of the remote interest of the officer at the time the contract was executed.

Government Code Section 1090 is California's strict conflict of interest law that codified the common law prohibition against self-dealing by public officials. Its origin is traceable almost to the formation of the state. (See Stats. 1851, ch. 136, § 1, p. 522.) Essentially, Section 1090 bars a public agency from entering into any contract in which a public official with an interest therein participates in the making thereof. One foolish enough to hire a public official in any capacity in connection with the public contract that the same public official will approve or make, or that the body he sits on will approve or make, soon learns that the contract is void and any financial costs to the public agency shall be disgorged and returned to the public treasury.

The seminal case in this area is Thomson v. Call (1985) 38 Cal.3d 633 ("Thomson"). As the California Supreme Court observed, Section 1090 requires that:

> "every public official be guided solely by the public interest, rather than by personal interest, when dealing with contracts in an official capacity. Resulting in a substantial forfeiture, this remedy provides public officials [and those who seek to enter public contracts] with a strong incentive to avoid conflict-of-interest situations scrupulously." Id. at 650.

In Thomson, a taxpayer challenged a series of transactions where Councilmember Call and his wife sold adjoining land to a multi-family housing project developer, who as part of the transaction donated the parcel to the City in exchange for the project entitlements. Evidence showed that although the parcel appraised for approximately

$30,000, the Calls were paid $258,000 for their parcel. The trial court ordered Councilmember Call to disgorge the entire $258,000 purchase price while leaving title to the parcel in the City. Even though Councilmember Call claimed the transaction benefited the City by providing new parkland for its citizens, the Supreme Court held that the goals of avoiding even the appearance of impropriety and the undivided loyalty of public officials required disgorgement of the $258,000. This result was required regardless of the whether there was a showing of a loss of money by the public agency, whether the transaction was fair to the public agency, or whether there was evidence of actual fraud or dishonesty.

The fact pattern in Thomson involving the grant of land use entitlements in connection with a major development project provides background to consider the usual questions that must be answered in a Section 1090 situation.

The issue is analyzed based upon the following questions:

1. Who is the individual with the potential conflict of interest?
2. Does the decision involve a contract and is that contract ultimately executed?
3. Is the individual making or participating in making the contract?
4. Does the official have a financial interest in the contract?
5. If the official is a board member, does a remote interest exception apply?
6. For all officials, does a non-interest exception apply?
7. Can the limited "rule of necessity" be applied?
8. If a contract has been made in violation of Section 1090, what are the consequences?

Following is an analysis of each of these questions in the context of the Millennium Project.

1. **The Person:** The individual with the potential conflict of interest is the President of the City Planning Commission, William Roschen, who is a principal owner and managing partner of Roschen Van Cleve Architects, a firm he owns with his wife. Section 1090 applies to all public officials, including board members, officers, employees, and independent contractors who perform a public function. Thomson, supra, 38 Cal.3d at 645-650 [city council member]; Campagna v. City of Sanger (1996) 42 Cal.App.3d 533 [contract city attorney]. The Los Angeles City Attorney on March 28, 2013 publicly declared that William Roschen has a Section 1090 interest in the

Development Agreement. So there can be little dispute that Roschen has a potential unlawful financial interest in any contract related to the Millennium Project.

2. **The Contract:** In determining whether or not the individual would be involved in making a contract, the California Attorney General and the Courts have referred to general contract principles. The following California Attorney General opinions have used traditional contract law principles to determine whether or not the person with a potential conflict of interest is involved with the making of a contract: 89 Ops.Cal.Atty.Gen. 258, 260 (2006); 84 Ops.Cal.Atty.Gen. 34, 36 (2001); 78 Ops.Cal.Atty.Gen. 230, 234 (1995). Following general contract law principles, Section 1090 may not be narrowly construed to defeat its purpose to disqualify participation in any form of a contract. Carson Redevelopment Agency v. Padilla (2006) 140 Cal.App.4th 1323, 1333; People v. Honig (1996) 48 Cal.App.4th 289, 314.

The Millennium Project included not only the proposal to enter into a Development Agreement, but also a set of entitlements granted with a large list of Project conditions. In order to assure the City and public interest that the Millennium Developer will carry out all of the Project conditions, prior to the issuance of any building permits, the City's grant of the entitlements is conditioned on the execution and recording of a covenant and agreement setting forth all of the conditions of Project approval. The covenant and agreement makes all Project conditions enforceable, contractual conditions upon the owner of the land and successors in title. For example, through the covenant and agreement, the City could sue the Millennium Developer or its successors in interest in contract for violation of any Project condition which had been imposed by the City in return for the City's granting of the various entitlements.

In 1978, after considering the statutory goals in evaluating whether a development agreement was a contract, the California Attorney General substantially relied upon Civil Code definitions of a contract to find that a development agreement granted in connection with a real estate project was a contract within the meaning of Section 1090:

> "A development agreement contains the essential elements of a contract as defined by the Legislature. 'A contract is an agreement to do or not to do a certain thing.' (Civ. Code, § 1549.) 'It is essential to a contract that there should be: 1. Parties capable of contracting; 2. Their consent; 3. A lawful object; and, 4. A sufficient cause or consideration.' (Civ. Code, § 1550.) A development agreement contemplates that

> both the city or county and the developer will agree to do or not to do certain things. Both parties will mutually consent to terms and conditions allowable under the law. Both will receive consideration. The developer will essentially receive the local agency's assurance that he can complete the project. The local agency in turn will reap the benefit of the development, with all the conditions it might legitimately require, such as streets, parks, and other public improvements or facilities. (See Civ. Code, §§ 1556, 1565, 1595, 1596, 1605.)" 78 Ops.Cal.Atty.Gen. 230, 231-232.

The Los Angeles City Attorney recognized that the Millennium Development Agreement was a contract within the meaning of Section 1090. However, it appears that the Los Angeles City Attorney failed to apply the same contract principles in evaluating the tract map and other proposed City entitlements to determine if they constitute contracts. The City entitlements include the City's tract map approvals and the other City entitlements in which the CPC was the initial decision maker for the City.

The consent of the City of Los Angeles and the Millennium Developer to enter into a mutually enforceable contractual agreement is expressed by two written documents: (1) The CPC/City Council Determination Letters signed by legally authorized representatives of the City, and (2) the Covenant and Agreement signed by the Millennium Developer that lists all of the City's conditions under which the City is willing to grant the Project entitlements. Both the tract map approvals and the other City land use entitlements granted in the CPC determination letters contain Project conditions stating that the City will only issue permits to proceed to Project construction when the Millennium Developer executes and records in the land records of the County the Master Covenant and Agreement memorializing that the Developer binds itself and its successors to all of the Project conditions recorded in a form to the satisfaction of the City Planning Department.

Traditional contract principles do not require a single written instrument for there to be a contract. Mutual consent by the parties to a contract can be expressed in the exchange of written documents. Civil Code Section 1614 provides that "A written instrument is presumptive evidence of a consideration." The formality of the promises exchanged between the City and the Project Developer to carry out a contractual zoning matter supports the conclusion that the City's tract map and other determinations combined with the Developer's offer of execution of a Master Covenant and Agreement constitutes mutual assent to and of a contract.

For the same reasons, the other CPC Project entitlements considered by the CPC on March 28, 2013 also amount to a contract, not much different from the proposed Development Agreement, particularly since the City Planner testified at the hearing that the City would incorporate much of the substantive provisions of the withdrawn Development Agreement into the CPC entitlements that would be granted by the remaining CPC Commissioners hearing the case.

The conclusion that both the City and Millennium Developer understand that they are entering into an enforceable agreement is bolstered by language likely written by the Millennium Developer and accepted by the City in an Errata to the Final EIR:

> "Withdrawal of the Development Agreement does not affect the approval of the Project, the substantive provisions of the Development Regulations or the Land Use Equivalency Program that control the height, bulk, massing, use and other essential aspects of [the] Project that may impact the physical environment. Each of these controls has been incorporated into the "Q" conditions to be adopted and approved by the City and, as conditions of the Project approvals, each of them will be fully enforceable by the City throughout the life of the Project."

Thus, both the City and Millennium Developer agree that they are granting entitlements in exchange for Project conditions, and they are enforceable through execution of a Covenant and Agreement that binds the parties and successors in interest. Just like the Development Agreement, that is a contract, too.

3. **The Making:** Having determined that Roschen has a potential conflict of interest in a contract, the next question is whether he is involved in the making of the contract.

Participation in the making of a contract is also very broadly construed by California courts and the California Attorney General. Any act including preliminary discussions, negotiations, planning, drawing of plans, and solicitation of bids are included (Millbrae Assn. for Residential Survival v. City of Millbrae (1968) 262

Cal.App.2d 222, 237) as well as deciding on a formal approval or authorization of the contract.

This prohibition extends to the entire board of which Roschen is a member, whether or not he participates in the public hearing:

> "[W]here an official is a member of a board or commission that has the power to execute the contract, he or she is conclusively presumed to be involved in the making of his or her agency's contracts irrespective of whether he or she actually participates in the making of the contract. (Thomson v. Call (1985) 38 Cal.3d 633, 645 & 649; Fraser-Yamer Agency, Inc. v. County of Del Norte (1977) 68 Cal.App.3d 201; 89 Ops.Cal.Atty.Gen. 49 (2006).)" *Conflicts of Interest* (2010) California Attorney General's Office, p. 60.

Roschen's status as President of the CPC, and given that City Planning staff overseen by the CPC would carry out the execution and approval of the Master Covenant and Agreements to implement the CPC decision, mean that the entire CPC was disqualified from participating in the making of the CPC Entitlement Contracts.

4. **Financial Interest:** As determined above, the contracting parties are the City of Los Angeles and the Millennium Project Developer. Roschen is therefore not directly interested in the proposed contract. However, as an architect who has provided and been paid by the Millennium Project Developer for services during the environmental assessment of the Project's impacts upon the Capitol Records and other nearby buildings, Roschen has an indirect financial interest in the CPC Entitlement Contract. (**Exhibit 25**.) Additionally, Roschen may be under contract to provide professional services to the Millennium Developer related to the Millennium Project because the Historic Resources Technical Report in the appendices of the EIR recommend that "The Project design team will consult with a preservation architect or other qualified professional regarding compatible design and siting of new construction." (**Exhibit 26**.) Roschen has recently been hired as a consulting preservation architect on other controversial projects such as the Sunset Gordon project where he was involved in CIM Group's illegal demolition of the 1924 Old Spaghetti Factory building and historic Sunset Blvd. facades. Thus, Millennium is not the only major developer that has given the President of the City Planning Commission work to do on their projects.

Roschen has an indirect financial interest in the proposed CPC Entitlement Contracts that would enable the Millennium Project to move forward for which he has received compensation and, depending upon his consulting contract with the Millennium Developer, may bring additional compensation to his architectural firm. Indirect financial interests that are not remote or non-interests as statutorily defined are unlawful interests. Thomson v. Call (1985) 38 Cal.3d 633, 645, citing Moody v. Shuffleton (1928) 203 Cal. 100.

5. **Remote Interest:** Government Code Section 1091 allows members of multi-members bodies to make a contract when one member of the board has a remote interest if that member disqualifies himself from participating and discloses this fact in the minutes. Govt. Code § 1091(c). The possible remote interest that could apply in this case would be Section 1091(b)(11) which authorizes an engineer, geologist, or architect who provides services to a consulting, engineering, or architectural firm so long as he or she does not serve as an officer, director, or in a primary management capacity. Because Roschen is a principal of his architectural firm, he is both an owner and serves in a primary management capacity. This status removes Roschen from a possible statutory remote interest exception to Section 1090.

6. **Non Interest:** Government Code Section 1091.5 sets forth certain situations where a technical financial interest might disqualify a public official in the absence of these additional exceptions. There is a long list of interests that the Legislature has determined to be non-interests. Based upon a review of these additional exceptions, it does not appear that Roschen would qualify for any of them.

7. **Rule of Necessity:** A limited rule of necessity can apply to allow a board member or individual to participate in making certain contracts, but this exception is limited to essential municipal services where no other source is available. Because the approval of the Millennium Project Entitlement Contracts is not an essential service, but rather a discretionary land use decision, no rule of necessity allows William Roschen or the CPC to participate in making the Entitlement Contracts.

8. **Remedy for Violation of 1090:** Because the City, Roschen and the CPC allowed the Millennium Project to go to hearing and approval before the CPC Commissioners, they have violated Section 1090. Violation of Section 1090 may trigger an investigation by the District Attorney to determine whether or not Roschen and the Millennium Project Developer violated the law, including criminal provisions. If there is

a criminal finding, including of a knowing violation of Section 1097, Roschen would be forever barred from holding public office.

A Section 1090 violation would entitle any interested person to initiate litigation to set aside the CPC Entitlement Contracts and require disgorgement of all financial benefits wrongfully enjoyed by Roschen, if any.

Based upon the foregoing analysis, William Roschen has a conflict of interest in the Millennium Project Development Agreement and the CPC Entitlement Contracts. His interest, although indirect, disqualifies himself and the CPC from participating in making of the contracts. His conflict of interest is neither remote nor a statutorily defined non-interest, and because no limited rule of necessity applies, the CPC violated Section 1090 by participating in making the CPC Entitlement Contracts which involve offers, acceptances and consideration, and which will culminate in a series of recorded Covenants and Agreements.

Because a Section 1090 violation taints the entire transaction, there is no lawful way for the City Council to approve the Millennium Project and enter into the unlawful CPC Entitlement Contracts. The entire Project must be rejected on this additional ground. To the extent that the process is restarted at some point – which seems unlikely in light of the seismic issues discussed above – it must be restarted through a fully public process which includes a new DEIR, one that is not tainted in any manner by Roschen's involvement or work on studies, including studies that he prepared and was paid for and which currently infect the EIR before you, all in violation of Govt. Code Section 1090.

III. THE CITY VIOLATED APPELLANT AND THE PUBLIC'S DUE PROCESS RIGHTS BY FAILING TO ATTACH THE PROPOSED DEVELOPMENT REGULATIONS AND LAND USE EQUIVALENCY PROGRAM TO THE CITY'S LETTERS OF DETERMINATION.

The LAMC authorizes any aggrieved person to file an appeal from the CPC's approval of Project entitlements, including the vesting tentative tract map. It goes without saying that before a meaningful appeal may be prepared by any appellant, the City has a duty, as a matter of fair hearing process, to issue a complete letter of determination setting forth the actions taken by the City. On May 1, 2013, this firm notified the City of the uncertainty of precisely what Development Regulations and what Land Use Equivalency Program was approved by the City Planning Commission, as follows:

> "RE: VTTM-71837-CN-1A and CPC-2008-3440-VZC-CUB-CU-ZV-HD
>
> Mr. Williams:
>
> Our office received the above-referenced determination letters issued by the Los Angeles City Planning Commission on April 27, 2013.
>
> *VTTM-71837 Determination*
>
> The Determination Letter for VTTM-71837-CN-1A states on page 8, Paragraph 14(b) that: "The design and development of the structure shall be in substantial conformance with the Development Regulations attached to CPC-2008-3440-VZC-CUB-CU-ZV-HD and CPC-2013-103-DA. Paragraph 14(c) contains a similar provision that refers to the Development Regulations.
>
> On page 8, Paragraph 14(a) states: "Limit the proposed development to the following uses, and/or as described in the Land Use Equivalency Program pursuant to CPC-2008-3440-VZC-CUB-CU-ZV-HD and CPC-2013-103-DA."
>
> Thus, in order to fully understand the action of the City Planning Commission in VTTM 71837-CN-1A, a person receiving the Determination Letter must refer to the CPC Determination to review the proposed Development Regulations and Land Use Equivalency Program.
>
> *CPC Determination*
>
> The CPC Determination Letter on page Q1 in multiple places refers to the "attached" Exhibit D (the Land Use Equivalency Program) and Exhibit C (the Millennium Project Development Regulations). (The CPC Determination Letter makes no apparent reference to any Exhibits A or B.) The detailed Land Use Equivalency Program and the Millennium Project Development Regulations contain

> substantive provisions of the CPC's decision that are supposed to be attachments to the Determination Letter.
>
> Our review of the copies of the two Determination Letters, and those received by other members of the interested public show that the City failed to attach these critical portions of the CPC Determination Letters. We have no idea if the Land Use Equivalency Program or the Development Regulations adopted by the CPC are the same or different from prior iterations of those documents that were originally proposed as part of a Development Agreement now publicly withdrawn by the Developer and presumably not considered by the City.
>
> Without attaching the precise version of these documents that the CPC supposedly approved as part of its substantive decision, it is impossible for the interested public to determine what the CPC is approving, whether or not the interested public objects to what has been approved, and how to intelligently formulate an appeal of the CPC's decision if one was trying to formulate one. For these reasons, both Determination Letters, which expressly refer to and rely upon substantive portions of the decision omitted from the materials mailed to the interested public, fail to constitute constitutionally valid notice of the actions of the CPC.
>
> On this basis, we demand that the CPC immediately give the public notice of rescission of the two Determination Letters and issue full and complete determination letters in accordance with concepts of constitutionally required notice of the CPC's entire decision.
>
> Please contact me as soon as possible to inform whether or not the City will cure and correct this serious public notice problem."

Despite this demand for immediate clarification of what the City Planning Commission had approved, the City waited six days to respond. The City's response arrived just a few hours before the deadline for filing an appeal of the tract map, thereby foreclosing Appellant's ability to look at the particular location of the final approved documents before expiration of the appeal period.

The City Planning Commission Assistant merely stated that it is the "standard practice" of the City not to mail attachments to letters of determination, but that the public may view these attachments at the City Planning Department in City Hall during regular business hours. One wonders if there is a difference between the letter of determination of the City Planning Commission mailed to the applicant whose project was approved by the City Planning Commission, and those mailed to appellants and other interested parties. If there is, the City has shown favoritism toward the applicant's right to notice compared to those interested persons who asked for written notice of the City's decision. This improperly deprived Appellant and all members of the interested public of a complete notice of the CPC's actions, in violation of due process of law.

Nowhere is this alleged City "standard practice" set forth in the letter of determination so that a member of the public who received the notice of the CPC's action would know where to look. The closest reference is a statement that the record for the purposes of the environmental review is in the custody of the City Planning Department, but there is no statement of where an aggrieved person might look to find the applicable attachments to the letters of determination.

Additionally, to the best of the knowledge of Appellant, the Millennium Development Regulation and the Land Use Equivalency Program are not "voluminous," as asserted by the City Planning Commission's assistant. Minimum constitutional due process requires that the burden of the City to attach the two exhibits to these letters of determination was not so great as to justify not doing so, especially where the letters of determination failed to inform potential appellants where to obtain copies of the actual approved documents.

For this reason, Appellant has been prejudiced to the extent it has been unable to formulate and identify all potential grounds for appealing the decisions of the City Planning Commission. The City's refusal to correct this fatal notice error is a prejudicial abuse of discretion that deprived Appellant of the right to complete notice of the City Planning Commission's actions. For this reason, Appellant reserves the right to raise additional grounds for appeal, which grounds were obscured or hidden by the City's failure to give full notice of the decisions it made. The City may not constitutionally pick and choose who is to know the actions of its City Planning Commission.

In a rebuttal letter dated May 31, 2013, attorneys for the Millennium Developer assert at page 3 that there is no due process violation because the proposed Land Use Equivalency Program and the Development Regulations were contained in the Draft EIR and therefore, both Appellant and average members of the public could dig through the appendices to locate copies of these documents.

This is nonsense. Without seeing the precise wording of what the CPC approved, the public and Appellant have no way of comparing the original proposed documents in the Draft EIR to the final approved versions to assure that no changes crept into the approved version.

And apparently attorneys for the Millenniun Developer are talking out of both sides of their mouth. At the same time they wrote these claims that Appellant and the public could look at the versions in the Draft EIR to find out what the final action was or is, they were participating in the review and release of the City's Errata to the Final EIR, also dated May 2013. Page 1 of the Errata states:

> "Minor revisions and clarifications have been made to the Development Regulations and are attached to this Errata Sheet as Exhibit A. The proposed changes to the Development Regulations do not deprive the public of either a meaningful opportunity to comment upon a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such an effect that the Project proponent has declined to implement."

And true to form for the City of Los Angeles, a copy of the Development Regulations **as now revised** is <u>not</u> attached to the Errata to the Final EIR as scanned into the online official City Council file. No one has been given access to this revised document, which may or may not be accurately described in the Errata.

Even review of the Errata suggested that changes characterized as "minor" are actually significant. According to the Errata, the floor plate of one of the towers just got 5% bigger and the math looks like that is almost 6,000 more square feet. Where is this 6,000 additional square feet going to be added to the towers? Will it cause a significant impact on views of the Capital Records building? How much will it change traffic volumes, parking demand, police services, etc.?[5] Who knows?

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[5] All CEQA subject areas should be revisited alone based upon this potentially significant change to the Project.

Appellant cannot have a fair hearing before the City Council when it has not received proposed changes, evidence and argument related to the new version of the Development Regulations it is appealing. The inability to meet the new changes with evidence and argument is a denial of due process of law. Clark v. City of Hermosa Beach (1996) 48 Cal.App.4th 1152. See also Govt. Code Section 65803 that the City of Los Angeles has never implemented. In fact, without disclosing the changes, the public is expected to take the City's word that the changes are "minor" and "non-substantive" and do not deprive anyone of due process of law. Due process requires more than just the City's bald assertion that it has complied with CEQA and due process.

IV. THE PROJECT ENTITLEMENTS BASED UPON THE UNLAWFULLY ADOPTED HOLLYWOOD COMMUNITY PLAN UPDATE ARE FURTHER SUBJECT TO NULLIFICATION.

The Project has been approved based upon the Hollywood Community Plan Update, which is currently subject to litigation in three separate lawsuits that may overturn the City Council's adoption of the new community plan and its associated zoning. The Project has not been conditioned on the possibility that the underlying zoning will be placed back to zoning that is much less dense than that used and approved in the letters of determination. This flaw is fatal to the density approved for the Project, and the Millennium Developer can have no vested interest in the Project density sought should the Hollywood Community Plan Update be overturned in those pending lawsuits.

V. THE LAND USE EQUIVALENCY PROGRAM IMPOSED AS A "Q" CONDITION EXCEEDS THE AUTHORITY OF THE CITY PLANNING DEPARTMENT AND CITY COUNCIL, AND THUS IS *ULTRA VIRES*.

The CPC letter of determination cites LAMC Section 12.32G as purported authority to adopt Q conditions in association with the Project approvals. Among the Q conditions listed in the CPC letter of determination is a statement that:

> "The use of the subject property shall be limited to those uses permitted in the Land Use Equivalency Program, attached as Exhibit D **or** as permitted in the C2 Zone as defined in Section 12.16.A of the LAMC." (Emphasis added.)

The Land Use Equivalency Program claims without any supporting evidence in the record that it is necessary to grant the applicant "flexibility" in deciding what the

Project will be due to the "uncertainty" of the real estate market. There is no data whatsoever that the alleged "uncertainty" of the real estate market is any different now compared to years in the past. The Land Use Equivalency Program, completely unjustified as being required for any legitimate purpose (other than to evade CEQA review and public accountability for what the Project is or will be [see Section I (a)-(c), supra]), does not meet the purposes set forth in the Q condition provisions of the LAMC.

Retired City of Los Angeles Zoning Administrator Jon Perica in his report attached at **Exhibit 27** explains that the history and use of Q conditions in real estate development projects in Los Angeles was for the purpose of imposing further restrictions on a project in connection with a zone change. When the Millennium Project Developer withdrew the Development Agreement, the City Planning Department attempted to use Q conditions to authorize the Millennium Development Regulations and the Millennium Land Use Equivalency Program.

As outlined by Mr. Perica, the City enacted the use of Q conditions when developers obtained zone changes and then, instead of submitting plans to build the project that they said they would build, submitted plans to build a project also authorized under the new zone. Q conditions have been used to impose additional restrictions in use and site development that exceed those imposed by the zoning set forth in the LAMC. In fact, Q conditions act much like a Development Agreement (particularly where the City's standard Q conditions include a requirement to reduce all of the project conditions to an enforceable contract) in the sense that while the developer gets the certainty of building the project under current laws and regulations existing at the time of approval of the Development Agreement, the developer can only build the project restricted to the use, density, height, and size limits specified in the Q conditions.

However, instead of imposing a restriction, the Millennium Developer's Land Use Equivalency Program grants infinite flexibility for the Project Developer to wait until after expiration of the CEQA and Planning Act statutes of limitations to reveal what will be constructed. Instead of protecting the public from adverse environmental impacts, it may now perversely (and illegally) purport to authorize them.

Because the City has made no showing that the Land Use Equivalency Program is actually necessary, or that it furthers the purposes set forth in LAMC Section 12.32.G that constitute the authority to impose Q conditions, or is consistent with that section, the Advisory Agency and the City Planning Commission exceeded their Municipal Code authority in approving the Land Use Equivalency Program as part of the applicant's entitlements.

Furthermore, the Q condition seems to be written as a back door method to return to the very "bait and switch" zone change mischief that Q conditions were intended by the City Council to halt when it enacted LAMC Section 12.32.G. As the entitlement literally reads, the Millennium Project Developer can choose land uses that were analyzed in the EIR as part of the Land Use Equivalency Program OR it can choose any other land use authorized in the C2 zone. This appears to authorize any of the very broad list of uses in a C2 zone, <u>including uses that have not been disclosed or analyzed at all in the EIR</u>. For instance, in a C2 zone, other uses allowed by right include anything in more restrictive zones such as private schools or auditoriums seating up to 3,000, and similar uses..

Is the peculiar wording of the Q condition that allows any of the uses in the Land Use Equivalency Program OR those uses in the C2 zone a giant loophole allowing the Millennium Project Developer to add uses to the Project after the expiration of the CEQA and State Planning Code statutes of limitation, which uses have not been disclosed, studied or mitigated at all? If the City uses such poorly worded Q conditions, the potential authorization of undisclosed and unstudied land uses constitutes a violation of the purposes set forth in LAMC Section 12.32.G, and of CEQA.

Additionally, the C2 zone is not defined in the LAMC section cited in the entitlement (it is set forth in LAMC Section 12.14, not 12.16), so what is precisely being authorized is very unclear – the opposite of the purpose and intent of Q conditions, which are normally used to restrict uses to those declared by the developer and studied in the environmental review documents. On this additional ground, the Project entitlements sought by the Millennium Developer and approved by the CPC are illegal.

VI. <u>THE MILLENNIUM DEVELOPMENT REGULATIONS, WHICH PURPORT TO GRANT RELIEF FROM APPLICABLE LOS ANGELES MUNICIPAL CODE PROVISIONS, VIOLATE THE CITY CHARTER AND STATE LAW ON PLANNING UNIFORMITY.</u>

The Millennium Development conditions, however the final version attached to the applicant's version of the letter of determination (or subsequent "Errata") may read, purport to allow, through the use of a Q condition, land use entitlements that are <u>more permissive</u> than the applicable LAMC provisions. Section 1.4.2 on page 5 of the version of the Development Regulations attached to the March 28, 2013 Planning Staff Report states:

> "Wherever the [Millennium Development] Regulations contain provisions which establish regulations that are different from or more or less restrictive than the zoning or land use regulations in the Los Angeles Municipal Code ("LAMC") that apply to the Project Site, the Regulations shall prevail pursuant to the Millennium Development Agreement approved by the City Council." (Emphasis added.)

The DEIR also declared that the Millennium Development Regulations, to the extent that they were more permissive than the LAMC, would prevail.

Q condition No. 2 provides that before the City will issue any permits for the subject project, the Millennium Developer's detailed development plans "shall be submitted for review and approval by the Department of City Planning – Major Project Section for verification of compliance with the Development Regulations attached as Exhibit C." (CPC Letter of Determination, p. Q-1.)

This Q condition, which incorporates the Development Regulations merely by reference, are actually a giant loophole to override any LAMC provision that conflicts with the special, ad-hoc Millennium Development Regulations. As set forth above and in Mr. Perica's report attached at **Exhibit 27**, Q conditions are required to impose additional restrictions to assure that a developer receiving a zone change will build the project promised, and not something that was not originally proposed. As Mr. Perica explains, the Millennium Development Regulations purport to override the Los Angeles Municipal Code; that is not a permissible use of a Q condition. It exceeds the authority conferred upon the City Planning Department and CPC because it violates the City Charter provisions on variances, and it violates Government Code Section 65860 that requires uniformity between and among a city's general plan, zoning laws and regulations, and subordinate project entitlements.

A project's Q condition may not declare itself superior to this City's Charter or State laws. Neighbors in Support of Appropriate Land Use v. County of Tuolumne (2007) 157 Cal.App.4th 997, 1009-1010 (county's purported use of development agreement provisions to grant a use unauthorized by county's zoning ordinance were *ultra vires* acts of the Board of Supervisors and *void ab initio*). In the Neighbors case, the county argued that the development agreement statute authorized the Board of Supervisors to negotiate and grant to a developer a use that was not authorized for the zone in which the subject property was located. The Court of Appeal rejected the contention. (Id. at 1012-1015.) The Court of Appeal, citing language in the Supreme Court's seminal land use case of Topanga Association for a Scenic Community v. County of Los Angeles (1974) 11 Cal. 3d 506, 517-518, that zoning is like a contract, observed that neither general zoning laws nor the Development Agreement Act permit a public agency to override other existing laws via a contractual agreement with a developer:

> "By creating an ad hoc exception to benefit one parcel in this case – an exception that was not a rezoning or other amendment of the ordinance, not a conditional use permit in conformance with the ordinance, and not a proper variance – the county allowed this 'contract' to be broken." (Id. at 1009.)

In a similar manner, the City originally planned to confer upon the Millennium Development Regulations superiority over the LAMC by entering into a development agreement. When that plan was dashed by the Government Code Section 1090 conflict discussed above, the City Planning Department and Millennium Developer hastily tried to adopt the Millennium Development Regulations as a Q condition (which the City Attorney apparently did not realize violated Section 1090 as well). Whether adopted under the Development Agreement Act or a Q condition, City officials have no authority to grant ad hoc exemption of the Millennium Project from the LAMC – or the City Charter-mandated process for obtaining a variance.

Requests for relief from the LAMC are required to be considered via the City Charter-mandated variance process. There is no question that the City lacks authority to override the City Charter or the Zoning Code in a Project condition. Accordingly, the Millennium Development Regulations and Land Use Equivalency Program are unlawful.

Whenever an applicant requests relief from strict application of a particular LAMC provision, Los Angeles Charter Section 562 requires the owner/applicant to apply for a variance. It is unlawful to use a Q condition to adopt custom written development regulations that purport to override LAMC provisions that are more restrictive, and without applying for a variance as required by the people in their Charter. Because the Advisory Agency and the CPC exceeded their authority in approving Project

Development Regulations that purport to override LAMC provisions and the Los Angeles Charter, the Project approvals are *ultra vires* acts and *void ab initio* on this additional ground.

VII. Q CONDITION 2 THAT PURPORTS TO GIVE PLANNING STAFF UNFETTERED DISCRETION TO MODIFY THE PROJECT TO OVERRIDE THE MUNICIPAL CODE AND THE PROJECT CONDITIONS IS AN UNLAWFUL DELEGATION OF LEGISLATIVE POWER.

Q condition 2 includes this breathtaking new authority of the City Planning Department – Major Projects Section staff: "Minor deviations may be allowed in order to comply with the provisions of the Municipal Code, the subject conditions, and the intent of the subject permit authorization."

This language purports to authorize someone – it is not clear who – to approve without a public hearing "minor deviations," which are not defined, from the Municipal Code and the Project conditions. This is illegal, in the first place, on the ground that it is void for vagueness. Second, no statutory or Municipal Code authority is cited that authorizes such variance power, and none exists. In fact, for the City Planning Department to contend that it has the power to grant minor deviations from project conditions or declare an intent contrary to the clear language of a project condition contradicts the holding in Terminal Plaza Corp. v. City and County of San Francisco (1986) 186 Cal.App.3d 814, 830-835. In that case, San Francisco planners claimed that they could reinterpret a project condition to mean something other than the words used by the City Planning Commission when it approved the project. Id. The Court held that a zoning administrator or City staff member has no such power. Id. The report of retired Los Angeles Zoning Administrator Jon Perica explains that to his knowledge, the City of Los Angeles has never granted such authority, and the proposal to allow non-public variance decision-making is inconsistent with applicable laws.

Moreover, for the City Planning Department and CPC to try to authorize it as part of a Q condition is inconsistent with the purpose and intent of Q conditions. For this additional reason, the actions of the Planning Department and CPC are *ultra vires* and *void ab initio*.

VIII. SUBSTANTIAL EVIDENCE DOES NOT SUPPORT THE FINDINGS FOR THE CITY'S GRANT OF CONDITIONAL USES AND VARIANCES.

The Project Developer sought a vesting conditional use to permit a hotel within 500 feet of an R zone and a master conditional use to permit the sale and dispensing of a full line of alcohol for on- and off-site consumption and live entertainment. Additionally, the Project Developer sought a zone variance to permit outdoor eating areas above the ground floor, and a zone variance to permit reduced parking for a sports club/fitness facility.

Because the Project description fails to set forth the number, location and a myriad of other essential factors to evaluate the hotel and its associated uses or all of the various locations for the dispensing of alcohol, it is impossible to make the necessary findings to support these conditional uses. Specifically, there can be no adequate findings on alleged unusual circumstances or hardship justifying the variances, nor can there be a reliable factual basis to conclude that the conditional use will not be incompatible with adjoining properties or even uses within the Millennium Project because the Millennium Developer has refused to specify what the Project will actually be.

Similarly, because the Project description fails to set forth the number, location and a myriad of other essential factors to evaluate the alleged hardship and other variance findings to justify the requested outdoor eating areas and the reduced parking for sports club/fitness facility, it is impossible to make the necessary findings to support the grant of variances. For instance, because the Project Developer was not required by City officials to state exactly what the Project is, the City cannot make findings that the bars, restaurant and other outdoor noise, music, and patrons will not disturb the residents of the Project itself or adjoining landowners. Without a finite Project proposal, the City essentially has handed its authority over to the Project Developer to determine what is or is not compatible with the various uses that end up being built on the site. This is illegal.

IX. THE CITY'S MAY 2013 ERRATA TO THE FINAL EIR FALSELY CLAIMS THAT THE CITY WILL STILL RECEIVE THE "COMMUNITY BENEFITS" OFFERED BY THE PROJECT.

On page 3 of the City's May 2013 Errata to the Final EIR, the City asserts that even though the Development Agreement was withdrawn by the Millennium Developer, all promised community benefits will still be received. This claim is utterly false.[6]

The Millennium Project has a group of supporters consisting of its paid consultants, non-profits who hope to receive grants from Millennium, union workers who want the promised prevailing wage for construction jobs, and the City itself because of a promise of Millennium to pay millions of dollars into an affordable housing fund. But if any of these Project supporters put down their pom poms and actually read the CPC's Letter of Determination, NONE of the promised monetary payments to benefit unions, non-profits and others have been incorporated into the "Q" Conditions.

Most likely, in order to retain the support of those erstwhile beneficiaries, Millennium will stand up at the PLUM Committee meeting and SAY it will honor all of its commitments voluntarily. This will be said with a wink to the City Attorney who has taken the position that voluntary project conditions are unenforceable against a developer.

Thus, after the Millennium Developer uses that chorus of supporters in front of the City Council, the flower will fall from the vine and those supporters may soon learn that Millennium will refuse to "honor" any of its voluntary commitments.

X. THE CONDUCT OF CITY PLANNING OFFICIALS AND THE CITY ATTORNEY VIOLATE THE GOOD FAITH OBLIGATIONS OF THOSE WHO HOLD PUBLIC OFFICE.

The way in which the Millennium Hollywood Project entitlements are being processed by City officials marks an alarming departure from their mandatory duty to

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[6] The elimination and/or non-enforceability of the so-called "community benefits" that were to be conferred through the now-withdrawn Development Agreement also renders all of the City's findings allegedly in support of any Statement of Overriding Considerations under CEQA invalid. The evidence does not support the findings, and the findings do not support the approvals.

carry out the responsibilities of their offices with "disinterested skill, zeal, and diligence, and primarily for the benefit of the public." Noble v. City of Palo Alto (1928) 89 Cal.App.2d 47, 51; Clark v. City of Hermosa Beach (1996) 48 Cal.App.4th 1152, 1170. It is a fundamental principle of law that public officers must obey the law, Wirin v. Parker (1957) 48 Cal.2d 890, 894, and they have absolutely no authority to decide to ignore laws they are duty bound by their office to carry out, whether or not they disagree with them. Lockyer v. City and County of San Francisco (2004) 33 Cal. 4th 1055, 1079-1082.[7]

Our Supreme Court long ago confirmed that acceptance of election or appointment to a public office carries with it the duty to exercise good faith and diligence, even if the law does not expressly state it. San Diego County v. Utt (1908) 173 Cal. 554, 559-560. The Court of Appeal confirmed this principle in holding that a public officer is, as a result of holding his office, duty-bound to discharge those responsibilities with integrity and fidelity to the public that he or she serves. Terry v. Bender (1956) 143 Cal.App.2d 198, 206.

These fundamental precepts of public service have been discarded by the way the City Planning Department, the CPC, and City Councilman and soon-to-be-Mayor Eric Garcetti have overseen preparation of a scheme to break the "social contract" with the stakeholders living and working broadly in the City of Los Angeles, and specifically in the vicinity of the proposed Millennium Hollywood Project.

Since when does CEQA allow a developer not to commit to particular project before analyzing it for potential impacts and required mitigation?

Since when can the City Planning Director require a nearby property owner at Hollywood & Gower to seek and obtain a variance from the Advisory Agency's regulation requiring 2.5 parking spaces per condominium unit, but the Millennium Developer is allowed to proceed as if the Advisory Agency's regulation does not even exist?

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[7] The United States Supreme Court has consistently held that all governmental officials from the highest to lowest are creatures of law and are bound to obey it. The Floyd Acceptances (1868) 74 U.S. 666; Burton v. United States (1906) 202 U.S. 344 (1906); Davis v. Passman (1979) 442 U.S. 228.

Since when did the City of Los Angeles determine, in direct violation of CEQA mandates, that it could override the specific study directions given by Caltrans, a responsible agency under CEQA with specific rights and duties?

Since when does the City participate in the obfuscation of life and safety issues related to the proximity of an active earthquake fault within the Project site? The total lack of substantial evidence to support the false conclusion that the Hollywood Fault is far away from the Project site, the failure to address the data from Dr. Dolan of USC, and the suppression of the California Geological Survey's 2010 Fault Map which shows active faults across the Millennium Site, shock the conscience. It most certainly does not comply with the requirements of CEQA or State law regarding building in, near or on an earthquake rupture zone.

Since when can a developer who has business before the City's Planning Commission think he can "facilitate" his Project entitlements through the City by hiring the President of the City Planning Commission to work on the very Project Mr. Roschen and his Commission colleagues were asked to consider and approve?

Since when does the City Planning Department staff think that it can grant itself in a Q condition the power to approve secret variances from Project conditions imposed by the CPC, and unilaterally interpret the "intent" of those project conditions – in direct violation of law, including Terminal Plaza Corp. v. City and County of San Francisco (1986) 186 Cal.App.3d 814, 830-835?

Since when did the City of Los Angeles and the City Attorney conclude that they could allow a developer to write special development regulations that explicitly state that when adopted by the City (in a development agreement, and now a Q condition contract) the developer's regulations would "prevail" over the City's own Charter and Municipal Code?

And finally, since when did it become a policy and practice of the City to ignore applicable state and local laws *en masse* to approve completely inappropriate real estate projects while ignoring all duties of public trust, fidelity and good faith, and thus requiring communities to sue the City to compel its compliance with laws which our California and United States Supreme Courts say they must obey as public officials?

The City has committed a gross violation of the public trust in allowing the Millennium Hollywood Project to get this far. The law requires that City officials carry out their mandatory duty to protect the health, safety and welfare of the community by denying this Project and the subject EIR.

X. CONCLUSION.

On behalf of Appellant, its constituent groups, dozens of supporting neighborhood associations, and hundreds of thousands of Hollywood and City of Los Angeles residents, we urge you to reject the Project and its EIR entirely.

Very truly yours,

ROBERT P. SILVERSTEIN
FOR
THE SILVERSTEIN LAW FIRM

RPS:jmr
Attachments

Stop the Millenium Hollywood Project

Support our request for modifying the project to reasonable scale

Organizations Joined Against Millennium

The Stop Millennium Hollywood Project effort is supported by the following local organizations

Neighborhood Councils:

Greater Griffith Park Neighborhood Council
Greater Wilshire Neighborhood Council
Hollywood Studio District Neighborhood Council
Hollywood United Neighborhood Council
Hollywood Hills West Neighborhood Council
North Hills West Neighborhood Council

Neighborhood Associations:

Argyle Civic Association
Beachwood Canyon Neighborhood Association
Bel Air Knolls Property
Bel Air Ridge Association
Bel Air Skycrest Property
Benedict Canyon Association
Brentwood Hills Homeowners Assn.
Brentwood Residents Coalition
Cahuenga Pass Property Owners
Canyon Back Alliance
Crests Neighborhood
Franklin Ave. / Hwd. Blvd. Wes
Franklin Hills Residents
Greater Wilshire Neighborhood Council – Land Use Committee
Hancock Park Homeowners Association
Highlands Owners Association
Hollywood Dell Civic Association
Hollywood Heights Association
Hollywoodland Homeowners Association
Holmby Hills Homeowners
Kagel Canyon Civic Assn.
Lake Hollywood Homeowners
Laurel Canyon Association

Lookout Mountain Alliance
Los Feliz Improvement Association
Mt. Olympus Property Owners
Mt. Washington Homeowners' Alliance
North Beverly – Franklin Canyon Home owners Association
Nichols Canyon Association
Oak Forest Canyon Association
Oaks Homeowners Assn.
Outpost Estates Homeowners
Pacific Palisades Residents Assn.
Roscomare Valley Association
Shadow Hills Property Owners
Sherman Oaks Homeowners
Studio City Residents Association
Sunset Hills HOA
Tarzana Property Owners
Torreyson-Flynn Association
Upper Mandeville Canyon
Whitley Heights Civic

One thought on "Organizations Joined Against Millennium"

Del Rey Residents Association

June 4, 2013 at 7:47 am

The Del Rey Residents Association joins the other neighborhood associations in opposing this project. Bad planning in one corner of the city is bad planning for all.

Environmental Review Section

City Hall • 200 N. Spring Street, Room 750 • Los Angeles, CA 90012

LOS ANGELES CITY
PLANNING
DEPARTMENT

DRAFT ENVIRONMENTAL IMPACT REPORT

HOLLYWOOD COMMUNITY PLAN AREA

Hollywood & Gower

Case No. ENV-2007-5750-EIR

Council District No. 13

THIS DOCUMENT COMPRISES THE EIR AS REQUIRED UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

Project Address: 6100, 6104 & 6116 W. Hollywood Boulevard and 1633, 1645, 1647 & 1649 N. Gower Street

Project Description: The proposed project involves demolition of the existing parking lot and construction of an approximately 197,503 square foot mixed-use development that would rise to 20 stories, and would contain one subterranean parking level. The proposed building would extend approximately 270 feet in height. The proposed project would contain 7,200 square feet of retail space and 176 residential units. The proposed project would potentially include a 2-foot street dedication along Hollywood Boulevard and a 5-foot dedication along the southern half of Gower Street. A 5-foot merger is being requested along the northern half of Gower Street. As previously stated, the project site is currently zoned C4-2D-SN and C4-2D. The existing "D" limitation restricts total Floor Area Ratio (FAR) on the project site to 2:1 (per Ordinance No. 165,662, effective May 7, 1990). In order to allow for the proposed project, the Applicant proposes to rezone the project site such that the current "D" limitation of 2:1 maximum FAR would be removed and replaced with a "D" limitation allowing a maximum FAR of 4.5:1. This would permit approximately 197,503 square feet of total floor area (after dedications).

APPLICANT:
6104 Hollywood, LLC

PREPARED BY:
Christopher A. Joseph & Associates

October 2009

Table I-1 (Continued)
Summary of Impacts/Mitigation Measures

Environmental Impact	Mitigation Measures Project Enhancements	Level of Significance After Mitigation
foot side yard required in the C4 Zone, and a 10-foot rear yard, in lieu of the 20-foot rear yard required in the C4 Zone, for the proposed parking podium levels (Parking Levels 2 through 5) which contain residential parking. The area surrounding the project site is entirely commercial, observing no required yards. Observing the required yards would create a streetscape that is not uniform with the surrounding area. Therefore the granting of an adjustment would result in development compatible and consistent with the surrounding uses and the impacts of the adjustment would be less than significant. <u>Parking Requirement</u> The proposed project would provide 345 parking spaces on one level subterranean and 4 level above grade parking levels, including 331 spaces for the residential development and 14 spaces for the retail development. Under the requirements of the LAMC, 194 parking spaces would be required for the development. As the proposed project would supply an excess of 151 parking spaces, the proposed project would be consistent with the LAMC parking requirements. The *City of Los Angeles Planning Department Residential Parking Policy for Division of Land – No. AA 2000-1* establishes a standard parking requirement of 2 spaces per dwelling unit for condominium subdivisions of six or more units plus 0.25 space/unit for guest parking in non-parking congested areas or 0.5 space/unit for guest parking in parking congested areas. The project site is located in a parking congested area. Using this policy of two spaces/unit, plus 0.5 space/unit for guest parking results in a requirement of 440 parking spaces for the 176 residential units. However, the project proposes only 331 residential units resulting in 109 parking spaces less than required. The project applicant is confident the amount of proposed parking would meet the needs of the proposed project, since the residential portion of the project will operate as apartments and the applicant only requests a subdivision for financing purposes. The project is targeted to individuals and households attracted to a location with employment and urban amenities accessible by walking or by public transit. There are a number of public transit opportunities available within		

was therefore evaluated only with regard to potential installation of a new traffic signal. Therefore, based on LADOT's current policy, no significant project impact will occur at this location. In addition, project traffic impacts at the remaining 10 study intersections are generally relatively minor, and do not approach the levels of significance described in Table IV.L-3.

Parking and Access

Parking Requirements

Parking for the proposed project will be provided in a multi-level above and below grade parking garage located behind (south of) the Hollywood Boulevard retail frontage and below the residential levels of the project; a total of approximately 345 residential, guest, and commercial parking spaces will be provided for the entire project, including approximately 331 resident and guest parking spaces, and 14 retail/commercial spaces.

The current City of Los Angeles Municipal Code (LAMC – Section 12.21.A) requires that all development projects provide off street parking for their uses, and identifies specific parking ratios for various residential and commercial uses. The standard LAMC parking requirements for "commercial" uses include the provision of a minimum of 4.0 spaces per 1,000 square feet of floor area for "retail" use. The current Code also requires residential developments to provide parking based on the number of "habitable rooms"; the generally accepted interpretation of these Code requirements call for the provision of a minimum of 1.0 spaces per unit for "bachelor" or "efficiency" apartments (one habitable room), 1.5 spaces per unit for one-bedroom units (two habitable rooms), to 2.0 spaces per unit for two-bedroom (three habitable rooms) or larger units. No specific requirements for additional "guest" parking beyond those parking ratios noted are identified in the LAMC. The project would exceed these Code requirements.

However, as previously discussed, although the project proposes the residential units as "for rent" units, the development will apply for a subdivision map for the site, thereby providing for future conversion to ownership units. As such, pursuant to the Advisory Agency of the City of Los Angeles (Policy AA 2000-1), parking requirements for "market rate" condominium uses are applicable to these residential units; the Advisory Agency identifies a parking requirement of 2.0 parking spaces per unit (generally regardless of the number of bedrooms), plus additional guest parking provided at 0.50 spaces per unit. These parking ratios were assumed to be applicable to the proposed project.

Additionally, the project is located within the Community Redevelopment Agency of the City of Los Angeles (CRA/LA) Hollywood Redevelopment Plan Area, as well as the City of Los Angeles' Enterprise Zone; LAMC Section 12.21 A4 (x)(3) provides for modified parking requirements for a number of land uses within these areas. The LAMC parking requirement modifications are designed to provide incentives to developers to encourage the types of projects most beneficial to the local community, as well as to addressing existing and future traffic congestion by promoting reduced dependence on automobiles and increased mixed-use, pedestrian, and transit activity.

With respect to the proposed project specifically, the LAMC notes that commercial uses such as office and retail within the Redevelopment Area and/or Enterprise Zones are allowed to provide two parking spaces per 1,000 square feet of floor area; these area-specific parking ratios represents a 50-percent reduction in typical retail parking as compared to the general citywide LAMC parking ratios. No modifications to residential parking requirements are noted in the LAMC for the Hollywood Redevelopment Area or City's Enterprise Zones, although as noted above, the Advisory Agency residential parking condominium policy recommendations were used to determine the amount of parking needed by the residential component of the proposed project. Therefore, using the applicable parking ratios described above, the number of parking spaces required by the project was calculated, and the results are shown in Table IV.L-7.

As summarized in Table IV.L-7 below, the project in its entirety will require a total of approximately 454 parking spaces, including approximately 352 residential spaces, 88 residential guest spaces, and 14 retail/commercial parking spaces based on the applicable Advisory Agency recommended residential (condominium) parking ratios, and retail use reductions identified in the LAMC for the CRA/LA's Hollywood Redevelopment Area and/or the City's Enterprise Zone projects. The project will provide the required number of retail/commercial parking spaces, but will be approximately 109 spaces deficient under the Advisory Agency's policy for the residential component, including 65 resident and 44 guest spaces. The residential parking provided for the project, a total of 331 spaces, results in an average of approximately 1.88 parking spaces per unit, including approximately 1.63 assigned resident spaces per unit, and 0.25 guest spaces per unit. Given the urban surroundings of the project, and the availability of public transit opportunities adjacent to and in close proximity to the site, the proposed amount of residential parking is anticipated to be adequate to meet the needs of the project. It is also of note that a recently approved project located nearby in the vicinity (Paseo Plaza) was required to only provide 0.25 guest parking spaces per unit, rather than the 0.50 spaces identified by the Advisory Agency. If this standard were to be applied to the proposed project, the development would only be 65 "resident" spaces deficient. However, due to these parking shortages with respect to the Advisory Agency's policy for condominiums the applicant will request that the Advisory Agency reduce the required parking for this project.

Table IV.L-7
Project Parking Requirements

Component	Size	Parking Ratio	Parking Required
Residential (Advisory Agency standards)			
Resident	176 du	2.00/unit	352 spaces
Guest		0.50/unit	88 spaces
Subtotal Residential Required Parking			440 spaces
Retail	7,200 sf	2.00/1,000 sf	14 spaces
Total Required Project Parking			**454 spaces**
Total Project Parking Provided			**345 spaces**
Total Project Parking Surplus/(Deficit)			***(109) spaces***

Source: Hirsch/Green Transportation Consulting, Inc., September, 2008.

November 20, 2012

LOS ANGELES FIRE DEPARTMENT

BRIAN L. CUMMINGS
FIRE CHIEF

November 8, 2012

BOARD OF FIRE COMMISSIONERS
FILE NO. 12-195

TO: Board of Fire Commissioners

FROM: Brian L. Cummings, Fire Chief

SUBJECT: PRELIMINARY REPORT – TASK FORCE ON INFORMATION AND DATA ANALYSIS

FOR INFORMATION ONLY: _____ Approved _____ Approved w/Corrections _____ Withdrawn
_____ Denied _____ Received & Filed _____ Other

For Information Only

On June 27, 2012, the Fire Chief formed the Task Force on Information and Data Analysis composed of public and private leaders for their knowledge, vision, public policy experience, and diversity of professional and organizational expertise.

The multi-disciplinary task force, comprised of sworn and civilian Fire Department personnel, with specialized technical assistance provided by subject matter experts from the RAND Corporation, University of Southern California, and the Los Angeles Police Department including a liaison from the Fire Commission, spent four months analyzing response time data.

The task force reviewed the Controller's Audit and was directed to refine processes for presenting clear, consistent and easily understood information regarding response times, as well as establishing measurements and benchmarks.

The Fire Department embraces the preliminary report to develop a system that will enable data to be shared with members of the public and Department in a transparent manner.

Board report prepared by Assistant Chief Patrick Butler Chair Task Force IDA.

Attachment

LOS ANGELES FIRE DEPARTMENT

BRIAN L. CUMMINGS
FIRE CHIEF

November 2, 2012

TO: Brian L. Cummings, Fire Chief

FROM: Patrick I. Butler, Assistant Chief
Special Operations Division

SUBJECT: PRELIMINARY REPORT - TASK FORCE ON INFORMATION AND DATA ANALYSIS

Executive Summary

During recent months, a number of issues arose that brought to question the reliability of response times reported by the Los Angeles Fire Department. In order to address these concerns, and to ensure public confidence, Fire Chief Brian L. Cummings, with the full encouragement and support from the Board of Fire Commissioners, appointed a task force to identify potential issues and provide recommendations and solutions related to the Department's information and data analysis. This Task Force on Information and Data Analysis ("Task Force IDA") is comprised of subject matter experts from within the LAFD, and works in close conjunction with technical advisors from RAND and USC. Fire Commissioner Alan J. Skobin serves as the Fire Commission liaison and provides guidance, support, and leadership. Additionally, the subcommittee included recommendations from Mr. Jeff Godown, who formally served as a performance and data management consultant for the department and who identified some issues and provided support.

Task Force IDA established three separate tracks, each with specific and measurable objectives: Track 1- Data Accuracy/Interpretation, Track 2 – Research Plan and Development of FIRESTATLA[1], a data driven and accountability system, which will enable the LAFD to use leading-edge technology and innovative management techniques to enhance Department performance, accountability and transparency. Track 3 - Implementation of FIRESTATLA and other performance measurements.

In order to effectively address the first track of data accuracy and interpretation, the Task Force subcommittee developed a process which included problem definition,

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[1] FIRESTAT / management system / Los Angeles Fire Department council file: 12-0240 - Motion moved by Councilmember Mitchell Englander

methodology, identification of data sources, analysis, testing, and implementation. This report is primarily focused on Track 1, Data Accuracy/Interpretation.

The initial research required analysis of approximately 2.4 million incident records collected between January of 2007 and March of 2012, as well as recent data from July, August and September of 2012.

As a result of our initial analysis the subcommittee identified issues in the following four areas and have implemented short-term solutions and provided recommendations for longer-term solutions: 1) LAFD Computer Aided Dispatch, 2) Training/Education, 3) Integration and Synchronization, and 4) Technology. Additionally the Task Force conducted an emergency response time analysis.

1) The LAFD Computer Aided Dispatch system (CAD) is a 30 year old system that was designed and implemented for dispatching emergency resources. During the last 30 years, it has had several hardware and software upgrades, including a new platform which was upgraded through reverse engineering in 2002. The LAFD CAD was not designed for the demand of today's data reporting requirements and has limitations with many current technologies. It is an event-driven system with human interaction that captures transactions and inputs from callers, dispatchers, and responding units. While it can be used to provide data-based reports, the use should be limited in scope and only with a complete understanding of reporting criteria. Through initial analysis, the subcommittee found problems with the reporting system and the reporting criteria. These problems have since been identified and corrections implemented to ensure accurate reporting.

The corrections include several programming changes as well as establishing criteria for incident coding and separating non-emergency responses as recommended in the Controller's Audit[2]. In addition, the subcommittee developed and implemented a Standards Management System to identify and flag data anomalies. A new report[3] is now generated that supervisors and analysts can then use to determine the nature of these anomalies, which may be caused by human error, process inefficiency, and/or unique aspects of Los Angeles. Because the time-stamping process from the time LAFD takes the call to resources arriving at the scene is currently not completely automatic, and there are other steps that involve human interaction, human errors will continue to occur. However, once they are identified, the involved procedure, whenever possible, will be modified in order to reduce the frequency of occurrences. Similarly, should an anomaly be due to inefficiency of the existing process, efforts are being implemented for process improvements.

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[2] http://controller.lacity.org/stellent/groups/electedofficials/@ctr_contributor/documents/contributor_web_content/lacityp_020450.pdf

[3] Outside Standards Report - Developed by FirstWatch and the LAFD

The new Standards Management System developed by the subcommittee, with properly defined categories will provide a constant feedback loop for identifying and correcting anomalies. With these short term implementations, the existing CAD system can now provide more accurate data than before, and the department can use it for limited reporting purposes until enhancements to CAD system are made. Further, all prior reporting data should not be relied upon until they are properly recalculated and validated with the new recommended changes.

2) Training/Education - The statistical analysis of data by LAFD department staff who are not trained in this field led in part to inaccurate reporting. A general lack of data knowledge, interpretation, and understanding of the CAD systems can magnify this problem.

It became apparent that policy decisions based on data requires professional analysts to work more closely with policy makers to improve decision making and eliminate ambiguity. Until the selection, development and formal training of LAFD staff who work in a number of disciplines including data analysis are accomplished, future data-based decisions should include input from the Task Force.

3) Integration and Synchronization - The data which the LAFD relies on to make certain public safety decisions is managed, maintained, and accessed by multiple departments. The Information Technology Agency (ITA) maintains the CAD data production, and both the LAFD Management Information Systems Division (MIS) and Planning Section share and access these data through a sub-set of data bases and filtering reports. To achieve accuracy and accountability, all participants who play a role in data reporting, should be well integrated and synchronized. The LAFD needs to improve its processes of integration and synchronization with ITA. ITA has trained and qualified experts, many with over 25 years of experience in this field. It is essential that upon finding data anomalies, a thorough investigation and cross checking with ITA should occur. In the past, there have been cases where ITA employees with expert knowledge in data management and interpretation were never accessed by LAFD staff. In addition there were times when both agencies used different interpretations, which led to different conclusions.

Until a formal integration process is in place, all Fire Department requests for CAD data reports and interpretation should be routed through the LAFD Metropolitan Fire Dispatch and Communications Division which will vet these with the Public Safety Dispatch Division from the Information Technology Agency.

4) Technology - There are a number of technologies available that can enhance public safety and reduce response times, and are at varying degrees of progress in the department. These technologies include; Fire Station Alerting System (FSAS), Computer Aided Dispatch System (CAD), Global Positioning Systems(GPS), Automatic Vehicle Locating Systems (AVL), Geographic Information Systems (GIS), Automatic

Resource Recommendation Software (ARRS),and Traffic Pre-emption Systems. Currently, the Department does not have GPS or AVL in all of its units and is in the process of replacing the FSAS. A team outside the scope of the Task Force was assembled to assess the current CAD system and make recommendations for a future system.

The Department should develop a comprehensive technology-based strategic plan to address these and other needs. While technology is not a substitute for human interaction and decision making, it can certainly enhance efficiency in the operational aspects of resource dispatch and deployment.

Response Time Analysis

Because the initial focus of the subcommittee was aimed at data accuracy and interpretation, a baseline analysis of the department's emergency response time was conducted to better understand and identify problems. After running preliminary tests with the new changes and recommendations in place, the subcommittee conducted an emergency response time analysis for the month of September 2012 and arrived at the following results:

The average[4] total response time for all 911 emergency incidents in the City of Los Angeles from the time a 911 call is received by an LAFD dispatcher to the time the first unit arrives on scene is 6 minutes and 47 seconds (6:47)

Using the NFPA 1710 national standard for fire department response time performance the following are the preliminary results: EMS 60.9% and Fire 61.3%.

Accurate reporting of response time is an important tool in assuring the best possible emergency service for the City of Los Angeles. An accurate understanding of how quickly first responders are able to get on scene at emergencies is important for Fire Department management, city policy makers, and the public to determine the appropriate allocation of resources for the Los Angeles Fire Department.

Recommendations

Thus far the Task Force subcommittee has recommended and implemented (those marked with an asterisk below) the following recommendations as a result of our research, which we recommend should be adopted and implemented by the department.

- *Report total emergency response times to be from the time of call receipt by the LAFD to the time of the first unit on scene, according to guidelines set forth by NFPA 1221[5] and NFPA 1710[6].

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[4] City wide average is used in this method to establish a baseline but not as a statistical inference or performance indicator.

- *Establish clear and unambiguous definitions and standards for all terms, such as coding of incident types, used in the CAD data base.
- *Adopt the Standards Management System to flag, trap, and mitigate data anomalies in the areas of 1) call processing time, 2) turnout time, and 3) travel time.
- *Expand the current use of FirstWatch®[7] to include and continue near real time monitoring of CAD data with an emphasis on response time analysis.
- *Expand the current use of Palantir Gotham™[8] and/or other appropriate systems to aggregate and integrate databases for the purpose of department performance analysis.
- *Expand the current partnership with RAND Corporation to include policy analysis, operations research, and provide recommendations for technology enhancements and process improvements.
- Adopt and implement minimum training and education requirements for LAFD analysts.
- Establish a specific data analysis unit within the LAFD which includes technical assistance from outside experts and academics.
- Maintain continual analysis of CAD data.
- Develop and implement a publicly accessible website that provides response times by community and district.
- Integrate the LAFD Metropolitan Fire Dispatch and Communications Division with the Public Safety Dispatch Division from the Information Technology Agency into a single entity to mirror the model used by LAPD in TEAMS II.
- In order to provide consistency, maintain the current command team at Metropolitan Fire Dispatch and Communications Division until the programming changes and technology upgrades are in place.
- Determine and analyze the call processing and transfer time from the LAPD Public-Safety Answering Point (PSAP) to LAFD.
- Report response times by district, community and other geographical areas.
- Develop a process and coding system to identify transitional calls and responses (Emergency to Non-Emergency and Non-Emergency to Emergency).
- Analyze call processing and consider separating Card 33, 37, and other time intensive protocols for the purposes of analysis.
- Implement programming changes that restrict out of sequence MDC entries.

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[5] National Fire Protection Association 1221 - Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems (New Changes Adopted 2012)

[6] National Fire Protection Association 1710 - Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special operations to the Public by Career Fire Departments 2010 Edition

[7] FirstWatch® a syndromic surveillance program and real-time early warning system.

[8] Palantir Technologies is a software company that produces the Palantir Gotham™ and Palantir Metropolis™ platforms for analyzing, integrating, and visualizing data, including structured, unstructured, relational, temporal, and geospatial data.

Background

On July 7, 2012, Fire Chief Brian L. Cummings, with the full encouragement and support from the Board of Fire Commissioners assembled the LAFD Task Force on Information and Data Analysis ("Task Force IDA") to identify potential issues and provide recommendations and solutions related to the Department's information and data analysis. This Task Force on Information and Data Analysis ("Task Force IDA") is comprised of subject matter experts from within the LAFD, and works in close conjunction with technical advisors from RAND and USC. Fire Commissioner Alan J. Skobin serves as the Fire Commission liaison and provides guidance, support, and leadership. Additionally, the subcommittee included recommendations from Mr. Jeff Godown, who formally served as a performance and data management consultant for the department and who identified some issues and provided support.

The Task Force mission statement is: To develop systems, policies, and processes to accurately and transparently capture, measure, analyze, and report the inputs, outputs and outcomes of our Department. This real time accurate information will enhance leadership and policy decisions and allow our internal and external stakeholders to see and measure our performance, initiate discussion and dialogue, as well as develop and disseminate best practices throughout the Department.

Task Force IDA established three separate tracks, each with specific and measurable objectives. Each track has a subcommittee assigned to develop systems, policies, and processes to address each objective.

Track 1- Data Accuracy/Interpretation

- Conduct an analysis on LAFD data collection and review coding of incident types.
- Develop a consistent methodology for differentiating and coding emergency and non-emergency incidents.
- Develop a single agreed upon system for data processing and reporting of the statistical information.
- Analyze data, draw comparisons, and suggest policies and practices that might produce improvements in our system.

Track 2 – Research Plan and Development of FIRESTATLA

- Identify best practices in data collection and analysis from other fire departments and academia, and look for opportunities to apply these models in our organization.
- Determine what areas of the organization can benefit from data analysis.

- Seek input from the various segments of the Department and ensure that the field and operational level provide feedback.
- Determine resource needs and which Bureaus, Divisions, Sections, Units should be responsible.
- Determine how to gather performance data from other areas of the Department (e.g. OT, Work Comp, etc.) and develop a framework for objective and transparent analysis and decision making.

Track 3 - Implementation of FIRESTATLA

- Implement real time data analysis tools in order to report accurate and timely data.
- Implement leadership and accountability strategies that use data and other metrics (e.g. gap analysis) to drive continuous process improvement in the organization.
- Implement a consistent format for dialogue across the organization where data and other metrics can be discussed to help form the basis for improvements, changes, and best practices.
- Develop a method for disseminating best practices throughout the Department.
- Implement a publicly accessible system (website) to access real time information on response times and other performance data that the public wants to know.

Scope

This preliminary report has been developed to provide an overview, progress, and recommendations specifically related to Track 1 - Data Accuracy and Interpretation in the following 4 areas 1) LAFD Computer Aided Dispatch 2) Training/Education 3) Integration and Synchronization 4) Technology. Additionally the Task Force subcommittee conducted an emergency response time analysis.

The subcommittee assigned to data accuracy and interpretation is primarily a team which consists of members from public agencies, private enterprise, academia, and research institutions. These include; the Los Angeles Fire Department (LAFD), the Los Angeles Police Department (LAPD), Information Technology Agency (ITA), FirstWatch®, Palantir Technologies, USC, and the RAND Corporation.

Methodology

In order to effectively address data accuracy and interpretation, the team developed a process to define the problem, establish a methodology, identify data sources, and analyze data, testing, and implementation. Primary methods included; direct observations, interviews, qualitative and quantitative analysis. The initial steps required team members to analyze 2,425,582 incident records from January 1, 2007 to March 26, 2012 as well as 64,000 records from July, August, and September of 2012. Once a potential issue was identified, the team selected solutions and implemented these in a test bed "sandbox" server to test their findings. If the issue was resolved, the solution(s) would be tagged, identified with a number and implemented into the "live" data base.

Findings

A public-safety answering point (PSAP), is a call center responsible for answering calls to an emergency telephone number for police, fire, rescue, and ambulance services. In the City of Los Angeles, the LAPD serves as the PSAP and is the initial 911 receiving point of emergency calls for service. If the call requires a fire department response, the call is then transferred to the Metropolitan Fire Dispatch and Communications Division. In 2011 the LAFD responded to approximately 373,000 incidents[9].

LAFD Computer Aided Dispatch- The computer aided dispatch system is designed primarily to dispatch, and maintain the status of resources in the field. In the LAFD CAD system, fire department dispatchers receive calls for service from various sources; one source is the Enhanced 911 (E911), which is interfaced with the computer and automatic number identification automatic location identification (ANI-ALI). This system automatically inputs the telephone number and address of the caller into the CAD, eliminating the time required to manually locate the address and facilitating the process of request for service. As the dispatcher gains information on the type of call through a series of questions, it is manually entered into the CAD system. When the CAD system has sufficient information to recommend a response algorithm; it will do so by issuing the recommendation for the approval of the dispatcher. (See Attachment C for Call Processing and Response Time Continuum)

Apart from E911, there are several other ways in which the public and other agencies can call and request emergency service. Those include; calls via 10 digit numbers, calls transferred from another PSAP, calls from a third party, out of state calls, and other methods. Calls that originate outside of E911 do not have ANI-ALI and require dispatchers to verify and manually enter the address, which increases call processing time and ultimately increase total response time. Cell phone calls require more time to validate the address and location of the caller.

In addition, a CAD system manages resource status and interfaces with a records management system to capture and retain incident data. The central focus of a CAD system should be aimed at making the job of the 911 call takers, dispatchers, resource controllers and first responders faster, safer and more efficient so that the public receives fast and effective service. While these objectives are critical, accurate statistical reporting and analysis should not be compromised, because they are the indicators whether objectives are met and or better met.

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[9] 11-10-2011 LAFD Fire Facts

The use of trained and qualified personnel and the partnership with outside private enterprises such as FirstWatch® , is essential when interpreting reports and making data-based decisions from the CAD system. The CAD system requires continual software and programming upgrades/changes, each of which may consider and exclude different types of data anomalies. It is important to make clear what is excluded from the calculation of the response time and explain why these anomalies are treated and displayed separately.

The LAFD CAD is over 30 years old and certain enhancements and improvements to the LAFD system could improve both the dispatching, response, and reporting aspect. It may also have some limitations that can no longer be adapted to adequately and reliably interface with new systems and technologies. An LAFD dispatcher should always be able to process calls and provide pre-arrival instructions without completing a large number of steps. Anything that can be auto-populated or automated with the latest technology such as the capabilities of geographic information systems (GIS) and automatic vehicle location (AVL) or other service enhancements should be implemented.

The overall system uses a combination of technology and human interaction to effectively dispatch resources and provide service. This human interaction also presents areas for human error to occur. Three areas were identified where human error could impact dispatching and data capturing: 1) Call Processing, 2) Dispatching, and 3) Responding.

During call processing, dialogue between the requesting party and dispatcher can create conditions for error. Some examples include unknown address/location, type of emergency, language barrier, third party information, and other information that requires the dispatcher to verify and cross check the information, each of which further delays dispatch. Additionally, some calls require special detailed instruction for processing, including lost hikers, inter-facility transports, locating caller, Emotional Content and Cooperation Score (ECCS-level), or other necessary time required to effectively dispatch the resources.

During dispatching, the dispatcher has to initiate a series of command prompts and maintain situational awareness for other calls pending in the queue. This manual interaction is subject to human error and has the potential to delay a dispatch.

During response, the responding units manually update their status and push buttons on a mobile data computer (MDC) to signal and trigger a time stamp when they are enroute to a call (ENR), on-scene of a call (ONS) and then available from the call (AVI). These data are captured by the CAD and essentially determine this segment of the response timeline. If a firefighter forgets to push the button or the radio signal is interrupted due to radio coverage or a system outage, then this time sequence may be incomplete or incorrect. The subcommittee found approximately 150 records per month that appeared to have out of order, incomplete, or negative time stamps. These are being analyzed and are identified by the Standards Management System. Programming changes that restrict MDC out of sequence entries may eliminate some of these errors.

One of the initial action items for the subcommittee was to analyze response time data to identify patterns and outliers. During this process, it was discovered that there were instances where the data inaccurately reported some response times to take as long as 28 hours to arrive on scene. This was clearly a mistake. By homing in on these outliers and drilling down into these incidents, the subcommittee determined that certain programming changes to the computer aided dispatch system (CAD) caused the reporting side of the CAD to generate data that was inaccurately interpreted.

The programming changes that affected these reports were the result of prior programming changes that were designed to address issues, which the subcommittee found had caused unintended second and third order effects.

As reported in the City Controller's Audit[10], the Department did not have a consistent method for differentiating and coding emergency responses and non-emergency responses. This issue was addressed by the subcommittee and resolved by adopting a single standard which clearly defines these types of responses. Using this new standard the department will be able to more accurately report response times and perhaps recalculate previously-reported inaccurate data that have drawn public attention. Additionally the subcommittee identified transitional calls; those that can originate as an emergency call/response and then are downgraded to non-emergency or upgraded from non-emergency to emergency are not easily identified and should be assigned a separate code in the CAD when this takes place because they can skew data.

The following is a list of issues that were discovered and programming changes that have been implemented to enhance reporting criteria[11]:

- WRS Override - Subsequent responding units overriding the initial on-scene time.
- Date Stamp Clock - Some data fields had an additional 24 hour time stamp added.
- Dropped Records - The MIS data base had missing records due to a routine data push.
- Emergency and Non-Emergency criteria - Controller's Audit found errors in criteria.
- Pended Calls - Dispatcher training has been implemented.
- Address Command Prompt - Incorrect/old address data on the command line caused faulty time stamp.

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[10] http://controller.lacity.org/stellent/groups/electedofficials/@ctr_contributor/documents/contributor_web_content/lacityp_020450.pdf

[11] These programming changes will be monitored with the SMS to ensure compliance.

Issue	Description	Impact	Solution	Implementation
WRS Override	Subsequent responding units overriding time stamps	Caused reports to include the time stamp from the last transaction. Led to inaccurate reporting by LAFD	Programming changes will capture the time stamp from the first unit when querying reports	Yes
24 hour Date Stamp Clock	Some data fields had an additional 24 hour time stamp added	Caused certain incidents to show more than 24 hour response times	Programming changes will eliminate the 24 hour date stamp from these incidents. Outside Standard Report will flag these occurrences.	Yes
Emergency and Non-Emergency Criteria	Not all incidents are clearly identified as Emergency or Non-Emergency	Causes the reports to include calls for Non-Emergency service which impacts response time reporting	LAFD adopted a standard list that separates these types of calls	Yes
Pended Calls	Emergency calls are sometimes manually processed and a dispatcher may forget to dispatch a pending call in the queue	Causes a delay in dispatching	Dispatcher training and Outside Standard Report will flag these occurrences.	Yes
Address Command Line Prompt	Incorrect/old address data on the command line caused faulty time stamp.	Causes wrong time stamp to be included in the report and can either show positive or negative response times	Current solution being beta-tested.	No *Outside Standard Report will flag these occurrences.*

Dropped Records	MIS data base was found to have missing records due to a routine data push.	Caused missing records on the reporting side. Including out of sequence AVI time stamps.	ITA staff is restoring records through archives/tapes and will analyze for additional issues. Programming changes are being implemented.	On-going - progress includes 1 year of back data already in the restoration process

Training/Education-The Department relies on data to make certain operational and public safety decisions. While it has some very experienced personnel in terms of emergency operations, it lacks professional experience in the areas of statistical analysis and data interpretation. While the inaccurate reporting of response times was caused by a full array of problems described above, inexperienced personnel do increase human errors. Having conducted direct observations and interviews with Department personnel in the LAFD Planning Section, the subcommittee found that there were no formal education or professional certificates required to serve in these positions. Establishing clear performance metrics and blending practical experience with theory through professional courses or advanced degrees in statistics and operations research will enhance data-based decisions in the LAFD.

Integration and Synchronization- The data which the LAFD rely on to make certain public safety decisions is managed, maintained, and accessed by multiple departments. The Information Technology Agency (ITA) maintains the CAD data production and the LAFD Management Information Systems Division (MIS) and Planning Section shares and accesses these data through a sub-set of data bases and filtering reports. In order to prevent a situation where there may be competing or different priorities, the Public Safety Dispatch Division from the Information Technology Agency should be re-assigned from ITA to the LAFD under the formal command of Metropolitan Fire Dispatch and Communications Division. This re-alignment will ensure a single point of direction and eliminate the potential impacts from organizational shifts in priorities.

Technology- How to improve the overall level of the department's technology and equipment has become a very important issue at present. There are several technologies available that can enhance public safety and reduce response times. These technologies include; Fire Station Alerting System (FSAS), Computer Aided Dispatch System (CAD), Global Positioning Systems(GPS), Automatic Vehicle Locating Systems (AVL), Geographic Information Systems (GIS), Automatic Resource Recommendation Software (ARRS) and Traffic Pre-emption Systems.

Many fire departments have a paradoxical relationship with technology. While one should embrace the ideas of new technology, real time information and analysis tools, it is also important to understand that technology can sometimes be unreliable and may create a dependence which can compromise decision making and impact service. The combination of these two downsides could be problematic. To address this concern, technology should be designed and built to enhance service delivery and reduce human error, but not to replace the necessary experience and decision making skills that firefighters have developed.

Currently the department is taking steps to replace the Fire Station Alerting System (FSAS) and CAD. The FSAS is the system that controls the fire station dispatch audio, signal lights, and other fire station alerting hardware and software. This proposed system should decrease incident turnout times through early pre-alerting of first responders, prior to actual dispatch recommendation and voice dispatch phase. Additionally it may decrease human error during a pre-alert or dispatch phase through text-to-speech technology to fire stations and to first responders available on radio in the field. The FSAS may also create efficiencies and reduce dispatcher stress through the use of text-to-speech technology, lessening time for dispatchers to vocalize dispatches and concentrate on CAD dispatch recommendations and essential voice radio traffic on tactical channels.

In September of 2012, the department initiated the first step towards developing a future CAD system. This initial step included the development of a CAD assessment team, who will develop criteria and conduct a specific needs assessment before proceeding with a request for proposal. Improving, upgrading, or replacing the CAD will facilitate integration with several other technologies that will enhance dispatching and improve reporting and records management. For example, there are certain technology improvements that could reduce human error in responding units, like "geofencing". A geo-fence could be dynamically generated, as in a radius around an address, location, or predefined set of boundaries. Once a dispatch is received and the apparatus is moving above a certain speed, the system automatically transmits the signal to the CAD and triggers an enroute time stamp, instead of having to push a button. Also, when the apparatus is within a certain distance of the address, it will automatically trigger an on-scene stamp and decrease human error if someone forgets to press the button. This type of technology can automatically handle many of the manual prompts.

Another CAD integrated technology is Automatic Resource Recommendation Software (ARRS). In this system the resource recommendation decision is based on the real-time location providing quicker emergency responses and better allocation of resources. The department has taken the initial steps towards implementing AVL into the existing CAD and will pursue integration with ARRS.

Advancements in traffic management technology include the Traffic Pre-emption Systems, which allows the normal operation of traffic lights to be preempted by an emergency vehicle. This system is designed to help reduce response times and enhance traffic safety by stopping conflicting traffic and allowing the emergency vehicle right-of-way.

The subcommittee recommends that the department continue to upgrade and replace their systems as well as adopt and implement many of these new technologies to improve safety, service, and reduce response times.

Response Time Analysis[12] - While the initial focus of the subcommittee was aimed at data accuracy and interpretation, a baseline analysis of the Department's emergency response time was conducted to verify that the programming changes and Standards Management System were accurate. After running preliminary tests with July and August data, the subcommittee ran the same test with the new changes and recommendations in place for September and determined the following results:

The average[13] total response time for all 911[14] emergency incidents in the City of Los Angeles from the time a 911 call is received by an LAFD[15] dispatcher to the time the first unit arrives on scene is 6 minutes and 47 seconds (6:47). This time includes the average call processing time of 1 minute and 42 seconds.

The response time analysis was based on the following criteria:

- All emergency responses (Fire/Other/EMS) within the month of September 2012; from the time a call is received via a 911 call by the LAFD dispatch center to the time the first until arrives on scene of the incident address. This total response time for this calculations includes; call processing time, turnout time, and travel time.
- Removing records that had negative time records or out of sequence time stamps, which are being reviewed as part of the subcommittee's recommendations.

The subcommittee also broke down these calls into Fire and EMS and compared them to the NFPA 1710 performance standard, which states that *"the fire department shall establish a performance objective of not less than 90 percent for the achievement of each turnout time and travel time objective specified in 4.1.2.1"*.

Using the criteria for Emergency Medical Services and Fire the following are the results for the month of September 2012[16]:

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[12] See Attachment A - *FirstWatch September Response Time Data Review - LAFD Task Force IDA*
[13] Average is used in this method to establish a baseline but not as a statistical inference or performance indicator.
[14] Calls received via 911 lines were analyzed in this test because they include an initial time stamp.
[15] This number does not include the call transfer time from the LAPD PSAP to LAFD.
[16] Note: Using only 1 month of data as a baseline - sample size may not be indicative of a larger set.

EMS

- Average Response Time (HH:MM:SS): *00:05:01*
- Median[17] *00:04:40*
- Mode[18] *00:04:45*
- Count of Calls *Within 5* Minutes: *12,216 (60.9%)*
- Count of Calls *Over 5* Minutes: *7,836 (39.1%)*

Fire

- Average Response Time (HH:MM:SS): *00:05:38*
- Median[19] *00:04:49*
- Mode[20] *00:04:52*
- Count of Calls *Within 5:20* Minutes/Seconds: *1,130 (61.3%)*
- Count of Calls *Over 5:20* Minutes/Seconds: *713 (38.7%)*

NFPA 1710 Response Time Standard 2010
90% Achievement for EMS/Fire excluding ALS

Emergency Incident	Turnout Time	Travel Time	Response Time
Emergency Medical Services - First Resource	60 seconds	240 seconds	300 seconds (5 minutes)
Fire - First Resource	80 seconds	240 seconds	320 seconds (5 minutes 20 secs.)

Using the Standards Management System - Minimum and maximum time stamps were also analyzed to determine causal factors in any type of large variance of separation. The maximum and minimum sample also referred to in our analysis as the largest observation, and smallest observation, are the values of the greatest and least elements of the data set. Using this approach as another method to analyze data, the department can focus on outliers to determine causal factors, human error, process inefficiency, resources, and/or unique aspects of Los Angeles

<u>Limitations of this Report</u>

This preliminary report only sampled emergency incidents from July, August and September of 2012, and conducted an average total response time (Call Processing, Turnout, and Travel Time) as well as baseline EMS and Fire calls for September 2012. While the sample of data may be too small to make any specific inferences; the

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[17] The numerical value separating the higher half of the sample data from the lower half.
[18] The value that appears/occurs most often in the sampled data.
[19] *Ibid*
[20] *Ibid*

department will be able to conduct additional response time analysis by specific queries, such as EMS, Fire, and other types of incidents with the recommendations in place.

The subcommittee did not analyze the department deployment plans[21] and did not apply those factors to the scope of this analysis.

Further Research

The subcommittee recommends that the department continue to analyze response times and other data as well as compare these numbers within a larger sample size. Additionally, the department should analyze response times in different communities and fire station districts. This research can be achieved by expanding the use of the RAND Corp., USC, FirstWatch®, Palantir Technologies and other industry experts, as well as establishing an LAFD Data Analysis Unit with trained personnel. Continued testing and analysis will be required to identify and ensure that data anomalies are properly addressed.

FIRESTATLA - In April of 2012, Councilmember Mitchell Englander introduced a motion directing the department to develop and implement FIRESTATLA, a data driven performance and accountability system which will enable the LAFD to use leading-edge technology and innovative management techniques to identify gaps and enhance department performance. The Task Force has undertaken the lead for development and implementation of this important program, which will transition this to the department once it is developed. While the primary focus of the Task Force thus far has been data accuracy and interpretation, a separate committee of the Task Force has made significant progress in developing the framework for FIRESTATLA with the support and guidance from Chief Brian Cummings, Fire Commissioner Alan J. Skobin and John Neuman, the LAPD Senior Management Analysts and Assistant Commanding Officer of the Real-Time Analysis and Critical Response (RACR) Division[22].

Commissioner Skobin, who formerly served as an LAPD Commissioner for 9 years, has tremendous background in public safety and was integrally involved with performance improvements and institutional reform at the LAPD. His experience, along with that of John Neuman, who has a depth of knowledge and experience, and was recently assigned to assist with FIRESTATLA, will provide the necessary foundation for the Task Force to develop the vital framework and strategy for FIRESTATLA. FIRESTATLA will use data as the foundation for transparency, accountability, and development of best practices.

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[21] Modified Coverage Plan(MCP) - Enhanced Modified Coverage Plan (EMCP) - Deployment Plan (DP)

[22] Detailed to the LAFD with the support of LAPD Chief Charlie Beck, and facilitated by the Deputy Mayor for Homeland Security and Public Safety.

The Task Force plans to issue a public report on its progress and strategy for implementation of FIRESTATLA. The target date for completion of this report is early December 2012.

Conclusion

This preliminary report identified issues with the current CAD system, data accuracy, and interpretation. The subcommittee implemented solutions and recommendations that will allow the department to once again report response times. With the implementation of new technologies, FIRESTATLA, Standards Management System, training and developing a formal structure for analysis and reporting, the subcommittee is confident that the department will be able to accurately, transparently, and reliably report response times, and to ensure public confidence.

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Acknowledgements

The following is the list of subcommittee members and advisory teams that contributed to the content of this preliminary report or provided advisory support.

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References and Attachments

Attachment A - FirstWatch - September Response Time Data Review -LAFD Task Force IDA - 10/10/2012 (Preliminary Report)

Attachment B - Outside Standards Report (Example)

Attachment C - Call Processing and Response Continuum

FirstWatch - September Response Time Data Review
LAFD Task Force IDA - 10/10/2012

Attachment A

Contents

FirstWatch - September Response Time Data Review LAFD Task Force IDA - 10/10/2012

Overview

Response Time Analysis for September, 2012

The basis of the criteria used in following response time analysis is centered on information provided by the Task Force IDA sub-committee. Asking the question: How long does it take to get a resource to a 911 emergency call from the time that it is received by LAFD? There are two specific segments that we are focused on for this report: 1) Alarm Call Processing - Initial 911 to WRS and 2) Response Time - WRS to 1st Unit On Scene.

Summary of Analysis

Criteria

FirstWatch Trigger Source for Analysis: Task Force IDA - LAFD - Response Time 5 mins

- Date Range: Between September 1, 2012 00:00:00 and September 30, 2012 23:59:59
- All Fire and EMS emergency calls that came in on a 911 phone line, excluding specified non-emergency calls types. (Also referred to as *"Overall"* in this report)
- *Excludes* the following *non-emergent* Incident types:

  11A1,12A2,12A2E,12A3,12A3E,13A1,13A1C,16A1,16A2,16A3,17A0G,17A1,17A1G,17A1J,17A2,17A2G,17A2J,17A3,17A3G,17A3J,17O1,17O1J,18A1,1A1,20A1,20A1C,20A1H,21A1,21A2,22A1,22A1A,22A1B,22A1M,22A1X,22A1Y,23O1V,24O1,25A1,25A1B,25A1V,25A1W,25A2,25A2B,25A2V,25A2W,26A1,26A10,26A11,26A12,26A13,26A14,26A15,26A16,26A17,26A18,26A19,26A2,26A20,26A21,26A22,26A23,26A24,26A25,26A26,26A27,26A28,26A3,26A4,26A5,26A6,26A7,26A8,26A9,26O10,26O11,26O12,26O13,26O14,26O15,26O16,26O17,26O,8,,26O19,26O2,26O20,26O21,26O22,26O23,26O24,26O25,26O26,26O27,26O28,26O3,26O4,26O5,26O6,26O7,26O8,26O9,27A1G,27A1S,27A1X,29A1,29A1A,29A1M,29A1U,29A1X,29O1,2A1,2A1I,2A1M,2A2,2A2I,2A2M,30A1,30A2,36A0,36A1A,36A1B,36A2A,36A2B,36A2C,3A1,3A2,3A3,4A1,4A1S,4A2,4A2S,5A1,5A2,7A3,7A3E,7A3F,8A1,8O1,8O1B,8O1C,8O1G,8O1M,8O1N,8O1R,8O1S,8O1U,9B1,9B1A,9B1B,9B1C,9B1D,9B1E,9B1F,9B1G,FO,ENG,ILLEGAL,INVEST,INVESTA,INVESTF,INVESTL,INVESTM,INVESTP,INVESTT,LOST,SAFEH,SAFES,TIRE,TOW,TRK,TSI,VIP.

- Calls must have an Initial 911 and 1st Unit On Scene timestamp to be a qualified record.
- Measured against 5 minute (300 seconds) response time standard (60 seconds for Alarm Call Processing and 240 seconds for turn-out and travel time)
- No specific unit type or capability designation is used for filtering criteria. We are evaluating all resource types.

FirstWatch - September Response Time Data Review
LAFD Task Force IDA - 10/10/2012

Dataset

- September 2012 - Total Overall Calls: ***22,049***
- Total Records Removed with Errors: ***154 (0.7%)***
    - *Bad or irregular records based on items identified in discussions - i.e. > 1st Unit Enroute timestamp before 1st Unit On Scene, and data entry errors for the September data set.* ***Recommend not focusing on these specific calls, since a low percentage.***
- Total Calls Evaluated (Errors Removed): ***21,895***

Alarm Call Processing - Initial 911 to WRS

- Average Initial 911 to WRS - Alarm Call Processing (HH:MM:SS): Time*:* ***00:01:42***
- Count of Calls ***Over*** 90 Seconds: ***10,994 (50.2%)***
- Count of Calls ***Within*** 90 Seconds: ***10,901 (49.8%)***

Incident Turnout Times - WRS to 1st Unit Enroute

- Average Incident Turnout - WRS to 1st Unit Enroute(HH:MM:SS): ***00:00:57***

Incident Response Times - WRS to 1st Unit On Scene

- Average Response Time (HH:MM:SS): ***00:05:05***
- Count of Calls ***Over 5*** Minutes: ***8,650 (39.5%)***
- Count of Calls ***Within 5*** Minutes: ***13,245 (60.5%)***

Incident Response Times EMS - WRS to 1st Unit On Scene

- Average Response Time (HH:MM:SS): ***00:05:01***
- Count of Calls ***Over 5*** Minutes: ***7,836 (39.1%)***
- Count of Calls ***Within 5*** Minutes: ***12,216 (60.9%)***

Incident Response Times Fire - WRS to 1st Unit On Scene

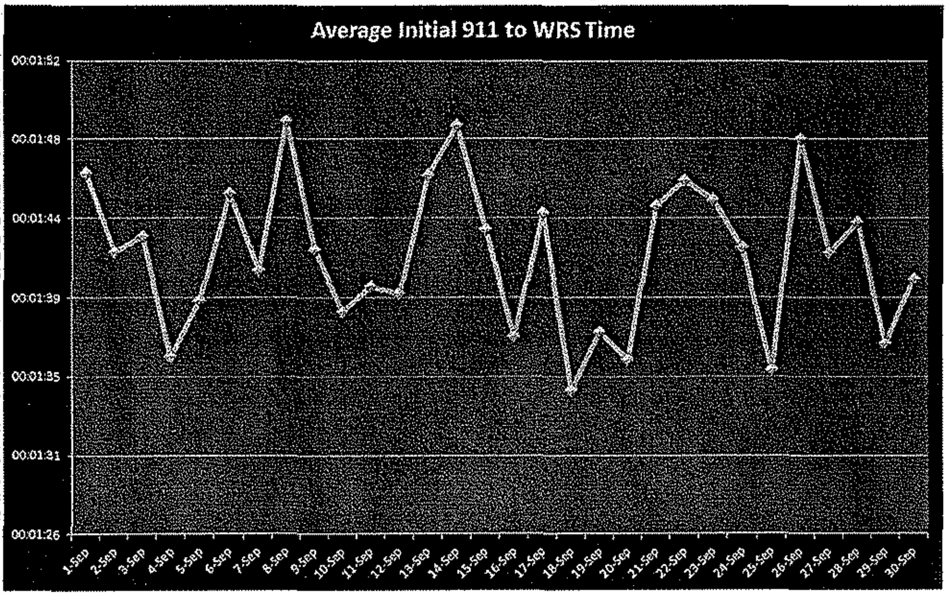
- Average Response Time (HH:MM:SS): ***00:05:38***
- Count of Calls ***Over 5:20*** Minutes/Seconds: ***713 (38.7%)***
- Count of Calls ***Within 5:20*** Minutes/Seconds: ***1,130 (61.3%)***

FirstWatch - September Response Time Data Review
LAFD Task Force IDA - 10/10/2012

Alarm Call Processing Charts

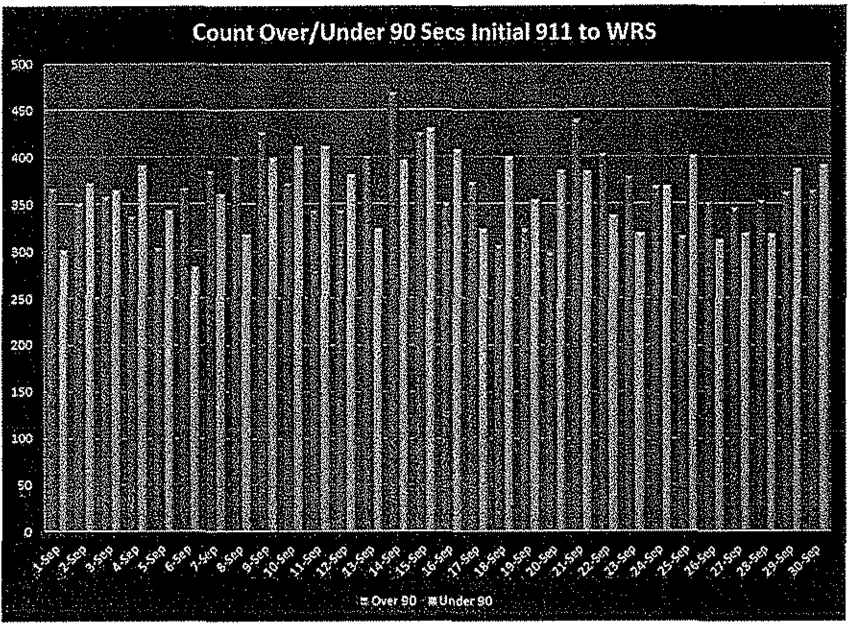
Average Initial 911 to WRS Time (Alarm Call Processing Time)

Row Labels	Average of Initial 911 to WRS (HH:MM:SS)
1-Sep	00:01:46
2-Sep	00:01:42
3-Sep	00:01:43
4-Sep	00:01:36
5-Sep	00:01:39
6-Sep	00:01:45
7-Sep	00:01:41
8-Sep	00:01:49
9-Sep	00:01:42
10-Sep	00:01:39
11-Sep	00:01:40
12-Sep	00:01:40
13-Sep	00:01:46
14-Sep	00:01:49
15-Sep	00:01:43
16-Sep	00:01:37
17-Sep	00:01:44
18-Sep	00:01:34
19-Sep	00:01:37
20-Sep	00:01:36
21-Sep	00:01:44
22-Sep	00:01:46
23-Sep	00:01:45
24-Sep	00:01:42
25-Sep	00:01:35
26-Sep	00:01:48
27-Sep	00:01:42
28-Sep	00:01:43
29-Sep	00:01:37
30-Sep	00:01:40
Grand Total	00:01:42



Count of Under/Over 90 Second Alarm Call Processing

Count of Incident #	Column Labels		
Row Labels	Over 90	Under 90	Grand Total
1-Sep	367	301	668
2-Sep	351	373	724
3-Sep	358	365	723
4-Sep	337	392	729
5-Sep	303	344	647
6-Sep	367	283	650
7-Sep	386	361	747
8-Sep	400	318	718
9-Sep	427	399	826
10-Sep	372	411	783
11-Sep	344	411	755
12-Sep	344	382	726
13-Sep	401	323	724
14-Sep	469	397	866
15-Sep	426	430	856
16-Sep	351	408	759
17-Sep	374	323	697
18-Sep	307	400	707
19-Sep	323	355	678
20-Sep	299	386	685
21-Sep	440	385	825
22-Sep	404	338	742
23-Sep	379	319	698
24-Sep	369	369	738
25-Sep	316	401	717
26-Sep	352	312	664
27-Sep	346	319	665
28-Sep	354	318	672
29-Sep	363	387	750
30-Sep	365	391	756
Grand Total	10994	10901	21895
Percentage	50.2%	49.8%	

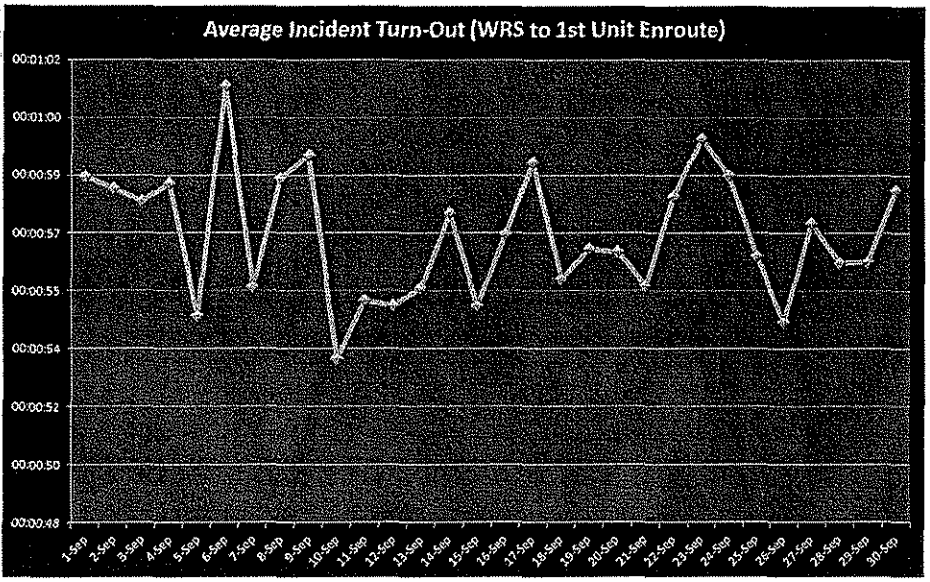


FirstWatch - September Response Time Data Review
LAFD Task Force IDA - 10/10/2012

Incident Turn Out Times Charts

Incident Turnout - Overall (WRS to 1st Unit Enroute)

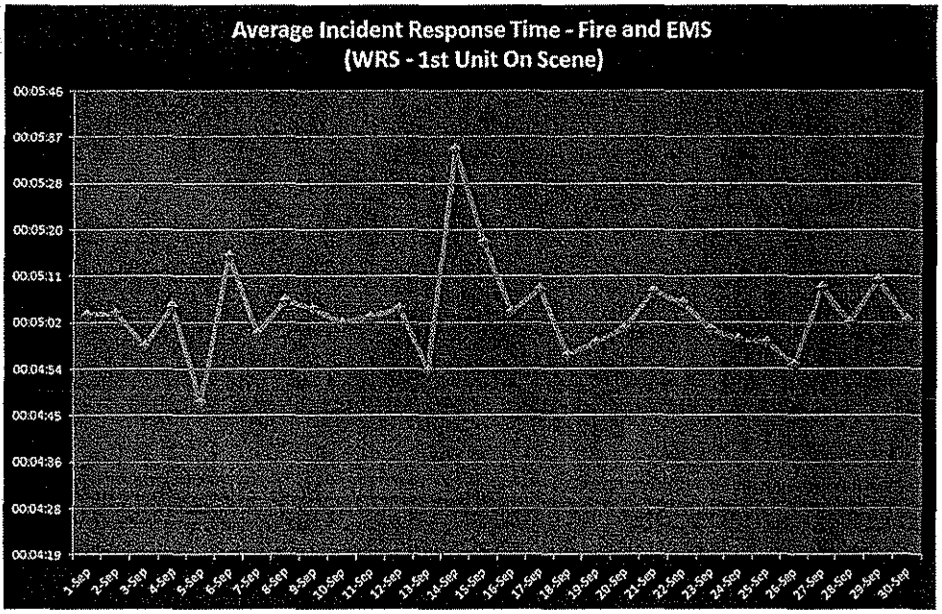
Row Labels	Average of WRS To 1st ENR(D HH:MM:SS)
1-Sep	00:00:59
2-Sep	00:00:58
3-Sep	00:00:58
4-Sep	00:00:59
5-Sep	00:00:55
6-Sep	00:01:01
7-Sep	00:00:55
8-Sep	00:00:59
9-Sep	00:00:59
10-Sep	00:00:53
11-Sep	00:00:55
12-Sep	00:00:55
13-Sep	00:00:55
14-Sep	00:00:58
15-Sep	00:00:55
16-Sep	00:00:57
17-Sep	00:00:59
18-Sep	00:00:56
19-Sep	00:00:57
20-Sep	00:00:56
21-Sep	00:00:55
22-Sep	00:00:58
23-Sep	00:01:00
24-Sep	00:00:59
25-Sep	00:00:56
26-Sep	00:00:54
27-Sep	00:00:57
28-Sep	00:00:56
29-Sep	00:00:56
30-Sep	00:00:58
Grand Total	00:00:57



Incident Response Times Charts

Average Response Time - Overall (WRS to 1st Unit On Scene)

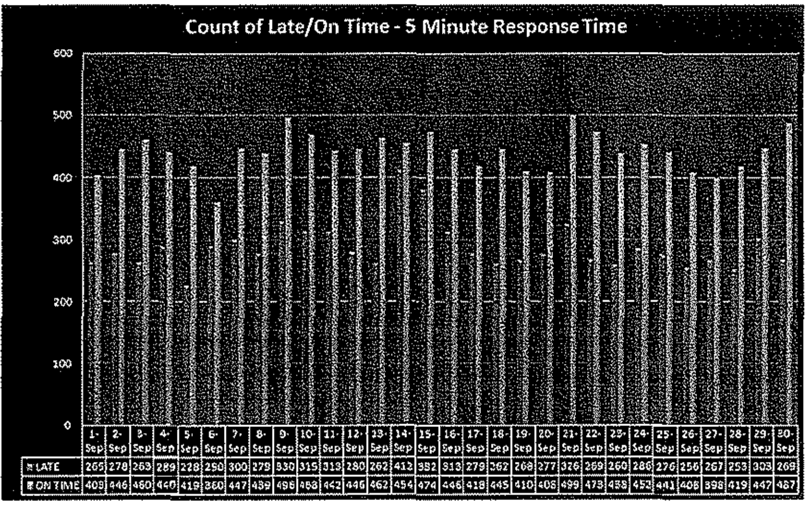
Row Labels	Average of WRS to 1st ONS (HH:MM:SS) (Response Time)
1-Sep	00:05:04
2-Sep	00:05:04
3-Sep	00:04:58
4-Sep	00:05:05
5-Sep	00:04:48
6-Sep	00:05:15
7-Sep	00:05:00
8-Sep	00:05:07
9-Sep	00:05:06
10-Sep	00:05:02
11-Sep	00:05:03
12-Sep	00:05:05
13-Sep	00:04:54
14-Sep	00:05:35
15-Sep	00:05:17
16-Sep	00:05:04
17-Sep	00:05:09
18-Sep	00:04:57
19-Sep	00:04:59
20-Sep	00:05:01
21-Sep	00:05:08
22-Sep	00:05:06
23-Sep	00:05:01
24-Sep	00:04:59
25-Sep	00:04:59
26-Sep	00:04:55
27-Sep	00:05:09
28-Sep	00:05:03
29-Sep	00:05:10
30-Sep	00:05:03
Grand Total	00:05:05



FirstWatch - September Response Time Data Review
LAFD Task Force IDA - 10/10/2012

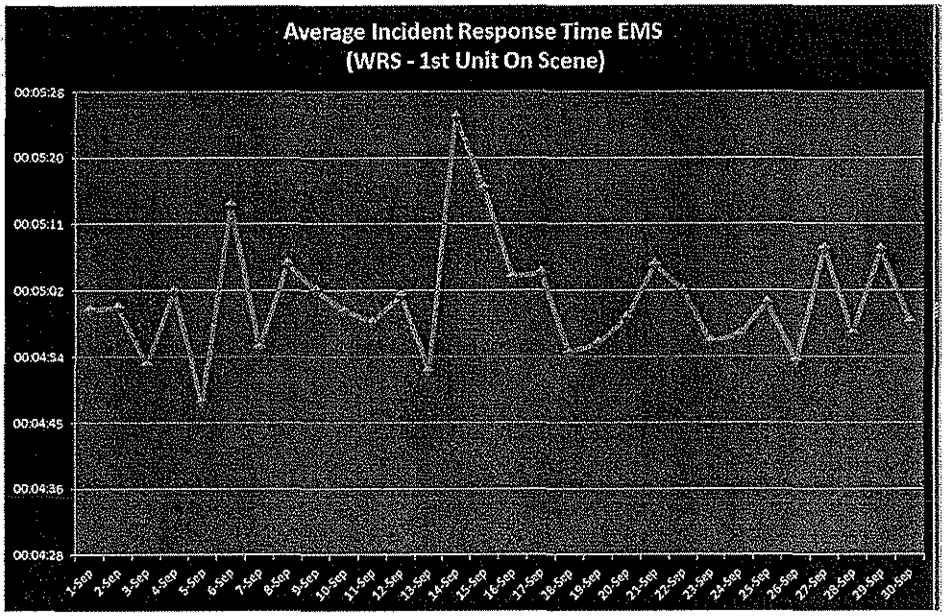
Count of Calls Over/Under 5 Minute (300 SECS) Response Time- Overall (WRS to 1st Unit On Scene)

Count of Incident #	Column Labels		
Row Labels	LATE	ON TIME	Grand Total
1-Sep	265	403	668
2-Sep	278	446	724
3-Sep	263	460	723
4-Sep	289	440	729
5-Sep	228	419	647
6-Sep	290	360	650
7-Sep	300	447	747
8-Sep	279	439	718
9-Sep	330	496	826
10-Sep	315	468	783
11-Sep	313	442	755
12-Sep	280	446	726
13-Sep	262	462	724
14-Sep	412	454	866
15-Sep	382	474	856
16-Sep	313	446	759
17-Sep	279	418	697
18-Sep	262	445	707
19-Sep	268	410	678
20-Sep	277	408	685
21-Sep	326	499	825
22-Sep	269	473	742
23-Sep	260	438	698
24-Sep	286	452	738
25-Sep	276	441	717
26-Sep	256	408	664
27-Sep	267	398	665
28-Sep	253	419	672
29-Sep	303	447	750
30-Sep	269	487	756
Grand Total	8650	13245	21895
Percentage	39.5%	60.5%	



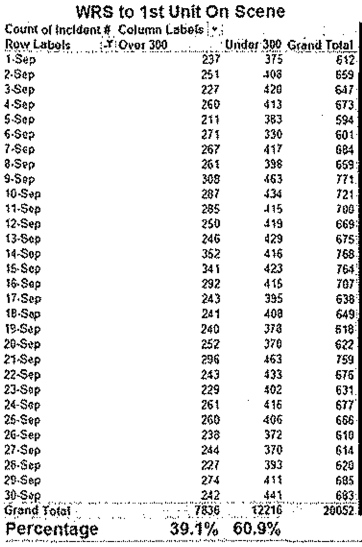
Average Response Time EMS (WRS to 1st Unit On Scene)

Row Labels	Average of WRS to 1st ONS (HH:MM:SS) (Response Time)
1-Sep	00:05:00
2-Sep	00:05:00
3-Sep	00:04:53
4-Sep	00:05:02
5-Sep	00:04:48
6-Sep	00:05:14
7-Sep	00:04:55
8-Sep	00:05:06
9-Sep	00:05:02
10-Sep	00:05:00
11-Sep	00:04:58
12-Sep	00:05:02
13-Sep	00:04:52
14-Sep	00:05:25
15-Sep	00:05:16
16-Sep	00:05:04
17-Sep	00:05:06
18-Sep	00:04:54
19-Sep	00:04:56
20-Sep	00:04:59
21-Sep	00:05:06
22-Sep	00:05:02
23-Sep	00:04:56
24-Sep	00:04:57
25-Sep	00:05:01
26-Sep	00:04:53
27-Sep	00:05:08
28-Sep	00:04:57
29-Sep	00:05:08
30-Sep	00:04:58
Grand Total	00:05:01



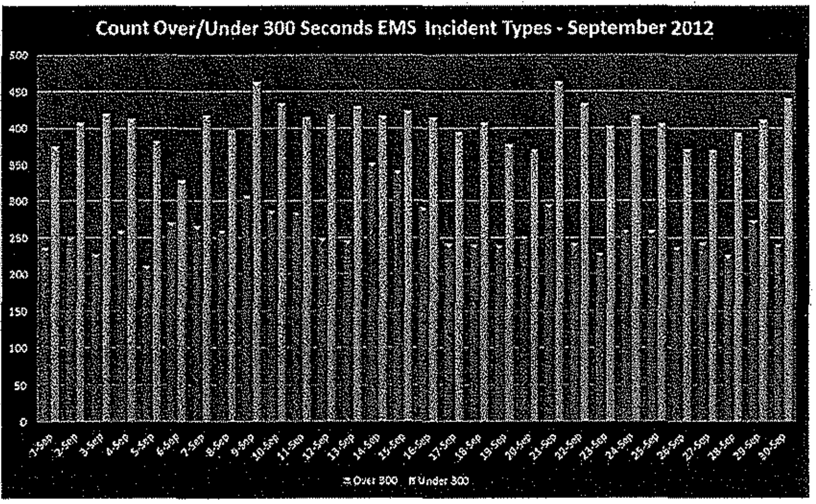
FirstWatch - September Response Time Data Review
LAFD Task Force IDA - 10/10/2012

Count of Calls Over/Under 5 Minute (300 SECS) Response Time EMS (WRS to 1st Unit On Scene)

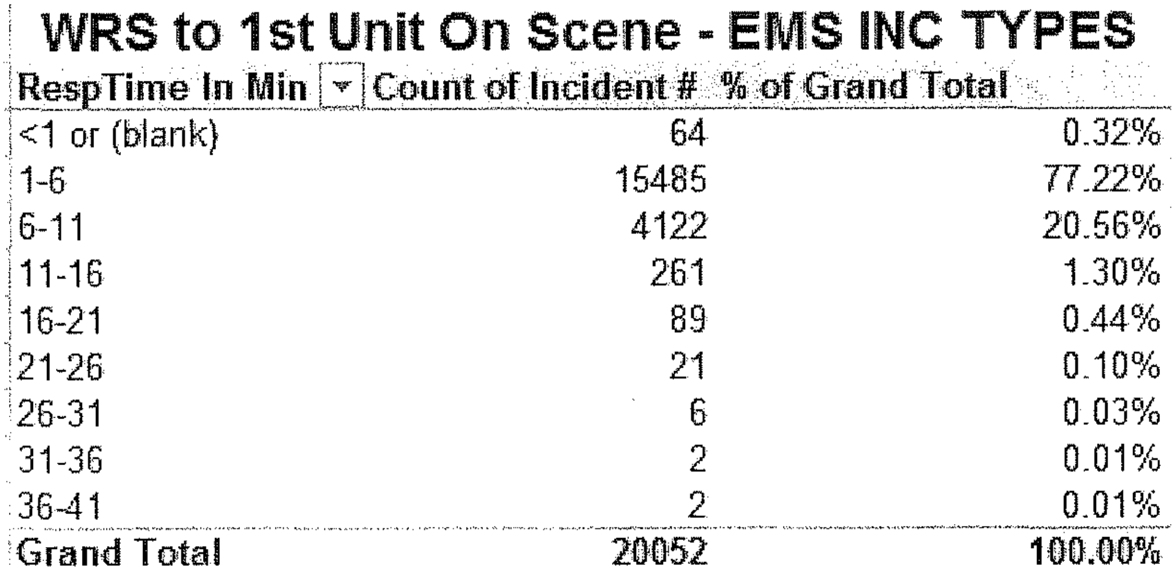


WRS to 1st Unit On Scene

Count of Incident #	Column Labels		
Row Labels	Over 300	Under 300	Grand Total
1-Sep	237	375	612
2-Sep	251	408	659
3-Sep	227	420	647
4-Sep	260	413	673
5-Sep	211	383	594
6-Sep	271	330	601
7-Sep	267	417	684
8-Sep	261	398	659
9-Sep	308	463	771
10-Sep	287	434	721
11-Sep	285	415	700
12-Sep	250	419	669
13-Sep	246	429	675
14-Sep	352	416	768
15-Sep	341	423	764
16-Sep	292	415	707
17-Sep	243	395	638
18-Sep	241	408	649
19-Sep	240	378	618
20-Sep	252	370	622
21-Sep	296	463	759
22-Sep	243	433	676
23-Sep	229	402	631
24-Sep	261	416	677
25-Sep	260	406	666
26-Sep	238	372	610
27-Sep	244	370	614
28-Sep	227	393	620
29-Sep	274	411	685
30-Sep	242	441	683
Grand Total	7836	12216	20052
Percentage	39.1%	60.9%	


Count Over/Under 300 Seconds EMS Incident Types - September 2012

Response Time Intervals EMS



WRS to 1st Unit On Scene - EMS INC TYPES

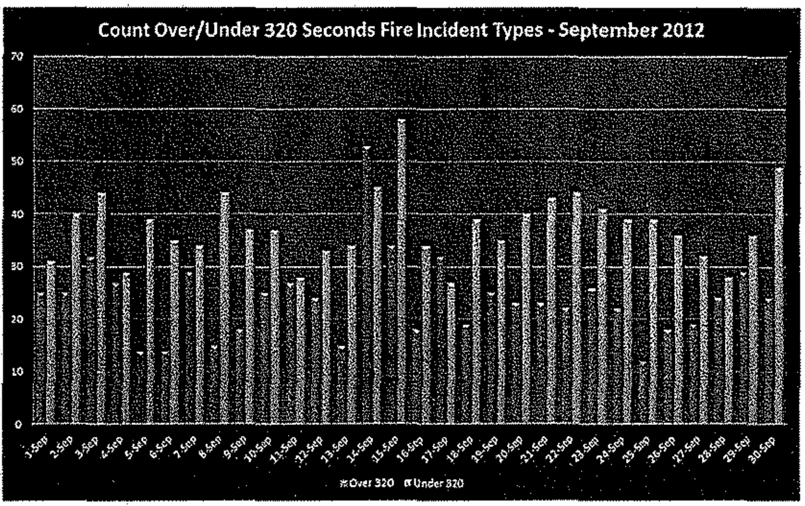
RespTime In Min	Count of Incident #	% of Grand Total
<1 or (blank)	64	0.32%
1-6	15485	77.22%
6-11	4122	20.56%
11-16	261	1.30%
16-21	89	0.44%
21-26	21	0.10%
26-31	6	0.03%
31-36	2	0.01%
36-41	2	0.01%
Grand Total	20052	100.00%

FirstWatch - September Response Time Data Review
LAFD Task Force IDA - 10/10/2012

Count of Calls Over/Under 5:20 Minute (320 SECS) Response Time Fire (WRS to 1st Unit On Scene)

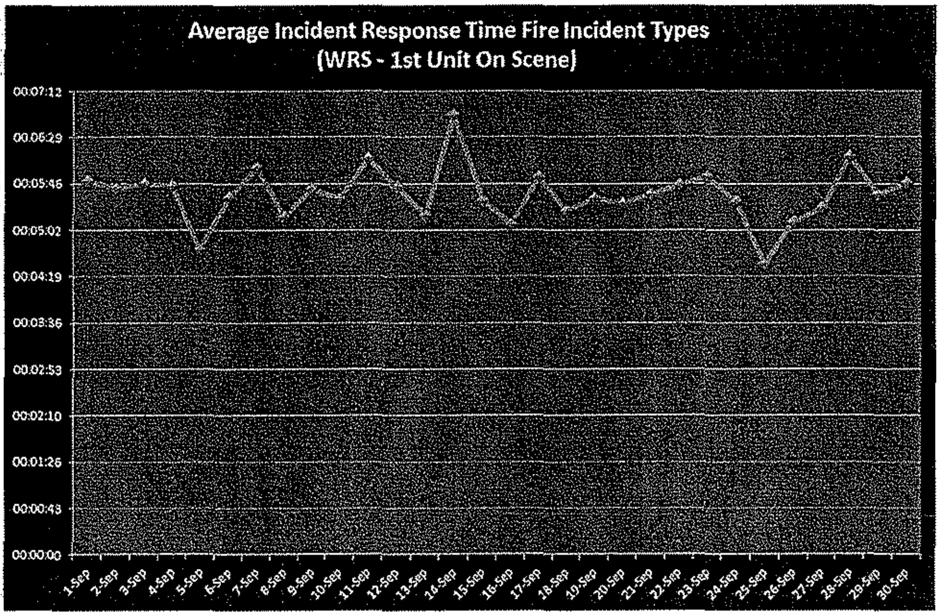
WRS to 1st Unit On Scene

Count of Incident #	Column Labels		
Row Labels	Over 320	Under 320	Grand Total
1-Sep	25	31	56
2-Sep	25	40	65
3-Sep	32	44	76
4-Sep	27	29	56
5-Sep	14	39	53
6-Sep	14	35	49
7-Sep	29	34	63
8-Sep	15	44	59
9-Sep	18	37	55
10-Sep	25	37	62
11-Sep	27	28	55
12-Sep	24	33	57
13-Sep	15	34	49
14-Sep	53	45	98
15-Sep	34	56	92
16-Sep	18	34	52
17-Sep	32	27	59
18-Sep	19	39	58
19-Sep	25	35	60
20-Sep	23	40	63
21-Sep	23	43	66
22-Sep	22	44	66
23-Sep	26	41	67
24-Sep	22	39	61
25-Sep	12	39	51
26-Sep	18	36	54
27-Sep	19	32	51
28-Sep	24	28	52
29-Sep	29	36	65
30-Sep	24	49	73
Grand Total	713	1130	1843
Percentage	38.7%	61.3%	

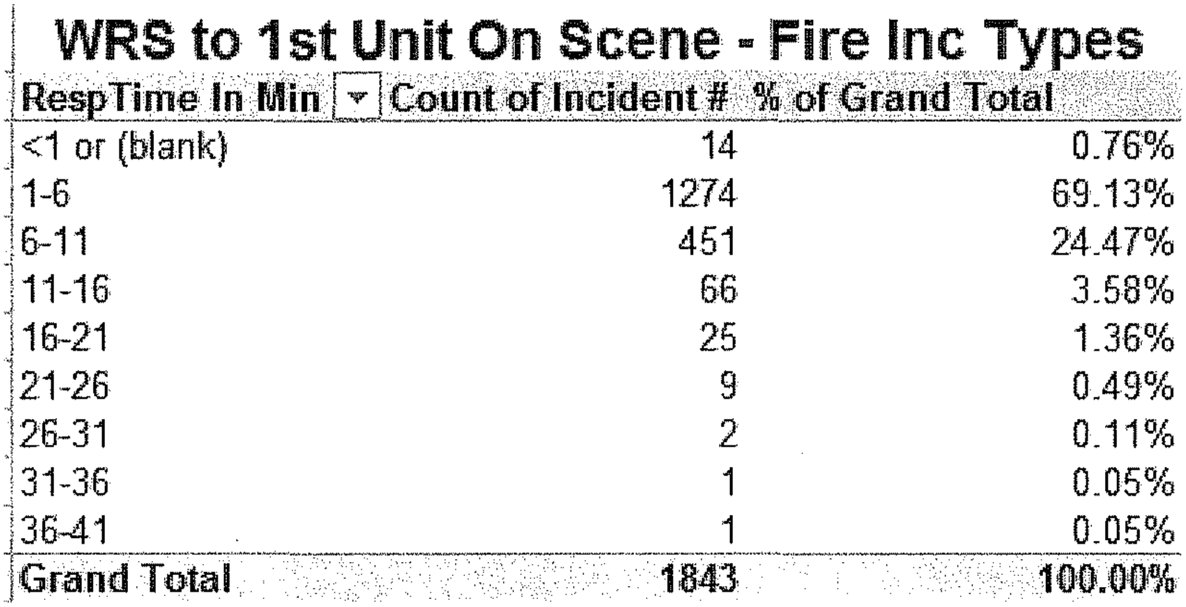


Average Response Time Fire (WRS to 1st Unit On Scene)

Row Labels	Average of WRS to 1st ONS (HH:MM:SS) (Response Time)
1-Sep	00:05:48
2-Sep	00:05:42
3-Sep	00:05:45
4-Sep	00:05:43
5-Sep	00:04:44
6-Sep	00:05:33
7-Sep	00:06:00
8-Sep	00:05:15
9-Sep	00:05:40
10-Sep	00:05:32
11-Sep	00:06:09
12-Sep	00:05:43
13-Sep	00:05:17
14-Sep	00:06:50
15-Sep	00:05:30
16-Sep	00:05:08
17-Sep	00:05:52
18-Sep	00:05:21
19-Sep	00:05:32
20-Sep	00:05:27
21-Sep	00:05:36
22-Sep	00:05:44
23-Sep	00:05:52
24-Sep	00:05:29
25-Sep	00:04:31
26-Sep	00:05:10
27-Sep	00:05:23
28-Sep	00:06:11
29-Sep	00:05:36
30-Sep	00:05:46
Grand Total	00:05:38



Response Time Intervals Fire



WRS to 1st Unit On Scene - Fire Inc Types

RespTime In Min ▾	Count of Incident #	% of Grand Total
<1 or (blank)	14	0.76%
1-6	1274	69.13%
6-11	451	24.47%
11-16	66	3.58%
16-21	25	1.36%
21-26	9	0.49%
26-31	2	0.11%
31-36	1	0.05%
36-41	1	0.05%
Grand Total	**1843**	**100.00%**

Response Time Review - Outside Standard Responses

LOS ANGELES FIRE DEPARTMENT FOUNDED 1886

Attachment B

Criteria:

Date Range: to

Total Response Time is measured as initial 911 received to First Unit On Scene. Using 8 minute as the standard

8 Minutes used for initial analysis only – secondary analysis will include other standards

Total Records:		Average:		Average:		Average:		Average:		Average:		Average:
134		00:00:22		00:02:06		00:02:28		00:01:04		00:06:18		00:09:50
Incident Number	Initial 911 Time	Initial 911 to Creation	% of RT	Creation to WRS	% of RT	Initial 911 to WRS	% of RT	WRS to 1st ENR	% of RT	1st ENR to ONS	% of RT	Total Response Time
[redacted]	10/14/2012 1:09:19 AM	00:00:30	3%	00:01:20	7%	00:01:50	9%	00:02:20	12%	00:15:29	79%	00:19:39
[redacted]	10/14/2012 6:23:52 PM	00:00:23	2%	00:01:20	7%	00:01:43	9%	00:00:51	5%	00:16:07	86%	00:18:41
[redacted]	10/14/2012 3:42:28 PM	00:00:26	2%	00:00:27	2%	00:00:53	5%	00:00:44	4%	00:16:42	91%	00:18:19
[redacted]	10/14/2012 2:05:11 PM	00:00:20	2%	00:00:58	5%	00:01:18	7%	00:00:59	5%	00:15:38	87%	00:17:55
[redacted]	10/14/2012 8:19:31 AM	00:00:29	3%	00:00:07	1%	00:00:36	3%	00:02:15	13%	00:15:02	84%	00:17:53
[redacted]	10/14/2012 5:03:37 PM	00:00:53	5%	00:08:37	50%	00:09:30	56%	00:00:59	6%	00:06:37	39%	00:17:06
[redacted]	10/14/2012 6:42:38 PM	00:00:05	1%	00:01:51	11%	00:01:56	12%	00:00:36	4%	00:13:34	84%	00:16:06
[redacted]	10/14/2012 12:22:05 PM	00:00:37	4%	00:00:12	1%	00:00:49	5%	00:01:17	8%	00:13:59	87%	00:16:05
[redacted]	10/14/2012 8:30:32 AM	00:00:33	4%	00:00:55	6%	00:01:28	10%	00:00:58	7%	00:12:05	84%	00:14:22
[redacted]	10/14/2012 7:56:32 AM	00:00:06	1%	00:05:14	40%	00:05:20	41%	00:01:08	9%	00:06:28	50%	00:12:56
[redacted]	10/14/2012 8:14:47 PM	00:00:12	2%	00:04:11	33%	00:04:23	34%	00:00:42	5%	00:07:43	60%	00:12:48
[redacted]	10/14/2012 4:53:41 PM	00:00:28	4%	00:02:10	17%	00:02:38	21%	00:01:15	10%	00:08:40	69%	00:12:33
[redacted]	10/14/2012 8:18:23 PM	00:00:30	4%	00:02:12	18%	00:02:42	22%	00:00:43	6%	00:08:42	72%	00:12:07
[redacted]	10/14/2012 1:41:36 AM	00:00:24	3%	00:02:18	19%	00:02:42	22%	00:00:16	2%	00:09:06	75%	00:12:04
[redacted]	10/14/2012 2:32:30 PM	00:00:12	2%	00:01:08	9%	00:01:20	11%	00:01:18	11%	00:09:25	78%	00:12:03
[redacted]	10/14/2012 5:47:52 PM	00:00:13	2%	00:07:11	60%	00:07:24	62%	00:00:10	1%	00:04:25	37%	00:11:59
[redacted]	10/14/2012 9:56:02 PM	00:00:26	4%	00:06:21	53%	00:06:47	57%	00:01:26	12%	00:03:46	31%	00:11:59

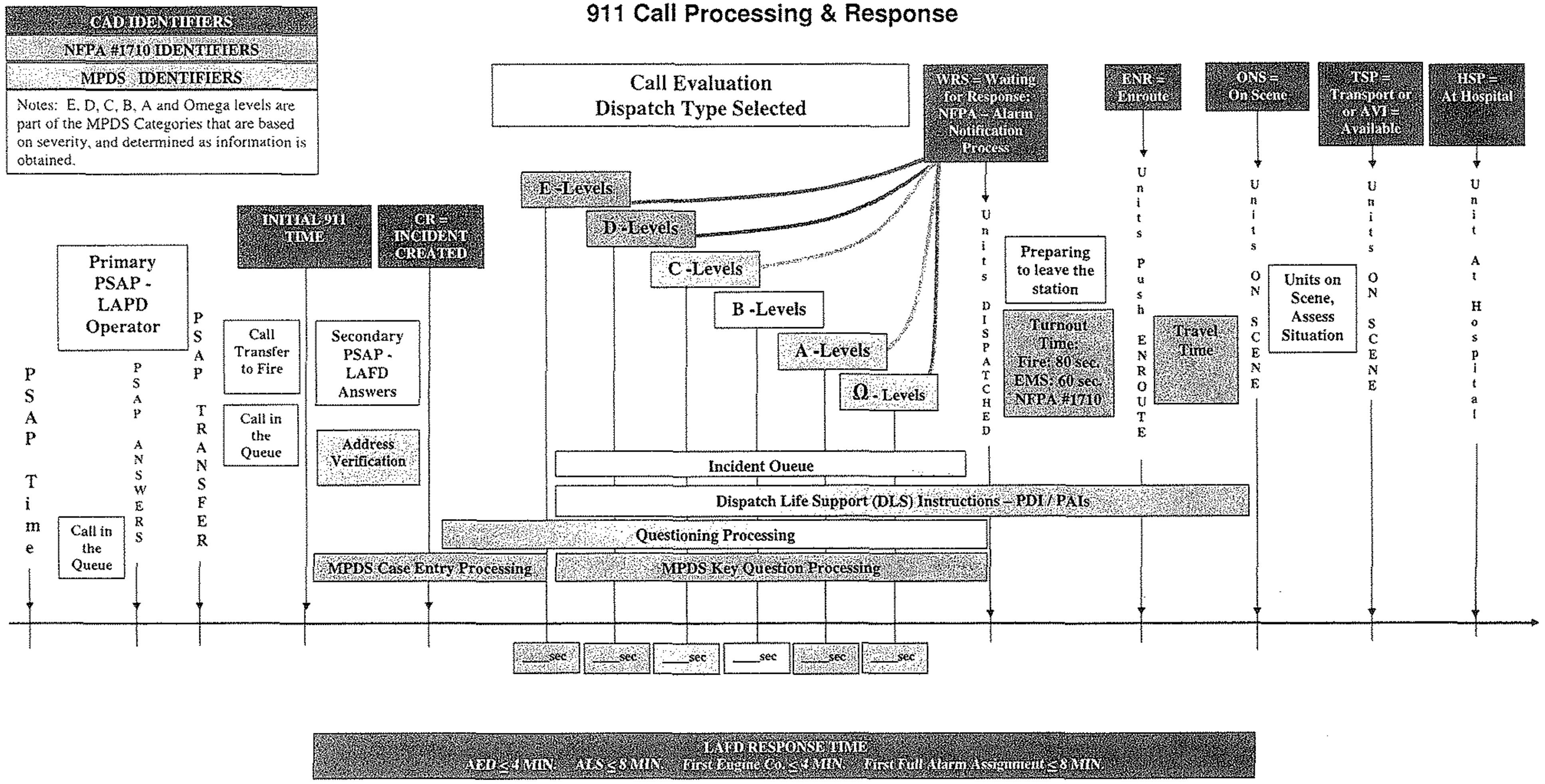
EXAMPLE

Dispatch Center

Field Resources

Attachment C

Los Angeles Fire Department
Information and Data Analysis Task Force
911 Call Processing & Response



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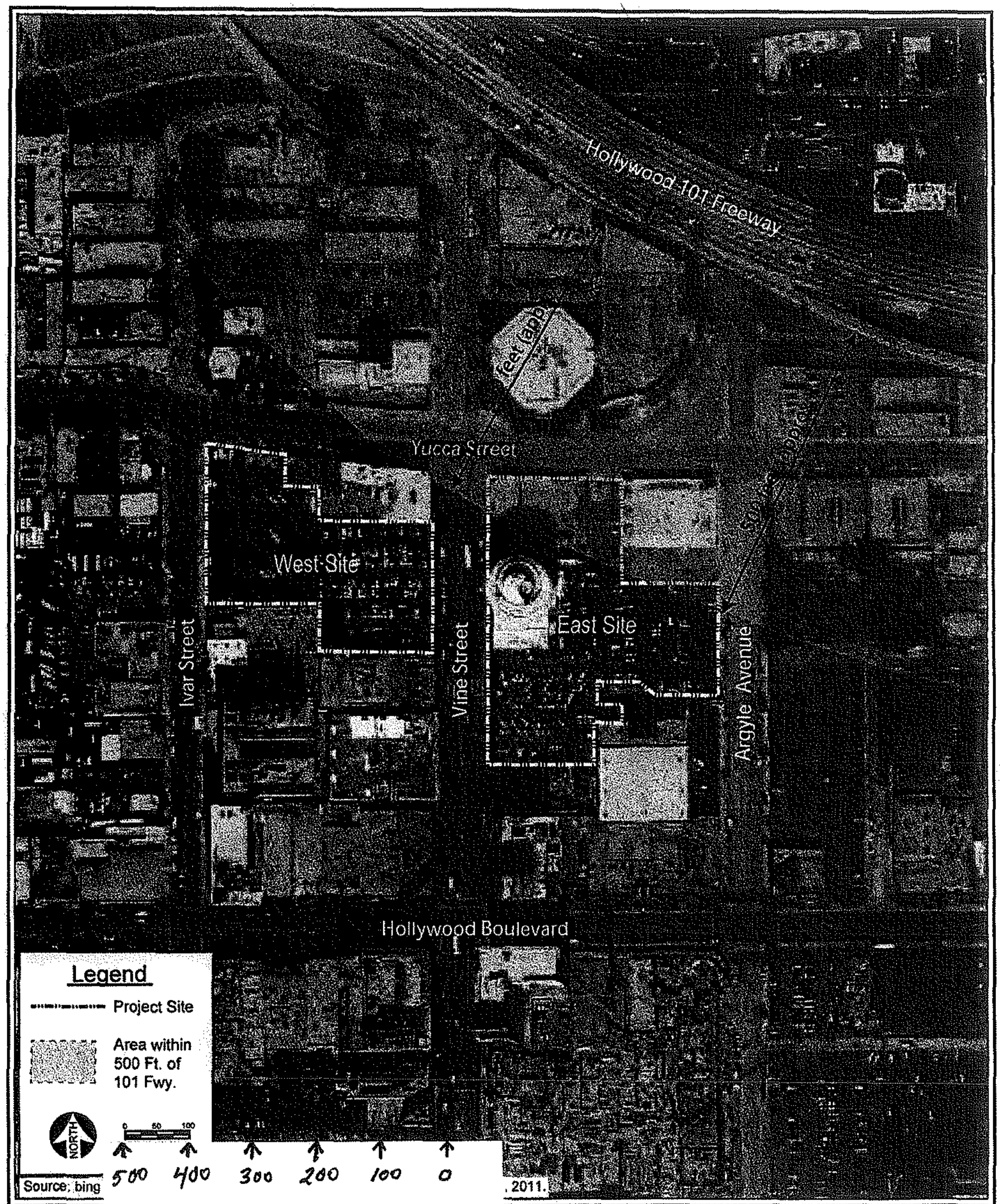

Source: bing

, 2011.

Figure 3
Approximate Limits of the Project Site
Within 500 Feet of the 101-Freeway

Source: bing maps, 2011; Image courtesy of Microsoft Corporation and USGS, 2011.

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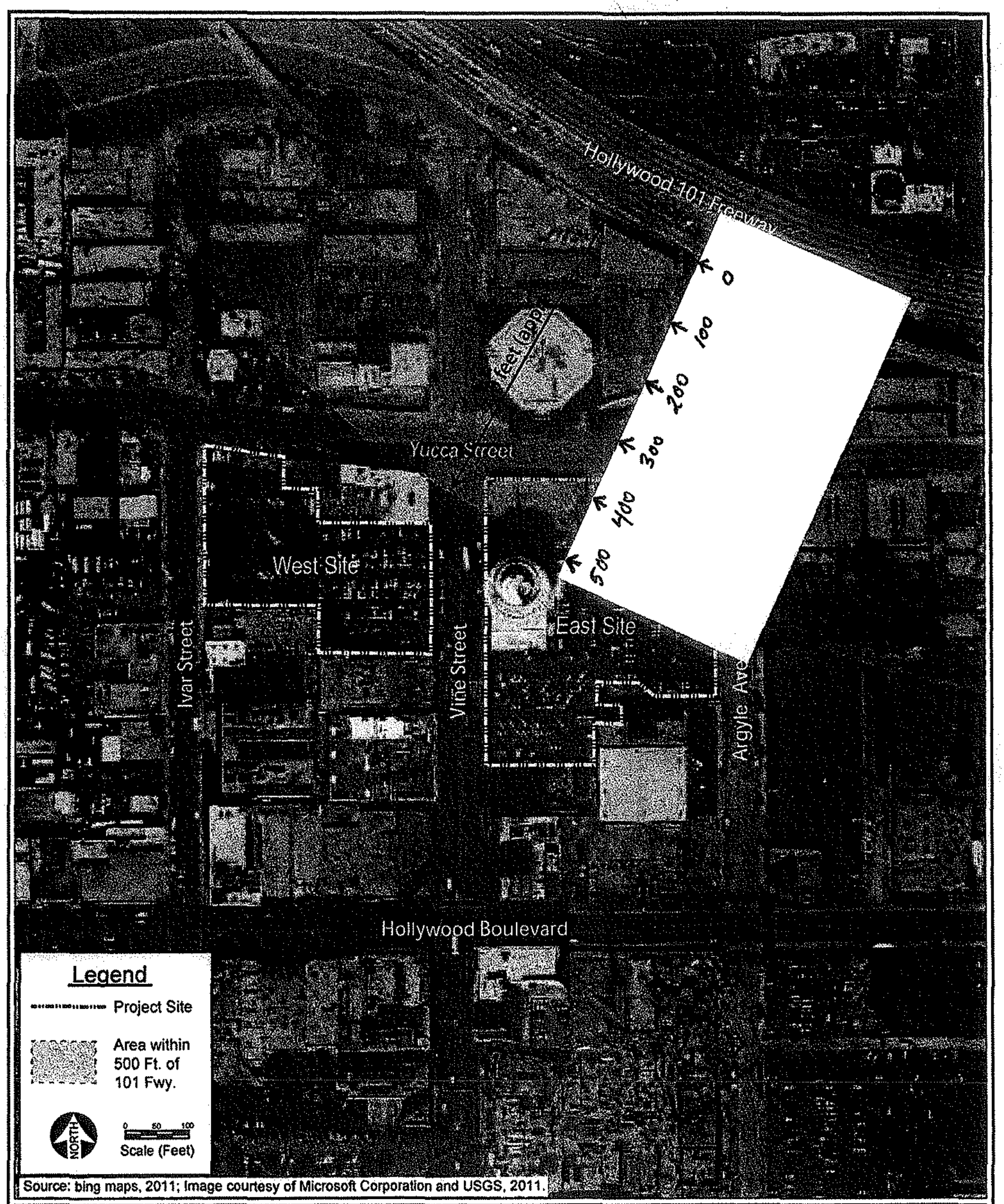
Figure 3
Approximate Limits of the Project Site
Within 500 Feet of the 101-Freeway



Source: bing maps, 2011; Image courtesy of Microsoft Corporation and USGS, 2011.

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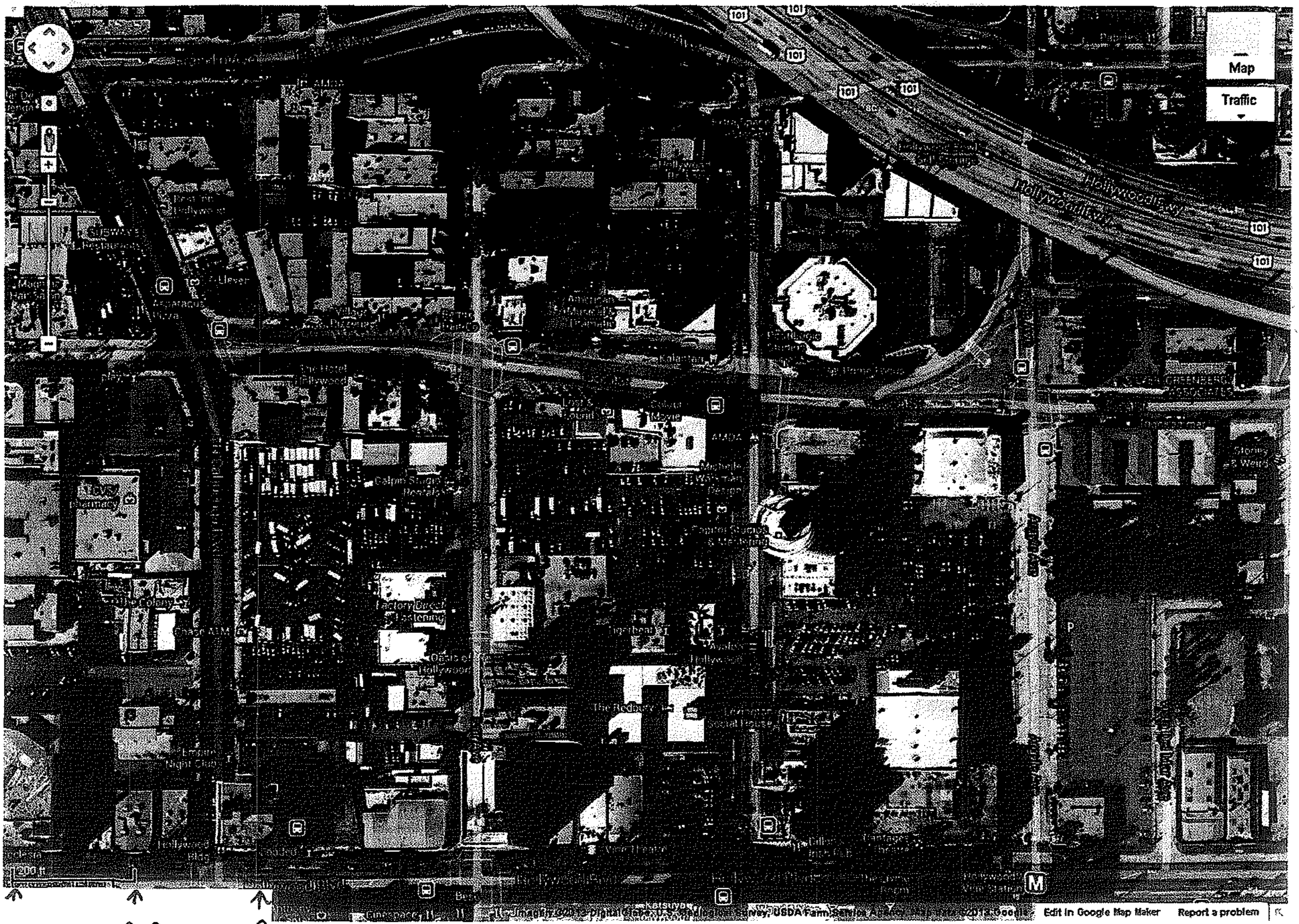
Figure 3
Approximate Limits of the Project Site Within 500 Feet of the 101-Freeway


Map
Traffic
101
Hollywood Fwy
Argyle Ave
200 ft
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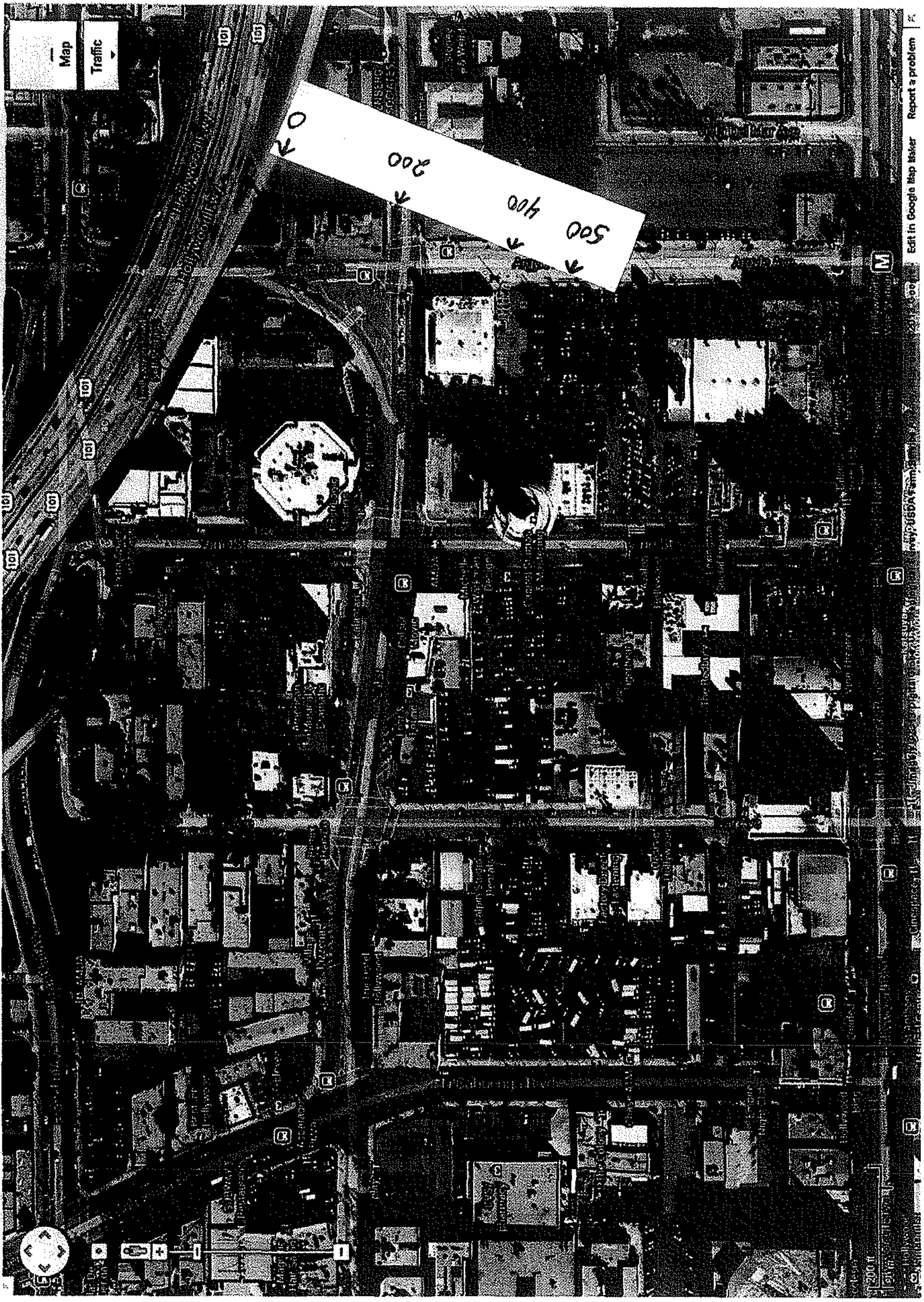
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Hollywood Fwy
Hollywood Fwy
200 ft
Edit in Google Map Maker
Report a problem

CITY PLANNING COMMISSION

200 N. Spring Street, Room 272, Los Angeles, California, 90012, (213) 978-1300
www.lacity.org/PLN/index.htm

Determination Mailing Date: APR 0 4 2013

CPC-2008-4604-GPA-ZC-HD-CUB-DB-SPR
CEQA: ENV-2011-0585-EIR, SCH No. 2011031049

Location: 11122 W. Pico Boulevard; 2431-2441 S. Sepulveda Boulevard; ADD Area: 11240, 11250, 11120, 11160, 11110 W. Pico Boulevard
Council Districts: 5 – Koretz, 11 – Rosendahl
Plan Area: West Los Angeles
Requests: General Plan Amendment, Zone Change, Height District Change, Conditional Use, Density Bonus, Site Plan Review

Applicant: Casden West LA, LLC and Los Angeles County Metropolitan Transportation Authority (MTA)
Representative: Howard Katz, Casden West LA, LLC

At its meeting on February 28, 2013, the following action was taken by the City Planning Commission:

1. **Approved** a **General Plan Amendment** to Change the Light Manufacturing and Public Facilities land use designation to **Community Commercial.**
2. **Disapproved** a General Plan Amendment for the **Add Area** located at 11110, 11200, 11240, 11250 and 11160 W. Pico Boulevard.
3. **Approved** a **Zone Change** from M2 and PF to **(T)(Q)C2-1-O**.
4. **Approved** a **Height District Change** for the PF zoned portion of the site from Height District 1XL to **Height District 1.**
5. **Approved** a **Conditional Use** to permit the sale and dispensing of a full-line of alcohol for off-site consumption for one grocery tenant.
6. **Approved** a **Conditional Use** to permit the sale and dispensing of a full-line of alcohol for off-site consumption for one retail tenant.
7. **Approved** a **Density Bonus** to allow 71 Very Low Income Senior Household units with 36 parking spaces, utilizing Parking Option, with one on-menu incentive to permit a floor area ratio of 3:1.
8. **Approved** the **Site Plan Review**.
9. **Adopted** the attached **Conditions of Approval.**
10. **Adopted** the attached **Findings.**
11. **Certified** that it has reviewed and considered the Environmental Impact Report, **ENV-2008-3989-EIR** (SCH No. 2009061041), including the accompanying mitigation measures, the Mitigation Monitoring and Reporting program, and **Adopt** the related environmental Findings, and Statement of Overriding Considerations as the environmental clearance for the project and Find:
    a. The Environmental Impact Report (EIR) for the Casden Sepulveda Project, which includes the Draft EIR and the Final EIR, has been completed in compliance with the California Environmental Quality Act (CEQA), Public Resources Code Section 21000 et seq., and the State and City of Los Angeles CEQA Guidelines.
    b. The Project's EIR was presented to the City Planning Commission (CPC) as a recommending body of the lead agency, and the CPC reviewed and considered the information contained in the EIR prior to recommending the project for approval, as well as all other information in the record of proceedings on this matter.
    c. The Project's EIR represents the independent judgment and analysis of the lead agency.

Recommendation to the City Council:

1. **Recommend** that the City Council **Approve** a **General Plan Amendment** to Change the Light Manufacturing and Public Facilities land use designation to **Community Commercial.**
2. **Recommend** that the City Council **Disapprove** a General Plan Amendment for the **Add Area** located at 11110, 11200, 11240, 11250 and 11160 W. Pico Boulevard.
3. **Recommend** that the City Council **Approve** a **Zone Change** from M2 and PF to **(T)(Q)C2-1-O.**
4. **Recommend** that the City Council **Approve** a **Height District Change** for the PF zoned portion of the site from Height District 1XL to **Height District 1.**
5. **Recommend** that the City Council **Adopt** the attached **Conditions of Approval.**
6. **Recommend** that the City Council **Adopt** the attached **Findings.**
7. **Recommend** that the City Council **Certify** it has reviewed and considered the Environmental Impact Report, **ENV-2008-3989-EIR** (SCH No. 2009061041), including the accompanying mitigation measures, the Mitigation Monitoring and Reporting program, and **Adopt** the related environmental Findings, and Statement of Overriding Considerations as the environmental clearance for the project and Find:
   a. The Environmental Impact Report (EIR) for the Casden Sepulveda Project, which includes the Draft EIR and the Final EIR, has been completed in compliance with the California Environmental Quality Act (CEQA), Public Resources Code Section 21000 et seq., and the State and City of Los Angeles CEQA Guidelines.
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   c. The Project's EIR represents the independent judgment and analysis of the lead agency.

Fiscal Impact Statement: There is no General Fund impact as administrative costs are recovered through fees.

This action was taken by the following vote:

Moved:	Roschen
Seconded:	Lessin
Ayes:	Burton, Eng, Hovaguimian
Absent:	Freer, Cardoso, Perlman, Romero

Vote: **5 - 0**

James K. Williams, Commission Executive Assistant II
City Planning Commission

Appeals: **If the Commission has disapproved the Zone Change request, in whole or in part, the applicant may appeal that disapproval to the Council within 20 days after the mailing date of this determination. Any appeal not filed within the 20-day period shall not be considered by the Council. All appeals shall be filed on forms provided at the Planning Department's Public Counters at 201 N. Figueroa Street, Fourth Floor, Los Angeles, or at 6262 Van Nuys Boulevard, Suite 251, Van Nuys.**

Final Appeal Date: APR 24 2013

If you seek judicial review of any decision of the City pursuant to California Code of Civil Procedure Section 1094.5, the petition for writ of mandate pursuant to that section must be filed no later than the 90th day following the date on which the City's decision became final pursuant to California Code of Civil Procedure Section 1094.6. There may be other time limits which also affect your ability to seek judicial review.

Attachments: Conditions, Maps, Ordinance, Findings, Resolution
City Planner: Henry Chu

35. **Driveway Plan.** Prior to the issuance of a demolition permit, the Applicant shall submit a driveway plan, to the satisfaction of DOT, which addresses:

    a. Pedestrian safety and technology and equipment installed within the driveways proposed along Pico Boulevard and Sepulveda Boulevard.

    b. All delivery truck loading and unloading shall take place on site with no vehicles backing into or out of the Project site from any adjacent street.

    The driveway and circulation plan shall be submitted to DOT's Citywide Planning Coordination Section (201 N. Figueroa Street, 4th Floor, Station 3, at 213-482-7024) to avoid delays in the building permit approval process. In order to minimize and prevent last minute building design changes, it is imperative that the Applicant, prior to the commencement of building or parking layout design efforts, contact DOT for driveway width and internal circulation requirements so that such traffic flow considerations are designed and incorporated early into the building and parking layout plans to avoid any unnecessary time delays and potential costs associated with late design changes.

36. **Wayfinding Signage.** Prior to the issuance of any Certificate of Occupancy or Temporary Certificate of Occupancy, the Applicant shall submit plans for wayfinding signage along the perimeter of the Project property, at the above-ground podium level for residents, and throughout the site to increase awareness of non-car amenities, to the satisfaction of the Planning Department.

37. **Bus/Shuttle Layover Areas.** When reasonably appropriate prior notice has been given, the Applicant shall participate in all meetings conducted by staff of the applicable transit agencies pertaining to the development of bus/shuttle layover areas within or near the project site.

→ 38. **Residential Dwelling Units.** No residential dwelling units shall be within 500 feet of the Freeway.

39. **Big Box Retail and Grocery Market Entrance/Exit.** The Applicant shall design the Project to include an Entry/Exit access point at the southeast portion for the big box retail store and grocery market. The entry/exit access point shall not be limited to an emergency exit but shall serve as an additional entry/exit for the patrons.

40. **Public Restrooms.** The Applicant shall submit final plans detailing the incorporation of public restrooms located at the southeast portion of the project site to the satisfaction of the Director of Planning. The final design shall specify the location of the facilities and identify how access to and from the facility will be achieved.

41. **Affordable Senior Housing Building.** The Applicant shall maintain the restricted Affordable Senior units in a separate building form the unrestricted units, and shall design the restricted building to meet the physical and social needs of senior citizens so as to comply with California Civil Code Section 51.2.

- <u>Lowered Podium Level</u>
  The Revised Project eliminates one level of above grade commercial space, which sets the podium level approximately 22 feet lower than the Original Project.

- <u>Peak Building Heights Reduced</u>
  The removal of a 22-foot commercial story and the redistribution of units reduces the top building height of the rear structure by five feet (from 201 feet to 196 feet). Further, the heights to the tops of the other structures were lowered by 6 to 12 feet.

- <u>Increase in Distance between Structures</u>
  Under the Revised Project, there is a distance of 84 feet between the two Sepulveda Boulevard structures and 118 feet between the Exposition Boulevard fronting structures.

- <u>Increased Number of Residential Units</u>
  The Revised Project increases the number of residential units from 538 to 638, which includes an increase of 12 in senior affordable units from 59 to 71 units.

- <u>Direct Multi-Level Commercial Garage Access</u>
  The Revised Project will provide direct access to the various levels to the new garage. All commercial parking levels will be linked internally.

- <u>Commercial/Resident Parking Levels</u>
  Parking Level P4 of the Revised Project is designed to accommodate both commercial and resident parking. The allocation of spaces between these two uses will be able to be changed should parking demand shift and more spaces need to be allocated to one use or the other.

- <u>No Building Construction on Public Storage Land</u>
  The design of the Revised Project no longer includes the construction of any garage space below or residential space above land owned by Public Storage. The Revised Project only will utilize a surface easement to improve the pedestrian access to the residential and retail lobbies on Pico Boulevard.

- <u>Parking</u>
  The number of residential parking spaces increased as the number of residential units increased. However, the total number of parking spaces in the project decreased by 234. Parking will still exceed LAMC requirements.

→ While the City Planning Commission recommended different condtions of approval at its hearing on February 28, 2013, those conditions do not affect the development envelope of the Project. Most notably, the heights of the Project buildings would remain within the heights previously analyzed in the Final EIR even accounting for the Commission's condition that no residential dwelling unit be within 500 feet of the Freeway. Accordingly, the findings made below concerning the Revised Project are equally applicable to the Project as conditioned by the Commission.

would eliminate the CO significant impact that would have occurred under the Original Project.

2. Mitigation Measures.

a. See Mitigation Measure (b) in Section F.2. below.

3. Findings.

Changes or alterations have been required in, or incorporated into, the Original Project, which avoid or substantially lessen the significant environmental effects of operational emissions generated by the Original Project. Yet, the potential for a significant project-specific and cumulative impact remains, as is the case for the Revised Project. There are no feasible mitigation measures that would avoid or substantially lessen these significant environmental impacts. However, for the reasons described above, the Revised Project would not result in any new significant impacts or increase the severity of any previously identified significant impact with respect to this environmental impact, and the same mitigation measures will be incorporated into the Revised Project. Specific economic, legal, social, technological, or other considerations, including considerations identified in Section XI of this document (Statement of Overriding Considerations) justify the decision to proceed with the Revised Project despite this significant impact.

4. Rationale for Findings.

The following rationale was applicable to the Original Project and remains applicable to the Revised Project: Operational emissions will be primarily generated by motor vehicles. The Project will prepare and implement a TDM program to the satisfaction of LADOT that will reduce traffic impacts of the Project and encourage Project residents, employees, and patrons to reduce vehicular traffic on the street and freeway system during the most congested periods of the day. Moreover, the Project is a transit oriented development that will increase density in proximity to, and encourage the use of public transit in an established urban environment. However, even with implementation of this mitigation, impacts related to ROG, NOx and CO will remain significant and unavoidable. There is no feasible mitigation that would further reduce this impact.

5. Reference.

For a complete discussion of Air Quality (operations) impacts, see Section IV.C of the DEIR, MMRP (Mitigation Measure N-2), and Errata #3.

C. Land Use Planning (Conflict with Land Use Plan, Policy or Regulation)

1. Description of Significant Effects.

The Original Project would require the demolition of existing buildings at the Project Site and the development of the site with mixed-use commercial and residential uses. The applicant is requesting multiple discretionary approvals in connection with the same. While the Original Project would result in new mixed-use residential and retail development, it is located in close proximity to the San Diego Freeway, which may result in health risk impacts, specifically outdoor air quality impacts, and is inconsistent with certain policies and objectives set forth in the City's General Plan concerning preservation of industrial uses.

For the same reasons, the Revised Project will be inconsistent with those policies since the Revised Project would provide the same uses (residential and commercial) and generate substantially the same aggregate number of employees and resident.

The Add Area Project is the re-designation of three properties from Light Manufacturing and Public Facilities to Community Commercial in order to provide for logical, consistent area-wide planning and uniform land use designations in the future. No zone change is proposed in connection with the re-designation. Accordingly, there will be inconsistencies between the zoning of the Add Area Project properties and the new General Plan designation if the Add Area Project is approved. Said inconsistencies will also mean that the existing self-storage facility on the Add Area Project site will become a non-conforming use if the Add Area Project is approved.

2. Mitigation Measures.

a. For the residential portion of the Development Project, an air filtration system shall be installed and maintained with filters meeting or exceeding the ASHRAE standard 52.2 Minimum Efficiency Reporting Value (MERV) of 13, to the satisfaction of the Department of Building and Safety.

3. Findings.

Changes or alterations had been required in, or incorporated into, the Original Project, which avoid or substantially lessen the significant environmental effects related to land use and planning, and generated by the Original Project. However, the potential for significant project-specific and cumulative impacts remain. The same level and impacts apply equally to the Revised Project, although for the reasons described above, the Revised Project would not result in any new significant impacts or increase the severity of any previously identified significant impact with respect to this environmental impact, and the same mitigation measures will be incorporated into the Revised Project. There are no feasible mitigation measures that would avoid or substantially lessen these significant environmental effects. However, specific economic, legal, social, technological, or other considerations, including considerations identified in Section XI of this document (Statement of Overriding Considerations) justify the decision to proceed with the Revised and Add Area Projects despite this significant impact.

4. Rationale for Findings.

The following rationale was applicable to the Original Project and remains applicable to the Revised Project. The inconsistency of the Project with certain policies and objectives in the General Plan relate to the siting of residential uses near sources of air pollution and the preservation of existing industrial uses. Inconsistency in these respects does not necessarily dictate that the Project is inconsistent with the General Plan as a whole. State law does not require a perfect match between a proposed project and the applicable land use plan. Thus, state law does not impose a requirement that a proposed project comply with every policy in a land use plan since such policies often try to accommodate a wide range of competing interests. Thus, to be "consistent" with a land use plan itself, the proposed project must only be "in harmony" with the applicable land use plan. As found in the Findings Regarding General Plan Amendment and Zone Change for Casden West LA, LLC's Proposed Project at Pico Boulevard and Sepulveda Boulevard, the Revised Project is consistent with numerous policies in the General Plan and Community Plan, including policies encouraging transit oriented development and increasing density near rail lines. The Project Site is consistent with those policies, which existing uses at the Project Site do nothing to advance. However, the inconsistency with objectives related to the siting of residential uses near air pollution sources and preserving existing industrial uses may cause a land use impact that is significant within the meaning of CEQA, given the City's particular CEQA significance threshold for land use impacts for this project.

The Project will exceed relevant health risk thresholds as indicated in the Final EIR. No feasible and quantifiable mitigation is available to reduce outdoor PM10 and PM2.5 emissions and indoor NO2 1-hour concentrations to levels below relevant health risk thresholds. While there is no quantifiable mitigation available to reduce the potential impacts set forth above, there are several available mitigation strategies that could improve outdoor and indoor air quality at the Project Site. These include: (1) locate opens space areas (courtyards, patios, balconies, etc.) as far from the freeway sources as possible; (2) plant vegetation between receptors and freeway sources; (3) consider site plan design minimizing operable windows and building frontages to the freeway; (4) consider options for mechanical and ventilation systems (i.e., supply or exhaust based systems); (5) if a supply-based system is proposed (i.e., actively brining outside air through intake ducts), consider locating intakes as far from the freeway sources as possible. To the extent feasible, these strategies will be implemented, and they may serve to reduce the aforementioned impacts to a less than significant level. However, because these strategies are not quantifiable, impacts related to inconsistencies with General Plan policies, including the health risk impacts discussed above' will remain significant and unavoidable.

The Add Area Project is the re-designation of three properties from Light Manufacturing and Public Facilities to Community Commercial. The re-designation is intended to provide for logical, consistent area-wide planning and uniform land use designations within the Development Project area, and in the neighborhood as a whole. Notwithstanding this intent, the re-designation will create zoning inconsistencies in the short term because the Add Area Project parcels are not currently zoned consistent with the proposed General Plan designation. For these reasons, impacts related to land use consistency would also be significant and unavoidable for the Add Area Project. There is no mitigation that would avoid these conflicts.

The Project will result in the loss of an existing industrial site in the City. It will replace existing industrial uses with a job-rich, mixed-use housing development, however, and will result in a net increase of jobs at the Project Site. Nonetheless, and because of General Plan policies that express a preference for preserving industrial uses within the City, this impact will remain significant and unavoidable.

5. Reference.

For a complete discussion of Land Use Planning impacts, see Section IV.I of the DEIR, (Mitigation Measure I-3), Errata #3, and the Findings Regarding General Plan Amendment and Zone Change for Casden West LA, LLC's Proposed Project at Pico Boulevard and Sepulveda Boulevard.

D. Original and Revised Project – Noise (Cumulative Construction and Operation)

1. Description of Significant Effects.

As discussed above, project-specific construction noise impacts would not rise to a level of significance. Nonetheless, the Original Project, together with associated related projects could result in a cumulatively significant impact with respect to construction

City Planning Commission Meeting 2-28-13 re Casden West

Part 5; 18:50

Henry Chu: Should we go into health and air quality?

Commissioner: Yes, let's go there.

Chu: Okay, so it's Building 4. The Council office made a comment that 50% -- or 25% of the residences were within --

Commissioner: I think he said 25%.

Chu: 25% were within -- were in -- were closer than 500 feet from the 405 freeway. So, yes, Building 4 is actually 350 feet away from the 405 freeway and -- umm this is City Planning Commission policy of not enf -- not allowing residential developments within 500 feet of the freeway. The applicant has stated that they would install HEPA filters of -- I believe it was 13 -- on the opposite end, but the air is constantly moving in the area. Even if you put the project 500 feet away from the freeway, it wouldn't change the air quality impacts.

Commissioner: So let's take a minute on this one. This has been a long time focus of this Commission, going back literally 7 years. We have tried to focus on ways to look at the health of our citizens, to look at the health certainly of sensitive users. Um, this is -- we've actually held here at Commission invited guests to speak to the particulate issue which is where the 500-foot number comes from. This is study that has been done around ultra-fine particulates at USC and we invited them to come here and talk to us about it. Our threshold in the past has been looking at a zoning change to residential from a public facilities issue as a concern. It's hard to go to residential when we clearly know the health risks that we're putting, I think, our residents under. My sense is that this project, if they held to the 500-foot line, which is what we would have to ask them to volunteer to do, would be to move the residence 500 feet back from the freeway. My concern also is that the very tallest building is the one closest of the freeway. So for me, that would be the threshold of discussion around this project and let's get right to it and talk about the density issue. If we were to move the building back, the question would be for the applicant, we would advise to keep the same volume that the project now represents, the same envelope that's been reviewed in terms of the EIR and in terms of the project. So that would mean a reduction in units for the total project. So, that would be the scenario that I would say that this Commission needs to discuss and see if it's an opportunity for us to review the project in that light. So I put that on the table. One, because this Commission has consistently done that and reviewed projects with this issue on public facility sites, and second, because it is very clear new evidence about health concerns and I'm very reluctant to approve a residential use within that 500 feet. Others?

Commissioner 2: Just for clarification, Commissioner Burton, which portion of the site is public facilities and what is not?

Chu: The MTA portion of the site.

Commissioner 2: Right, so what percentage of the site is that? Approximately?

Chu: Um, probably about 25 to 30 percent.

Commissioner 2: So about 1/3 of the site?

Chu: I would say.

Commissioner 1: Others? Sean?

Commissioner 2: I mean Commissioner Roschen, one of the -- you know, I understand that the Commission has adopted this policy. One of the concerns I have is making the project more dense if you were to push the residential over. One of the things I like about the current site design is that the amenities are in the middle of the project and they have access. It's more of a village concept. There's some different massing. It gives people in the project equal opportunities to the amenities. So one of the things I would be concerned about is moving the entities to the extreme of the project and I think farthest away from where the seniors are located. I would just want to think about that.

Commissioner 1: Why don't we do this, because I think, I'd hate to put that up as the discussion point. That versus health, but let's take that under the discussion around, let's call it the TOD orientation, the urban design of the project.

Commissioner 2: That would be fine. And I think it would be great to have more information on the health aspect. We've heard you talk a little bit about potential HEPA filters, as well as it being an active air -- area. It would be interesting to have more data on that as we discuss this. I don't know who best to provide that, but that would be useful.

Chu: We do have an environmental consultant present, Mr. Brett Palmeroy, who conducted the air quality study.

Commissioner 1: And we've had this discussion of course, previously in the Commission. And the concern around the filters too, is that with bedrooms you have open windows and so the filters are less effective. Others on the air quality issue?

Commissioner 3: I have one question.

Commissioner 1: George?

Commissioner 2: I'm sorry, I'm not quite -- can we hear at some point from the consultant and hear some perspective on that issue?

Commissioner 1: Sure. Do you want to ask him that? Do you want to invite him up? Is he here?

Commissioner 2: George, I didn't mean to cut you off just before we move off this topic.

Commissioner 1: No. Thank you, Sean.

Brett Palmeroy: Hi. My name is Brett Palmeroy with Parker Environmental Consultants. Was there a specific question? I didn't hear the specific question from the back.

Commissioner 2: We're just trying to make a determination of the health risks within 500 feet of the freeway and there was some discussion of adding HEPA filters or being an active air area. Can you just shed some light on that for us?

Palmeroy: Well based on my experience with coordinating with the South Coast Air Quality Management District and I believe it was already referenced with the USC studies, the carcinogenic materials are the ultra-fine particulars, the 0.1 diameter microns. So the HEPA filters really achieve their most effectiveness with the larger diameter pollutants. So the measureable effectiveness is hard to relate to an urbanized and developed location like this. You can do it in a lab, but in terms of the nature of the impact being reduced to a less than significant level from a CEQA perspective, it is difficult to rely on a HEPA filter or a MERV-13 to achieve a 0.1 micron diameter filtration. The effectiveness is really targeted more from the two microns up to the 10, the PM2.5, the PM10.

Commissioner 4: Everyone understand that?

Commissioners: [Laughter.]

Commissioner 5: George did.

Palmeroy: It's in the HRA specifically with respect to the effectiveness of the reduction of particulate matter as a whole and the HEPA filters will serve to do that, and in terms of the diesel particulate and the ultra-fine particulates, that's where the study area becomes a little less concrete and a little less of a guaranty in terms of a mitigation standpoint.

Commissioner 3: And what's the effect of being 500 feet away from the freeway versus 350 feet from the freeway?

Palmeroy: The effect is that is that the impacts will be reduced. To the extent that they are reduced --

Commissioner 3: Significantly reduced?

Palmeroy: In terms of CEQA language or in terms of every day language? I mean, it's a -- with every distance you are set back, you will see an improvement. That's the nature of the situation. So, from a 500-foot setback scenario, you'd be needing CARB's recommendation and their siting criteria for sensitive receptor. That's where the analysis would fall in terms of the CEQA language.

Part 6; 00:00

Commissioner 3: And that was one of the bases for the 500-foot?

Palmeroy: Right.

Commissioner 1: And that's the LAUSD prop -- policy as well.

Palmeroy: Right.

Commissioner 3: And what about this notion that you mention as active air area. Can you explain that a little bit to us? How does that -- what does that mean and how is that different from other areas?

Palmeroy: I think there's a lot of things to consider in this particular location, the freeway being elevated compared to the ground level location. And the climate in this particular location is predominately trending from the west to the east to the north from the winds location, from a climate perspective. And then you have a lot of different sources contributing to the ambient air quality. The freeway is one source, but you have roadways and other local networks and buses and trucks and things that actively use the smaller side streets too, which are also contributing to the air quality. The HRA itself just focuses on just the freeway because that's what the policies are trying to address. There's a lot of different things factoring into the actual air quality conditions of the site, in addition to just the freeway. So it's worth noting that the ambient air quality for the entire basin, for some perspective, the cancer risks that were modeled back in 2004 by the Air Quality Management District, concluded that the basin average for cancer risks is somewhere around 1200 per 1 million. And for this particular study, we concluded that around 300 feet, it was about 400 per 1 million from just the freeway. So the freeway contributes to the ambient, but as a basin-wide issue it's not just -- I mean it's a localized impact for this project based on the setback from the freeway, but there's multiple factors contributing to the ambient air quality of the project.

Commissioner 1: So, at this point, I want to thank you Brett. Sean, I'd like to cover all these other things if we can and we can always revisit this. That was really helpful. Thank you. Henry --

Palmeroy: Thank you.

Commissioner 1: Let's go on to the next --

Commissioner 6: Can I just ask one question?

Commissioner 1: Yeah if you can kinda --

Commissioner 6: Yeah, very, very small question. Can you address the effectiveness of HEPA filters in a residential where you have open windows -- what is it going to be doing? And especially in an area where the climate is moderate where you don't need to run the air conditioning all the time? So what would HEPA really do to the people living in those units?

Palmeroy: That's a very good question and it's something I that needs to be discussed in coordination between the HBAC and mechanical team from the site design perspective. Based on just ventilation of the building itself, there are a lot of different ventilation options, supply based and exhaust based meaning you're either bringing in active air from the outside through your building or you're allowing the building to send the air from the inside out. So, it's an exhaust -- that would be the exhaust scenario. So to answer your question, the HEPA filters, the AQMD has said there is about an 85% per MERV13 equivalent HEPA filter, which is about an 85% real world reduction effectiveness of reducing the particulate matter in a residential project like this assuming there is operable windows. They've done a few studies to show that there's -- even though in a lab setting, if you look at a chart for MERV ratings, you can achieve something better in real life that usually comes around to 85% removal efficiency.

Commissioner 1: Brett, I'm going to say thanks very much. Really helpful. We do have to keep this moving and there's still a lot to cover. So, Henry can we take on the next issue?

DEPARTMENT OF
CITY PLANNING
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INFORMATION
www.planning.lacity.org

April 12, 2013

SENT VIA EMAIL TO ROBERT@ROBERTSILVERSTEINLAW.COM, NOT FOLLOWED BY U.S. MAIL

Mr. Silverstein:

RE: Public Records Act Request For Casden West Project

This letter is a follow up to our extension letter dated March 29, 2013, in response to your request dated March 21, 2013, seeking records from the Department of City Planning pursuant to the California Public Records Act (CPRA) regarding the above.

After thorough research, the Department advises you to use the link below which may be responsive to your requests #1 and 2:

http://www.planning.lacity.org/code_studies/airquality/StaffRpt_AdvisoryNotice_ExhibitsA-F.pdf

Also, for #1, and attached to the email which contained this letter, is the ZI for the Advisory Notice for Freeway Adjacent Sensitive Uses, which became effective in November 2012.

For #3, the audio of the hearing of City Planning Commission Case #2008-4604-GPA-ZC-HD-CUB-DB-SPR can be accessed via our website: www.planning.lacity.org, under Meetings and Hearings. The case file itself can be viewed beginning on Wednesday, April 17, 2013. Please call me at 213-798-1260 to make an appointment to review this case.

Please call me at 213-978-1260 should you have any questions. Thank you.

Sincerely,

Beatrice Pacheco

for Mark Lopez
Custodian of Records

ML:bp

ZONING INFORMATION (Z.I.) NO. 2427
FREEWAY ADJACENT ADVISORY NOTICE FOR SENSITIVE USES

Effective: November 8, 2012
Council District: Citywide, within 1,000 feet of freeways

Instructions:

All applicants filing a discretionary application for which the City Planning Commission is the initial decision-maker or the decision-maker on appeal, shall receive a copy of the attached Advisory Notice. The Advisory Notice applies to the following types of discretionary applications:

Discretionary Permit	LAMC Section
Conditional Use Permits granted by the CPC	12.24 U
Density Bonus	12.21.A.25
Public, Quasi-Public Open Space Land Use Categories	12.24.1
Zone Change	12.32
General Plan Amendment	11.5.6
Major Project Review/CUP	12.24.U.14
Tentative Tract Map	17.06
Preliminary Parcel Map	17.50

Please review the "Frequently Asked Questions" attachment and refer any other pre-filing questions regarding the notice or its applicability to the Development Services Center (213) 482-7077 or planning@lacity.org. Inquiries regarding the applicability of the Advisory Notice to a specific project or case may be directed to the Project Planner assigned to the application.

FREEWAY ADJACENT ADVISORY NOTICE FOR SENSITIVE USES FREQUENTLY ASKED QUESTIONS

1. Why am I receiving a copy of the Freeway Adjacent Advisory Notice?

In recent years, the City Planning Commission (CPC) has taken an increased interest in projects classified as sensitive receptor sites, particularly schools and residential uses, in close proximity to freeways.

In order to inform applicants of the CPC's concerns on the matter and provide guidance for addressing this issue from the early inception of a project, the Freeway Adjacent Advisory Notice is being distributed to all applicants for new projects and expansions of existing development involving sensitive uses within 1,000 feet of freeways.

2. Why was 1,000 feet chosen as the boundary for the Advisory Notice?

Freeways are a major stationary source of air pollution and their impact on the air we breathe and public health in cities has been and continues to be a subject of public health research. Scientific literature previously focused on impacts to immediately surrounding communities within 500 feet of freeways; however, recent studies have established strong links to negative health outcomes affecting sensitive populations as far out as 1,000 feet from freeways, in some instances up to one mile. The Commission felt that 1,000 feet would be a conservative distance that would include potential properties that could house populations considered to be more at-risk of the negative effects of air pollution caused by freeway proximity.

3. Are the recommendations in the Advisory Notice mandatory?

The Advisory Notice is informational in nature and does not impose any additional land use or zoning regulations. It is intended to inform applicants of the significance of this issue for the City Planning Commission. Several recommended approaches are highlighted to assist in navigating through this complex issue; however, applicants need not adhere to any one particular method for addressing air quality impacts on a particular project. Project design features or conditions may be tailored to individual projects as deemed appropriate.

4. Is this a prohibition or a moratorium?

The Freeway Adjacent Advisory Notice is not a prohibition or moratorium on new development near freeways. It is advisory only and serves as an early notification to applicants of discretionary projects who may not otherwise be aware of the potential impacts on future building occupants of siting a building near a freeway. The notice provides background on the issue and guidance that will assist the City Planning Commission in making required findings for discretionary approvals after considering the unique circumstances of each individual case.

ADVISORY NOTICE REGARDING SENSITIVE USES NEAR FREEWAYS

TO: APPLICANTS FOR NEW PROJECTS AND EXPANSIONS OF EXISTING DEVELOPMENTS INVOLVING SENSITIVE USES WITHIN 1,000 FEET OF FREEWAYS

FROM: THE CITY PLANNING COMMISSION

EFFECTIVE DATE: NOVEMBER 8, 2012

CITY PLANNING COMMISSION'S STATEMENT OF CONCERN:

The purpose of this notice is to alert applicants to the City Planning Commission's recent concerns relative to the placement of sensitive uses near freeways. In recent years, the City Planning Commission (CPC) has taken an increased interest in projects classified as sensitive receptor sites, particularly schools and residential uses, in close proximity to freeways.

APPLICABILITY AND INTENT OF THIS NOTICE:

This notice serves to advise applicants for discretionary land use requests under the authority of the City Planning Commission of the Commission's concerns. Project design alternatives have been identified below. If integrated into the project design, these measures may help to reduce or address impacts and public health risks, and therefore, should be considered.

BACKGROUND:

Review of recent air pollution studies shows a strong link between the chronic exposure of populations to vehicle exhaust and particulate matter from roads and freeways and elevated risk of adverse health impacts, particularly in sensitive populations such as young children and older adults. Areas located within 500 feet of a freeway[1] are known to experience the greatest concentrations of fine and ultrafine particulate matter (PM), a pollutant implicated in asthma and other health conditions. In 2003, the California Legislature enacted SB 352, which precludes the siting of public schools within 500 feet of a freeway, unless it can be shown that any significant health risk can be mitigated.

On January 26, 2009 the City Planning Department presented a report to the City Planning Commission in response an earlier Commission request for Department staff to outline recommendations addressing the issue of public health and freeway proximity. In response to a subsequent request on November 11, 2011, the Planning Department submitted a report in January 2012 outlining potential mitigation measures for housing projects in proximity to freeways. On July 12, 2012 the CPC directed staff to prepare an advisory notice notifying applicants of the Commission's interest and careful consideration of public health implications in their review of freeway-adjacent projects.

DEFINITION OF SENSITIVE USES:

South Coast AQMD's Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning, defines a sensitive receptor as a person in the population who is particularly susceptible to health effects due to exposure to an air contaminant.

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[1] Freeway, as defined in the Caltrans Highway Design Manual – Chapter 60, pg. 60-2: (May 7, 2012)
"Freeway--A divided arterial highway with full control of access and with grade separations at intersections."

The following are land uses (sensitive sites) where sensitive receptors are typically located:

- residences
- schools, playgrounds and childcare centers
- long-term health care facilities
- rehabilitation centers
- adult day care/convalescent centers
- hospitals
- retirement homes

EXISTING ADOPTED POLICIES:

The City's General Plan already contains adopted policies addressing health-based risks and outcomes. Below are a few that are directly related to the placement of sensitive uses near freeways.

> **Air Quality Element Policy 4.3.1:** Revise the City's General Plan/Community Plans to ensure that new or related sensitive receptors are located to minimize significant health risks posed by air pollution sources.
>
> **Housing Element Policy 4.1.9:** Whenever possible, assure adequate health-based buffer zones between new residential and emitting industries.
>
> **Housing Element Policy 2.1.2:** Establish standards that enhance health outcomes.

A Finding of consistency with the existing policies in the City's adopted General Plan will be weighed in the Commission's consideration of each project, as set forth in LAMC Section 12.32 C.3 (Land Use Legislative Actions):

"**Procedure for Applications**. **(Amended by Ord. No. 173,754, Eff. 3/5/01.)** Once a complete application is received, as determined by the Director, the Commission shall hold a public hearing or direct a Hearing Officer to hold the hearing. If a Hearing Officer holds the public hearing, he or she shall make a recommendation for action on the application. *That recommendation shall then be heard by the Planning Commission, which may hold a public hearing and shall make a report and recommendation regarding the relation of the proposed land use ordinance to the General Plan and whether adoption of the proposed land use ordinance will be in conformity with public necessity, convenience, general welfare and good zoning practice.*"

STANDARD CONDITIONS AND DESIGN ALTERNATIVES TO CONSIDER:

Currently, there is no requirement to provide mitigation measures to address diminished ambient air quality in projects that are developed "by-right" - that is, without discretionary approval. However, with projects that require discretionary approval, the City has an opportunity to impose conditions to lessen the effects of air pollution exposure.

Incorporating the following standard conditions can further enable the Commission to evaluate the merits of a project in order to make the required Findings.

Though impact analysis of the air environment on new sensitive receptors in proximity to transportation facilities is not required by CEQA, in the interest of providing information to the public, and creating healthy communities, the following measures should be taken under advisement.

1. **Conduct Site-Specific Health Risk Assessment**

The City Planning Commission advises that applicants of projects requiring an Environmental Impact Report, located in proximity of a freeway, and contemplating residential units, schools, and other sensitive uses, perform a Health Risk Assessment as a supplemental technical report. The Health Risk Assessment can provide valuable information to applicants in understanding any potential health risks associated with a project and will enable applicants to make informed decisions about site planning and design up-front, from the earliest stages of a project. A Health Risk Assessment is prepared by a qualified consultant who can: identify air quality levels particular to a specific project site based upon variables such as topography and prevailing wind patterns, for example; disclose potential health risks to future residents or occupants that may result from the project; and offer best practices to improve health outcomes, based upon emerging research and in accordance with policies of the South Coast Air Quality Management District (SCAQMD).

2. **Improve Indoor Air Quality with MERV-Rated or HEPA Air Filtration Equipment**

As a condition of approval, the City Planning Commission may, at its discretion, impose a requirement that any project proposing sensitive land uses (as defined above) within 1,000 feet of a freeway shall be required to install and maintain air filters meeting or exceeding the ASHRAE Standard 52.2 Minimum Efficiency Reporting Value (MERV) of 11 or higher.

3. **Further Reducing Exposure through Project Design**

   - Building Orientation. Locate open space areas (courtyards, patios, balconies, etc) as far from the freeway sources as possible;

   - Screening with Vegetation. Plant vegetation between receptors and freeway sources. Mature tree species such as redwood, live oak, and deodar trees have found to remove particulate matter[2].

   - Reduce Operable Windows. Consider designing a site plan that requires minimal operable windows on freeway-facing frontages.

FUTURE STEPS:

The City may go further to address this issue in New Community Plans, as part of the new Health and Wellness Chapter of the General Plan Framework, and possibly through development standards in the Comprehensive Zoning Code Revision. In the interim this important issue will continue to be brought to the fore, and alternatives and conditions suitable to each individual project considered.

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[2] Cahill, Thomas A. 2008. Removal Rates of Particulate Matter onto Vegetation as a Function of Particle Size. Breathe California Sacramento-Emigrant Trails.
http://www.sacbreathe.org/Local%20Studies%20Vegetation%20Study.pdf

HEALTH RISK ASSESSMENT FOR THE PROPOSED MILLENNIUM HOLLYWOOD DEVELOPMENT

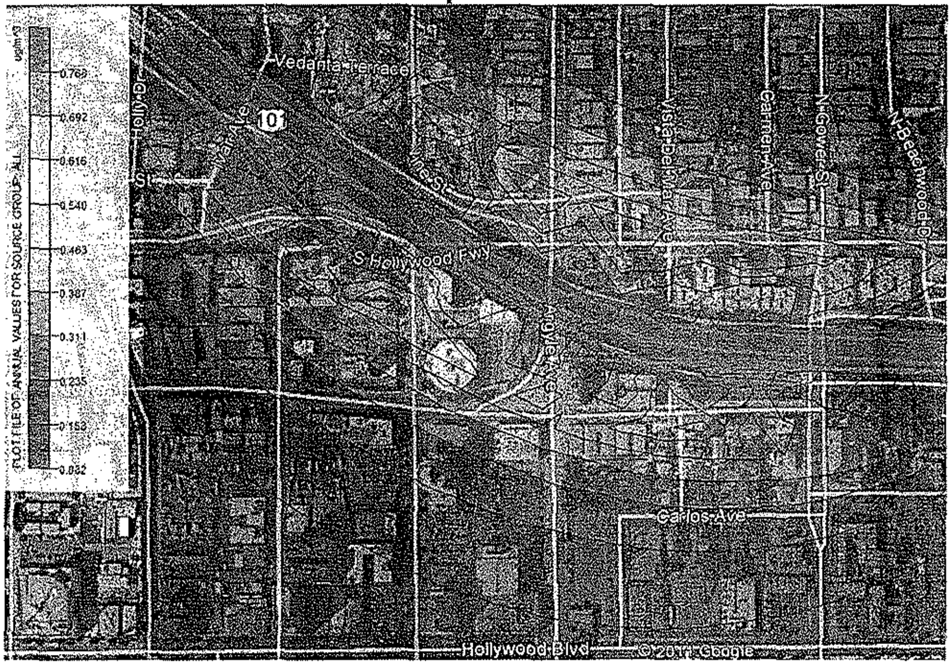
Prepared for:
CAJA Environmental Services
11990 San Vicente Blvd., Suite 200
Los Angeles, CA 90019

Prepared by:

PARKER
ENVIRONMENTAL CONSULTANTS
25000 Avenue Stanford, Suite 209
Santa Clarita, CA 91355
www.parkerenvironmental.com

June 25, 2012

Figure 2
DPM Dispersion Model



CONCLUSION

As discussed above, the 101 Freeway creates an ambient air quality environment at the Project Site where carcinogenic risk and maximum 1-hour concentrations of NO_2 exceed SCAQMD standards. As stated previously, the risks in this environment are primarily related to DPM emissions, which contributed more than 95 percent of the identified carcinogenic risk values for all exposure durations, from vehicles traveling on the 101 Freeway.

The Project, however, would not include the operations of any land uses routinely involving the emission, use, storage, or processing of carcinogenic or non-carcinogenic toxic air contaminants. Similarly, the Project does not propose land uses that routinely attract heavy-duty diesel-fueled vehicles to the Project Site. Thus, no appreciable operational-related TACs would result from Project implementation.

As previously discussed, to reduce exposure to DPM associated with vehicle emissions, CARB recommends avoiding siting new sensitive land uses such as residences, schools, daycare centers, playgrounds, or medical facilities within 500 feet of a freeway, urban roads with traffic volumes exceeding 100,000 vehicles/day, or rural roads with volumes greater than 50,000 vehicles/ day. The Project Site has a combined lot area of approximately 194,495 square feet (4.47 acres). Approximately 85 percent of the Project Site's lot area is located more than 500-feet from the 101 Freeway. As shown in Figure 3 on page 19, the areas of the Project Site that fall within 500 feet of the 101 Freeway are limited to areas within the East Site and include a portion of the Capitol Records Complex and a separate approximate 2,800 square-foot triangular-shaped area within northeast corner of the East Site. The Capitol Records Complex is currently developed with commercial office land uses, and is proposed to be retained as office uses under the proposed development. As such, no residential or other sensitive land uses would be located within this area on the East Site as part of the Project. The approximate 2,800 square-foot triangular-shaped area on the northeast corner of the East Site does fall within the proposed podium footprint of the proposed structure, and as such could potentially be developed with residential or other sensitive land uses. This area represents approximately 1.4 percent of the Project Site's total lot area. Thus, approximately 98.6% of the Project's proposed development area would be located farther than 500 feet from the 101 Freeway. Accordingly, the Project would be substantially consistent with CARB's siting recommendations. As discussed previously in this report, the Project Site is within the Hollywood Community Plan Area, for which the City recently completed a Final EIR for the Hollywood Community Plan Update. CARB commented on the City's EIR and stated that "[i]f the lead agency determines that a mitigation measure requiring a 500 foot buffer between the 101 Freeway and sensitive land uses is infeasible then the potential health risks impacts to these receptors should be quantified."[20] Accordingly, this HRA has been prepared to quantify health risks at the Project Site. Based on the findings of air pollutant concentrations predicted for the Project Site, the Project's sensitive land uses would be exposed to unhealthy outdoor air quality.

To minimize adverse health effects associated with diminished ambient air pollution levels in the project vicinity, the Department of City Planning recommends that projects incorporate air filtration systems with filters meeting or exceeding the ASHRAE 52.2 Minimum Efficiency Reporting Value (MERV) of 13, to the satisfaction of the Department of Building and Safety. While MERV 13 filters would be effective in improving indoor air quality as compared to lower efficiency filters, data published by the SCAQMD indicates that filters with this rating typically achieve a dust spot efficiency of approximately 85% for PM_{10} and $PM_{2.5}$. Yet, DPM (the primary TAC of concern at the Project Site) is classified as ultrafine particulate (less than $PM_{0.1}$) and thus the indoor air filtration would have no measureable affect at lowering the indoor carcinogenic risk at the Project Site. Thus, no feasible mitigation is available to reduce carcinogenic risk impacts or exposure impacts to elevated NO_2 at the Project Site to levels below the thresholds of significance.

Certain strategies may nevertheless improve outdoor and indoor air quality at the Project Site. These strategies include:

- Attempting to locate open space areas, such as courtyards, patios, balconies, as far from the freeway sources as possible;
- Considering vegetation plantings between sensitive receptor uses and freeway sources;
- Considering site plan design that limits operable windows and building frontages to the freeway;

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[20] *CARB Comment Letter on Hollywood Community Plan Update Draft EIR, p.1, June 1, 2011.*

Source: bing maps, 2011; Image courtesy of Microsoft Corporation and USGS, 2011.

PARKER
ENVIRONMENTAL CONSULTANTS

Figure 3
Approximate Limits of the Project Site
Within 500 Feet of the 101-Freeway

- Considering options for mechanical and ventilation systems, such as supply or exhaust based systems, that enhance air quality;
- Considering that, if a supply-based system (i.e., actively bringing outside air through intake ducts) is used, it locates intakes as far from the freeway sources as possible.

In summary, the Project Site is located in an existing ambient air quality environment that exceeds standards due to heavy traffic on the 101 Freeway. This HRA has quantified and disclosed the potential air quality health risks associated with the Project Site location consistent with the recommendations of CARB and the Department of City Planning's recommended approach for projects within the Hollywood Community Plan Area that are within 500 feet of the 101 Freeway.

The NEW ENGLAND
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ESTABLISHED IN 1812 SEPTEMBER 9, 2004 VOL. 351 NO. 11

The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age

W. James Gauderman, Ph.D., Edward Avol, M.S., Frank Gilliland, M.D., Ph.D., Hita Vora, M.S., Duncan Thomas, Ph.D., Kiros Berhane, Ph.D., Rob McConnell, M.D., Nino Kuenzli, M.D., Fred Lurmann, M.S., Edward Rappaport, M.S., Helene Margolis, Ph.D., David Bates, M.D., and John Peters, M.D.

ABSTRACT

BACKGROUND

Whether exposure to air pollution adversely affects the growth of lung function during the period of rapid lung development that occurs between the ages of 10 and 18 years is unknown.

METHODS

In this prospective study, we recruited 1759 children (average age, 10 years) from schools in 12 southern California communities and measured lung function annually for eight years. The rate of attrition was approximately 10 percent per year. The communities represented a wide range of ambient exposures to ozone, acid vapor, nitrogen dioxide, and particulate matter. Linear regression was used to examine the relationship of air pollution to the forced expiratory volume in one second (FEV_1) and other spirometric measures.

RESULTS

Over the eight-year period, deficits in the growth of FEV_1 were associated with exposure to nitrogen dioxide ($P=0.005$), acid vapor ($P=0.004$), particulate matter with an aerodynamic diameter of less than 2.5 μm ($PM_{2.5}$) ($P=0.04$), and elemental carbon ($P=0.007$), even after adjustment for several potential confounders and effect modifiers. Associations were also observed for other spirometric measures. Exposure to pollutants was associated with clinically and statistically significant deficits in the FEV_1 attained at the age of 18 years. For example, the estimated proportion of 18-year-old subjects with a low FEV_1 (defined as a ratio of observed to expected FEV_1 of less than 80 percent) was 4.9 times as great at the highest level of exposure to $PM_{2.5}$ as at the lowest level of exposure (7.9 percent vs. 1.6 percent, $P=0.002$).

CONCLUSIONS

The results of this study indicate that current levels of air pollution have chronic, adverse effects on lung development in children from the age of 10 to 18 years, leading to clinically significant deficits in attained FEV_1 as children reach adulthood.

From the Department of Preventive Medicine, University of Southern California, Los Angeles (W.J.G., E.A., F.G., H.V., D.T., K.B., R.M., N.K., E.R., J.P.); Sonoma Technology, Petaluma, Calif. (F.L.); Air Resources Board, State of California, Sacramento (H.M.); and the University of British Columbia, Vancouver, B.C., Canada (D.B.). Address reprint requests to Dr. Gauderman at the Department of Preventive Medicine, University of Southern California, 1540 Alcazar St., Suite 220, Los Angeles, CA 90089, or at jimg@usc.edu.

N Engl J Med 2004;351:1057-67.

THERE IS MOUNTING EVIDENCE THAT air pollution has chronic, adverse effects on pulmonary development in children. Longitudinal studies conducted in Europe[1-3] and the United States[4-6] have demonstrated that exposure to air pollution is associated with reductions in the growth of lung function, strengthening earlier evidence[7-12] based on cross-sectional data. However, previous longitudinal studies have followed young children for relatively short periods (two to four years), leaving unresolved the question of whether the effects of air pollution persist from adolescence into adulthood. The Children's Health Study[13] enrolled children from 12 southern California communities representing a wide range of exposures to ambient air pollution. We documented the children's respiratory growth from the ages of 10 to 18 years. Over this eight-year period, children have substantial increases in lung function. By the age of 18 years, girls' lungs have nearly matured, and the growth in lung function in boys has slowed considerably, as compared with the rate in earlier adolescence.[14] We analyzed the association between long-term exposure to ambient air pollution and the growth in lung function over the eight-year period from the ages of 10 to 18 years. We also examined whether any observed effect of air pollution on this eight-year growth period results in clinically significant deficits in attained lung function at the age of 18 years.

METHODS

STUDY SUBJECTS

In 1993, the Children's Health Study recruited 1759 fourth-grade children (average age, 10 years) from elementary schools in 12 southern California communities as part of an investigation of the long-term effects of air pollution on children's respiratory health.[6,12,13] Data on pulmonary function were obtained by trained field technicians, who traveled to study schools annually from the spring of 1993 through the spring of 2001 to perform maximal-effort spirometric testing of the children. Details of the testing protocol have been published previously.[12] We analyzed three measures of pulmonary function: forced vital capacity (FVC), forced expiratory volume in the first second (FEV_1), and maximal midexpiratory flow rate (MMEF). Pulmonary-function tests were not performed on any child who was absent from school on the day of testing, but such a child was still eligible for testing in subsequent years. Children who moved away from their recruitment community were classified as lost to follow-up and were not tested further. From the initial sample of the 1759 children in 1993, the number of children available for follow-up was 1414 in 1995, 1252 in 1997, 1031 in 1999, and 747 in 2001, reflecting the attrition of approximately 10 percent of subjects per year.

A baseline questionnaire, completed at study entry by each child's parents or legal guardian, was used to obtain information on the children's characteristics, including race, presence or absence of Hispanic ethnic background, level of parental education, presence or absence of a history of asthma diagnosed by a doctor, exposure to maternal smoking in utero, and household exposure to gas stoves, pets, and environmental tobacco smoke. Questions administered at the time of annual pulmonary-function testing were used to update information on asthma status, personal smoking status, and exposure to environmental tobacco smoke. The distribution of baseline characteristics of all study subjects and of two subgroups defined according to the length of follow-up (all eight years or less than eight years) is shown in the Supplementary Appendix (available with the full text of this article at www.nejm.org). The length of follow-up was significantly associated with factors related to the mobility of the population, including race, presence or absence of Hispanic ethnic background, presence or absence of exposure to environmental tobacco smoke, and parents' level of education. However, the length of follow-up was not significantly associated with baseline lung function or the level of exposure to air pollution, suggesting that the loss to follow-up did not differ with respect to the primary variables of interest.

The study protocol was approved by the institutional review board for human studies at the University of Southern California, and written informed consent was provided by a parent or legal guardian for all study subjects. We did not obtain assent from minor children, since this was not standard practice when the study was initiated.

AIR-POLLUTION DATA

Air-pollution–monitoring stations were established in each of the 12 study communities and provided continuous data, beginning in 1994. Each station measured average hourly levels of ozone, nitrogen dioxide, and particulate matter with an aerodynamic diameter of less than 10 μm (PM_{10}). Stations also collected two-week integrated-filter samples for measuring acid vapor and the mass and chemical makeup of particulate matter with an aerodynamic diameter of less than 2.5 μm ($PM_{2.5}$). Acid vapor included both inorganic acids (nitric and hydrochloric) and organic acids (formic and acetic). For statistical analysis, we used total acid, computed as the sum of nitric, formic, and acetic acid levels. Hydrochloric acid was excluded from this sum, since levels were very low and close to the limit of detection. In addition to measuring $PM_{2.5}$, we determined the levels of elemental carbon and organic carbon, using method 5040 of the National Institute for Occupational Safety and Health.[15] We computed annual averages on the basis of average levels in a 24-hour period in the case of PM_{10} and nitrogen dioxide, and a two-week period in the case of $PM_{2.5}$, elemental carbon, organic carbon, and acid vapor. For ozone, we computed the annual average of the levels obtained from 10 a.m. to 6 p.m. (the eight-hour daytime average) and of the one-hour maximal levels. We also calculated long-term mean pollutant levels (from 1994 through 2000) for use in the statistical analysis of the lung-function outcomes.

STATISTICAL ANALYSIS

The outcome data consisted of the results of 5454 pulmonary-function tests of 876 girls and 5300 tests of 883 boys over the eight-year period. We adopted a two-stage regression approach to relate the longitudinal pulmonary-function data for each child to the average air-pollution levels in each study community.

The first-stage model was a regression of each pulmonary-function measure (values were log-transformed) on age to obtain separate, community-specific average growth curves for girls and boys. To account for the growth pattern during this period, we used a linear spline model[14] that consisted of four straight lines over the age intervals of younger than 12 years, 12 to 14 years, 14 to 16 years, and older than 16 years, constrained to be connected at the three "knot" points. The model included adjustments for log values for height; body-mass index (the weight in kilograms divided by the square of the height in meters); the square of the body-mass index; race; the presence or absence of Hispanic ethnic background, doctor-diagnosed asthma, any tobacco smoking by the child in the preceding year, exposure to environmental tobacco smoke, and exercise or respiratory tract illness on the day of the test; and indicator variables for the field technician and the spirometer. In addition to these covariates, random effects were included to account for the multiple measurements contributed by each subject. An analysis of residual values confirmed that the assumptions of the model had been satisfied. The first-stage model was used to estimate the mean and variance of the growth in lung function over the eight-year period in each of the 12 communities, separately for girls and boys.

The second-stage model was a linear regression of the 24 sex- and community-specific estimates of the growth in lung function over the eight-year period on the corresponding average levels of each air pollutant in each community. Inverses of the first-stage variances were incorporated as weights, and a community-specific random effect was included to account for residual variation between communities. A sex-by-pollutant interaction was included in the model to evaluate whether there was a difference in the effect of a given pollutant between the sexes, and when this value was nonsignificant, the model was refitted to estimate the sex-averaged effect of the pollutant. Pollutant effects are reported as the difference in the growth in lung function over the eight-year period from the least to the most polluted community, with negative differences indicative of growth deficits with increasing exposure. We also considered two-pollutant models obtained by simultaneously regressing the growth in lung function over the eight-year period on pairs of pollutants.

In addition to examining the growth in lung function over the eight-year period, we analyzed the FEV_1 measurements obtained in 746 subjects during the last year of follow-up (average age, 17.9 years) to determine whether exposure to air pollution was associated with clinically significant deficits in attained FEV_1. We defined a low FEV_1 as an attained FEV_1 below 80 percent of the predicted value, a criterion commonly used in clinical settings to identify persons who are at increased risk for adverse respiratory conditions. To determine the predicted FEV_1, we first fitted a regression model for observed FEV_1 (using log-transformed values) with the following predictors: log-transformed height, body-mass index, the square of the body-mass index, sex, race or ethnic group, asthma status, field technician, and interactions between sex and log-transformed height, sex and asthma, and sex and race or ethnic group. This model explained 71 percent of the variance in the attained FEV_1 level. For each subject, we then computed the predicted FEV_1 from the model and considered subjects to have a low FEV_1 if the ratio of observed to predicted FEV_1 was less than 80 percent. Linear regression was then used to examine the correlation between the community-specific proportion of subjects with a low FEV_1 and the average level of each pollutant from 1994 through 2000. This model included a community-specific random effect to account for residual variation. Regression procedures in SAS software[16] were used to fit all models. Associations denoted as statistically significant were those that yielded a P value of less than 0.05, assuming a two-sided alternative hypothesis.

RESULTS

From 1994 through 2000, there was substantial variation in the average levels of study pollutants across the 12 communities, with relatively little year-to-year variation in the annual levels within each community (Fig. 1). From 1994 through 2000, the

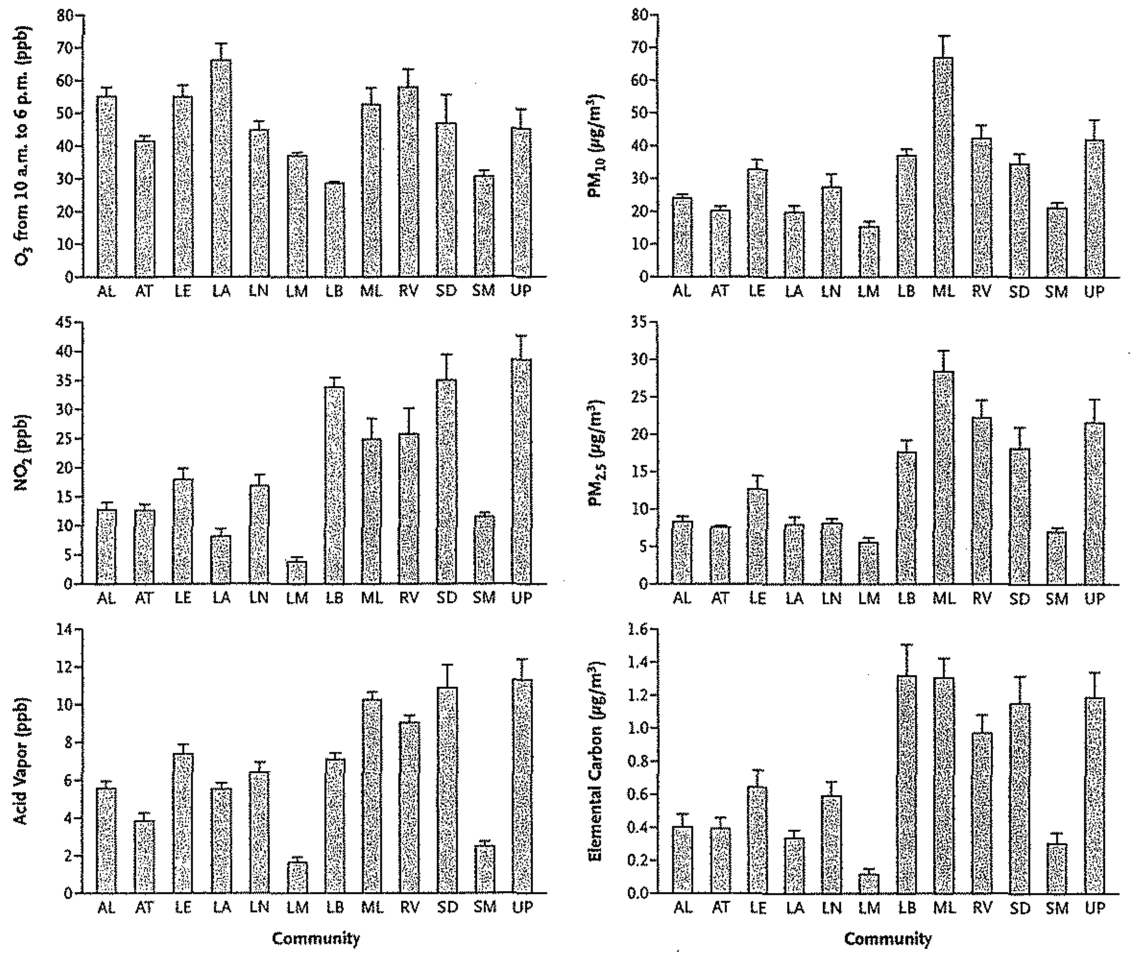

Figure 1. Mean (+SD) Annual Average Levels of Pollutants from 1994 through 2000 in the 12 Study Communities in Southern California.
AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 µm and less than 2.5 µm, respectively.

average levels of ozone were not significantly correlated across communities with any other study pollutant (Table 1). However, correlations between other pairs of pollutants were all significant, ranging from an R of 0.64 ($P<0.05$) for nitrogen dioxide and organic carbon, to an R of 0.97 ($P<0.001$) for PM_{10} and organic carbon. Thus, nitrogen dioxide, acid vapor, and the particulate-matter pollutants can be regarded as a correlated "package" of pollutants with a similar pattern relative to each other across the 12 communities.

Among the girls, the average FEV_1 increased from 1988 ml at the age of 10 years to 3332 ml at the age of 18 years, yielding an average growth in FEV_1 of 1344 ml over the eight-year period (Table 2). The corresponding averages in boys were 2082 ml and 4464 ml, yielding an average growth in FEV_1 of 2382 ml over the eight-year period. Similar patterns of growth over the eight-year period were observed for FVC and MMEF (Table 2).

Although the average growth in FEV_1 was larger in boys than in girls, the correlations of growth with air pollution did not differ significantly between the sexes, as shown for nitrogen dioxide in Figure 2. The sex-averaged analysis, depicted by the regression line in Figure 2, demonstrated a significant negative correlation between the growth in FEV_1 over the eight-year period and the average nitrogen dioxide level ($P=0.005$). The estimated difference in the average growth in FEV_1 over the eight-year period from the community with the lowest nitrogen dioxide level to the community with the highest nitrogen dioxide level, represented by the slope of the plotted regression line in Figure 2, was −101.4 ml.

Estimated differences in the growth of FEV_1, FVC, and MMEF during the eight-year period with respect to all pollutants are summarized in Table 3. Deficits in the growth of FEV_1 and FVC were observed for all pollutants, and deficits in the growth of MMEF were observed for all but ozone, with several combinations of outcome variables and pollutants attaining statistical significance. Specifically, for FEV_1 we observed significant negative correlations between the growth in this variable over the eight-year period and exposure to acid vapor ($P=0.004$), $PM_{2.5}$ ($P=0.04$), and elemental carbon ($P=0.007$), in addition to the above-mentioned correlation with nitrogen dioxide. As with FEV_1, the effects of the various pollutants on FVC and MMEF did not differ significantly between boys and girls. Significant deficits in FVC were associated with exposure to nitrogen dioxide ($P=0.05$) and acid vapor ($P=0.03$), whereas deficits in MMEF were associated with exposure to nitrogen dioxide ($P=0.02$) and elemental carbon ($P=0.04$). There was no significant evidence that ozone, either the average value obtained from 10 a.m. to 6 p.m. or the one-hour maximal level, was associated with any measure of lung function. In two-pollutant models for any of the measures of pulmonary function, adjustment for ozone did not substantially alter the effect estimates or significance levels of any other pollutant (data not shown). In general, two-pollutant models for any pair of pollutants did not provide a significantly better fit to the data than the corre-

Table 1. Correlation of Mean Air-Pollution Levels from 1994 through 2000 across the 12 Study Communities.*

Pollutant	O_3 (10 a.m.–6 p.m.)	NO_2	Acid Vapor†	PM_{10}	$PM_{2.5}$	Elemental Carbon	Organic Carbon
			R value				
O_3							
1-Hour maximal level	0.98	0.10	0.53	0.31	0.33	0.17	0.25
10 a.m.–6 p.m.		−0.11	0.35	0.18	0.18	−0.03	0.13
NO_2			0.87	0.67	0.79	0.94	0.64
Acid vapor†				0.79	0.87	0.88	0.76
PM_{10}					0.95	0.85	0.97
$PM_{2.5}$						0.91	0.91
Elemental carbon							0.82

* Unless otherwise noted, values are the 24-hour average pollution levels. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.

† Acid vapor is the sum of nitric, formic, and acetic acid levels.

Table 2. Mean Levels of Growth in Pulmonary Function during the Eight-Year Study Period, from 1993 to 2001.*

Pulmonary-Function Measure	Girls			Boys		
	Age of 10 yr	Age of 18 yr	Average 8-yr growth	Age of 10 yr	Age of 18 yr	Average 8-yr growth
FVC (ml)	2262	3790	1528	2427	5202	2775
FEV_1 (ml)	1988	3332	1344	2082	4464	2382
MMEF (ml/sec)	2311	3739	1428	2287	4709	2422

* Levels at the ages of 10 and 18 years are derived from the growth model described in the Methods section. FVC denotes forced vital capacity, FEV_1 forced expiratory volume in one second, and MMEF maximal midexpiratory flow rate.

sponding single-pollutant models; this was not surprising, given the strong correlation between most pollutants.

The association between pollution and the growth in FEV_1 over the eight-year period remained significant in a variety of sensitivity analyses (Table 4). For example, estimates of the effect of acid vapor and elemental carbon (model 1 in Table 4) changed little with adjustment for in-utero exposure to maternal smoking (model 2), presence in the home of a gas stove (model 3) or pets (model 4), or parental level of education (model 5). To account for possible confounding by short-term effects of air pollution, we fitted a model that adjusted for the average ozone, nitrogen dioxide, and PM_{10} levels on the three days before each child's pulmonary-function test. This adjustment also had little effect on the estimates of the long-term effects of air pollution (model 6). Table 4 also shows that the effects of pollutants remained large and significant in the subgroups of children with no history of asthma (model 7) and those with no history of smoking (model 8). The effects of pollutants were not significant among the 457 children who had a history of asthma or among the 483 children who had ever smoked (data not shown), although the sample sizes in these subgroups were small. Model 9 demonstrates that the extremes in pollutant levels did not drive the observed associations; in other words, we found similar effect estimates after eliminating the two communities with the highest and lowest levels of each pollutant. Finally, model 10 shows the effects of pollutants in the subgroup of subjects who underwent pulmonary-function testing in both 1993 and 2001 (i.e., subjects who participated in both the first and last year of the study). The magnitudes of effects in this subgroup were similar to those in the entire sample (model 1), suggesting that observed effects of pollutants in the entire sample cannot be attributed to biased losses to follow-up across communities. These sensitivity analyses were also applied to the other pollutants and to FVC and MMEF, with similar results.

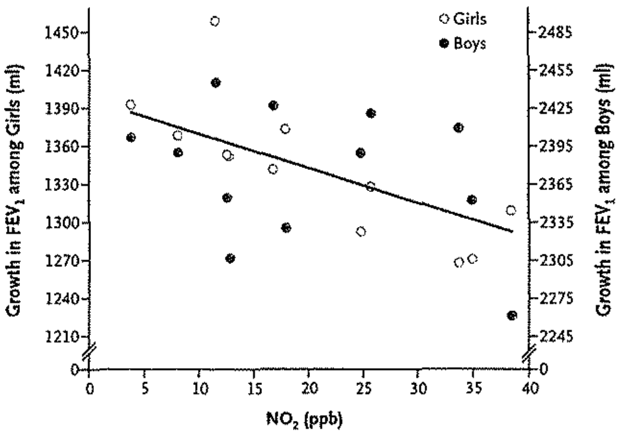

Figure 2. Community-Specific Average Growth in FEV_1 among Girls and Boys During the Eight-Year Period from 1993 to 2001 Plotted against Average Nitrogen Dioxide (NO_2) Levels from 1994 through 2000.

Pollution-related deficits in the average growth in lung function over the eight-year period resulted in clinically important deficits in attained lung function at the age of 18 years (Fig. 3). Across the 12 communities, a clinically low FEV_1 was positively correlated with the level of exposure to nitrogen dioxide ($P=0.005$), acid vapor ($P=0.01$), PM_{10} ($P=0.02$), $PM_{2.5}$ ($P=0.002$), and elemental carbon ($P=0.006$). For example, the estimated proportion of children with a low FEV_1 (represented by the regression line in Fig. 3) was 1.6 percent at the lowest level of exposure to $PM_{2.5}$ and was 4.9 times as great (7.9 percent) at the highest level of exposure to $PM_{2.5}$

Table 3. Difference in Average Growth in Lung Function over the Eight-Year Study Period from the Least to the Most Polluted Community.*

Pollutant	FVC		FEV_1		MMEF	
	Difference (95% CI) *ml*	P Value	Difference (95% CI) *ml*	P Value	Difference (95% CI) *ml/sec*	P Value
O_3						
10 a.m.–6 p.m.	−50.6 (−171.0 to 69.7)	0.37	−22.8 (−122.3 to 76.6)	0.62	85.6 (−130.0 to 301.1)	0.40
1-Hour maximal level	−70.3 (−183.3 to 42.6)	0.20	−44.5 (−138.9 to 50.0)	0.32	45.7 (−172.3 to 263.6)	0.65
NO_2	−95.0 (−189.4 to −0.6)	0.05	−101.4 (−164.5 to −38.4)	0.005	−211.0 (−377.6 to −44.4)	0.02
Acid vapor	−105.2 (−194.5 to −15.9)	0.03	−105.8 (−168.8 to −42.7)	0.004	−165.0 (−344.8 to 14.7)	0.07
PM_{10}	−60.2 (−190.6 to 70.3)	0.33	−82.1 (−176.9 to 12.8)	0.08	−154.2 (−378.3 to 69.8)	0.16
$PM_{2.5}$	−60.1 (−166.1 to 45.9)	0.24	−79.7 (−153.0 to −6.4)	0.04	−168.9 (−345.5 to 7.8)	0.06
Elemental carbon	−77.7 (−166.7 to 11.3)	0.08	−87.9 (−146.4 to −29.4)	0.007	−165.5 (−323.4 to −7.6)	0.04
Organic carbon	−58.6 (−196.1 to 78.8)	0.37	−86.2 (−185.6 to 13.3)	0.08	−151.2 (−389.4 to 87.1)	0.19

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 37.5 ppb of O_3 (measured from 10 a.m. to 6 p.m.), 46.0 ppb of O_3 (the one-hour maximal level), 34.6 ppb of NO_2, 9.6 ppb of acid vapor, 51.4 μg of PM_{10} per cubic meter, 22.8 μg of $PM_{2.5}$ per cubic meter, 1.2 μg of elemental carbon per cubic meter, and 10.5 μg of organic carbon per cubic meter. CI denotes confidence interval.

(P=0.002). Similar associations between these pollutants and a low FEV_1 were observed in the subgroup of children with no history of asthma and the subgroup with no history of smoking (data not shown). A low FEV_1 was not significantly correlated with exposure to ozone in any group.

DISCUSSION

The results of this study provide robust evidence that lung development, as measured by the growth in FVC, FEV_1, and MMEF from the ages of 10 to 18 years, is reduced in children exposed to higher levels of ambient air pollution. The strongest associations were observed between FEV_1 and a correlated set of pollutants, specifically nitrogen dioxide, acid vapor, and elemental carbon. The effects of these pollutants on FEV_1 were similar in boys and girls and remained significant among children with no history of asthma and among those with no history of smoking, suggesting that most children are susceptible to the chronic respiratory effects of breathing polluted air. The magnitude of the observed effects of air pollution on the growth in lung function during this age interval was similar to those that have been reported for exposure to maternal smoking[17,18] and smaller than those reported for the effects of personal smoking.[17,19]

Cumulative deficits in the growth in lung function during the eight-year study period resulted in a strong association between exposure to air pollution and a clinically low FEV_1 at the age of 18 years. In general, lung development is essentially complete in girls by the age of 18 years, whereas in boys it continues into their early 20s, but at a much reduced rate. It is therefore unlikely that clinically significant deficits in lung function at the age of 18 years will be reversed in either girls or boys as they complete the transition into adulthood. Deficits in lung function during young adulthood may increase the risk of respiratory conditions — for example, episodic wheezing that occurs during a viral infection.[20] However, the greatest effect of pollution-related deficits may occur later in life, since reduced lung function is a strong risk factor for complications and death during adulthood.[21-27]

Deficits in lung function were associated with a correlated set of pollutants that included nitrogen dioxide, acid vapor, fine-particulate matter ($PM_{2.5}$), and elemental carbon. In southern California, the primary source of these pollutants is motor vehicles, either through direct tailpipe emissions or downwind physical and photochemical reactions of vehicular emissions. Both gasoline- and diesel-powered engines contribute to the tons of pollutants exhausted into southern California's air every day, with diesel vehicles responsible for disproportionate amounts of nitrogen dioxide, $PM_{2.5}$, and ele-

Table 4. Sensitivity Analysis of the Effects of Acid Vapor and Elemental Carbon on Growth in FEV_1 over the Eight-Year Study Period.*

Model	Acid Vapor	Elemental Carbon
	Difference (95% Confidence Interval)	
Main model (model 1)†	−105.8 (−168.8 to −42.7)	−87.9 (−146.4 to −29.4)
Additional covariates‡		
Main model + in-utero exposure to maternal smoking (model 2)	−108.8 (−173.3 to −44.2)	−85.8 (−147.4 to −24.1)
Main model + exposure to gas stove (model 3)	−106.0 (−181.5 to −30.6)	−84.8 (−154.7 to −14.9)
Main model + pets in home (model 4)	−108.4 (−171.6 to −45.2)	−89.8 (−149.1 to −30.6)
Main model + parental level of education (model 5)	−100.7 (−167.2 to −34.2)	−80.9 (−142.7 to −19.0)
Main model + short-term effects of pollution (model 6)§	−112.4 (−201.4 to −23.3)	−103.2 (−181.8 to −24.5)
Subgroup effects		
No history of asthma (model 7)¶	−98.1 (−166.4 to −29.8)	−88.9 (−149.2 to −28.6)
No history of smoking (model 8)‖	−115.6 (−233.7 to 2.5)	−113.3 (−214.9 to −11.6)
After exclusion of communities with lowest and highest levels of pollution (model 9)**	−106.7 (−192.3 to −21.2)	−94.7 (−173.7 to −15.7)
Complete follow-up (model 10)††	−132.4 (−226.2 to −38.7)	−97.4 (−195.6 to 0.9)

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 9.6 ppb of acid vapor and 1.2 μg of elemental carbon per cubic meter.

† Model 1 is equivalent to effect estimates for FEV_1 in Table 3 and is based on data on 1759 children.

‡ The main model was adjusted for each of the covariates listed.

§ Values were adjusted for the average levels of O_3, NO_2, and PM_{10} on the three days before each child's pulmonary-function test.

¶ The analysis includes data on 1302 children with no history of doctor-diagnosed asthma.

‖ The analysis includes data on 1276 children with no history of active tobacco smoking at any time during follow-up.

** The analysis excludes children from the two communities with the lowest and highest levels of each pollutant. This leaves 1507 children (excluding those from Lompoc and Upland) in the analysis of acid vapor and 1484 children (excluding those from Lompoc and Long Beach) in the analysis of elemental carbon.

†† The analysis includes 713 children who underwent pulmonary-function testing in both 1993 and 2001 (i.e., those observed throughout the study).

mental carbon. In the current study, however, we could not discern the independent effects of pollutants because they came from common sources and there was a high degree of intercorrelation among them; similar difficulties have also been encountered in other studies of lung function and air-pollutant mixtures.[1,2,9,28-30] Since ozone is also formed during photochemical reactions involving fuel-combustion products, one might expect ozone to be correlated with the other study pollutants and therefore to show similar associations with lung function. However, the Children's Health Study was specifically designed to minimize the correlation of ozone with other pollutants across the 12 study communities. Thus, although ozone has been convincingly linked to acute health effects in many other studies,[11] our results provide little evidence that ambient ozone at current levels is associated with chronic deficits in the growth of lung function in children. Only a few other studies have addressed the long-term effects of ozone on lung development in children, and results have been inconsistent.[31] Although we found little evidence of an effect of ozone, this result needs to be interpreted with caution given the potential for substantial misclassification of exposure to ozone.[32,33]

The mechanism whereby exposure to pollutants could lead to reduced lung development is unknown, but there are many possibilities. Our observation of associations between air pollution and all three measures of lung function — FVC, FEV_1, and MMEF — suggests that more than one process is involved. FVC is largely a function of the number and size of alveoli, with differences in volume pri-

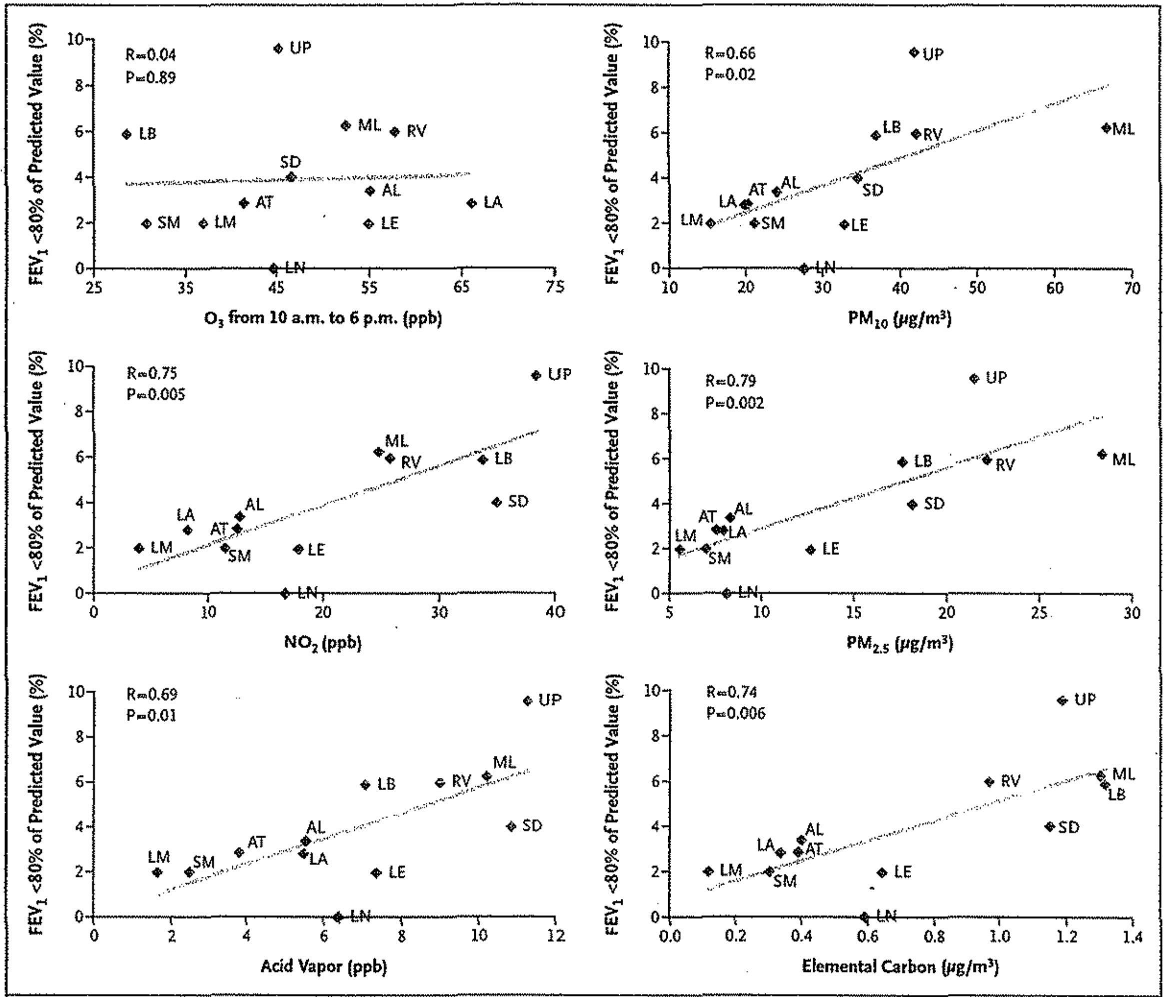

Figure 3. Community-Specific Proportion of 18-Year-Olds with a FEV_1 below 80 Percent of the Predicted Value Plotted against the Average Levels of Pollutants from 1994 through 2000.

The correlation coefficient (R) and P value are shown for each comparison. AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.

marily attributable to differences in the number of alveoli, since their size is relatively constant.[34] However, since the postnatal increase in the number of alveoli is complete by the age of 10 years, pollution-related deficits in the growth of FVC and FEV_1 during adolescence may, in part, reflect a reduction in the growth of alveoli. Another plausible mechanism of the effect of air pollution on lung development is airway inflammation, such as occurs in bronchiolitis; such changes have been observed in the airways of smokers and of subjects who lived in polluted environments.[35,36]

A strength of our study was the long-term, prospective follow-up of a large cohort, with exposure and outcome data collected in a consistent manner throughout the study period. As in any epidemiologic study, however, the observed effects could be biased by underlying associations of the exposure and outcome to some confounding variables. We adjusted for known potential confounders, including personal characteristics and other sources of exposure to pollutants, but the possibility of confounding by other factors still exists. Over the eight-year follow-up period, approximately 10 percent of study subjects were lost to follow-up each year. Attrition is a potential source of bias in a cohort study if loss to follow-up is related to both exposure and outcome. However, we did not see evidence that the loss of subjects was related to either baseline lung function or exposure to air pollution. In addition, we observed significant associations between air pollution and lung growth in the subgroup of children who were followed for the full eight years of the study, with effects that were similar in magnitude to those in the group as a whole, thus making loss of subjects an unlikely source of bias.

We have shown that exposure to ambient air pollution is correlated with significant deficits in respiratory growth over an eight-year period, leading to clinically important deficits in lung function at the age of 18 years. The specific pollutants that were associated with these deficits included nitrogen dioxide, acid vapor, $PM_{2.5}$, and elemental carbon. These pollutants are products of primary fuel combustion, and since they are present at similar levels in many other areas,[37,38] we believe that our results can be generalized to children living outside southern California. Given the magnitude of the observed effects and the importance of lung function as a determinant of morbidity and mortality during adulthood, continued emphasis on the identification of strategies for reducing levels of urban air pollutants is warranted.

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Southern California Environmental Health Sciences Center

Special Issue

Welcome to our Center Newsletter:

The goal of our Center is to improve health by investigating environmental exposures, addressing risks from these exposures, studying who might be most susceptible, and linking our research efforts with the communities we serve.

Our Center has scientists from USC and UCLA who study cancer, respiratory disease and adverse reproductive outcomes. Some of our scientists also develop new methods for designing studies and evaluating exposures.

We hope that our newsletters will help you learn more about our research efforts and community outreach and education activities.

Dr. Frank Gilliland
Center Director

If you missed any issues of the newsletter, please go to our website.

Moving Forward: A conference on healthy solutions for

Breaking News!

Living near a highway affects lung development in children, according to a USC study

Major traffic exposure could result in lifetime deficits in lung function

Los Angeles, Jan. 25, 2007 - Children who live near a major highway are not only more likely to develop asthma or other respiratory diseases, but their lung development may also be stunted.

According to a study that will appear in the February 17 issue of *The Lancet* and now available online, researchers at the Keck School of Medicine of the University of Southern California (USC) found that children who lived within 500 meters of a freeway, or approximately a third of a mile, since age 10 had substantial deficits in lung function by the age of 18 years, compared to children living at least 1500 meters, or approximately one mile, away.

"Someone suffering a pollution-related deficit in lung function as a child will probably have less than healthy lungs all of his or her life," says lead author W. James Gauderman, associate professor of preventive medicine at the Keck School of Medicine of USC. "And poor lung function in later adult life is known to be a major risk factor for respiratory and cardiovascular diseases."

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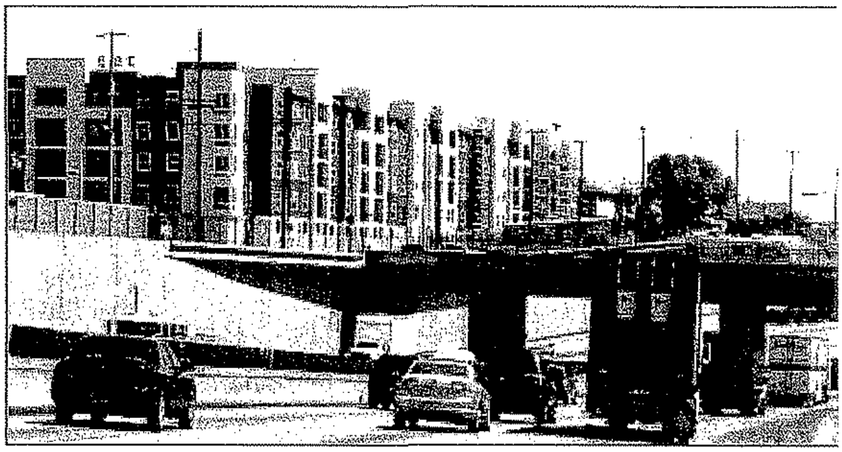


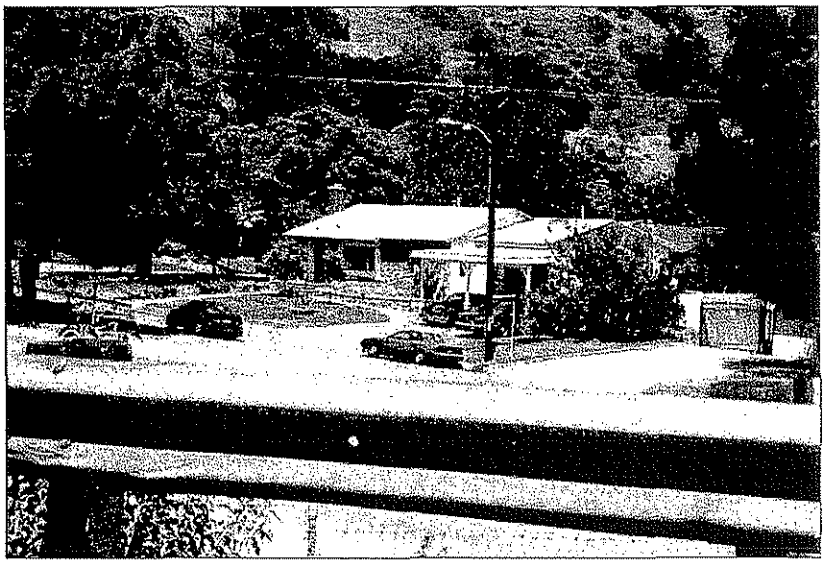
The study draws upon data from the Children's Health Study (CHS), a longitudinal study of respiratory health among children in 12 southern California communities. More than 3,600 children around the age of 10 years were evaluated over a period of eight years, through high-school graduation. Lung function tests were taken during annual school visits, and the study team determined how far each child lived from freeways and other major roads.

"Otherwise-healthy children who were non-asthmatic and non-smokers also experienced a significant decrease in lung function from traffic pollution," continues Gauderman. "This suggests that all children, not just susceptible subgroups, are potentially affected by traffic exposure".

Lung function was assessed by measuring how much air a person can exhale after taking a deep breath, and how quickly that air can be exhaled. Children's lung function develops rapidly during adolescence until they reach their late teens or early 20s. A deficit in lung development during childhood is likely to translate into reduced function for the remainder of life.

"This study shows there are health effects from childhood exposure to traffic exhaust that can last a lifetime," said David A. Schwartz, M.D., the Director of the National Institute of Environmental Health Sciences (NIEHS). "The NIEHS is committed to supporting research to understand the relationship between environmental exposures and diseases, and to identify ways to reduce harmful exposures to all populations, especially children so they can realize their full potential for healthy and productive lives."

Previous studies have demonstrated links between lung function growth and regional air quality. These findings in this study add to that result, demonstrating that both regional air pollution and local exposure to traffic pollution affect lung development.



"This study provides further proof that regional air quality regulations may need to be adjusted based on local factors, including traffic volume," says Gauderman. "This is important because in areas where the population continues to grow, more and more children are living or attending school near busy roadways. This may be harmful in the long run." Gauderman adds that community leaders, school districts, and developers should consider these results when developing new schools or homes.

Study sites included the cities of Alpine, Anaheim, Glendora, Lake Arrowhead, Lake Elsinore, Long Beach, Mira Loma, Riverside, San Bernardino, San Dimas, Santa Barbara, Santa Maria and Upland.

Funding for this study came from the California Air Resources Board, the National Institute of Environmental Health Sciences, the U.S. Environmental Protection Agency, the National Heart, Lung and Blood Institute, and the Hastings Foundation.

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W. James Gauderman, Hita Vora, Rob McConnell, Kiros Berhane, Frank Gilliland, Duncan Thomas, Fred Lurmann, Edward Avol, Nino Kunzli, Michael Jerrett and John Peters, "Effect of exposure to traffic on lung development from 10 to 18 years of age: a cohort study," *The Lancet*, Volume 368, February 2007.

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To view other press stories from today, January 26, please go to:

LA Times article: Freeways' tainted air harms children's lungs, experts say

Sacramento Bee article: Living near busy roads tied to kids' lung risk

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Faculty Profile: Dr. W. James Gauderman

Professor of Preventive Medicine
Division of Biostatistics
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Expertise:

- Air pollution and increased incidence of asthma, bronchitis and other respiratory illnesses in children
- Smog and its long-term effects on lung development
- Long-term effects on children's lungs of air pollutants such as nitrogen dioxide, particulate matter and acid vapors resulting from the burning of fossil fuels and emissions from industrial plants
- Lung function and respiratory health in school-aged children in Southern California
- Gene/environment interactions
- Gene/smoking interaction in lung cancer
- Genetic epidemiology
- Environmental health
- Biostatistics

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Photo of Dr. James Gauderman: USC Expert Directory

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More:
Biographical information can be found at:
http://www.usc.edu/schools/medicine/util/directories/faculty/profile.php?PersonIs_ID=351

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http://www.laweekly.com/2010-03-06/news/black-lung-lofts/

Black Lung Lofts

Many children being raised in L.A.'s hip, new freeway-adjacent housing are damaged for life
By Patrick Range McDonald
Saturday, Mar 6 2010

On a recent afternoon in the Eastside neighborhood of Lincoln Heights, Fay Green stands in the hallway of her apartment complex, which sits just feet above the bumper-to-bumper traffic of the I-5 freeway. A soft-spoken black woman, she lives with her five kids and one grandson in an urban planner's idea of perfection: the dense, "Avenue 26" master-planned community, touted by Mayor Antonio Villaraigosa and the city's Department of Housing as an environmentally smart "transit-oriented development" in the city's core, efficiently served by light rail. From the outside, the stylish-looking village of 156 condos, called Puerta del Sol, and 378 other apartments squeezed between Avenue 26 and the thundering I-5 gives off a Crate & Barrel vibe. But Green's four-bedroom unit, in the building dubbed Tesoro del Valle Family Apartments, is regularly dirtied by a heavy film of what she calls "dust." She explains, "I clean the place up, and in two or three days, I have to wipe again."

The bedroom of her young son, who has a sinus problem, requires extra attention so he can breathe; Green herself suffers from asthma. She says these sicknesses started before she moved to Avenue 26, erected less than 100 feet from one of the world's busiest, and filthiest, freeways, used by 285,000 vehicles per day. But when the weather is hot, or other conditions create smog, Green notices that many of her kids start to cough. She won't feel well, either.

Green moved into the new apartment in 2006. She vaguely remembers a TV news report about the health risks of living near a freeway, but had never really thought about whether she or her young family could become sick from the clouds of vehicle exhaust and tire-brake dust that hover above, and directly next to, the I-5.

Her neighbors tell a similar story. Jesse A. Flores, in his 60s, says he never thought about the problems of living adjacent to a major freeway. "So far, I'm okay," he says. "Nothing wrong with me."

Aura Sanabria, a 20-something mother of three young kids, has the same concerns Green has. She too complains about the heavy "dust" that builds up in her apartment. "I'm always cleaning and dusting," she says.

Teenager Andrew Garcia says he and his parents never think about the invisible particles that work their way into the family home. "All we think about is that it's easier to get on the freeway or to the Metro," says Garcia, who takes the Gold Line to high school.

These residents don't know what the science shows, but L.A.'s elected leaders do.

In 2004, USC's landmark Children's Health Study made waves nationally, confirming that thousands of Southern California children living in near high-traffic roadways were contracting higher levels of crippling asthma and children living in smoggy areas were suffering impaired lung development.

The study proved long-held beliefs that fine particles such as those caused by tire rubber and brake metal — so tiny that scientists say the dust seeps through the smallest cracks and holes and thus is not blocked by air filtration systems or triple-paned windows — were burrowing into people's lungs.

When the revelations broke in The New England Journal of Medicine, L.A. was in the grips of a badly overheated housing bubble. City Hall politicians and planning officials were embracing trendy housing projects alongside freeways, especially downtown, where urbanists touting a "sustainable" lifestyle, free of suburban commuting, were moving into places like the Medici and Orsini luxury complexes — a stone's throw from the Harbor and Hollywood freeways, respectively.

L.A. officials were so thrilled with the new apartments rising next to freeways that they got into an ugly tussle with Orsini developer Geoff Palmer when he rebuffed City Hall's pressure to make room in his freeway-adjacent Medici building — for low-income families including children.

Meanwhile, on the other side of downtown, the Los Angeles Housing Department provided down payments to buyers to move into Puerta del Sol, a stylish condo complex in the Avenue 26 community where teenager Andrew Garcia breathes in the factorylike emissions and particulates created daily by 285,000 vehicles.

Since then, with the city's enthusiastic backing, including that of Councilman Ed Reyes, who represents Lincoln Heights, the village's politically well-connected developer, Percy Vaz, has marketed the project to families tired of commuting — in effect, targeting parents to live in an area scientists now know is unusually hazardous to their children's health.

"We've known for eight or 10 years there have been these impacts," says Dr. Joe Lyou, executive director of California Environmental Rights Alliance, an environmental justice group. He sees the politicians at City Hall as knowingly endangering children.

In January 2007, USC scientists followed up their widely hailed Children's Health Study with an even more detailed and damning longitudinal study of 3,600 Southern California children — and this time the scientists went down to L.A. City Hall to get the attention of the politicians.

"I woke up one morning and read about [the study] in the newspaper," says Michael Woo, who sits on the Los Angeles planning commission and is dean of Cal Poly's College of Environmental Design. "That's when I started to put two and two together" — to realize that the city's residential zoning policies were making kids sick.

The new study showed that alarming numbers of children ages 10 to 18 who live within about a block — 528 feet — of a Southern California freeway suffer reduced lung development, a deficit likely to persist through adulthood, and which may increase the risk of respiratory disease and premature death. (Three weeks ago, a group of USC and European scientists delivered more bad news: Hardening of the arteries is twice as common among Angelenos living within a block of an L.A. freeway.)

But instead of playing a key role in the city's planning decisions, USC's 2007 study was ignored. City Hall leaders, dominated by the desires of developer-contributors and a strong chorus of "density hawks," were rewriting hard-fought Community Plans, tossing out height and size restrictions on apartment complexes citywide, and permitting the destruction of thousands of units of historic and affordable housing.

Through city zoning laws, subsidies, city pension-fund investments and other policies, city leaders have peddled freeway-abutting housing as "smart" land use that satisfies developers' push for "in-fill" projects on "underutilized" land. At one point during the frenetic housing boom in 2006, Villaraigosa and city-pension trustees held a press conference at the Puerta del Sol condos in the Avenue 26 development perched above the I-5 freeway. The mayor touted the development as a model example of middle-class housing in which to "raise a family" — a view that remains unshaken inside City Hall today.

Today, in fact, the Department of City Planning chief Gail Goldberg and the Office of Mayor Antonio Villaraigosa concede to L.A. Weekly that nobody in City Hall is tracking, or can even estimate, the number of children who have moved into housing erected within 500 feet of freeways since scientists documented the chilling health effects. Los Angeles lawmakers are making no effort to measure the human health costs of such housing. And with the shattered L.A. housing market now showing the first few signs of recovery, City Hall is set, once again, to embrace freeway-adjacent housing that's marketed to families.

One of the few elected leaders willing to be open about the unfolding situation is Hollywood-area City Councilman Tom LaBonge, who says, "It would be great if we could call a time-out and try to plan better, but it's not practical." He's given his blessing to freeway-adjacent housing in his district, and he insists, "We need to save jobs."

Nor do the city's planning department, Villaraigosa and the Los Angeles City Council warn buyers and tenants about the hazards of moving kids right next to freeways — the relatively modest disclosure rule sought two years ago by USC's scientists that some developers say they could live with.

"Regulation is years behind the science," says Bahram Fazeli, a researcher and policy analyst for Communities for a Better Environment, a grassroots environmental-justice organization that focuses on issues like addressing the "cumulative impacts" of smog. Of the Southern California freeway studies, Fazeli stresses, "The evidence that children are harmed is overwhelming."

L.A.'s major freeways were mostly built in the 1950s and 1960s, slashing through cohesive residential neighborhoods and creating strange dead-end streets in places like Hollywood, Westwood, Toluca Lake, Boyle Heights and Lincoln Heights. In the 1980s and 1990s, when new housing sprouted up beside freeways in West L.A., Reseda, Studio City, Hollywood and many other areas, environmentalists warned that purposely placing housing next to the world's busiest and most polluted freeways was a bad idea. They argued that any public good — providing affordable housing or addressing pent-up ownership demand for condos — was outweighed by extensive health costs to people and society.

But the science wasn't there to back up the activists — until a team of mostly USC scientists published the 2004 multimillion-dollar Children's Health Study in the prestigious New England Journal of Medicine. Studying more than 1,700 children, scientists compared communities that enjoy clean air, such as Lake Arrowhead and Alpine, to those with dirty air, such as Riverside and Long Beach. The study showed high rates of underdeveloped lungs among children in the polluted areas. The implications were clear: long-term health problems ranging from asthma to early death for significant numbers of children being raised in Southern California.

"That study had a tremendous impact because of the quality of the research," says environmentalist Lyou, who also sits on the governing board of the South Coast Air Quality Management District, which sets air pollution–control policies affecting more than 16 million people. "It really shocked a lot of people. It not only confirmed what people in the field already knew, but it also created an undebatable view on the issue."

Around the same time, UCLA also published important findings showing that pregnant women who lived within 750 feet of a freeway had a greater-than-normal risk of delivering premature babies.

When USC scientists Rob McConnell, Jim Gauderman and others followed up the 2004 study by researching a much larger group of children — specifically to look into health problems caused by living within 528 feet of Southern California's crammed freeways — the findings worried epidemiologist Gauderman enough to testify before the City Council.

In Council chambers on April 25, 2007, he warned: "It's not just watery eyes or coughing after a particularly polluted day. ... We're talking about long-term risks of asthma, long-term risks of reduced lung development in children."

Scientists are especially concerned about nitrogen oxide and "particulate matter," essentially a dust that sometimes can't be seen. Particulates can be metals, gas emissions from cars and trucks, tire rubber and tire-brake dust. When mothers like Fay Green and Aura Sanabria complain about never-ending "dust" that settles inside their apartments in the Puerta del Sol development next to the I-5, they are actually talking about particulate matter.

When kids breathe in this highly toxic particulate, it goes deep into their lungs and can cause long-term health problems.

After listening to researcher Gauderman, several City Council members sounded ready to act.

Council District 12 representative Greig Smith, from the San Fernando Valley, announced that he and Council District 1 representative Ed Reyes, from the city's Eastside, had put forth a motion to study the idea of changing zoning laws to discourage or stop new housing within 500 feet of freeways.

"Maybe we should change the way of doing things around here," Smith told Gauderman and his council colleagues. And City Council District 6 representative Tony Cardenas, also from the San Fernando Valley, declared, "We have a lot of issues in my district we'd like to address, but with science, in my opinion, it's the best way for us to create the best defense in order to defend the community."

Janice Hahn, who represents Council District 15 in San Pedro and is running this year for California's lieutenant governor as an environmental candidate, was even more forceful, announcing, "I think the time for studies is over. I think the time for action is now."

L.A.'s lawmakers talked a big game. But it was nothing more.

Councilman LaBonge, who set up Gauderman's visit to the City Council, concedes today that, after that downtown hearing nearly three years ago, the City Council did nothing. Smith and Reyes' motion to "look into" a 500-foot barrier zone between new homes and freeways never turned into anything substantive; Smith and Reyes recently declined to comment to the Weekly about their long-abandoned motion.

Within months of USC's appeal to the City Council, in fact, one of L.A.'s most brash examples of freeway-abutting housing, the Universal Lofts, rose in Cahuenga Pass at 3450 Cahuenga Blvd., with a banner exhorting Angelenos to both "live" and "work" in the pricey, corrugated metal–and–cinder block buildings.

City zoning approvals allowed the developer to cram his $4,000-per-month, three-bedroom apartments and $1 million condos into a strip of land no more than 20 feet from the 234,000 vehicles that rumble by daily on the Hollywood Freeway.

LaBonge says such housing will continue to rise because "environmental issues need to compete with all other issues," and averting a city fiscal disaster is the only thing on the City Council members' minds.

But critics say that hardly explains the City Council's failure to warn residents or to pursue better planning when the city was flush with funds. Bill Gallegos, executive director of Communities for a Better Environment, says, "They can't ignore the science. It just can't be shunted off to the side because of the economic crisis."

LaBonge's logic probably wouldn't go over well with an activist parent like Elaine Lyles, whose daughter Itanza developed asthma when she was 10 years old — she's now a sophomore in college. Lyles, a commercial real estate broker, volunteers at a healthy-lungs advocacy organization, and she doesn't want any parent or child to go through the ordeals her family suffered.

For years, Lyles has lived near the 10 freeway in the South Robertson neighborhood; Itanza attended a nearby school. Years ago, upon receiving harrowing calls from school that her young daughter couldn't breathe, Lyles was told by her doctor that the girl had contracted asthma due to "pollutants in the atmosphere." The diagnosis changed Itanza Lyles' life.

"She would have difficulty breathing and I would tell her to calm down and be patient," Elaine Lyles recalls. She sometimes clashed with doctors, who pushed her daughter to scale back her athletic activities in order to improve her health. "But she's full of life and active, and she would get angry because she couldn't live life to the fullest."

Lyles witnessed Itanza suffer horrific asthma attacks, which can kill victims via suffocation, and she remains haunted by the fear that her daughter could die at anytime. A friend at church tragically lost a child during a severe asthma attack, devastating her and shocking the Lyles family. "Your kid can't get air," Lyles says. "You have as many inhalers as possible around, but you never know. As a parent, you're never free of the idea that your child could succumb."

Lyles' oldest daughter doesn't have asthma. The first five years of her life, when her tiny lungs were undergoing a critical stage of development, the Lyles family lived far from a major Los Angeles freeway, in the Hollywood Hills near Griffith Park. "It's probably why she has better lung health," Lyles says. Many scientists today would probably agree.

Percy Vaz, developer of the Lincoln Heights master-planned community where Fay Green and Aura Sañabria clean up thick "dust" in the Tesoro del Valle apartments, opposes a buffer zone between housing and freeway lanes. "I think there are apartment buildings just as susceptible on a major thoroughfare," says Vaz, a prominent local developer and founder of AMCAL Housing, which specializes in for-sale and rental affordable housing. "Would we have a buffer zone on Wilshire Boulevard? On a gut level, 500 feet is far overreaching.

But even crowded Wilshire Boulevard doesn't carry anything approaching 285,000 cars per day, nor does any L.A. surface street. The sheer volume on the city's freeways is a key reason why people are getting sick.

Yet Vaz doesn't think a health-hazard warning for renters or buyers is necessary. In fact, his tenant Sanabria, the mother of three young children, is more concerned about homeless people sleeping nearby, and neighbor Jesse Flores worries about gang activity in the area. "They're killing each other like fools," Flores says.

Vaz reports that no one — not the city Planning Department nor Ed Reyes, chairman of the City Council's Planning and Land Use Management Committee, who represents Lincoln Heights — has spoken to him about enacting buffer zones or requiring a disclosure statement for housing placed within 500 feet of freeways. (Through a spokeswoman, Reyes tells the Weekly he's "unavailable" to talk about the health impacts caused when City Hall approves housing that abuts freeways.)

"If you're buying a home near a freeway, you know it's there," Vaz says. "The freeway is hitting you in the face. Most people are buying and renting because there is a freeway." Moreover, he is seeing more and more units erected near the freeways, in part, because "there's a shortage of land and people will build where they can," even on often-expensive freeway-adjacent land.

With city officials now focused on preventing the city government of Los Angeles from sliding into a deeper fiscal crisis, a debate over the health of tens of thousands of local children is unlikely to be welcomed by the City Council or Villaraigosa.

According to Woo, neither the City Council, led by electric car–driving Council President Eric Garcetti, nor Villaraigosa, who wants Los Angeles to be "the cleanest and greenest city" in America, has shown an interest in the 500-foot buffers or hazard-disclosure regulations suggested by the scientists. Inside City Hall, where real estate developers have enjoyed outsized influence for the past 100 years or so, such restrictions, Woo says, would "probably be very controversial."

But neither is the issue being pushed by the environmental community in Southern California, which has been much more focused on lobbying the California Legislature on state environmental laws and global warming.

"I can't think of an [environmental] group that's fighting development near freeways," says Martha Arguello, executive director of the Los Angeles chapter of Physicians for Social Responsibility, a nonprofit, public-health advocacy group. "I'm hard-pressed."

The nonprofit organization Breathe L.A. — which promotes itself as a 107-year-old public-benefit group dedicated to "clean air and healthy lungs in Los Angeles County" — is giving its 2010 Breath of Life Award to District 9 City Councilwoman Jan Perry. The strongly pro-development Perry has pushed for lofts, condos and apartments next to and near downtown's jammed freeways. She has not pushed any plan to warn Angelenos about the serious health effects on children who move into that housing.

According to Breathe L.A.'s announcement, sent to the media a few days ago, Jan Perry promotes "clean air and healthy lungs ... each and every day."

Environmentalists, says Bahram Fazeli of Communities for a Better Environment, have perhaps missed an opportunity by focusing on other issues, such as cleaning up the ports and working with the Mayor's Office to sign off on a "cumulative-impacts" directive.

Although the directive has been slow in coming, it would ideally force city departments to look into how specific, major projects, such as a new oil refinery or airport expansion, add overall pollution to neighborhoods — and then plan accordingly. But the cumulative-impacts rule probably would be silent on the more direct threat to human health — housing being built right next to L.A. freeways.

"Maybe we made a mistake, maybe we should have gone with (freeway-adjacent housing)," Fazeli offers. "But we always think about these things, and think about strategy, and we only have limited resources."

Some environmentalists also act as cheerleaders for dense urban housing, including that along freeways, arguing that it helps to combat global warming by discouraging suburban living. Their focus is not on the health of individuals but the planet.

For all of these reasons, the people who move their children into unusually unhealthy, freeway-frontage projects fall into the cracks.

Romel Pascual, Los Angeles acting deputy mayor for energy and environment, says Villaraigosa "is someone who looks at public health and thinks it's very important."

But the mayor has yet to look seriously at the danger of living next to the freeway. Says Pascual: "It's worth exploring."

On August 14, 2008, USC preventive medicine professor Rob McConnell and the university's community outreach expert Andrea Hricko sat before Villaraigosa's political appointees on the city Planning Commission to share USC's 2007 freeway-housing findings. The meeting had been arranged by planning commissioner Mike Woo, who was worried about freeway-adjacent housing.

Jim Gauderman's USC colleague, environmental-health researcher McConnell, told the Los Angeles Planning Commission, "The very smallest particles pass right through the respiratory system and into the body, including the brain." McConnell and Hricko urged city planners to push for a 500-foot buffer zone between new housing and freeways or, at least, pursue an ordinance requiring developers to disclose to prospective renters or buyers the risks of living within one block of freeways.

Hricko cited Puerta del Sol, the city-backed condos near the I-5 freeway in Lincoln Heights, and the massive, 1,000-unit, walled-in, University Village directly abutting the 405 freeway in West L.A., as two troubling, real-life examples of housing developments that could make residents sick. "There are a lot of small kids in that housing," Hricko said of University Village.

It's ironic that UCLA, with great ballyhoo, touted the new University Village as affordable college housing in the 1990s and filled it with university students and employees. University Village immediately flanks both sides of the 405 freeway along Sawtelle and Sepulveda boulevards, where 281,000 passing cars and trucks create one of the world's most congested freeways. The roar of traffic necessitated towering sound walls, yet the University Village Web site boasts a playground and "state-of-the-art" child-care center — for 200 children.

The pale-stucco apartment buildings have a hipster feel that has attracted many young medical-school students and other student residents, as well as UCLA employees. They probably think it's a great deal because the rents are set below market rates for the pricey Westside.

According to a UCLA scientist who works with the EPA Southern California Particle Center, no studies of health effects were conducted at University Village. But in 2004 scientists measured the shape and size of the indoor and outdoor ultrafine "nano" particles in the village — which are of concern to scientists because nano particles can act as miniature transporters of toxins into the human respiratory tract.

Just like developer Geoff Palmer's upscale Orsini and Medici residences in L.A.'s "new downtown," and the Avenue 26 project, University Village sits well inside the 500-foot zone scientists say is hazardous to kids — and, they fear, almost no amount of mitigation can change that. Some scientists say that air-filtration systems designed into buildings — and even double-paned and triple-paned windows that are common in the luxury downtown condos next to the Harbor and Hollywood freeways — cannot stop the finest pollutants from finding their way in.

As McConnell told the city's planning commission in 2008, when pollution is tested next to Southern California freeways "you see a huge increase in a number of traffic-related pollutants, and it diminishes quite rapidly when you go back to 300 meters" or 984 feet, about two city blocks. The number of asthma cases among children, McConnell explained, tracks the same way — more sick kids near the freeway, more healthy kids farther away.

That day, the USC professor gave the planning commissioners an unusually firm recommendation: "I think there's strong health-science justification for regulating exposures within 500 feet of roadways with heavy traffic," he said. "I'm not sure that will guarantee the health of our children, but I think that there's very good evidence that within that margin, what might be thought of as a margin of safety, that there are health effects that children are going to be suffering."

Hricko concurred, saying a 500-foot buffer zone was merely a "start" and strongly suggested that real estate developers be required to disclose to prospective buyers and tenants the facts about possible health risks of living right next to a freeway.

By the end of the two-hour City Hall meeting in the late summer of 2008, Michael Woo, the planning commissioner, was shaken to the bone. "My reaction was, 'This is a very serious problem,' that it's worse than I thought," Woo tells L.A. Weekly.

Then–planning commission President Jane Usher ordered Los Angeles City Planning Department staffer Charlie Rausch to return in three months with "next-steps" suggestions from the planning department for the planning commission to consider, and potentially enact.

But by the deadline in November 2008, Rausch's boss, planning chief Gail Goldberg, had failed to produce any "next steps" for the planning commission. Goldberg and Usher, in fact, were busy sparring over City Hall's controversial push to increase housing density in neighborhoods citywide. Goldberg led City Hall's so-called density hawks, and Usher was on the other side, upset that carefully designed

Community Plans were too often ignored by Goldberg's planning department — for example, that developers seeking height and size "variances" to override local zoning were regularly given the green light. Usher resigned as planning commission president that December, in a very public parting.

The next month, in January 2009, with the outspoken Usher gone, Goldberg finally delivered her list of freeway-adjacent housing recommendations, which Woo describes as "weak." Goldberg suggested several mitigation ideas she said had been "proven very effective." Among other things, Goldberg said vegetation could be planted between housing and freeways — but some scientists say a thick and deep stand of mature trees would be required.

She suggested the installation of home air-filtration systems and proposed that developers install windows that don't open — both measures that scientists say do not keep fine-particulate matter out of the lungs of children and others because the dust is so pervasive and works its way through a building's tiniest cracks and holes.

The planning department and Goldberg "never really accommodated anything from that [August] meeting" with the scientists, says Angelo Logan, executive director of East Yard Communities for Environmental Justice, who was present and also testified.

Goldberg's halfhearted recommendations have now become a forgotten, and possibly lost, public document.

City Planning Department Deputy Director Vincent Bertoni could not find the year-old "first steps" report for the Weekly after repeated requests in January, according to Bertoni's aide. And although that list of recommendations is clearly a public document, another staffer said it's something that the Los Angeles City planning department would not keep for future reference — a claim that drew an incredulous response from former commissioner Usher.

The Weekly finally obtained a copy of the forgotten Gail Goldberg plan from an environmental activist. It contains no suggestions that families or others be warned before renting or buying housing within a block of an L.A. freeway.

Today, years after scientists warned City Hall leaders, Woo says the planning commission has "no legal tools to prevent a developer from building" family housing right next to a freeway. And environmentalist Logan backs this up, saying that the problems of "planning near freeways has been ignored."

Developers of the "vast majority" of housing in L.A. don't need permission from Villaraigosa's planning commissioners because the developers are not seeking special variances to get around height or density rules, Woo says. As a result, the planning commission has limited chances to challenge freeway-adjacent housing. "We don't have a very good process for at least questioning housing projects near freeways," he says.

One developer who would oppose a freeway buffer zone is Jeremy Byk, vice president of real estate development at Sherman Oaks–based IMT Residential. IMT builds apartments near the 101 and 405 freeways in the San Fernando Valley, with literature promoting "easy freeway access." One luxury project in Encino, with a towering lobby and grape-arbor façade still under construction, will soon offer two- and three-bedroom, mostly market-rate apartments 70 feet from the humming roadbed of the Ventura Freeway.

For IMT, if it can place an apartment building on land directly adjacent to a busy freeway, it can advertise, without paying a penny, to thousands of motorists every day. The complex in Encino, at 5501 Newcastle Ave., had for months a banner festooned across the front reading "Multi-Family Housing," which could be seen by the roughly 291,000 cars and trucks that pass that stretch daily.

"We like to be near as highly trafficked and high-visibility roadways as possible," says Byk. "It drives our sales that way."

He says he hasn't read the USC studies and didn't know about the push by scientists for the 500-foot buffers or a disclosure statement warning parents. He says he's fine with the idea of a health-hazard disclosure statement, but not a buffer zone. "It's ridiculous."

The developer says he is "always concerned" about the health of his tenants. But he is apparently unaware that some scientists don't believe current mitigation measures sufficiently keep out the pervasive toxic particles. He explains, "We're building modern buildings with air filters and dual-paned windows. We mitigate as much as possible."

Byk argues that in the future, vehicles will be far cleaner, and that current levels of lung damage will be reduced. "Emissions from cars and diesel trucks are ever diminishing ... I don't see it as a long-term, significant issue."

But, as Lyou of AQMD points out, California is many years from attaining lower, federally mandated emissions standards — and the volume of traffic is not decreasing but increasing. Even if radically lower tailpipe emissions were achieved in the next decade, Lyou says, cars and trucks will continue to produce vast amonts of hazardous freeway particulate matter from tire rubber and brake dust.

If leading scientists are shocked that their years of effort researching the health of thousands of children in Southern California produced zero action from L.A.'s mayor and 15 council members, many are unwilling to say so — or even to discuss their disappointment — publicly.

Andrea Hricko, director of community outreach at USC's Keck School of Medicine, though not a scientist, is charged with educating elected officials about important studies conducted by scientists like Rob McConnell and Jim Gauderman. But she doesn't play the kind of political hardball needed to get City Council members and the Mayor's Office involved in a controversial issue that would almost certainly infuriate developers — who are big campaign contributors to many City Hall politicians.

"This particular issue about buffer zones and freeways is a difficult one for city policy," Hricko says politely.

Although researcher McConnell strongly and very publicly supported 500-foot buffer zones in 2008, and Hricko backed him up and firmly put forth the idea of a health-hazard disclosure statement, she backtracked recently, telling the Weekly that she and McConnell "haven't advocated for a particular thing." The city of Los Angeles, she now says, has "plans to develop" regulations to address the problem of new housing next to freeways.

In fact, city leaders have no such plan. Officials in the Planning Department can't even find the old ideas from Gail Goldberg's January 2009 "first-steps" list. Comments from Councilman LaBonge, commissioner

Woo, and acting deputy mayor Pascual make clear that no elected City Hall politician is taking up the cause.

Yet Los Angeles City Council members do approve headline-grabbing environmental policies that tend to portray them as benevolent guardians of human health.

The council has banned smoking outdoors in or near restaurant patios, and in 2008, the council placed a controversial temporary ban on new fast-food outlets in a 32-square-mile area of South Los Angeles after Jan Perry said her constituents were eating too much fat. She and other council members used the scientifically dubious argument that fast-food chains were to blame, only to be embarrassed by a Rand Corp. study some months later clearly showing that South Los Angeles actually has fewer fast-food chains than several areas of L.A.

The council is not considering a disclosure ordinance, however, to warn people about the well-researched and proven risks, especially for children, of living right next to a freeway. Joe Lyou finds the situation "outrageous," saying, "To create housing near areas that are dangerous for your health just seems so fundamentally wrong."

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RESEARCHER FROM CHILDREN'S HOSPITAL LOS ANGELES AND USC FINDS PROXIMITY TO FREEWAY IS ASSOCIATED WITH AUTISM

Case-control study demonstrates connection between autism and traffic pollution

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LOS ANGELES (December 16, 2010) – Living near a freeway may be associated with increased risk of autism, according to a study published by a team of researchers from Children's Hospital Los Angeles, the Keck School of Medicine of the University of Southern California (USC) and the UC Davis MIND Institute.

The paper will appear online in the journal Environmental Health Perspectives this week.

"Children born to mothers living within 309 meters of a freeway appeared to be twice as likely to have autism," said Heather Volk, PhD, MPH, and first author on the study. Dr. Volk holds a joint appointment at the Community, Health Outcomes & Intervention Research Program at The Saban Research Institute of Children's Hospital Los Angeles, the Zilkha Neurogenetic Institute and the Department of Preventative Medicine at USC.

Autism is a developmental disorder that has long been ascribed to genetic factors. While changes in diagnostic criteria and increased awareness have been thought to contribute to the rising incidence of the disorder, these factors alone cannot explain the dramatic increase in the number of children affected. The Centers for Disease Control reported a 57 percent increase between 2002 and 2006. This study supports the theory that environmental factors, in conjunction with a strong genetic risk, may be one possible explanation for the increase.

Heather Volk PhD, MPH, Community, Health Outcomes & Intervention Research Program at The Saban Research Institute of Children's Hospital Los Angeles, the Zilkha Neurogenetic Institute and the Department of Preventative Medicine at USC

While little is known about the role of environmental pollutants on autism, air pollution exposure during pregnancy has been seen to have physical and developmental effects on the fetus in other studies. Exposure to air pollution during the first months of life has also been linked to cognitive developmental delay. However, the authors said that this study is the first to link exposure to vehicular pollutants with autism risk, though direct measurements of pollutants were not made.

Data from children with autism and typically developing children, who served as controls, were drawn from the Childhood Autism Risks from Genetics and the Environment (CHARGE) study, a population-based case-control study of preschool children. Children were between the ages of 24 and 60 months at the start of the study and lived in communities around Los Angeles, San Francisco and Sacramento. Population-based controls were recruited from state of California birth files, and were frequency matched to the autism cases by age, gender, and broad geographic area. Each participating family was evaluated in person. All children were assessed; assessment of autism was done using well-validated instruments.

The study examined the locations where the children's families' lived during the first, second and third trimesters of their mothers' pregnancies, and at the time of the baby's birth and looked at the proximity of these homes to a major road or freeway. The participants' gestational ages were determined using ultrasound measurements and prenatal records.

Dr. Volk and her colleagues found that living within 309 meters of a freeway (or just over 1000 feet) at birth was associated with a two-fold increase in autism risk. This association was not altered by adjustment for child gender or ethnicity, maximum education in the home, maternal age, or prenatal smoking. The researchers found no consistent pattern of association of autism with proximity to a major road.

Traffic-related air pollutants have been observed to induce inflammation and oxidative stress in toxicological and human studies. The emerging evidence that oxidative stress and inflammation are involved in the pathogenesis of autism supports the findings of this study.

"We expect to find many, perhaps dozens, of environmental factors over the next few years, with each of them probably contributing to a fraction of autism cases. It is highly likely that most of them operate in conjunction with other exposures and/or with genes," said Irva Hertz -Picciotto, PhD, chief of the division of environmental and occupational health in the Department of Public Health Sciences at UC Davis, and principal investigator on the CHARGE study.

Dr. Volk's co-authors on the study include: Rob McConnell, MD, from the Department of Preventative Medicine at USC, Irva Hertz-Picciotto, PhD, and Lora Delwiche, MS, from the University of California at Davis, and Fred Lurmann, of Sonoma Technology, Inc.

This study was supported by grants from the National Institute of Environmental Health Sciences, the Environmental Protection Agency, the MIND Institute, the Southern California Environmental Health Sciences Center, Autism Speaks, and the Las Madrinas Endowment on Autism Research, Intervention and Outcomes.

The Saban Research Institute of Children's Hospital Los Angeles is among the largest and most productive pediatric research facilities in the United States, with 100 investigators at work on 186 laboratory studies, clinical trials and community-based research and health services. The Saban Research Institute is ranked eighth in National Institutes of Health funding among children's hospitals in the United States.

Founded in 1901, Children's Hospital Los Angeles is one of the nation's leading children's hospitals and is acknowledged worldwide for its leadership in pediatric and adolescent health. Children's Hospital Los Angeles is one of only seven children's hospitals in the nation – and the only children's hospital on the West Coast – ranked for two consecutive years in all 10 pediatric specialties in the U.S. News & World Report rankings and named to the magazine's "Honor Roll" of children's hospitals.

Established in 1885, the Keck School of Medicine of USC (www.keck.usc.edu) is dedicated to excellence in medical education, patient care and research. Children's Hospital Los Angeles is staffed by physicians and scientists who are on the Keck School faculty. The Keck School is home to a number of leading scientific programs, including the Zilkha Neurogenetic Institute (www.usc.edu/schools/medicine/research/institutes/zni/), a premier translational brain disease institute dedicated to discovering the causes of and developing treatments for a variety of brain disorders. Children's Hospital Los Angeles is a premier teaching hospital and has been affiliated with the Keck School of Medicine of the University of Southern California since 1932.

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Study Links Autism to 101, 405 Freeway Traffic

The UCLA study identifies 7,603 autistic children whose mothers were exposed to high levels of air pollution during pregnancy.

Posted by Jared Morgan (Editor), March 11, 2013 at 03:26 pm

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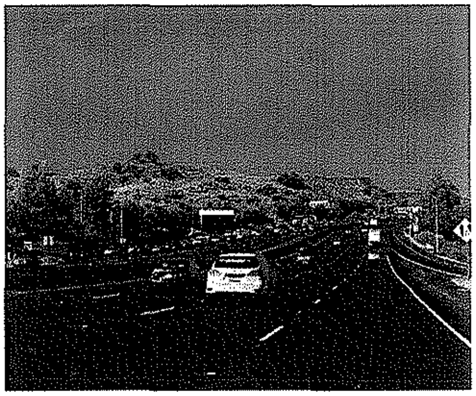

Researchers at UCLA have discovered a link between cases of autism in Los Angeles County and air pollution caused mostly by freeway traffic in the area, including that of the 101 and 405 freeways near Sherman Oaks.

The study, published March 1 in Environmental Health Perspectives, looked at 7,603 children ages 3-5 who were diagnosed with autism during 1998-2009 and found associations between the disorder and pregnant women living in Los Angles County. The researchers worked closely with the California Department of Developmental Services and other agencies to identify children for the study.

The researchers — Tracy Ann Becerra, Michelle Wilhelm, Jørn Olsen, Myles Cockburn and Beate Ritz — used a land-use regression model of statistical analysis and data from ambient air pollutant monitoring stations positioned throughout L.A. County.

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Ambient Air Pollution and Autism in Los Angeles County, California

Tracy Ann Becerra,[1] Michelle Wilhelm,[1] Jørn Olsen,[1] Myles Cockburn,[2] and Beate Ritz[1]

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BACKGROUND: The prevalence of autistic disorder (AD), a serious developmental condition, has risen dramatically over the past two decades, but high-quality population-based research addressing etiology is limited.

OBJECTIVES: We studied the influence of exposures to traffic-related air pollution during pregnancy on the development of autism using data from air monitoring stations and a land use regression (LUR) model to estimate exposures.

METHODS: Children of mothers who gave birth in Los Angeles, California, who were diagnosed with a primary AD diagnosis at 3–5 years of age during 1998–2009 were identified through the California Department of Developmental Services and linked to 1995–2006 California birth certificates. For 7,603 children with autism and 10 controls per case matched by sex, birth year, and minimum gestational age, birth addresses were mapped and linked to the nearest air monitoring station and a LUR model. We used conditional logistic regression, adjusting for maternal and perinatal characteristics including indicators of SES.

RESULTS: Per interquartile range (IQR) increase, we estimated a 12–15% relative increase in odds of autism for ozone [odds ratio (OR) = 1.12, 95% CI: 1.06, 1.19; per 11.54-ppb increase] and particulate matter ≤ 2.5 µm (OR = 1.15; 95% CI: 1.06, 1.24; per 4.68-µg/m^3 increase) when mutually adjusting for both pollutants. Furthermore, we estimated 3–9% relative increases in odds per IQR increase for LUR-based nitric oxide and nitrogen dioxide exposure estimates. LUR-based associations were strongest for children of mothers with less than a high school education.

CONCLUSION: Measured and estimated exposures from ambient pollutant monitors and LUR model suggest associations between autism and prenatal air pollution exposure, mostly related to traffic sources.

KEY WORDS: air pollution, autism, land-use regression, pregnancy, traffic. *Environ Health Perspect* 121:380–386 (2013). http://dx.doi.org/10.1289/ehp.1205827 [Online 18 December 2012]

Autistic disorder (AD) is a serious developmental condition characterized by impairments in social interaction, abnormalities in verbal and nonverbal communication, and restricted stereotyped behaviors thought to be attributable to insults to the developing fetal and/or infant brain (American Psychiatric Association 2000; Geschwind and Levitt 2007). The prevalence of autism has risen for the past 20 years, partly due to changes in case definition and improved case recognition. Hertz-Picciotto and Delwiche (2009) suggested the observed rise in incidence in California between 1990 and 2001 may partially but not fully be explained by younger age at diagnosis (12% increase) and inclusion of milder cases (56% increase). Although evidence for genetic contributions is considered quite strong, twin concordance research recently suggested that environmental causes are also important (Hallmayer et al. 2011), and it is quite conceivable that multiple genes interact with environmental factors (Cederlund and Gillberg 2004; Glasson et al. 2004).

Few studies to date have examined the impact of air pollution on brain development in general during pregnancy, although air pollution exposure during the prenatal period has been associated with a variety of adverse birth outcomes (Ritz and Yu 1999; Ritz et al. 2000; Srám et al. 2005; Williams et al. 1977) and neuropsychological effects later in childhood (Calderón-Garcidueñas et al. 2008; Edwards et al. 2010; Perera et al. 2006, 2012; Suglia et al. 2008; Tang et al. 2008; Wang et al. 2009). The biological mechanisms by which air pollution may cause autism are largely unknown, although the immune system has been implicated as possibly playing a role (Hertz-Picciotto et al. 2008). Only three studies to date have examined associations between autism and air pollution exposures during the prenatal period (Kalkbrenner et al. 2010; Volk et al. 2010; Windham et al. 2006). In one study, autism was associated with ambient air concentrations of chlorinated solvents and heavy metals near birth residences (Windham et al. 2006). Another study of autism reported elevated odds ratios (ORs) for methylene chloride, quinoline, and styrene exposures in ambient air, but near-null effect estimates for ambient air metals and other pollutants (Kalkbrenner et al. 2010). A third study reported that children born to mothers living within 309 m of a freeway during pregnancy were more likely to be diagnosed with autism than children whose mothers lived > 1,419 m from a freeway (Volk et al. 2010).

We derived air pollution exposure measures using data from government air monitoring stations that provide information on spatial and temporal variations in criteria pollutants, and from a land use regression (LUR) model we developed for the Los Angeles Air Basin. The LUR model allowed us to greatly improve our spatial characterization of traffic-related air pollution. Because heterogeneity of the autism phenotype and its severity may be attributable to influences on different critical gestational windows of brain development (Geschwind and Levitt 2007), we also seasonalized these traffic measures to investigate vulnerable trimesters of development. Here we examine associations between measured and modeled exposures to prenatal air pollution and autism in children born to mothers in Los Angeles County, California, since 1995.

Methods

In this population-based case–control study, our source population consisted of children born in 1995–2006 to mothers who resided in Los Angeles County at the time of giving birth.

Case ascertainment and definition. In Los Angeles, children with autism are identified through seven regional centers, contracted by the California Department of Developmental Services (DDS), whose staff determine eligibility and coordinate services in their respective service areas. Cases are children given a primary diagnosis of AD, the most severe among the autism spectrum disorders (ASD) diagnoses, between 36 and 71 months of age at a Los Angeles Regional Center during 1998–2009. During our study period, eligibility for DDS services did not depend on citizenship or financial status—services were available to all children regardless of socioeconomic, health insurance status, or racial/ethnic identification. Referrals to the regional centers are usually made by pediatricians, other clinical providers, and schools, but parents may also self-refer their children.

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Supplemental Material is available online (http://dx.doi.org/10.1289/ehp.1205827).

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The authors declare they have no actual or potential competing financial interests.

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The diagnosis of AD was based on the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision* (DSM-IV-R) (American Psychiatric Association 2000), code 299.00, reported on the Client Development Evaluation Report (CDER). Validation studies have established the reliability and validity of the CDER in California (California Department of Developmental Services 1986, 2007).

Record linkage. We attempted to link 10,821 DDS records of children with autism to their respective birth records using the National Program of Cancer Registries Registry Plus™ Link Plus Software [Centers for Disease Control and Prevention (CDC) 2010a]. Given the child's first and last name, birth date, and sex; mother's first and last name and birth date; and father's last name and birth date, we probabilistically matched the two records and reviewed all high scoring linkages (≥ 25), almost half of the linkages (9,120 of 22,806), only accepting those manually confirmed to be likely matches (see CDC for record linkage concepts) (CDC 2010b). The remaining lower scoring linkages were reviewed using SAS version 9.2 (SAS Institute Inc., Cary, NC) and accepted on the condition that the child's first and last name, and birth date matched perfectly. We correctly linked 8,600 DDS records (79.5% of all cases) to birth records. Of the 2,221 DDS records not linked to CA birth records, 35% were not born in Los Angeles County, 46% were missing birthplace information, and only 19% recorded the child as born in Los Angeles County. The most common reason for nonlinkage was missing or incomplete linkage information on either of the records.

From among linked cases, we further excluded children whose mother's residency was outside of Los Angeles County during her pregnancy (n = 41), records with missing or implausible gestational ages (< 21 or > 46 weeks) or birth weights (< 500 g or > 6,800 g) (n = 508), and cases who did not have a primary diagnosis of AD (n = 448), leaving a final sample of 7,603 children with autism successfully linked to a birth certificate who met all inclusion criteria.

Control selection. We selected 10 controls for each case from our source population. Using birth certificates, each control was randomly selected without replacement and matched on birth year and sex. In addition, each control's gestational age at birth had to be equal to or greater than the gestational age at birth of their matched case to ensure prenatal exposures could be estimated for comparable lengths of time. Children were eligible as controls if they had no documentation of autism—did not have a DDS record in Los Angeles County by 2009, had a plausible gestational age (21–46 weeks inclusive) and birth weight (500–6,800 g inclusive), and the mother resided in Los Angeles County at the time of birth.

Matching by birth year balanced the large increase in autism rates during the case ascertainment period, 1998–2009. The matched control set included 76,030 children born during 1995–2006. From among these, we further excluded 248 control children who died before 6 years of age (71 months) based on California death records, leaving 75,782 controls.

Residential locations at delivery that were reported on birth certificates were mapped using a custom geocoder (Goldberg et al. 2008), and further exclusions were necessary if residential addresses were not geocodable (9 cases, 147 controls) [see Supplemental Material, Table S1 (http://dx.doi.org/10.1289/ehp.1205827)]. The geocoded residential locations at birth were then linked to the nearest government air monitoring station in Los Angeles County and our LUR model.

This research was approved by the University of California, Los Angeles, Office of the Human Research Protection Program and the California Committee for the Protection of Human Subjects, and was exempted from informed consent requirements.

Exposure assessment. Using measurements for the criteria pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), nitric oxide (NO), ozone (O_3), and particulate matter concentrations with an aerodynamic diameter ≤ 10 μm (PM_{10}) and ≤ 2.5 μm ($PM_{2.5}$) from nearest monitoring stations, we estimated average exposures for the entire pregnancy and for three specific periods during pregnancy based on the birth date and gestational age reported on the birth certificate: first trimester (estimated first day of last menstrual period through day 92), second trimester (days 93–185), and third trimester (day 186 to date of birth). The length of each pregnancy averaging period for controls was the same as for their matched case: Averaging periods for each autistic risk set were truncated at the gestational age of the matched case at birth. Hourly measurements for CO, NO_2, NO, and O_3 (1000–1800 hours) were first averaged for each day if sufficient data were available [for details, see Supplemental Material, Table S2 (http://dx.doi.org/10.1289/ehp.1205827)]. Daily averages for the gaseous pollutants and 24-hr measurements of PM_{10} and $PM_{2.5}$ (collected every 6 and 3 days, respectively) were then averaged over the different pregnancy periods when data were sufficient to do so (see Supplemental Material, Table S2).

To classify prenatal exposures to traffic-related pollutants on a more spatially-resolved scale, we extracted NO and NO_2 concentration estimates at each residential location from the LUR model surfaces we developed for the Los Angeles Air Basin (Su et al. 2009). This LUR model was based on approximately 200 measurements of outdoor air pollution taken during 2006–2007 in locations across Los Angeles County, in addition to predictors of traffic exhaust concentrations (such as traffic counts, truck routes, and roadways). The model explained 81% and 86% of the variance in measured NO and NO_2 concentrations, respectively (Su et al. 2009).

The LUR models most closely approximate annual average concentrations. Thus, in addition to using the LUR annual average ("unseasonalized") estimates, we also generated "seasonalized" estimates to incorporate yearly and monthly air pollution variations. Specifically, using ambient air monitoring data for NO and NO_2 at the closest monitoring station, the LUR estimates were adjusted to represent pregnancy month–specific LUR values by multiplying the LUR (unseasonalized) estimates for NO and NO_2 by the ratio of average ambient NO and NO_2 during each pregnancy month to annual average ambient NO and NO_2 (2006–2007). These seasonalized monthly LUR values were then averaged over each pregnancy period. We applied the same exclusion criteria for missing values as described above when generating the pregnancy month scaling factors using the government monitoring data.

Statistical analysis. We calculated Pearson's correlation coefficients to examine relations between the various pollutant measures. Associations between air pollution exposure and odds of AD diagnosis were examined using one- and two-pollutant models. We adjusted for LUR estimates of traffic-related exposures in our monitor-based pollutant models and assessed particles and the gaseous pollutant ozone together in the same model. We calculated ORs and 95% CIs using conditional logistic regression to estimate increases in odds of AD per interquartile range (IQR) increase in pregnancy exposures, based on exposure distributions in the controls.

We adjusted for potential confounders for which data were available on birth certificates based on prior knowledge (see Table 1 for categories used in models): maternal age, maternal place of birth, race/ethnicity, and education; type of birth (single, multiple), parity; insurance type (public, private, or other, a proxy for socioeconomic status); and gestational age at birth (weeks). In addition, we estimated pollutant effects without adjustment for gestational age to allow for the possibility that this factor might be an intermediate and thus on the causal pathway between air pollution and autism.

We expected maternal education to correlate with estimates of air pollution and autism (Ponce et al. 2005), so we also used unconditional logistic regression models to estimate associations stratified by maternal education (less than high school, high school,

Table 1. Demographic and prenatal characteristics by case (7,594) and control group ($n = 75,635$) [n (%)].

Characteristics	AD cases	Controls[a]
Sex		
Male	6,291 (82.8)	62,643 (82.8)
Female	1,303 (17.2)	12,992 (17.2)
Birth year		
1995	277 (3.7)	2,762 (3.7)
1996	319 (4.2)	3,173 (4.2)
1997	382 (5.0)	3,812 (5.0)
1998	487 (6.4)	4,859 (6.4)
1999	455 (6.0)	4,533 (6.0)
2000	594 (7.8)	5,904 (7.8)
2001	732 (9.6)	7,285 (9.6)
2002	885 (11.7)	8,776 (11.6)
2003	1,035 (13.6)	10,336 (13.7)
2004	1,034 (13.6)	10,284 (13.6)
2005	874 (11.5)	8,735 (11.6)
2006	520 (6.9)	5,176 (6.8)
Gestational age (weeks) (mean ± SD)	39.0 ± 2.6	39.4 ± 2.3
Maternal characteristics		
Maternal age at delivery (years)		
≤ 18	178 (2.3)	4,997 (6.6)
19–25	1,673 (22.0)	23,906 (31.6)
26–30	2,034 (26.8)	20,228 (26.7)
31–35	2,159 (28.4)	16,845 (22.3)
> 35	1,550 (20.4)	9,654 (12.8)
Missing	0	5 (0.0)
Maternal birthplace		
U.S.-born	3,544 (46.7)	32,590 (43.1)
Foreign-born	4,038 (53.2)	42,930 (56.8)
Unknown	12 (0.1)	115 (0.1)
Maternal race/ethnicity		
Non-Hispanic white	2,625 (34.6)	20,616 (27.3)
Non-Hispanic black	622 (8.2)	6,028 (8.0)
Hispanic	3,183 (41.9)	40,118 (53.0)
Asian	1,073 (14.1)	8,123 (10.7)
Other/unknown	91 (1.2)	750 (1.0)
Maternal education		
< High school	1,725 (22.7)	27,232 (36.0)
High school	1,861 (24.5)	20,115 (26.6)
> High school	3,926 (51.7)	27,400 (36.2)
Unknown	82 (1.1)	888 (1.2)
Prenatal characteristics		
Type of birth		
Single	7,218 (95.0)	73,880 (97.7)
Multiple	376 (5.0)	1,755 (2.3)
Insurance type		
Public (Medi-Cal)	2,971 (39.1)	39,382 (52.1)
Private	4,432 (58.4)	33,746 (44.6)
Other	117 (1.5)	1,925 (2.6)
Unknown	74 (1.0)	582 (0.8)
Parity		
One (index birth)	3,280 (43.2)	29,399 (38.9)
Two	2,556 (33.7)	23,495 (31.1)
Three	1,134 (14.9)	13,296 (17.6)
> Three	623 (8.2)	9,417 (12.4)
Unknown	1 (0.0)	28 (0.0)
Birth weight (g) (mean ± SD)	3321.0 ± 640.9	3377.8 ± 543.3
Paternal age at delivery (years)		
≤ 18	53 (0.7)	1,484 (2.0)
19–25	1,017 (13.4)	16,067 (21.2)
26–30	1,545 (20.4)	17,752 (23.5)
31–35	1,999 (26.3)	17,174 (22.7)
> 35	2,502 (32.9)	17,286 (22.9)
Unknown	478 (6.3)	5,872 (7.8)
Paternal education		
< High school	1,508 (19.9)	23,653 (31.3)
High school	1,931 (25.4)	19,725 (26.1)
> High school	3,589 (47.3)	25,145 (33.2)
Unknown	566 (7.4)	7,112 (9.4)

[a]Controls are matched to cases by sex and birth year, and at minimum reached the gestational age of the case.

more than high school) controlling for the matching variables (birth year, sex, and gestational weeks at birth) in addition to the other covariates noted above.

Results

Both mothers and fathers of children with autism were older and more educated than parents of control children, and mothers were more often non-Hispanic white but less often Hispanic, especially foreign-born Hispanic (Table 1). A higher percentage of mothers of case children were primiparous and had multiple gestations. As expected, children with autism had a lower mean gestational age at birth and birth weight than control children. Of the children with autism not linked to a Los Angeles County birth record, parental characteristics were undetermined because of frequent missing information—50–60% missing maternal and paternal age/birthday (results not shown). However, of these non-linked DDS records, 42% of families were Hispanic (results not shown), comparable to the 41.9% of Hispanic mothers of case children included in this study (Table 1).

Unseasonalized LUR-based exposure estimates for NO and NO_2 were negatively correlated with entire pregnancy ozone ($r = -0.23$ and -0.33, respectively) but positively correlated with entire pregnancy CO, NO, NO_2, and $PM_{2.5}$ ($r = 0.22$–0.43), and as expected, correlations between measured levels of pollutants and seasonalized LUR estimates were stronger than correlations with unseasonalized LUR estimates ($r = 0.30$–0.73) [see Supplemental Material, Table S3 (http://dx.doi.org/10.1289/ehp.1205827)]. Even though all trimester-specific measures correlated moderately with entire pregnancy averages ($r \geq 0.46$), second-trimester exposure averages correlated most strongly with entire pregnancy averages ($r \geq 0.80$), and first- and third-trimester averages for the same pollutants were least correlated ($r = 0.05$–0.37) (results not shown).

We estimated 4–7% relative increases in odds of an AD diagnosis per IQR increase in unseasonalized LUR measures of NO and NO_2 in adjusted models (Table 2). These OR estimates remained similar (1.03 to 1.09) in two-pollutant adjusted models (Table 3). ORs for autism per IQR increase in monitor-based estimates of entire pregnancy exposure to NO and NO_2 were slightly smaller than associations with IQR increases in LUR-based estimates (Table 2). We also estimated increases in odds of AD diagnosis per IQR increase in entire pregnancy exposure to ozone (OR = 1.06; 95% CI: 1.01, 1.12) and $PM_{2.5}$ (OR = 1.07; 95% CI: 1.00, 1.15) (Table 2). In two-pollutant models these estimates increased (O_3 OR = 1.12; 95% CI: 1.06, 1.19; $PM_{2.5}$ OR = 1.15; 95% CI: 1.06, 1.24) when we mutually adjusted for both pollutants (Table 3). In addition, without adjustment for gestational weeks at birth, associations increased further or remained the same; for the two-pollutant models including ozone and $PM_{2.5}$ (O_3 OR = 1.14; 95% CI: 1.10, 1.19; $PM_{2.5}$ OR = 1.15; 95% CI: 1.09, 1.22) or O_3 and LUR–NO_2 (O_3 OR = 1.10; 95% CI: 1.06, 1.14; LUR–NO_2 OR = 1.10; 95% CI: 1.07, 1.13) (results not shown).

In general, effect estimates did not show consistent patterns across trimesters in one-pollutant models. For example, average second- and third- but not first-trimester exposures to O_3 were associated with AD [first-trimester OR = 1.00 (95% CI: 0.97, 1.03); second-trimester OR = 1.02 (95% CI: 1.00, 1.05); third-trimester OR = 1.04 (95% CI: 1.01, 1.06)] [see Supplemental Material, Table S4 (http://dx.doi.org/10.1289/ehp.1205827)].

Table 2. Associations between IQR increases in entire pregnancy average air pollution exposures and AD: conditional logistic regression analysis using matched controls.[a]

		Unadjusted	Adjusted[b]	
Exposure metric	IQR	OR	n[c] (case/control)	OR (95%CI)
U-LUR-NO	9.40 ppb	0.87	7,420/72,231	1.04 (1.00, 1.08)
U-LUR-NO_2	5.41 ppb	0.91	7,420/72,231	1.07 (1.03, 1.12)
S-LUR-NO	18.46 ppb	0.84	6,279/52,144	1.02 (0.96, 1.08)
S-LUR-NO_2	9.70 ppb	0.87	6,279/52,144	1.05 (0.98, 1.12)
CO	0.55 ppm	0.85	7,421/72,253	0.99 (0.94, 1.05)
NO	29.67 ppb	0.85	7,421/72,253	1.01 (0.95, 1.07)
NO_2	10.47 ppb	0.89	7,421/72,253	1.04 (0.98, 1.10)
O_3	11.54 ppb	1.19	7,421/72,253	1.06 (1.01, 1.12)
PM_{10}	8.25 μg/m^3	0.96	6,795/63,662	1.03 (0.96, 1.10)
$PM_{2.5}$	4.68 μg/m^3	1.01	5,840/55,776	1.07 (1.00, 1.15)

Abbreviations: S-LUR, seasonalized land use regression; U-LUR, unseasonalized land use regression.
[a] Controls matched to cases by birth year, sex, and at minimum reached the gestational age of the case. [b] Adjusted for maternal age, education, race/ethnicity, maternal place of birth; type of birth, parity, insurance type, gestational weeks at birth (continuous). [c] Sample with complete data (i.e., strata with at least one case and one control).

Table 3. Associations between IQR increases in entire pregnancy average air pollution exposures and AD: conditional logistic regression analysis using matched controls,[a] adjusted[b] two-pollutant models.

Pollutant 1	IQR	Pollutant 2	IQR	n[c] (case/control)	Pollutant 1 OR (95%CI)	Pollutant 2 OR (95%CI)
O_3	11.54 ppb	U-LUR-NO	9.4 ppb	7,420/72,231	1.08 (1.03, 1.14)	1.06 (1.02, 1.11)
O_3	11.54 ppb	U-LUR-NO_2	5.4 ppb	7,420/72,231	1.08 (1.03, 1.14)	1.09 (1.04, 1.13)
NO	29.67 ppb	U-LUR-NO	9.4 ppb	7,420/72,231	0.99 (0.93, 1.05)	1.04 (1.00, 1.09)
NO	29.67 ppb	U-LUR-NO_2	5.4 ppb	7,420/72,231	0.98 (0.92, 1.04)	1.08 (1.03, 1.13)
CO	0.55 ppm	U-LUR-NO	9.4 ppb	7,420/72,231	0.97 (0.92, 1.03)	1.05 (1.00, 1.09)
CO	0.55 ppm	U-LUR-NO_2	5.4 ppb	7,420/72,231	0.96 (0.91, 1.02)	1.08 (1.03, 1.13)
PM_{10}	8.25 μg/m^3	U-LUR-NO	9.4 ppb	6,794/63,642	1.02 (0.95, 1.10)	1.04 (1.00, 1.09)
PM_{10}	8.25 μg/m^3	U-LUR-NO_2	5.4 ppb	6,794/63,642	1.00 (0.93, 1.07)	1.08 (1.03, 1.13)
$PM_{2.5}$	4.68 μg/m^3	U-LUR-NO	9.4 ppb	5,839/55,757	1.06 (0.99, 1.14)	1.03 (0.98, 1.08)
$PM_{2.5}$	4.68 μg/m^3	U-LUR-NO_2	5.4 ppb	5,839/55,757	1.05 (0.97, 1.12)	1.07 (1.01, 1.12)
O_3	11.54 ppb	PM_{10}	8.25 μg/m^3	6,795/63,662	1.06 (1.01, 1.12)	1.04 (0.97, 1.11)
O_3	11.54 ppb	$PM_{2.5}$	4.68 μg/m^3	5,840/55,776	1.12 (1.06, 1.19)	1.15 (1.06, 1.24)

U-LUR, unseasonalized land use regression.
[a] Controls matched to cases by birth year, sex, and at minimum reached the gestational age of the case. [b] Adjusted for maternal age, education, race/ethnicity, maternal place of birth; type of birth, parity, insurance type, gestational weeks at birth (continuous). [c] Sample with complete data (i.e., strata with at least one case and one control).

Adjusting for maternal education changed air pollution effect estimates most strongly, likely because socioeconomic status is strongly associated both with air pollution exposure and autism diagnosis. We also investigated potential effect measure modification of the air pollution and autism association: We examined whether air pollution effect estimates vary according to strata of maternal education possibly due to differences in vulnerability, in actual exposure, or exposure and outcome misclassification. Generally, LUR-based traffic-related pollutant estimates showed the strongest association with autism in children of the least educated mothers, compared with mothers in the highest educational stratum (Table 4).

Discussion

We estimated an approximately 3–9% relative increase in the odds of AD per IQR increase in entire pregnancy exposure to NO (9.40 ppb) and NO_2 (5.41 ppb) as estimated by our two-pollutant LUR models. Our LUR model was built upon neighborhood-level measures of nitrogen oxides (NO_x) and represents smaller-scale variability in exhaust pollutants, compared with estimates based on air monitoring station measurements (Zhou and Levy 2007). We also estimated a 5–15% relative increase in the odds of AD per IQR increase in entire pregnancy exposure to $PM_{2.5}$ (4.68 μg/m^3) (Table 3), a pollutant whose concentrations are driven partly by fossil fuel combustion in motor vehicles. In addition, an 11.54-ppb increase in O_3 exposures during pregnancy was associated with a 6–12% relative increase in the odds of having a child diagnosed with autism.

Few studies have previously examined associations between air pollution–related exposures during the prenatal period and later development of autism, and none used ambient air monitoring data or LUR models to estimate risk in a large population. A relatively small study (284 cases, 657 controls) in the San Francisco Bay, California, area used study-specific census tract pollution

Table 4. Associations between IQR increases in entire pregnancy average air pollution exposures and AD: unconditional logistic regression by maternal education.

		Adjusted ORs by maternal education[a]					
		< High school		High school		> High school	
Pollutant	IQR	Case/control	Adjusted OR	Case/control	Adjusted OR	Case/control	Adjusted OR
U-LUR-NO	9.40 ppb	1,713/27,051	1.11 (1.05, 1.18)	1,842/19,962	1.03 (0.97, 1.09)	3,865/26,987	0.99 (0.95, 1.03)
U-LUR-NO_2	5.41 ppb	1,713/27,051	1.17 (1.10, 1.25)	1,842/19,962	1.06 (1.00, 1.13)	3,865/26,987	1.03 (0.99, 1.07)
S-LUR-NO	18.46 ppb	1,435/23,270	1.03 (0.96, 1.10)	1,513/16,533	1.02 (0.95, 1.09)	3,331/22,872	1.01 (0.96, 1.07)
S-LUR-NO_2	9.70 ppb	1,435/23,270	1.04 (0.97, 1.27)	1,513/16,533	1.07 (0.99, 1.15)	3,331/22,872	1.07 (1.01, 1.12)
CO	0.55 ppm	1,714/27,036	0.90 (0.85, 0.96)	1,842/19,949	1.03 (0.97, 1.09)	3,865/26,960	1.09 (1.04, 1.14)
NO	29.67 ppb	1,714/27,036	0.96 (0.89, 1.03)	1,842/19,949	1.02 (0.95, 1.09)	3,865/26,960	1.04 (0.99, 1.10)
NO_2	10.47 ppb	1,714/27,036	0.97 (0.90, 1.04)	1,842/19,949	1.08 (1.01, 1.16)	3,865/26,960	1.07 (1.02, 1.12)
O_3	11.54 ppb	1,714/27,036	1.09 (1.02, 1.16)	1,842/19,949	1.07 (1.01, 1.14)	3,865/26,960	1.04 (0.99, 1.09)
$PM_{2.5}$	8.25 μg/m^3	1,352/20,540	1.04 (0.96, 1.12)	1,415/15,547	1.09 (1.01, 1.17)	3,074/21,970	1.06 (1.00, 1.12)
PM_{10}	4.68 μg/m^3	1,585/24,775	0.97 (0.91, 1.04)	1,670/18,273	1.08 (1.01, 1.16)	3,550/24,707	1.02 (0.97, 1.07)

Abbreviations: S-LUR, seasonalized land use regression; U-LUR, unseasonalized land use regression. Missing maternal education (case/control): U-LUR: 63/718; S-LUR: 50/605; monitor-based criteria: 63/715; PM_{10}: 57/659; $PM_{2.5}$: 51/596.
[a] Adjusted for child's birth year, sex; maternal age, race/ethnicity, maternal place of birth; type of birth, parity, insurance type, gestational weeks at birth (continuous).

scores derived from annual average concentrations and found hazardous air pollutant (HAP) concentrations (i.e., mercury, cadmium, nickel, trichloroethylene, and vinyl chloride) near birth residences to be associated with autism (Windham et al. 2006). A study by Kalkbrenner et al. (2010) in North Carolina and West Virginia, with less exposure variability compared with California, reported near-null effect estimates for metals and several pollutants associated with AD in the San Francisco study. Both studies relied on the same HAP pollutant data source and the CDC autism surveillance system (Autism and Developmental Disabilities Monitoring Network) to identify cases. However, instead of sampling controls from birth certificates, the North Carolina/West Virginia study investigators, using education records, selected control children with speech and language impairment (383 cases, 2,829 controls). A third study (304 autism cases and 259 typically developing controls) based in California [Childhood Autism Risks from Genetics and the Environment (CHARGE) study] reported relatively strong associations (OR = 1.86, 95% CI: 1.04, 3.45) between childhood autism and proximity (living within 309 m) to a freeway during pregnancy (Hertz-Picciotto et al. 2006; Volk et al. 2010). Trimester-specific addresses were geocoded, and measures of distance to freeways and major roads were calculated using geographic information system software. This small study was the first to suggest that traffic-related exposures might increase the risk of autism. In our study, we observed weaker associations with monitor-based and modeled air pollution exposure estimates in a much larger study population.

Gestational toxicity may plausibly result from maternal exposure to NO_2, which has been shown to disturb early neuromotor development in animals, causing coordination deficits and reduced activity and reactivity in rats (Tabacova et al. 1985); specifically, NO_2 exposure at low (0.05–0.10 mg/m^3) and high (1 and 10 mg/m^3) concentrations for 6 hr each day throughout gestation affected neuromotor development in offspring. The mean NO_2 level in our study (30.8 ppb) [see Supplemental Material, Table S3 (http://dx.doi.org/10.1289/ehp.1205827)] falls within the exposure range classified as "low" in this animal study (0.05–0.10 mg/m^3 or 26.6–53.2 ppb). Beckerman et al. (2008) suggested that NO may be a proxy measure for ultrafine particle (UFP; < 0.1 μm in aerodynamic diameter) exposures from traffic exhaust and reported strong correlations between 1-week average concentrations of NO, NO_2, and NO_x and short-term (10 min) measures of UFP (r = 0.8–0.9) at varying distances from a major expressway in Toronto, Canada. Fine particles ($PM_{2.5}$) can cause oxidative stress, and *in vitro* animal and human postmortem brain studies showed they can trigger cellular toxicity and brain cell pathology (Lai et al. 2005; Li et al. 2003, Peters et al. 2006). Hertz-Picciotto et al. (2005) found that maternal $PM_{2.5}$ exposures 2 weeks before birth were associated with altered lymphocyte immunophenotypes, and suggested that this might mediate effects of air pollution on childhood morbidity. Developmental immune system disruption has been hypothesized to play a role in neurobehavioral disorders such as autism, considering the close connection between the development of the immune system and the central nervous system (Hertz-Picciotto et al. 2008).

To our knowledge, this is the first study to suggest associations between ozone and AD. Although O_3 levels have dropped over the last decade, the Los Angeles region still often has the highest levels of O_3 nationwide, violating federal health standards an average of 137 days/year (averages from 2007 through 2009) (Roosevelt 2011). In contrast with the traffic-related and particle associations that became positive only when we adjusted for maternal education, O_3 effect estimates moved closer toward the null after adjustment for covariates. This is consistent with expectations, because traffic-related pollution is higher in lower-SES (socioeconomic status) neighborhoods, whereas O_3 levels are higher in suburban high-SES areas, and autism is more likely to be diagnosed earlier in children of mothers with higher SES. Specifically, O_3 and NO follow opposite distribution patterns across the Los Angeles Air Basin. O_3 is formed by photochemical reactions in the presence of precursor pollutants from exhaust, and concentrations are low near freeways/roadways (due to presence of strong NO emission sources) and higher in suburban neighborhoods (Wilhelm et al. 2009). Controlled animal studies suggest that O_3 may cause adverse neurobehavioral effects after gestational exposure (Kavlock et al. 1980; Petruzzi et al. 1995; Sorace et al. 2001).

We relied on information recorded on California birth certificates to adjust for potential confounding by prenatal risk factors for autism reported in the literature (Gardener et. al. 2009, 2011)—parental age at birth, parity, maternal place of birth, and multiple births. However, we were unable to control for potential confounding due to maternal physical and mental health history, or maternal active or passive smoking. Women giving birth in Los Angeles are predominantly Hispanic, and our survey of 2,543 women giving birth in Los Angeles County in 2003 found that only 1% of foreign-born Hispanic, 5% of U.S.-born Hispanics, and 7% of non-Hispanic whites were active smokers during pregnancy (Hoggatt et al. 2012). Also, a recent study found no association [prevalence ratio = 0.88 (95% CI: 0.72, 1.08)] of maternal smoking during pregnancy with AD (Kalkbrenner et al. 2012). Confounding by other SES-related factors potentially correlated with air pollution is also a concern. Families of lower SES are more likely exposed to air pollution, and less likely represented in the autism case group, possibly due to underascertainment (Durkin et al. 2010; Grineski et al. 2007; Institute of Medicine 1999), which could have potentially biased our effect estimates toward the null. However, we estimated stronger associations among those with the lowest maternal education for LUR-based estimates of NO and NO_2. We adjusted for type of insurance (public vs. private pay), as well as other SES indicators important in the Los Angeles community (i.e., maternal place of birth and education) because we previously showed that these factors were sufficient to adjust adequately for SES in Los Angeles County birth outcome and air pollution studies; effect estimates for air pollution and birth outcomes were very similar when we adjusted for maternal occupation, income, and education or simply for birth certificate–derived SES measures (Hoggatt et al. 2012).

In addition to being a confounder, gestational age at birth may also be a mediator between air pollution and autism. In analyses not adjusting for gestational weeks at birth we estimated larger or similar effect sizes. However, not adjusting for gestational age at birth may also result in biased estimates because of our matching design. Specifically, because controls were sampled from among children who at birth had reached at minimum the gestational age of the matched case, gestational age as a matching variable required that we analytically control for it. Thus the magnitude and direction of any potential bias from adjusting or not adjusting for gestational age at birth is not easily quantifiable.

A source of exposure measurement error is the reliance on address information reported on birth certificates, which does not account for women who worked far from home or residential mobility during pregnancy. Previous U.S.-based studies (1997–2004) indicate that 15–30% of women change residence during pregnancy (Chen et al. 2010; Lupo et al. 2010). In our previous population-based survey of 2,543 women residing in 111 ZIP codes in Los Angeles County and delivering in 2003, 22% reported moving during pregnancy (Ritz et al. 2007). Our survey also found pregnant women of lower SES less likely to be employed and more likely to spend time near their residence, suggesting exposure is less misclassified for lower compared with higher-SES women.

Distance from a monitoring station likely introduced some nondifferential misclassification of exposure, especially for pollutants such as CO and NO_2 that are more heterogeneously distributed. On average, the distance between home addresses and the nearest monitoring station was 6.7 miles in our study, and monitor-based estimates of CO, NO, and NO_2 are questionable in their validity if air pollution measurements are more accurate representations of actual exposures for women living closer to a station (Ghosh et al. 2012; Wilhelm et al. 2011). Ambient station measures for $PM_{2.5}$ and O_3, however, are less likely to misrepresent actual exposures, because these pollutants are generally considered more homogeneously distributed over larger regions.

LUR-derived NO and NO_2 estimates are much more spatially resolved than monitor-based estimates, and were previously associated with adverse pregnancy outcomes in the same Los Angeles population (Ghosh et al. 2012; Wilhelm et al. 2011). Our LUR model not only represents local traffic-related pollution well, it reduces possible confounding by spatial SES factors. For example, autism diagnoses have been reported to vary spatially in California due to SES (Van Meter et al. 2010), but measures of air pollution are not inherently influenced by these spatial factors related to SES (Wilhelm et al. 2009). For pollutants that are more homogeneous over larger regional areas, such as $PM_{2.5}$ and O_3, confounding due to SES is possible; nevertheless, associations were stronger when we mutually adjusted for both pollutants.

A major strength of our study was the use of our novel LUR exposure measures for traffic-related pollution in addition to routine, government monitoring station data for criteria pollutants to help identify specific emissions of concern for autism. Furthermore, selection bias due to participation is unlikely to have occurred.

Conclusions

The observed association with the LUR model estimates and monitoring station–based O_3 and $PM_{2.5}$ measures suggest a link between AD and traffic-related exposures during pregnancy. Ideally, future autism and air pollution studies should use neighborhood-level monitoring or modeling of air toxins such as polycyclic aromatic hydrocarbons and possibly speciated $PM_{2.5}$ to determine whether these results are reproducible with improved air pollution assessment.

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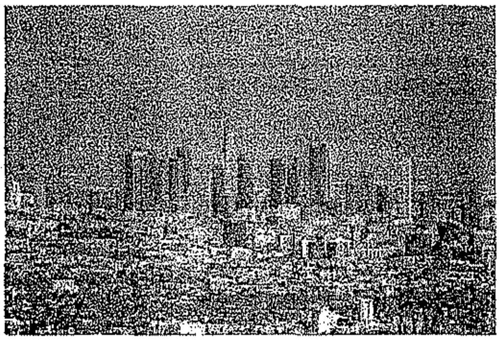
A quarter of Angelenos breathe noxious freeway pollutants every morning

By Alison Hewitt | April 17, 2013



Although air quality has improved dramatically in Los Angeles in recent decades, a joint study by UCLA and the California Air Resources Board suggests that roughly a quarter of Angelenos are exposed to noxious plumes of freeway fumes almost every morning — far more people than previously believed.

Researchers found that overnight atmospheric conditions concentrate freeway pollutants in a plume stretching 1.5 kilometers (approximately 0.93 mile) downwind, seeping inside homes and buildings, and lingering as late as 10 a.m. The same effect would be expected downwind of any highway nationwide, the researchers said.

Half of the residents of the greater Los Angeles area live within these impact zones around freeways, meaning that about a quarter are on the downwind side of a freeway on any given day.

The 1.5 kilometer measurement is in striking contrast to earlier studies in the United States and Australia showing that daytime pollutant concentrations extended no more than about 300 meters (about 0.19 mile) downwind of major roadways, and confirms an earlier UCLA study that showed the same result at a single coastal location.

Professor Suzanne Paulson of UCLA's Department of Atmospheric and Oceanic Sciences and the Institute of the Environment and Sustainability headed the study, working with Professor Emeritus Arthur Winer of UCLA's Fielding School of Public Health and led by Wonsik Choi, a postgraduate researcher in Paulson's lab. The findings were published in December in the journal **Atmospheric Environment**.

The researchers measured pollutant concentrations upwind and downwind of the 91, 210, 110 and 101 freeways using a zero-emission vehicle equipped with specialized instruments to quantify the amount of ultrafine particles and other tailpipe pollutants such as nitrogen oxide and carbon monoxide. Starting before morning rush hour, a researcher drove back and forth several times on surface streets perpendicular to the four freeways, visiting each freeway five times.

"This is happening around every freeway," Paulson said. "It's clear that heavily trafficked roadways have a large impact on downwind populations, and a similar situation likely happens around the world in the early morning hours. The particles tend to end up indoors, so a lot of people are being exposed inside their homes and schools."

Although closed windows help block the particles from seeping inside, previous studies have shown that indoor pollution levels still reach 50 to 70 percent of outdoor levels, the researchers noted.

By knowing which way the wind is blowing, the researchers can extrapolate their findings to any freeway. Their latest measurements, and the most common nighttime wind patterns, result in the following impact zones:

Sides of freeways in greater Los Angeles with concentrated pollution in early morning

Location	Freeway	Typically polluted side	How determined
Carson	110	Mostly east, sometimes west	Current study
Claremont	210	South	Current study
Downtown L.A.	101	South	Current study
Paramount	91	South	Current study
San Fernando Valley	101	North	Extrapolated from wind data
San Fernando Valley	118	South	Extrapolated from wind data
San Fernando Valley	405	Varies: West and east	Extrapolated from wind data
Santa Monica	10	South	Earlier study
West L.A.	405	West	Extrapolated from wind data

The morning concentration of pollutants near highways is due to a combination of the nighttime cooling of the atmosphere, called a nocturnal surface inversion, and the weak evening breeze. At night, cool air sinks, trapping polluted air close to the ground, where it can't interact with cleaner air from above. As drivers create more emissions overnight and during morning rush hour, Los Angeles' mild "land breeze" pushes the increasing pollution in a plume to one side of the freeway. The cold layer traps the plume until well into the morning rush hour, when sun-warmed air begins to rise and a stronger sea breeze takes over, mixing pollutants throughout the atmosphere and diluting their influence.

"While freeway plumes vary slightly from location to location, all of the sites exhibited highly elevated traffic-related pollution at distances of at least 1.5 kilometers on the downwind side of the freeway in the early morning," Choi said.

Freeway pollutants have been linked to increases in asthma, heart attacks, strokes, diabetes, low birth weight, pre-term births and other ailments. So what can people do to limit their exposure to polluted air?

"If your home is within about 1.5 kilometers of a freeway, you may want to close your windows during the early morning hours," Winer said. "It's also best not to run or otherwise heavily exercise within the 1.5 kilometer impact zone in the early morning."

Likewise, schools near freeways should avoid holding gym classes first period, and people with breathing difficulties should filter their indoor air, the researchers suggested.

The UCLA Institute of the Environment and Sustainability is an educational and research institute that unites disciplines: physical, life and social sciences; business and economics; public policy and urban planning; engineering and technology; and medicine and public health. The institute includes multiple cross-disciplinary research centers, and its environmental science undergraduate degree program is one of the fastest growing majors at UCLA. The institute also advises businesses and policymakers on sustainability and the environment and informs and encourages community discussion about critical environmental issues.

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latimes.com/news/science/sciencenow/la-sci-sn-freeway-air-pollution-20130417,0,536917.story

latimes.com

Freeway air pollution travels farther in early morning

By Bettina Boxall, Los Angeles Times

1:53 PM PDT, April 17, 2013

Two years ago researchers outfitted an electric Toyota RAV4 with a set of test instruments and drove back and forth near four Los Angeles County freeways between 4:30 a.m. and 6:30 a.m., sampling the air.

The results confirmed that in the early morning, concentrated plumes of air pollution from freeways can travel more than a mile downwind, exposing more residents than previously thought to harmful pollution levels.

Most previous air quality studies, based on measurements taken during the day or evening, have found that vehicle emission plumes generally blow no more than about 1,000 feet downwind from a major roadway before they break up.

But in the hours just before sunrise, weather conditions are different. Nocturnal surface inversions, caused by nighttime cooling, trap air near the ground, slowing the dispersal of concentrated pollution particles and allowing them to travel farther than during the day.

A 2009 study documented extended emission plumes near the 10 Freeway in the early morning. To see whether the same thing was happening elsewhere, researchers from UCLA and the California Air Resources Board in 2011 sampled the air in residential neighborhoods downwind of the 91 Freeway in Paramount, the 210 in Claremont, the 110 in Carson and the 101 in downtown Los Angeles.

Their findings, published in December in the journal Atmospheric Environment, suggest that in the hours before sunrise, residential exposure to freeway pollution is more far-reaching than previously thought.

"It's clear heavily trafficked roadways have a large impact on downwind populations, and a similar situation likely happens around the world in the early morning hours," said Suzanne Paulson, a UCLA atmospheric sciences professor and co-author of the paper. "The particles tend to end up indoors, so a lot of people are being exposed inside their homes and schools."

Studies have shown that exposure to elevated levels of vehicle pollution can contribute to asthma, heart disease and other health problems.

In greater Los Angeles, where apartment buildings and single-family homes stand cheek by jowl with some of the busiest freeways in the nation, the researchers estimated that on any given morning, roughly a quarter of the population could be exposed to downwind pollution consisting of ultrafine particles, nitric oxide and hydrocarbons.

Their advice: If you live within roughly a mile of a freeway and are downwind, keep your windows closed in the hours just before sunrise. Use air conditioning. Install HEPA air filters. Postpone outdoor exercise until later in the morning or exercise farther away from the highway.

After sunrise, the surface air warms up and the inversion breaks up, diluting the pollution.

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June 3, 2013

Mr. Robert Silverstein
The Silverstein Law Firm, APC
215 North Marengo Avenue, 3rd Floor
Pasadena, CA 91101-1504

Proj. No. 130501

Subject: Millennium Hollywood Project

Dear Mr. Silverstein

Per your request, I have reviewed the Millennium Hollywood Project environmental documentation related to traffic, circulation and parking. This documentation consists of:

- the Draft Environmental Impact Report (DEIR) including its applicable Appendices, and
- the Final Environmental Impact Report (FEIR) including its applicable Appendices

In addition I have referred to the following documents:

- Traffic Study Policies and Procedures (TSPP), Dated May 2012, published by the City of Los Angeles Department of Transportation (LADOT),
- 2010 Congestion Management Program (CMP) prepared by the Los Angeles County Metropolitan Transportation Authority (LACTMA)
- Guide to the Preparation of Traffic Studies (Guide), Caltrans

I am a Registered Civil and Traffic Engineer in the State of California (Registration Numbers 20137 and 525, respectively) and a Registered Engineer (in retired status) in the States of Washington, Arizona, and Florida. I have over 50 years of experience in traffic and transportation engineering, traffic modeling and forecasting, parking studies, and the preparation of traffic impact studies. I have personally prepared or had a key role in the preparation of over 400 reports in various jurisdictions in California, Washington, Oregon, Arizona, Nevada, and Ohio, as well as several multi-State projects sponsored by the U.S. Department of Transportation. My curriculum vitae (cv.) is presented as Exhibit 1, attached.

Based on my review of the documents cited above and my education, professional knowledge and many years of experience, I have noted several deficiencies and/or omissions in the environmental documentation for the Millennium Hollywood Project. These deficiencies and/or omissions are discussed in the following pages of this letter.

A. Deficiencies in Process, Mitigation Measures and Monitoring

1. **Caltrans concerns have not been addressed adequately:** CMP guidelines (Appendix D, Page D-2, attached as Exhibit 2) state: "Caltrans must also be consulted through the Notice of Preparation (NOP) process to identify other specific locations to be analyzed on the state highway system." By letter dated May 18, 2011 (attached as Exhibit 33) Caltrans requested specifically that the traffic study address the freeway main line and all on/off ramps of State Route 101 (SR-101) within a five-mile radius of the proposed Millennium Hollywood Project. In the same letter, Caltrans also referred the project's traffic consultant to Caltrans' traffic study guide and indicated that Caltrans staff "would like to meet with the traffic consultant to identify study locations in the State facilities before preparing the Environmental Impact Report (EIR)." Page III-34 of the DEIR (attached as Exhibit 4) states that "representatives from the City of Los Angeles Department of City Planning met with Caltrans Planning staff on September 15, 2011."

   The Traffic Study prepared by Crain & Associates and included in the DEIR as Appendix IV.K.1 (title pages are presented as Exhibit 5, attached) states in two places (please see Exhibits 5-a and 5-b) that the traffic study was performed in accordance with the LADOT TSPP (please see Exhibit 6 for the title page of the TSPP). The LADOT TSPP reiterates the LA County CMP requirement that Caltrans should be contacted and further states that "To assist in the evaluation of impacts on State facilities, the project's traffic consultant should refer to Caltrans' Guide for the Preparation of Traffic Impact Studies ..." and provides a link to access the web site (please see Exhibit 6-a).

The DEIR Traffic Study did not comply with the CMP guidelines and LADOT's TSPP, despite the written comments from Caltrans and the meeting held with Caltrans on September 15, 2011.

After preparation of the DEIR, Caltrans submitted a letter dated December 12, 2012 (please see Exhibit 7) reiterating its concerns about and requirements for the DEIR and providing further specific guidance as to what analyses would be required for Caltrans to conclude that impacts on the State Highway System are adequately analyzed. As stated in the Caltrans letter dated February 19, 2013 (please see Exhibit 8), Caltrans considers the responses to its previous comments to be inadequate and remains concerned about the lack of mandated disclosure and analysis of freeway operations (such as mainline traffic flow, weaving movements on the freeway, queuing at exit ramps that might hinder mainline flow, queuing at entrance ramp meters, merging/diverging maneuvers) and the project's impacts on those.

I have reviewed the responses that the City of Los Angeles provided in the FEIR to Caltrans' comments in the December 10, 2012 letter. I concur with Caltrans that significant unanswered issues remain, and significant informational gaps mar the EIR. The City's study approach fails to provide complete or accurate information. The City's use of the CMP methodology does not provide sufficient information related to the Project's impacts on the freeway system, and therefore did not adequately consider the potential significance of the Project's impacts on the freeway system. The City's responses to Caltrans are presented as Exhibit 9, attached. Following are some further thoughts about the City's inadequate and/or improper responses as contained in Exhibit 9:

Response to Comment No. 03-2: The CMP methodology is based purely on the traffic volume on the freeway, without recognizing such matters as weaving, queuing, merging and diverging movements. The Caltrans methodology, which is based on the Highway Capacity Manual, takes into consideration these freeway operational matters, which are, in turn, affected by such freeway design features as spacing of entry/exit points, presence or lack of auxiliary lanes, and others. While the Caltrans Guide does not provide specific threshold guidelines, it provides a methodology for determining freeway LOS correctly. The City and this EIR are mandated to comply with the Caltrans methodology and to disclose and analyze impacts accordingly in a recirculated DEIR.

Response to Comment No. 03-3: The documentation provided in Appendix B of the FEIR, Modeling Procedures and Results, is inadequate. The very brief documentation does not provide any credible data to support the statement that "The model demonstrated that the Project will not result in the addition of 150 trips or more to any freeway segment." The 4-page document falls far short of providing enough information for the public to make an informed judgment. The documentation should contain, as a minimum, information for the starting point which is the unaltered SCAG Regional Model as refined by LA DOT for use in the City of Los Angeles (the Base Model) in addition to the two scenarios presented "Base Minus Project" and "Base Plus Project." At a minimum, the information presented for each of the three scenarios should include:

- For the area within a 5-mile radius of the Project (as requested in Caltrans' letter in response to the NOP), computer-generated plots of the roadway network showing the raw (unadjusted) traffic volumes that resulted from the traffic assignment process. The plots should be of sufficiently large-scale to make it possible to read the traffic volumes on freeway-mainline, the HOV lanes (if any), and each of the entrance and exit ramps. A similar plot should be provided presenting the number of lanes assumed for all freeways and ramps, as well as the number of lanes and facility types assumed for all arterial facilities.
- Socio-economic data for the two Traffic Analysis Zones (TAZs) that contain the Project, along with a map of the TAZ boundaries within the five-mile radius area.
- A listing, or graphic presentation, of all freeway and major transit improvements (BRT, Light Rail, Metrolink, other fixed-guideway) that are included in the 2035 SCAG Regional Model but are not in service or are not under construction for the area bounded by I-10 on the South, I-405 on the West, SR-101/SR-134/I-210 on the North, and I-710 (alignment extended to I-210) on the East. For all four limits, the information should be presented for the freeways that are referenced to describe the boundaries.

The additional data requested should be available from the computer models that were run either in printed form, or can be plotted/printed readily from model files. The public cannot make an informed judgment as to the impacts of the Project on the freeway system based on what has been provided in the FEIR.

Response to Comment No. 03-5: The thoughts expressed in No. 03-2 and 03-3 are applicable here also.

Response to Comment No. 03-6: The statement that "Rather, the signalized intersections and the freeway mainline sections were determined to form the capacity constraints in the Hollywood area" is contradictory to the

Traffic Study findings. The Traffic Study determined that of the 37 intersections analyzed, 31 had LOS of "C" or better in both the morning and afternoon peak hours. Five intersections had LOS "D" or better in both peak hours. Only one had LOS "D" in the morning and LOS "E" in the afternoon peak hour (please see Exhibit 5-f, attached.) This finding would signify no capacity constraints associated with signalized intersections in the area and is directly contradictory to the statement in the response to this comment. Either the statement is not supported by substantial evidence or the intersection analysis presented in the Traffic Study is faulty. Either instance represents a deficiency in the environmental documentation.

Response to Comment No. 03-7: No further thoughts beyond those expressed in Item B.2 later in this letter.

Response to Comment No. 03-9: The selected zone analysis methodology is a very valuable analysis tool to determine the true "demand" created by the Project. It is appropriate for infill projects because the "intercepted" trips have already been deducted due to the pass-by reduction in the trip generation process. Using the trip distribution percentages from the selected zone analysis and applying the vehicular trip generation after credits, would account for "intercepted" trips.

Response to Comment No. 03-11: It is ironic that the City uses a "Planning Methodology" which does not take into consideration signal timing at all in the basic computation, but then applies a credit to reflect the effect of an "operational" feature such as the computerized signal system. Nonetheless, the real question is whether the CMA analysis produces LOS results for existing conditions that are consistent with actual conditions. Expressed differently, if there are long queues at an intersection and yet the CMA method produces an LOS of "C" or "D" or better, one would have to conclude that the CMA method does not do the job correctly.

Response to Comment No. 03-12: If in fact the freeway mainline constitutes a capacity constraint as stated in the City's response to Caltrans comment No. 03-6, the ramp meters are likely set at or near the maximum rates Caltrans deems possible. In the future, metering rates would be more likely to be tighter, allowing fewer vehicles per hour onto the freeway, rather than more, unless major capacity improvements are made on the freeway. It would be in the City's best interest to perform the analyses requested by Caltrans to publicly disclose and understand what problems the City may be facing in the future, and to mitigate those problems and impacts.

Response to Comment No. 03-13: The City's response ignores the basic issue which is that the weaving movements are an important consideration in determining freeway LOS.

Response to Comment No. 03-14: No further thoughts except that it would be in the best interests of the City to perform the analyses requested by Caltrans.

2. **Trip caps need further definition:** While the trip equivalency provisions give the City and the developer latitude in controlling the amount of development, the trip caps in the FEIR do not provide sufficient safeguards for certain situations that may arise, for the following reasons:

   a) **More development than addressed in the current environmental documents would be possible:** FEIR P.IV-22, bottom of page (please see Exhibit 10) states that " No building permits shall be issued or other measures taken by the City, which would allow the Project-related trip generation to exceed the Trip Cap, unless other supplemental analysis is completed." This statement implies that the trip caps may be violated with additional analysis and that more development than addressed in the current environmental analysis could be approved. Also, it is not stated whether the approval of the supplemental analysis would be under administrative purview or subject to CEQA compliance and public review.

   b) **The number of peak hourly trip credit for existing development should be fixed:** In order to prevent future analysts from raising the trip credit allowed for existing development, the amount of credit should be fixed at the level established in the current environmental analysis, 180 in the morning peak hour and 182 in the afternoon peak hour . This can be accomplished by inserting the maximum amount of credit into FEIR P.IV-18, Bullet item (c) (please see Exhibit 10).

   c) **Trip caps for the project should be directional, not total for peak hour:** It does not take much effort to come up with a mixed use scenario that stays within the peak hour total cap but violates the directional peak. Traffic impacts are in many cases sensitive to the direction of travel. Trip caps for the project should be made directional.

3. **Actual compared to estimated trips:** There is no provision in the traffic monitoring program to assess whether **actual** vehicular trips to/from the project exceed, in any phase of development or at full development, the **estimated** vehicular trips, and what action would be taken if the **actual**

trips were to exceed the estimated trips. This information should be provided in a recirculated DEIR.

B. Technical Points

1. The Traffic Study states that Vine Street is classified as a Major Highway Class II between Franklin Avenue and Melrose Avenue, and that the width of Vine Street within these limits is 65-75 ft. (please see Exhibit 5-c). The Traffic Study does not state the actual width of Vine Street along the frontage of the proposed Project. Exhibit 6-c, attached, indicates that the City of Los Angeles Public Department Standards call for a width of 80 or 90 ft. for the Major Highway Class II classification. Accordingly, the width of Vine Street is not compliant with current City design standards. The prior Hollywood Community Plan, which may become the operative community plan again, depending on the outcome of current litigation regarding the Updated Hollywood Community Plan (applicable excerpts in Exhibit 11, attached) also designates Vine Street as a Major Highway Class II, but with Modified design standards that call for a curb-to-curb width of 70 ft, with 15-ft sidewalks on either side of the street. Since the actual width of Vine Street along the frontage of the proposed Project is not stated in the Traffic Study, it is not possible to ascertain whether the street design is in compliance with the design standards of the Community Plan. The environmental documents are silent in the matter of the width of Vine Street even though it has significance in conjunction with the transit ridership credits as discussed in the next paragraph.

2. The reduction of vehicular trips by 25% due to expected transit ridership exceeds what the City Department of Transportation recommends in its Traffic Study Policies and Procedures (please see Exhibit 6-c attached). Per the guidelines, the maximum of 25% reduction may be applicable to developments that are "above or adjacent to a Metro Rail, Metrolink, or Orange Line station." Developments within ¼ mile walking distance may qualify for up to a 15% transit credit if certain improvements, including the provision of wider-than-standard sidewalks and dedication of additional right-of-way along the project frontage, are provided. The proposed mitigation measures do not contain such provisions. Accordingly, a 25% reduction as taken in the EIR is facially inapplicable and improper.

3. Truck access to the site is not analyzed, and the process of accommodating loading/unloading is not described. This is a significant omission of information necessary for informed decisionmaking and disclosure and mitigation of potential significant impacts. It is acknowledged that for purposes of intersection capacity and Level of Service, truck traffic is not an issue. Nevertheless, truck traffic in the immediate vicinity of the Project

and within the Project may present traffic operational problems depending on the location and configuration of truck loading/unloading areas, hours of delivery, the location and configuration of entry/exit points, and the size of trucks. This matter is not discussed at all in the environmental documents, except general statements to the effect that these matters will be handled later in discussions between the developer and City staff. Such deferred analysis and mitigation is improper.

4. Intersection Level of Service (LOS) computation does not consider the effect of pedestrian traffic on intersection capacity. In a high pedestrian activity area such as Hollywood Boulevard, pedestrians may cause substantial delay to vehicular traffic, especially vehicles turning left or right. The LADOT TSPP states that the standard intersection LOS computation procedure may be modified to reflect the effect of certain conditions, including high pedestrian volumes (please see Exhibit 6-d, attached). No adjustments were made in the LOS computations to reflect the effect of high pedestrian volumes. This omission results in a distortion of the conclusions, making them invalid indicators of actual conditions and impacts that can be expected to be experienced.

5. The existence of the midblock pedestrian signal on Vine is not even mentioned. The relationship of the pedestrian signal location vis-à-vis the project driveways on Vine is not discussed. Based on the approximate dimensions provided in the Traffic Study (please refer to Exhibit 5-d, attached), the West Site driveway on Vine Street would be about 60 to 70 ft north of the existing pedestrian cross-walk and midblock pedestrian signal. The East Site driveway would be about 150 ft south of the cross-walk. The proximity of the existing signalized cross-walk to the two full-service driveways proposed by the Project will create numerous opportunities for pedestrian/vehicular conflicts and potential pedestrian/vehicle collisions. Accordingly, there is a significant omission of necessary information about pedestrian safety impacts. This should be remedied in a recirculated DEIR.

6. For purposes of the traffic study, certain assumptions would need to have been made as to the allocation of land uses to each of the two portions of the proposed project (East Site v. West Site). This allocation is necessary to make, in turn, the allocation of the traffic to the intersections immediately adjacent to the Project as shown in the Traffic Study. However, the allocation of vehicular traffic to the project driveways is not presented in the Traffic Study. Also, the need for traffic control devices to be installed at the project driveways, if any, is not discussed, except mentioning that this matter will be coordinated with the City. Accordingly, there is a significant omission of necessary information. This should be

remedied in a recirculated DEIR. This lack of information makes it impossible to assess the following potentially significant impacts:

- Will it be necessary to install a traffic signal at either or both of the Project driveways on Vine Street?
- If yes, what would be the impact on the mid-block pedestrian signal?
- If not, how will pedestrian/vehicle conflicts be treated and to what extent will pedestrian activity disrupt traffic into and out of the driveways?

7. The pedestrian entry/exit points to the project and the pedestrian linkages between the East Site and the West Site of the Project are not shown, so it is not possible to assess:

    - Whether the East and West Sites are truly integrated to constitute a single project for purposes of internal trip-making and shared parking.
    - Whether the pedestrian linkages are going be sufficiently convenient in order to justify the internal trip making levels.
    - How internal pedestrian circulation to/from the various project components will be accommodated.
    - To what extent added pedestrian traffic at the mid-block pedestrian signal would cause additional delays to through traffic on Vine Street.

8. Parking-The residential tower (East Site) would have 450 units and 675 residential parking spaces, or 1.5 spaces per unit. In accordance with the Traffic Study, the total requirement would be 2.25 spaces per unit, or 1013 parking spaces, if the residential development were to be stand-alone, rather than part of a mixed use development (please see Exhibit 5-e). If the residential tower is built and occupied before any of the office/commercial, there would be no opportunity for shared parking or internal trip-making, so there would be a parking shortage of 338 spaces.

9. If movie/theater uses are allowed within the commercial designation, there could be traffic and parking impacts, especially on weekend afternoons and evenings when movie/theater and retail uses both attract high levels of patronage. This type of potential impact attributable to specific uses is not addressed in the EIR. Accordingly, there is a significant omission of necessary information. This should be remedied in a recirculated DEIR.

Please contact me if I can provide further details or clarification about any matters covered in this letter.

Sincerely,

Herman Basmaciyan

Herman Basmaciyan. P.E.

LIST OF EXHIBITS

1. Curriculum Vitae
2. Excerpts from the 2010 Los Angeles County Congestion Management Program
3. Caltrans letter in response to NOP, dated May 18, 2011
4. Excerpt from DEIR for Millennium Hollywood Project – Page III-34
5. Excerpts from Traffic Study (Appendix IV.K.1 of DEIR for Millennium Hollywood Project)
    a. Compliance with City Procedures (Page 1)
    b. Compliance with City Procedures (Page 4)
    c. Width of Vine Street
6. Excerpts from the LADOT TSPP
    a. Requirement to contact Caltrans and refer to Caltrans procedures
    b. City of LA Roadway Design Standards
    c. Transit Credit
    d. Project Site Plan and Location of Driveways
    e. Parking Space Requirements
    f. CMA Analysis Summary for Existing Conditions
7. Caltrans Letter of December 12, 2012
8. Caltrans Letter of February 19, 2013
9. City's Responses to Caltrans Comments in December 12, 2012 Letter
10. Trip caps
11. Excerpts from the Hollywood Community Plan-Street Classifications and Design Standards

LIST OF EXHIBITS

(Attached to Letter from Herman Basmaciyan to Mr. Robert Silverstein
Dated May 30, 2013)

1. Curriculum Vitae
2. Excerpts from the 2010 Los Angeles County Congestion Management Program (CMP)
3. Caltrans letter in response to Notice of Preparation (NOP), dated May 18, 2011
4. Excerpt from DEIR for Millennium Hollywood Project – Page III-34
5. Excerpts from Traffic Study (Appendix IV.K.1 of DEIR for Millennium Hollywood Project)
    a. Compliance with City Procedures (Page 1)
    b. Compliance with City Procedures (Page 4)
    c. Width of Vine Street
    d. Project Site Plan and Location of Driveways
    e. Parking Space Requirements
    f. CMA Analysis Summary for Existing Conditions
6. Excerpts from the City of Los Angeles Department of Transportation (LADOT) Traffic Study Policies and Procedures (TSPP)
    a. Requirement to contact Caltrans and refer to Caltrans procedures
    b. City of Los Angeles Roadway Design Standards
    c. Transit Credit
7. Caltrans Letter of December 12, 2012
8. Caltrans Letter of February 19, 2013
9. City's Responses to Caltrans Comments in December 12, 2012 Letter
10. Trip caps
11. Excerpts from the Hollywood Community Plan-Street Classifications and Design Standards

EXHIBIT 1

Curriculum Vitae (2 pages)

Herman Basmaciyan, P.E.

Profile

- Over 50 years of transportation planning and traffic engineering experience, including services to legal professionals
- Expert witness services in San Diego, Orange, Los Angeles, Riverside, and San Mateo Counties in eminent domain, traffic engineering, transportation engineering/planning, and parking matters
- Experience in numerous traffic impact studies, transportation planning projects, parking studies, analysis of land use/transportation system interrelationships and traffic/transportation engineering
- Management of, or key role in, a wide variety of transportation/traffic engineering projects in California, Oregon, Washington, Arizona, Nevada, Colorado, Montana, New Mexico, Ohio, and Louisiana

Expert Witness Experience

- Service to legal professionals since 1978, as a consultant and as a designated expert witness
- Courtroom expert witness testimony on 5 occasions
- Deposition on 12 occasions
- Advised legal professionals as consultant and potential expert witness in over 20 cases settled with no need for deposition

Education

- Master of Science in Civil Engineering, University of Virginia, 1962
- Bachelor of Science in Civil Engineering, Robert College,1960
- Numerous Short Courses in Transportation and Traffic Engineering

Registration

Professional Engineer:

- California, Civil
- California, Traffic
- Arizona (retired status)
- Florida (retired status)
- Washington (retired status)

Professional Organizations

- Institute of Transportation Engineers
- American Society of Civil Engineers

Employment History

- **Individual** Providing Expert Witness and Consultant Services, Corona del Mar, CA, since January 2005
- **Transportation Consultant,** County of Riverside, Riverside, CA, 2005-2011
- **Vice President**, Kimley-Horn and Associates, Inc, Orange, CA 1992-2004
- **Principal**, Basmaciyan-Darnell, Inc., Irvine, CA 1978-1992
- **Principal**, Herman Basmaciyan and Associates, Newport Beach, CA 1976-1978
- **Senior Associate**, VTN Corporation, Irvine, CA, and Bellevue, WA 1971-1976
- **Senior Transportation Planning Engineer**, DeLeuw, Cather and Company, San Francisco, CA 1970-1971
- **Advisory Analyst**, Service Bureau Corporation (then a subsidiary of IBM), Palo Alto, CA 1967-1970

- **Director**, Puget Sound Regional Transportation Study, Seattle, WA 1962-1967

- **Research Assistant**, Virginia Council of Highway Research, Charlottesville, VA 1960-1962

EXHIBIT 2

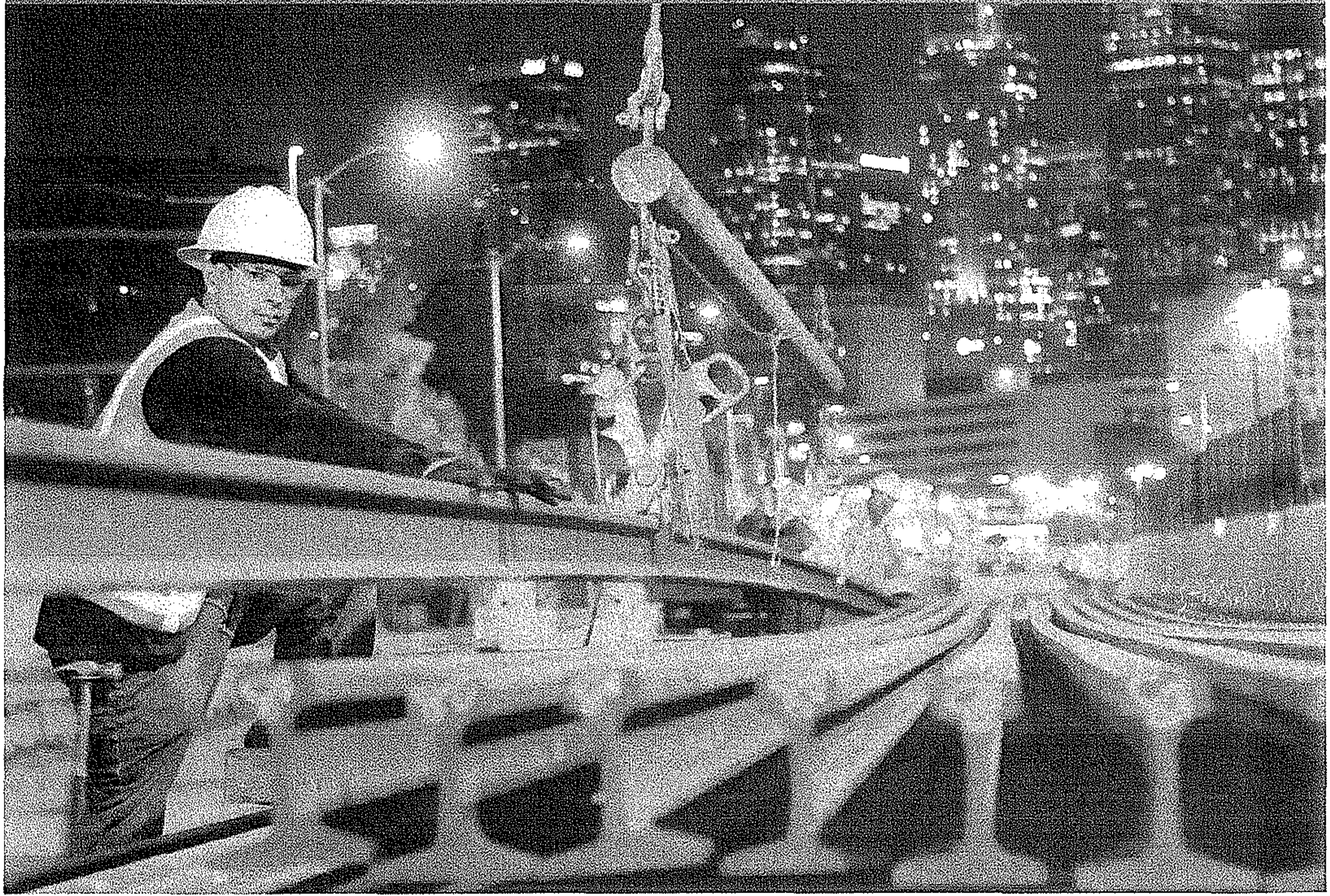
EXCERPTS FROM LOS ANGELES COUNTY CONGESTION MANAGEMENT PROGRAM (CMP)

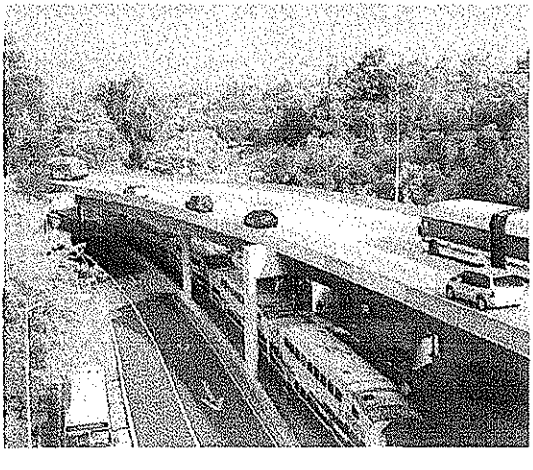
Cover Page
Page D-2 from CMP Document

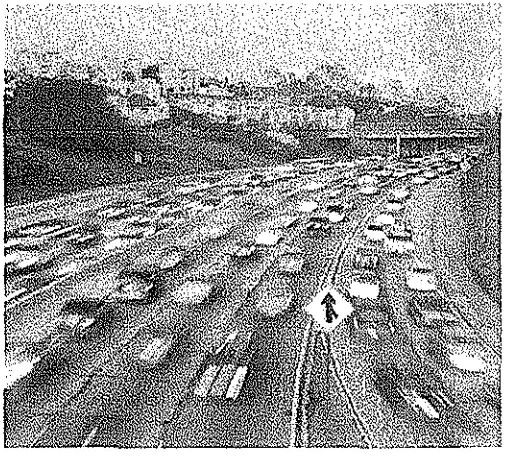
(Total of 2 Pages)

Los Angeles County
Metropolitan Transportation Authority

2010 CONGESTION MANAGEMENT PROGRAM







D.3 PROJECTS SUBJECT TO ANALYSIS

In general a CMP TIA is required for all projects required to prepare an Environmental Impact Report (EIR) based on local determination. A TIA is not required if the lead agency for the EIR finds that traffic is not a significant issue, and does not require local or regional traffic impact analysis in the EIR. Please refer to Chapter 5 for more detailed information.

CMP TIA guidelines, particularly intersection analyses, are largely geared toward analysis of projects where land use types and design details are known. Where likely land uses are not defined (such as where project descriptions are limited to zoning designation and parcel size with no information on access location), the level of detail in the TIA may be adjusted accordingly. This may apply, for example, to some redevelopment areas and citywide general plans, or community level specific plans. In such cases, where project definition is insufficient for meaningful intersection level of service analysis, CMP arterial segment analysis may substitute for intersection analysis.

D.4 STUDY AREA

The geographic area examined in the TIA must include the following, at a minimum:

☐ All CMP arterial monitoring intersections, including monitored freeway on- or off-ramp intersections, where the proposed project will add 50 or more trips during either the AM or PM weekday peak hours (of adjacent street traffic).

☐ If CMP arterial segments are being analyzed rather than intersections (see Section D.3), the study area must include all segments where the proposed project will add 50 or more peak hour trips (total of both directions). Within the study area, the TIA must analyze at least one segment between monitored CMP intersections.

☐ Mainline freeway monitoring locations where the project will add 150 or more trips, in either direction, during either the AM or PM weekday peak hours.

☐ Caltrans must also be consulted through the Notice of Preparation (NOP) process to identify other specific locations to be analyzed on the state highway system.

If the TIA identifies no facilities for study based on these criteria, no further traffic analysis is required. However, projects must still consider transit impacts (Section D.8.4).

D.5 BACKGROUND TRAFFIC CONDITIONS

The following sections describe the procedures for documenting and estimating background, or non-project related traffic conditions. Note that for the purpose of a TIA, these background estimates must include traffic from all sources without regard to the exemptions specified in CMP statute (e.g., traffic generated by the provision of low and very low income housing, or trips originating outside Los Angeles County. Refer to Chapter 5, Section 5.2.3 for a complete list of exempted projects).

D.5.1 **Existing Traffic Conditions.** Existing traffic volumes and levels of service (LOS) on the CMP highway system within the study area must be documented. Traffic counts must

EXHIBIT 3
Caltrans Letter in Response to Notice of Preparation (NOP)
Dated May 18, 2011
3 Pages

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY EDMUND G. BROWN, JR., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, REGIONAL PLANNING
IGR/CEQA BRANCH
100 MAIN STREET, MS # 16
LOS ANGELES, CA 90012-3606
PHONE: (213) 897-9140
FAX: (213) 897-1337

Flex your power!
Be energy efficient!

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CITY OF LOS ANGELES
MAY 24 2011
ENVIRONMENTAL
UNIT

May 18, 2011

IGR/CEQA No. 110501AL-NOP
Millennium Hollywood Project
Vic. LA-101, PM 7.37
SCH # 2011041094

Ms. Srimal P. Hewawitharana
City of Los Angeles
200 N. Spring Street, Room 750
Los Angeles, CA 90012

Dear Ms. Hewwitharana:

Thank you for including the California Department of Transportation (Department) in the environmental review process for the above referenced project. The proposed project would include the construction of approximately 1,052,667 square feet of new developed floor area. The project would develop a mix of land uses including residential dwelling units, luxury hotel rooms, office and associated uses, restaurant space, health and fitness club uses, and retail establishments.

Because of the size and land uses of the project, this project may have a regional traffic impact on the State facilities. To assist in our efforts to evaluate the impacts of this project on State transportation facilities, a traffic study should be prepared prior to preparing the Draft Environmental Impact Report (DEIR). Please refer the project's traffic consultant to the Department's traffic study guide Website:

http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

Listed below are some elements of what is generally expected in the traffic study:

1. Presentations of assumptions and methods used to develop trip generation, trip distribution, choice of travel mode, and assignments of trips to I-110, and all on/off ramps within 5 miles radius of the project site. The Department has concerns about queuing of vehicles using off-ramps that will back into the mainline through lanes. It is recommended that the City determine whether project-related plus cumulative traffic is expected to cause long queues on the on and off-ramps. We would like to meet with the traffic consultant to identify study locations on the State facilities before preparing the Environmental Impact Report (EIR).

2. Consistency of project travel modeling with other regional and local modeling forecasts and with travel data. The Department may use indices to verify the results and any differences or inconsistencies must be thoroughly explained.

3. Analysis of ADT, AM and PM peak-hour volumes for both the existing and future conditions in the affected area. Utilization of transit lines and vehicles, and of all facilities, should be realistically estimated. Future conditions should include build-out of all projects and any plan-horizon years. (see next item)

4. Inclusion of all appropriate traffic volumes. Analysis should include existing traffic, traffic generated by the project, cumulative traffic generated from all specific approved developments in the area, and traffic growth other than from the project and developments.

5. Discussion of mitigation measures appropriate to alleviate anticipated traffic impacts. These mitigation discussions should include, but not be limited to, the following:

    - Description of Transportation Infrastructure Improvements
    - Financial Costs, Funding Sources and Financing
    - Sequence and Scheduling Considerations
    - Implementation Responsibilities, Controls, and Monitoring

   Any mitigation involving transit or Transportation Demand Management (TDM) should be justified and the results conservatively estimated. Improvements involving dedication of land or physical construction may be favorably considered.

6. The Department may accept fair share contributions toward pre-established or future improvements on the State Highway System. Please use the following ratio when estimating project equitable share responsibility: additional traffic volume due to project implementation is divided by the total increase in the traffic volume (see Appendix "B" of the Guide).

   Please note that for purposes of determining project share of costs, the number of trips from the project on each traveling segment or element is estimated in the context of forecasted traffic volumes, which include build-out of all approved and not yet approved projects and other sources of growth. Analytical methods such as select-zone travel forecast modeling might be used.

   Please be reminded that as the responsible agency under CEQA, the Department has authority to determine the required freeway analysis for this project and is responsible for obtaining measures that will off-set project vehicle trip generation that worsens State Highway facilities. CEQA allows the Department to develop criteria for evaluating impacts on the facilities that it manages. In addition, the County CMP standards states that the Department should be consulted for the analysis of State facilities. State Routes mentioned in item #1 should be analyzed, preferably using methods suggested in the Department's Traffic Impact Study Guide. To help determine the appropriate scope, we request that a select zone model run is performed. We welcome the opportunity to provide consultation regarding the Department's preferred scope and methods of analysis.

We look forward to reviewing the traffic study and expect to receive a copy from the State Clearinghouse when the DEIR is completed. Should you wish to expedite the review process or receive early feedback from the Department please feel free to send a copy of the DEIR directly to our office.

As discussed in your telephone conversation on May 17, 2011 with Mr. Alan Lin, Project Coordinator, we would like to extend an invitation to meet with the City, developer, and the traffic consultant early in the process to discuss potential traffic impacts to the State facilities and possible mitigation measures prior to the preparation of the EIR.

If you have any questions, please feel free to contact me at (213) 897-9140 or Alan Lin the project coordinator at (213) 897-8391 and refer to IGR/CEQA No. 110501AL.

Sincerely,

Dianna Watson

DIANNA WATSON
IGR/CEQA Branch Chief

cc: Scott Morgan, State Clearinghouse

EXHIBIT 4

Excerpt from the DEIR for the Millennium Hollywood Project

Page III-34, Indicates Meeting with Caltrans was held (1 Page)

Libraries

Existing Library Facilities

The Goldwyn Hollywood Regional Branch Library (the Hollywood Regional Branch) would serve the Project. The Library is approximately 0.24 miles from the Project Site, located at 1623 N. Ivar Avenue.[15]

Based on Planning Department estimates, the LAPL estimates the Hollywood Regional Branch 2010 service population as approximately 91,980, and its 2020 service population as approximately 94,494. There are no planned improvements to add capacity through expansion.[16]

Additional details pertaining to existing and proposed libraries serving the Project area are provided in Section IV.J.5, Libraries, of this Draft EIR.

Transportation – Traffic, and Parking

Regulatory Framework

State of California Department of Transportation (Caltrans)

As the owner and operator of the State Highway System (SHS), the State of California Department of Transportation (Caltrans) implements established state planning priorities in all functional plans, programs, and activities. These priorities are: 1) to promote infill development and equity by rehabilitating, maintaining, and improving existing infrastructure that supports infill development and appropriate reuse and redevelopment of previously developed land, and by preserving cultural and historic resources; 2) to protect environmental and agricultural resources by preserving and enhancing valuable natural resources, including working landscapes, natural lands, recreation areas, and other open space areas; and 3) to encourage efficient development patterns by ensuring that infrastructure supports compact development adjacent to existing developed areas that are appropriately planned for growth and served by adequate transportation and other essential utilities and services (GC §650141.1).[17]

Caltrans has the responsibility to coordinate and consult with local jurisdictions and Tribal Governments when proposed local land use planning and development may impact these facilities. Pursuant to Section 21092.4 of the Public Resources Code (P.R.C), for projects of statewide, regional, or areawide significance, the lead agency shall consult with transportation planning agencies and public agencies which have transportation facilities within their jurisdictions which could be affected by the project. Consistent with this requirement, representatives from the City of Los Angeles Department of City Planning met with Caltrans Planning staff on September 15, 2011.

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[15] *Email correspondence with Joseph Molles, Los Angeles Public Library, November 16, 2011.*

[16] *Ibid*

[17] *Caltrans, Deputy Directive (DD)-25-R1, Effective June 2005, Re: Local Development Intergovernmental Review (LD-IGR).*

EXHIBIT 5

EXCERPTS FROM TRAFFIC STUDY (APPENDIX IV.K.1) TO DEIR

Exhibit 5 a–Cover and Title Pages of Traffic Study
Exhibit 5 b–Description of Project Site and Description of Study Procedures (2 Pages)
Exhibit 5 c—Documenting Width of Vine Street (1 Page)
Exhibit 5 d—Conceptual Project Site Plan and Text Describing Location of Driveways (2 Pages)
Exhibit 5 e—Parking Space Rates/Requirements (1 Page)
Exhibit 5 f—Summary of Intersection Level of Service Summary for 2011 Conditions (1 Page)

Appendix IV.K.1

Traffic Impact Study Report
Proposed Millennium Hollywood Development, Hollywood California

Crain & Associates
(June 2012)

TRAFFIC IMPACT STUDY REPORT FOR PROPOSED MILLENNIUM HOLLYWOOD DEVELOPMENT HOLLYWOOD, CALIFORNIA

Prepared for:

MILLENNIUM HOLLYWOOD LLC

Prepared by:

Crain & Associates
300 Corporate Pointe, Suite 470
Culver City, California 90230
(310) 473-6508

REGISTERED PROFESSIONAL ENGINEER
GEORGE RHYNER
NO. 2143
TRAFFIC
STATE OF CALIFORNIA

June 2012

INTRODUCTION

Crain & Associates has been retained to prepare this traffic analysis that assesses the potential impacts of the Millennium Hollywood Project on the surrounding roadway system. The analysis that follows was prepared in accordance with the assumptions, methodology and procedures approved by LADOT. (See Appendix A for the Memorandum of Understanding ("MOU") outlining the study parameters agreed to with LADOT.)

The Project will be developed on two sites that are located on the opposite sides of Vine Street. The East Site is located on the southeast corner of Yucca Street and Vine Street. The West Site is located across Vine Street, southwest of the corner of Yucca Street and Vine Street (the East Site and West Site are referred to collectively as the "Site"). The Site is located within the Hollywood Community of the City of Los Angeles and, as shown in Figure 1, Project Site Vicinity Map, is within the Hollywood Redevelopment Project area.

The Project would be a mixed use development, including residential, office, retail, quality restaurant, sports/ fitness club and luxury hotel uses on two sites. As part of the Project, the existing rental car facility area on the West Site will be demolished, but the existing Capitol Records Complex on the East Site will be preserved. The Capitol Records Complex includes the 13-story Capitol Records Building, along with its ancillary studio recording uses, and the existing two-story Gogerty Building.

This report presents the results of the analysis of existing (2011) and future (2020) traffic conditions before and after Project completion at the following 37 study intersections.

1. 101 Freeway NB Off-Ramp/Cahuenga Boulevard
2. Franklin Avenue/Highland Avenue (North)

These study intersections were selected because they were identified as having potentially significant traffic impacts and therefore require a detailed analysis. The selection was made in consultation with LADOT.

The locations of these study intersections relative to the Site are shown in Figure 2, Study Intersection Map. These intersections are the critical intersections along the primary access routes to and from the Site, and are the intersections expected to be most affected by Project traffic. As agreed to with LADOT, since the Site is along a major highway, in a commercial area, and not adjacent to any areas zoned for single family homes, no residential street segments were expected to have traffic conditions impacted by the Project traffic. (For analysis purposes, segments of local streets in an area designated for single-family homes are considered as "residential street segments".) Therefore, residential street segments would not be potentially significantly impacted by the Project and therefore residential segments were not required to be analyzed in this traffic report.

It should be noted that this report was prepared using the standard LADOT analysis format and procedures. The individual intersection traffic impacts for each project are determined to either be *significant or not significant*. The LADOT determination is based upon the magnitude of the project impact considering the project impact and also considering the cumulative traffic volumes (including existing traffic, ambient growth and related projects growth) anticipated to occur. By following the MOU and the other applicable LADOT Traffic Study guidelines, this report conforms to standard City procedures for determining both project and cumulative traffic impacts. Further, the Project land-uses and densities are consistent with the City's General Plan, including the existing and currently under consideration update of the Hollywood Community Plan. The Project also utilizes the land-uses incorporated into the Hollywood Community Plan update currently being considered by the City. Therefore the Project land-uses and design address the area transportation needs.

Cahuenga Boulevard, a north-south roadway, is designated as a Secondary Highway south of Franklin Avenue and a Major Highway Class II to the north. North of Franklin Avenue, Cahuenga Boulevard accesses the Hollywood Freeway. West of the Site, Cahuenga Boulevard provides two through lanes per direction within an approximate 56-foot wide roadway near its intersection with Hollywood Boulevard. There are left-turn channelization at most major intersections; however, left turns are prohibited during the weekday PM peak period (4:00 PM to 7:00 PM) at its intersections with Hollywood Boulevard and Selma Avenue.

Highland Avenue, a north-south roadway, is designated as a Major Highway Class II north of Melrose Avenue and a Divided Secondary Street south of Melrose Avenue. In the vicinity of the Site, this roadway provides three through travel lanes per direction, with left and/or right-turn channelization provided at the intersection with Hollywood Boulevard. Parking is prohibited on Highland Avenue at all times in the vicinity of the Site. Highland Avenue connects to the Hollywood Freeway with full northbound and southbound ramp connections approximately one and a half mile northwest of the Site.

Vine Street is a north-south Major Highway Class II between Franklin Avenue and Melrose Avenue, south of which, it transitions to Rossmore Avenue which is designated as a collector street. North of Franklin Avenue, Vine Street is designated as a Collector Street. Immediately south of Franklin Avenue, a southbound Hollywood Freeway off-ramp extends to Vine Street. Vine Street bisects the Site and provides two travel lanes per direction and left-turn channelization within an approximate 65- to 75-foot roadway width. The Hollywood Walk of Fame branches down both sides of Vine Street between Yucca Street and Sunset Boulevard.

Ivar Avenue, west of the Site, is a north-south local street with a roadway width of approximately 46 feet. It has one travel lane in each direction. Left turns are prohibited from 6:00 AM to 3:00 PM at its intersection with Hollywood Boulevard.

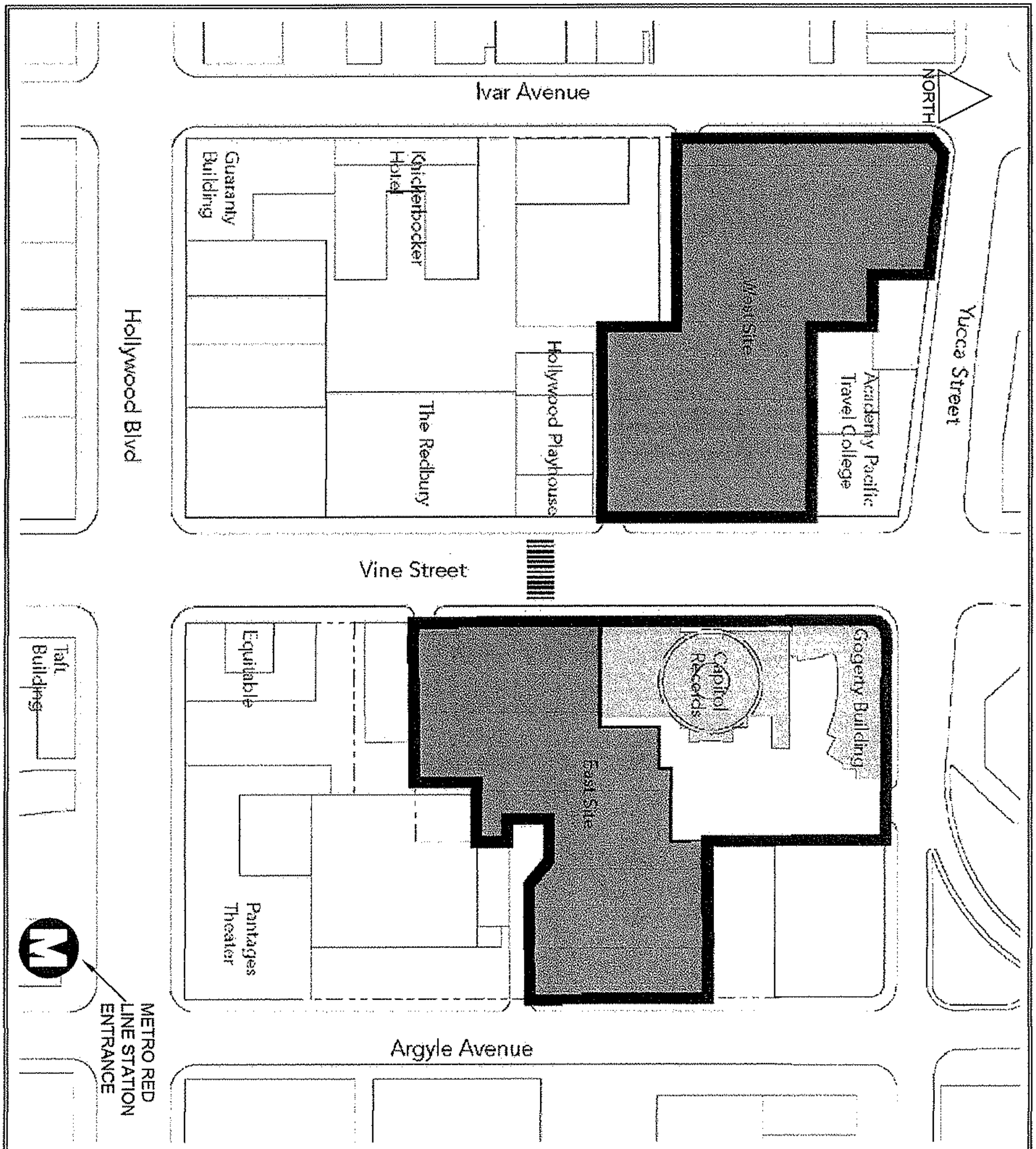


FIGURE 3

1/12/2012

FN: CAPITOL RECORDS\2012-00 MAIN REPORT\SITEPLAN

CONCEPTUAL PROJECT SITE PLAN

CRAIN & ASSOCIATES
Transportation Planning
Traffic Engineering
300 Corporate Pointe, Suite 470
Culver City, California 90230
PH (310) 473 6508 F (310) 444 9771
www.crainandassociates.com

Project Parking and Access

The Project would provide on-site parking in accordance with the parking requirements of the LAMC, and as otherwise permitted through a variance for the sports club parking and the Development Agreement with the use of a shared parking program. The actual number of parking spaces required for the Project will be dependent upon the land uses developed in accordance with the Land Use Equivalency Program included in the Development Agreement. (That program would limit the Project trip generation levels to those analyzed in this study.) The existing parking requirements and agreements that apply to the Capitol Records Complex would remain in place.

Based on the code required parking standards and the implementation of a shared parking program (see Appendix E for the detailed parking analysis), it is envisioned that the Project would include above-grade parking within the podium structures and approximately six levels of below grade parking. The existing parking requirements and agreements that apply to the Capitol Records Complex would remain in place.

Vehicular access to the West Site will be provided via two full-service driveways along Ivar Avenue and Vine Street respectively. The driveway on Ivar Avenue will be located approximately 250 feet south of Yucca Street and the driveway on Vine Street will be located approximately 270 feet south of Yucca Street. Both driveways will serve the parking structure on the West Site and thereby all uses of the project including the residential, commercial and non-commercial components situated on the West Site.

To access the East Site, three full-service driveways will be provided on Vine Street, Yucca Street and Argyle Avenue. The driveway on Vine Street will be located about 460 feet south of Yucca Street and will serve both the parking for both the residential and the office uses. The second East Site driveway, located on Argyle Avenue approximately 360 feet south of Yucca Street, will serve exclusively for the residential

Table 1
Hollywood Redevelopment Project Area
Parking Rates

LAND USE	RATE[1]	
Residential Condominiums	2.25 Spaces /	1 DU
Hotel: Rooms 1-30	1 Space /	1 RM
Rooms 31-60	1 Space /	2 RM
Rooms 61+	1 Space /	3 RM
Restaurant/Lounge	2 Spaces /	1 KSF
Conference/Banquet	2 Spaces /	1 KSF
Health Club		
W/ >50 KSF Office	2 Spaces /	1 KSF
Other	10 Spaces /	1 KSF
Office	2 Spaces /	1 KSF
Retail	2 Spaces /	1 KSF
Restaurant	2 Spaces /	1 KSF

Notes
[1] DU = Dwelling Unit; RM = Room; KSF = 1,000 Square Feet.

As shown in Table 2, the maximum parking demand for each land use component of the Project was then calculated. These maximum parking demands were then used to develop shared parking profiles based on the parking demand ratios and methodology provided in the Urban Land Institute's Shared Parking (2nd Edition, 2005) handbook. The procedures in the handbook account for parking demand fluctuations based on month of the year, time-of-day, weekday versus weekend, and customer/visitor versus employee. For resident parking, 1.5 out of the 2.25 parking spaces per residential unit in the Project will be assigned rather than shared. As detailed in the Shared Parking procedures, the assigned spaces were treated as 100 percent occupied at all times. The remaining residential parking and the parking for the other land uses would be shared, rather than being restricted for a particular land use. Thus, the percentage of parking spaces anticipated to be utilized/available at any given time was taken into account. The detailed calculations are included in the Attachment.

Table 3
Critical Movement Analysis (CMA) Summary
Existing (2011) Traffic Conditions

		AM Peak Hour		PM Peak Hour	
No.	**Intersection**	**CMA**	**LOS**	**CMA**	**LOS**
1.	101 Fwy NB Off-Ramp/ Cahuenga Blvd.	0.353	A	0.648	B
2.	Franklin Ave./ Highland Ave. (North)	0.734	C	0.833	D
3.	Franklin Ave./ Highland Ave. (South)	0.763	C	0.744	C
4.	Franklin Ave./ Cahuenga Blvd.	0.833	D	0.955	E
5.	Franklin Ave.-101 Fwy SB Off-Ramp/Vine St.	0.377	A	0.628	B
6.	Franklin Ave.-101 Fwy NB On-Ramp/Argyle Ave.	0.669	B	0.789	C
7.	Franklin Ave./ Gower St.	0.591	A	0.752	C
8.	Franklin Ave./ Beachwood Dr.	0.663	B	0.664	B
9.	Yucca St./ Cahuenga Blvd.	0.447	A	0.617	B
10.	Yucca St./ Ivar Ave.	0.095	A	0.169	A
11.	Yucca St./ Vine St.	0.429	A	0.378	A
12.	Yucca St./ Argyle Ave.	0.111	A	0.300	A
13.	Hollywood Blvd./ Fuller Ave.	0.507	A	0.425	A
14.	Hollywood Blvd./ La Brea Ave.	0.898	D	0.737	C
15.	Hollywood Blvd./ Highland Ave.	0.708	C	0.741	C
16.	Hollywood Blvd./ Cahuenga Blvd.	0.741	C	0.701	C
17.	Hollywood Blvd./ Ivar Ave.	0.366	A	0.416	A
18.	Hollywood Blvd./ Vine St.	0.734	C	0.703	C
19.	Hollywood Blvd./ Argyle Ave.	0.445	A	0.617	B
20.	Hollywood Blvd./ Gower St.	0.693	B	0.637	B
21.	Hollywood Blvd./ Bronson Ave.	0.527	A	0.479	A
22.	Hollywood Blvd./ 101 Fwy SB Off-Ramps	0.471	A	0.357	A
23.	Hollywood Blvd./ 101 Fwy NB Off-Ramps	0.340	A	0.311	A
24.	Selma Ave./ Cahuenga Blvd.	0.468	A	0.561	A
25.	Selma Ave./ Ivar Ave.	0.121	A	0.294	A
26.	Selma Ave./ Vine St.	0.467	A	0.512	A
27.	Selma Ave./ Argyle Ave.	0.256	A	0.338	A
28.	Sunset Blvd./ Highland Ave.	0.886	D	0.831	D
29.	Sunset Blvd./ Cahuenga Blvd.	0.673	B	0.703	C
30.	Sunset Blvd./ Ivar Ave.	0.355	A	0.513	A
31.	Sunset Blvd./ Vine St.	0.806	D	0.737	C
32.	Sunset Blvd./ Argyle Ave.	0.439	A	0.443	A
33.	De Longpre Ave./ Cahuenga Blvd.	0.341	A	0.389	A
34.	De Longpre Ave./ Vine St.	0.468	A	0.585	A
35.	Fountain Ave./ Vine St.	0.684	B	0.765	C
36.	Santa Monica Blvd./ Vine St.	0.754	C	0.797	C
37.	Melrose Ave./ Vine St.	0.747	C	0.821	D

EXHIBIT 6

EXCERPTS FROM LADOT TRAFFIC STUDY POLICIES AND PROCEDURES (TSPP)

Exhibit 6 a—Page 7 of TSPP (Requires Contact with Caltran's) (1 Page)
Exhibit 6 b—Attachment D of TSPP-Standard Street Dimensions (1 Page)
Exhibit 6 c—Pages 8 and 9 of TSPP-Allowable Transit Credits (2 Pages)

LADOT
Moving Los Angeles Forward

Traffic Study Policies and Procedures

May 2012

City of Los Angeles
Department of Transportation

http://ladot.lacity.org/

D. CONGESTION MANAGEMENT PROGRAM (CMP) GUIDELINES

The "Congestion Management Program for Los Angeles County" includes guidelines intended to assist local agencies in evaluating impacts of land use projects on the CMP system through the preparation of a regional transportation impact analysis (TIA). Appendix "B" of the 2010 CMP for Los Angeles County identifies the requirements and outlines the guidelines in the preparation of the CMP transportation impact analysis. A CMP TIA is necessary for all projects required to prepare an Environmental Assessment based on local determination. The geographic area examined in the TIA must include, at a minimum, the following:

- All CMP arterial monitoring intersections, including freeway on and off-ramp intersections, where a proposed project is expected to add 50 or more trips during either the weekday a.m. or p.m. peak hours (of adjacent street traffic).

- Mainline freeway monitoring locations where a project is expected to add 150 or more trips, in either direction, during either the weekday a.m. or p.m. peak hours.

Caltrans shall be consulted through the Notice of Preparation (NOP) process to identify other specific locations to be analyzed on the state highway system. To assist in the evaluation of impacts on State facilities, the project's traffic consultant should refer to Caltrans' "Guide for the Preparation of Traffic Impact Studies" found at the following web site:

http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

If, based on these criteria, the TIA identifies no impacted regional facilities, further CMP traffic analysis is not required. However, projects must still consider transit impacts (Appendix D of 2010 CMP for Los Angeles County) and provide a calculation of CMP "credits" and "debits" for the project. For further information about the CMP TIA process, please call LADOT CMP Monitoring Section at (213) 972-8473.

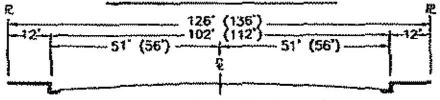
E. TRIP GENERATION CALCULATIONS

1. ITE Trip Generation Rates
The latest edition of ITE's Trip Generation Handbook for trip generation rates and formulas should be used to estimate the Project's trip generation. However, if the Project is in a TSP area, then the procedures and trip rate identified in the TSP should be applied. If other rates are proposed, then these rates must first be submitted with appropriate background survey data for approval by LADOT.

2. Unique Developments
Unique types of development may require trip generation studies of similar facilities in order to determine actual trip rates for use in the impact analysis. These developments may include land uses for which trip generation rates are not available in the ITE Trip Generation Handbook, or land uses for which the rates in the ITE Trip Generation Handbook are based on a small sample of surveyed sites. The procedures and the results of the trip generation studies must be approved by LADOT.

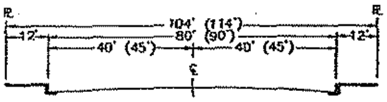
ATTACHMENT D

ARTERIAL STREETS



MAJOR HIGHWAY—CLASS I

At intersections with other Major Highways, the larger widths shown in parentheses should be provided, as determined by LADOT, utilizing a Standard Flare Section.



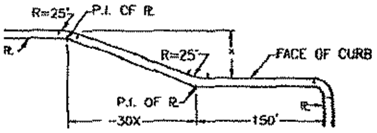
MAJOR HIGHWAY—CLASS II

At intersections where LADOT has determined that dual left turn lanes are required, the larger widths shown in parentheses shall be provided, utilizing a Standard Flare Section.

SECONDARY HIGHWAY

TRANSITIONAL EXTENSIONS

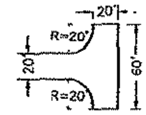
Where a designated Major Highway (Class I or II) or a Secondary Highway crosses another designated arterial street and then changes in designation to a street of lesser standard width, the street of lesser standard width shall be widened on both sides from the intersection to the width of the higher designation and tapered in a Standard Flare Section, as shown below, to provide an orderly transition.



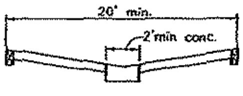
Dimensions shall be measured angle point to angle point.

STANDARD FLARE SECTION
(Plan View)

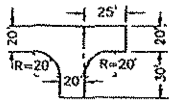
ALLEYS



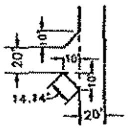
STANDARD TURNING AREA
(Plan View)



STANDARD CROSS-SECTION



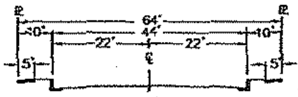
MINIMUM TURNING AREA
(Plan View)



STANDARD CUT-CORNERS FOR 90° INTERSECTION
(Plan View)

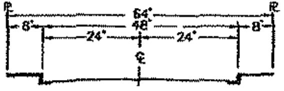
NOTE: Dimensions shown hereon are not to scale.

NON—ARTERIAL STREETS



COLLECTOR STREET

For use in quarter mile streets and school areas.

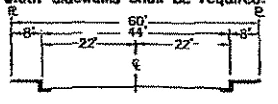


INDUSTRIAL COLLECTOR STREET

For use in industrial areas to assist the flow of local truck traffic within those areas to adjacent arterial streets. A 35' curb return radius is required.

LOCAL STREET

In commercial and multiple residential areas, a 40—foot roadway with 10—foot parkways, and full—width sidewalks shall be required.

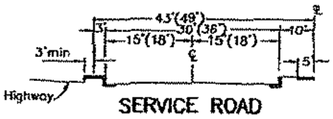


INDUSTRIAL LOCAL STREET

For use in industrial areas. A 35' curb return radius is required.

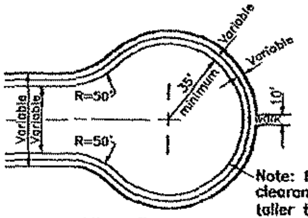
NONCONTINUOUS LOCAL STREET

May include cul—de—sac, loop streets and short connector streets. Where an approved internal pedestrian system is provided the parkway on one side may be reduced to 3—feet.



SERVICE ROAD

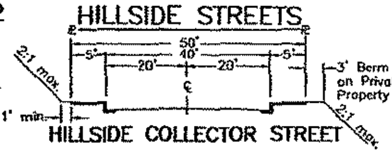
For use on adjoining major or secondary highways, except that the larger widths shown in parentheses shall be provided in multiple residential zones.



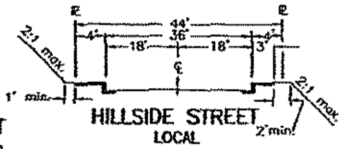
Note: For fire truck clearance, no obstruction taller than 6" shall be permitted within 3 ft. of the curb. On—street parking shall be prohibited.

CUL—DE—SAC
(Plan View)
MAY BE UNSYMMETRICAL

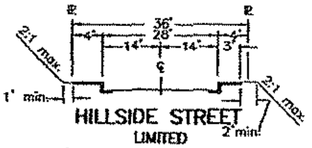
HILLSIDE STREETS



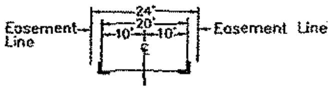
HILLSIDE COLLECTOR STREET



HILLSIDE STREET
LOCAL



HILLSIDE STREET
LIMITED
(Parking on one side only)



ACCESS ROADWAY
CONDITIONAL

(Limited to 4 dwelling units, and a maximum length of 300 feet. Private Street only)

STANDARD WALKWAY
CROSS — SECTION

PREPARED IN COOPERATION WITH THE DEPARTMENTS OF TRANSPORTATION AND CITY PLANNING

BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

STANDARD STREET DIMENSIONS

STANDARD PLAN
S—470—0

SUBMITTED March 25, 1999
Clark D. Robins
ENGINEER OF DESIGN
DEPUTY ENGINEER
APPROVED March 31 1999
Thomas Conner
CITY ENGINEER

DESIGNED BY	DRAWN BY	CHECKED BY
M.E.D., M.L.F., J.E.F. A.D.R.	R. TANABE	L. GANAJA

THOMAS K. CONNER
NO. 23733
EXP 12/31/2001
CIVIL

APPROVED 4-6-99
GENERAL MANAGER, DEPT. OF TRANSPORTATION DATE

Con Howe 4/6/99
DIRECTOR OF PLANNING DATE

ADOPTED MAY 13, 1999
CITY PLANNING COMMISSION DATE

SUPERSEDES	REFERENCES
D-22549	

VAULT INDEX NUMBER
B-4428

SHEET 1 OF 2 SHEETS

THIS STANDARD PLAN BECOMES EFFECTIVE ON NOVEMBER 10, 1999

3. Existing Use

When estimating the Project's net new trips, any claim for trip credits for an "existing" active land use requires that the "existing" use is/was in place at the time of the base year traffic counts. Generally, for CEQA purposes this means the "existing" use must have been active for at least 6 months during the past 2 years. To fully ensure that "existing use" trip credit claims are validated by LADOT, supporting documentation (leasing agreements, utility bills, etc.) must be submitted. Documentation of any previous environmental review of the circulation impacts of the "existing" use should be included in this submittal. Note that some specific plan ordinances allow different time frames for the determination of existing use trip credits and of any applicable trip fees.

4. Terminated Land-Use

Any claim for trip credits for a previously terminated land use must be supported with appropriate documentation of the previous active use, such as copies of any building permit, certificate of occupancy, business license, lease agreement, affidavits, or photographs as well as documentation as to when the previous land use was terminated. Documentation of any previous environmental review of the circulation impacts of the terminated land use should also be submitted in support of such claims. The absence of documentation of previous environmental review may result in denial of the claim for trip credits.

5. Pass-by Trips

Any claim for "pass-by" trip credits must use the trip reduction rates in the "LADOT Policy on Pass-By Trips" in **Attachment H**. However, these rates may be superseded by additional guidelines provided in specific plans or interim control ordinances. These rates are not applicable when reviewing impacts at Project driveways and at intersection(s) immediately adjacent to the Project site. These rates shall not be used in determining the need for a traffic study.

6. Transit Credit

LADOT encourages developers to design and construct transit-friendly projects that provide safe and walkable sidewalks to and from transit stations for project patrons. In line with the City policy to promote the use of mass transit and walking, LADOT, at its discretion, may allow up to a **25%** transit/walk trip credit subject to the following guidelines, on a case by case basis:

   a. Developments above or adjacent to a Metro Rail, Metrolink, or Orange Line station, or to a similar dedicated transit line station with convenient pedestrian access to the station may qualify for up to **25%** transit credit. The actual credit provided should be determined by an analysis of the transit service frequency and density at the specified transit station.

   b. Developments within a 1/4 mile walking distance of a transit station, or of a RapidBus stop, may qualify for up to a **15%** transit credit. The actual credit provided will be determined by an analysis of the transit service frequency and density at the specified transit station or RapidBus stop intersection. To obtain the maximum credit, applicants should implement the following improvements (listed in priority order):

- Provide a wider than standard sidewalk along the streets fronting the project through additional sidewalk easement or by dedicating additional right-of-way beyond street standards.

- Improve the condition and/or aesthetics of existing sidewalks leading to transit station(s) with adequate lighting to provide for a safer pedestrian environment.

- Provide continuous paved sidewalks / walkways with adequate lighting from all buildings in the Project to nearby transit services and stops. This may include mid-block paseos.

- Implement transit shelter improvements/beautification.

c. If the development is not within 1/4 mile walking distance of a transit station or a RapidBus stop, the Project may still qualify for up to **5%** transit credit. To obtain this credit, the Project should include specific features in its design that promote alternative travel modes and provide certain amenities to tenants and employees. Features and amenities that may qualify a Project for this credit include the following:

- An on-site transit information kiosk and/or on-site transit pass sales
- On-site facilities such as ATM machines, cafeteria and convenience shopping
- Charging for single occupant auto parking
- *Car share programs*
- Bicycle racks or other facilities on-site in addition to those which may be required by LAMC 12.21-A.16.
- Provision of on-site concierge service to facilitate use of transit, taxis, or private shuttles by employees/residents
- Provision of shuttle service for employees and/or customers

No trip generation credit will be given automatically to developments located in an area with infrequent transit service. However, all reasonable efforts by the developer to promote the use of mass-transit or walking will be considered for transit credit on a case by case basis.

NOTE: Refer to Section H of this TSPP for transit-related mitigation measures.

7. <u>Affordable Housing Credit</u>
Residential or mixed-use developments that include Affordable Housing Units [as defined in LAMC 12.22-A.25 (b)] qualify for a trip reduction credit of 5% on the basis of the percentage of total dwelling units reserved as affordable. A development for which all proposed dwelling units are to be affordable would receive the maximum aggregate credit of 5% (100 × 0.05). A development with 20% affordable units would qualify for a 1% aggregate trip credit (20 × 0.05), etc. Affordable Housing credit is allowed in addition to any Transit Credit granted through Section D.6 above.

EXHIBIT 7

Caltrans Letter in Response to Draft Environmental Impact Report (DEIR)
Dated December 10, 2012
(4 Pages)

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY EDMUND G. BROWN, JR., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, REGIONAL PLANNING
IGR/CEQA BRANCH
100 MAIN STREET, MS # 16
LOS ANGELES, CA 90012-3606
PHONE: (213) 897-9140
FAX: (213) 897-1337

Flex your power!
Be energy efficient!

December 10, 2012

Ms. Srimal Hewawitharana
Department of City Planning
City of Los Angeles
200 N. spring Street, Room 750
Los Angeles, CA 90012

IGR/CEQA No. 121036AL-DEIR
Referenced to IGR/CEQA No. 110501AL-NOP
Millennium Hollywood Project
Vic. LA-101, PM 7.37
SCH #: 2011041094

Dear Ms. Hewawitharana:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced project. The proposed project would include the construction of approximately 1 million square feet of developed floor area. The historic Capitol Records Building and the Gogerty Building would remain within the project site. The Project would demolish and/or remove the existing rental car facility. The project would develop a mix of land uses including 461 residential dwelling units, 254 luxury hotel rooms, 264,303 square feet of office space, 25,000 square feet of restaurant space, 80,000 square feet of health and fitness club space, and 100,000 square feet of retail space.

Below are Caltrans' major concerns with the Draft Environmental Impact Report (DEIR) for the Millennium Hollywood Project:

1. Caltrans submitted a comment letter dated May 18, 2011, on the Notice of Preparation (NOP) and met with the developer's consultant on September 15, 2011, to discuss Caltrans' concerns about the project's impact on the US-101 freeway and on/off ramps within the 5 miles radius of the project site. The traffic consultant acknowledged Caltrans' concerns and it was understood by both parties that the traffic procedures for analyzing impacts to the state highway system would follow standard statewide procedures outlined in Caltrans Traffic Study Guide. However, the June 2012 Traffic Impact Study (TIS), which is the basis for the traffic impact discussion in the DEIR, did not follow those procedures and does not analyze the impacts to the state highway system.

2. There was no analysis performed for any of the freeway elements. The TIS only used the Los Angeles County Congestion Management Program (CMP) criteria. However, the CMP fails to provide adequate information as to direct and cumulative impacts to the freeway mainline and ramps, per CEQA.

3. Currently, the Level of Service (LOS) for US-101 is operating at LOS F. Any additional trips will worsen the existing freeway condition. The TIS did not include a cumulative traffic analysis for US-101, which would consider the trips generated from the 58 related projects that are referred to in the DEIR, the proposed NBC Universal Project, and growth from the Hollywood Community Plan (Plan). Because the TIS prepared for the Plan in 2005 determined that build-out of the Plan would result in significant transportation impacts to the US-101, the Plan created a Transportation Improvement and Mitigation Plan (TIMP) to identify future improvements to the US-101. Since the proposed project site is located within the Plan area, the identified improvements should have been taken into consideration, as well as improvements listed in Metro's Long Range Transportation Plan.

4. Page IV.K.1-60 of the DEIR states: "The Project would result in a less than significant impact with respect to trip generation upon CMP locations and on freeway segments. No mitigation is required." This conclusion is not based on any credible analysis that could be found anywhere in the DEIR. It is Caltrans' opinion, based on the work that we have done in this area, that this project will result in significant impacts to the state highway system.

5. The submitted traffic analysis did not include the following ramp intersections that are closest to the project site, which may be significantly impacted by this development:

    - SB Route 101 on-ramp from Argyle Avenue
    - SB Route 101 off-ramp to Gower Avenue
    - NB Route 101 off-ramp to Gower Avenue
    - SB Route 101 off-ramp to Cahuenga Blvd.
    - SB Route 101 on-ramp from Cahuenga Blvd.
    - SB Route 101 off-ramp to Vine Street

    The traffic analysis at these off-ramps needs to show projected queue build-up upstream of the off-ramp. Although most of the on-ramps are meter controlled, the analysis needs to show how the added/over-flow volume to the on-ramp may affect other nearby intersections, including off-ramps. Caltrans is concerned that the freeway ramps will back up, creating a potentially unsafe condition. To ensure the ramps do not back up, the intersections adjacent to the ramps must be able to absorb the off-ramp volumes at the same time as they serve local circulation and land uses.

6. As shown in the DEIR, Table 5 Project Trip Generation, the project will generate a 19,486 average daily vehicle trips with 1,064/1,888 vehicle trips during the AM/PM peak hours. These volumes appear to be low and Caltrans requests that the lead agency verify

them. Also, the trip reduction credits taken are not in compliance with the Caltrans Traffic Impact Study Guide and any deviation should be properly justified and substantiated. For example, the 30% reduction of the retail pass-by trips is significantly high without justification. Utilizing such high reduction rates will result in inadequate identification of traffic impacts and mitigation, thus violating CEQA.

To address these concerns, an analysis for the project's impacts to the freeway system should be performed based on the proposed scope of the project as described in the DEIR and would need to include all of the following to determine the actual impact of this project on the State facilities in the project vicinity:

a. If the project will be developed in phases, the project added demand and trip assignment to US-101 should be based on each phase of the project, otherwise it should be based on 100% occupancy.

b. The Trip Generation figures and its distribution need to be forecasted based on a Select Zone Analysis. Based on the magnitude of the project and its close proximity to US-101, the trip assignment appears to be unreasonably low. Please elaborate on the trip assignment methodology utilized.

c. Trip Generation figures from other sources should be cross-referenced by the source, page number, year, and table numbers.

d. The off ramps on NB and SB US-101, between Vermont Avenue and Highland Avenue, which would represent the most impacted area by the proposed Development, should be analyzed utilizing the Highway Capacity Manual (HCM) 85th Percentile Queuing Analysis methodology with the actual signal timings at the ramps' termini.

e. Similarly, the on ramps on NB and SB US-101, within the same area, should be analyzed utilizing the same methodology and with the actual metering rates. These rates can be obtained by contacting Ms. Afsaneh Razavi, Senior Transportation Engineer, Caltrans Ramp Metering Department at (323) 259-1841.

f. An HCM weaving analysis needs to be performed for both the NB and the SB mainline segments, between the on and off ramps within the same area, utilizing balanced traffic demands entering and exiting the weaving segments.

Caltrans is concerned that the project impacts may result in unsafe conditions due to additional traffic congestion, unsafe queuing, and difficult maneuvering. These concerns need to be adequately addressed in the EIR. In summary, without the necessary traffic analysis, Caltrans cannot recognize the TIS and DEIR as adequately identifying and mitigating the project's impacts to the State highway facilities.

If you have any questions, please feel free to contact Alan Lin the project coordinator at (213) 897-8391 and refer to IGR/CEQA No. 121036AL.

Sincerely,

DIANNA WATSON
IGR/CEQA Branch Chief

cc: Scott Morgan, State Clearinghouse

EXHIBIT 8

Caltrans Letter in Response to Final Environmental Impact Report (FEIR)
Dated February 19, 2013
(5 Pages)

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY EDMUND G. BROWN, JR., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, REGIONAL PLANNING
IGR/CEQA BRANCH
100 MAIN STREET, MS # 16
LOS ANGELES, CA 90012-3606
PHONE: (213) 897-9140
FAX: (213) 897-1337

Flex your power!
Be energy efficient!

February 19, 2013

Ms. Srimal Hewawitharana
Department of City Planning
City of Los Angeles
200 N. spring Street, Room 750
Los Angeles, CA 90012

IGR/CEQA No. 130204AL-FEIR
Referenced to
IGR/CEQA No. 110501AL-NOP
IGR/CEQA No. 121036AL-DEIR
Millennium Hollywood Project
Vic. LA-101, PM 7.37
SCH #: 2011041094

Dear Ms. Hewawitharana:

Thank you for the opportunity to review the Final Environmental Impact Report (FEIR) for the Millennium Hollywood Project (Project). This letter serves to reiterate our concerns that the FEIR does not fulfill the requirements of the California Environmental Quality Act (CEQA).

We have the following comments after reviewing the FEIR:

1. CEQA requires the preparation of an EIR to identify a project's significant effects on the environment, identify alternatives to the project, and devise measures to mitigate or avoid those effects. (Pub. Resources Code §§ 21002.1, subd. (a) & 21061.) This Project is a project of statewide, regional, or areawide significance. (CEQA Guidelines § 15206, subd. (b).) When a project is of statewide, regional, or areawide significance, CEQA requires that the lead agency consult with responsible agencies, state agencies with jurisdiction over resources affected by the project, and public agencies with jurisdiction over a transportation facility. (Pub. Resources Code §21092.4, § 21153; CEQA Guidelines § 15086.) Caltrans notified the City of Los Angeles (City) that to properly assess the potential impacts to the State Highway System (SHS) from the Project, a proper traffic impact study (TIS) must be completed.

2. A valid TIS represents the linchpin in Caltrans' efforts to assess a project's potential impacts to the State transportation infrastructure. To assist the City in its preparation of a valid TIS, Caltrans informed the City that the TIS needs to comply with the "*Caltrans Guide for the Preparation of the Traffic Impact Studies*". Unfortunately, the City did not work with Caltrans and instead relied on its own Congestion Management Program (CMP), which **DOES NOT** adequately study the impacts to the SHS. Because the TIS did not adequately analyze the traffic impacts, the City therefore did not identify adequate mitigation. Caltrans is concerned that the Project impacts may result in unsafe conditions due to additional traffic congestion, unsafe queuing, and difficult maneuvering. The City's analysis incorrectly focuses its attention on impacts *to the CMP from the project.* CEQA does not call for an

evaluation of the impacts of a proposed project on an existing plan; it is concerned with the impacts from the project upon the environment, which is defined as the existing physical conditions in the affected area. The City did not study impacts to or identify adequate mitigation for the SHS.

3. Caltrans operates a multi-modal transportation system across the State, and is responsible for the planning, building and maintenance of that system. (Sts. & Hwy. Code § 90 et seq.) While the lead agency for a project has the authority to determine the initial significance of the project's impacts under CEQA, Caltrans has the ultimate authority under the Streets and Highways Code, as the owner and operator of the facilities, to make that determination on the SHS.

4. The intent of the CMP is to assist federal, state and local agencies in developing and implementing comprehensive planning strategies to handle traffic congestion. (Gov. Code, § 60588) Unfortunately, the CMP process does not adequately evaluate the impacts to the SHS, nor does it make the City the final authority over highway safety issues. As the owner and operator of the SHS facilities, Caltrans provides comments on environmental documents and the analysis of impacts to the SHS.

5. The purpose of allowing the public and other governmental agencies the opportunity to review EIRs includes: sharing expertise, disclosing agency analyses, checking for accuracy, detecting omissions, discovering public concerns, and soliciting counter proposals. (CEQA Guidelines, Section 15200.) The TIS did not provide Caltrans, or any other reader, with sufficient traffic analysis to properly review and assess the traffic assumptions, lead agency analysis, and conclusions regarding the Project and its impacts.

6. The CMP does not capture the same data for analysis that the Highway Capacity Manual (HCM) uses. For example, the CMP (1) fails to analyze off-ramps, (2) fails to analyze freeway impacts, including where existing LOS is F, if the Project trip assignments is less than 150 cars, (3) uses a flawed percentage ratio to determine the significance of impacts, and (4) incorrectly analyzes cumulative traffic impacts.

7. The CMP, Section D4 Study Area, indicates that "The geographic area examined in the TIA must include the following, ***at a minimum***" and "Caltrans must also be consulted through the Notice of Preparation (NOP) process to identify ***other specific locations*** to be analyzed on the state highway system." Caltrans identified potential study locations for the Project, but the City does not include an analysis of these locations in the FEIR.

8. CEQA requires mitigation for site-specific issues. However, the CMP does not include site-specific safety considerations, nor is it based on an appropriate measure of effectiveness for site-specific considerations. Therefore, analysis under the CMP alone does not comply with CEQA.

9. The FEIR fails to provide queuing analysis on the off-ramp where the freeway ramps will back up, creating a potential unsafe condition. As Caltrans has already informed the City, the off-ramps which would represent the most impacted area from the Project should be analyzed utilizing the HCM 85^{th} percentile queuing analysis methodology with the actual signal timings at the ramps termini. The City did not do this analysis in the FEIR, nor does the CMP address this issue.

10. The CMP improperly uses a percentage criterion for determining the significance of traffic impacts. The use of a "ratio theory" or "comparative approach," such as the CMP's "2% increase in trips" criterion, improperly measures a proposed project's incremental impact relative to the existing cumulative effect rather than measuring the combined effects of both the project and other relevant past, present, and future projects.

11. A lead agency that intends to approve developments with unmitigated significant traffic impacts must make Findings that no measures are feasible to mitigate those impacts, and must issue a Statement of Overriding Considerations, which indicates that allowing this project to proceed would be in the best interest of the general public.

12. Caltrans' Concerns with the City's Response to Comments in the FEIR:

    a) **Concerns regarding Response to Comment Nos. 03-2 and 03-5**
    The Traffic Impact Study Guide (TISG) states that "Caltrans endeavors to maintain a target LOS at the transition between LOS C and LOS D on the State highway facilities. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS." The City failed to consult with Caltrans to determine the appropriate target LOS for this project.

    What's more, the State Highway facility can absorb additional traffic without degradation, if it is operating at a higher level of service where there are uncongested operations, higher travel speeds and freedom of movement. However, the greater the congestion, the lower the threshold of traffic needed to create an impact. The TISG describes the trip generation changes that would trigger the need to consult with Caltrans or that are likely to indicate a probable significant effect. At certain locations, even less than 50 peak hour trips may have a significant impact on operations and the LOS. Impacts are most often considered significant by Caltrans if they might create an unsafe condition by increasing or relocating traffic demand, thereby increasing the risk of turn movement conflicts on the SHS. The other major concern is when the integrity of the SHS would be at risk from physically undermining or destroying the structures. Traffic that exceeds an operational or capacity threshold will have a different level of significance depending on whether the analysis looks at mainline or access locations.

    b) **Concerns regarding Response to Comment Nos. 03-3, 03-4 and 03-5**
    The Transportation Modeling Procedures and Results (Appendix B of FEIR) demonstrates that the Project adds traffic to the freeway. Cumulatively, the 58 related projects that are referred to in the DEIR, the proposed NBC Universal Project and the Hollywood Community Plan, also add traffic to the freeway and should have been included in the model. Route 101 already operates at LOS F in the vicinity of the Project. Regardless of programs that include upgrades to the transit system or TDM to improve traffic conditions, the net effect of any additional trips likely will worsen the existing freeway condition. Adopting an arbitrary value of 150 or more trips to constitute a significant impact is not a realistic approach and does not capture the impacts to the SHS. Any additional traffic to the mainline, particularly where the LOS is operating at "F" or worst, needs to be mitigated in compliance with CEQA.

Page 1 of the Transportation Modeling Procedures and Results states, "the Hollywood Community Plan Update was also determined not to have a significant impact on the freeway system." This statement is false; according to the DEIR (SCH No. 20020410009) for the Hollywood Community Plan Update (Page 4.5-30), the proposed plan compared to the 2005 conditions would result in an unavoidable significant adverse transportation impact and the Plan offers transportation improvements to mitigate the traffic impacts. The Hollywood Community Plan TIMP includes LRTP Highway/Freeway Improvements (page 48), LRTP Arterial Street Improvements (page 49), and Capital Improvements (page 66). All of those improvements include freeway mainline and on/off ramp improvements in the project vicinity.

Caltrans will consider any and all improvements that would benefit the SHS, including the ATSAC/Adaptive Traffic Control System Highway and Street Traffic Signal Management System. Instead, Caltrans was and still is unable to assess the benefits of such a program because there is no traffic study in the EIR that includes the necessary analysis.

c) **Concerns regarding Response to Comment Nos. 03-6, 03-11, and 03-14**
The listed ramp intersections *are* "those at which the Project traffic impacts have the potential to be significant and substantial." The study locations should include all freeway elements, including freeway mainline, weaving sections, meters, ramps, and ramp junctions, in the study area. The traffic impact analysis methodologies are spelled out in the Caltrans guidelines and are used throughout the State when State Highway facilities are involved. For off-ramps and ramp junctions, Caltrans uses the HCM for analysis. The FEIR is flawed because the City relies upon the Critical Movement Analysis (CMA), which does not address off-ramp queuing that can lead to operational and safety issues.

Without a queuing analysis at the intersections of US-101 off-ramp (see Caltrans letter dated December 10, 2012, Item #5 and #6d), neither Caltrans nor the City can determine whether the traffic from the off-ramps will back up to the mainline, thus creating an unsafe condition to the public. Therefore, the FEIR fails to provide and analyze the impacts upon the SHS from queuing. Again, please provide the traffic analysis at the specified locations, per our Comment Nos. 03-6 and 03-11, as there may be significant impacts from the Project.

d) **Concerns regarding Response to Comment No. 03-7**
Caltrans concurs with Comment No. 59-27 (Jordon, David). The internal capture rates in Table IV.K.1-4 lack support. LADOT relies on ITE studies from Florida from the early 1990s and these studies are outdated. Instead, the Texas A & M University, Texas Transportation Institute for the Federal Highway Administration collected updated data at Legacy Town Center in February 2010. Please submit this data and the corresponding analysis for this Project to Caltrans for our review.

e) **Concerns regarding Response to Comment No.03-9**
Limitations exist regardless of the type of analysis used, but Caltrans prefers the Select Zone Analysis. If the City instead utilizes a manual approach, the analysis should include

an appropriate study area that addresses impacts to State Highway facilities. Consultation with Caltrans is a critical step in the scoping process and all stakeholders should be included in the environmental review; unilateral review and approval by LADOT is not sufficient.

The traffic model analysis (FEIR Appendix B) provides alternative values for the traffic on US-101 which select locations that are too closed to the project resulting in an incomplete model analysis for the project trips distribution on the US-101 where only small amount of trip is assigned to US-101.

f) **Concerns regarding Response to Comment No. 03-13**
The City must conduct an HCM weaving analysis for both the northbound and southbound mainline segments, between the on- and off-ramps within the project vicinity utilizing balanced traffic demands entering and exiting the weaving segments. This would show whether the traffic flow will operate safely.

As stated above, Caltrans is concerned that the project impacts may result in unsafe conditions due to additional traffic congestion, unsafe queuing, and difficult maneuvering. These concerns need to be, and have not been, adequately addressed in the EIR. In summary, without the necessary traffic analysis, Caltrans cannot agree that the FEIR substantively identifies and mitigates the Project's impacts to the State highway facilities as required under CEQA.

We have been and will continue to be available to work in partnership with the City to identify adequate mitigation as a result of the traffic impacts from the Millennium Hollywood proposed project. If you have any questions, please feel free to contact me at (213) 897-9140 or Alan Lin, the project coordinator, at (213) 897-8391, and please refer to IGR/CEQA No. 130204AL.

Sincerely,

Dianna Watson

DIANNA WATSON
IGR/CEQA Branch Chief

cc: Scott Morgan, State Clearinghouse
Jon Foreman, City of Los Angeles

EXHIBIT 9

EXCERPT FROM FEIR (PAGES III.B-5 THROUGH III.B-12

Responses to Caltrans' Comments (8 Pages)

LETTER NO. 03 - CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS)

Dianna Watson
IGR/CEQA Branch Chief
District 7, Regional Planning
100 Main Street, MS#16, Los Angeles, CA 90012-3606

December 10, 2012

Comment No. 03-1

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced project. The proposed project would include the construction of approximately 1 million square feet of developed floor area. The historic Capitol Records Building and the Gogerty Building would remain within the project site. The Project would demolish and/or remove the existing rental car facility. The project would develop a mix of land uses including 461 residential dwelling units, 254 luxury hotel rooms, 264,303 square feet of office space, 25,000 square feet of restaurant space, 80,000 square feet of health and fitness club space, and 100,000 square feet of retail space.

Below are Caltrans' major concerns with the Draft Environmental Impact Report (DEIR) for the Millennium Hollywood Project:

Response to Comment No. 03-1

The comment is an introduction and as such, the comment is acknowledged for the record and will be forwarded to the decision-making bodies for their review and consideration. See Response to Comment Nos. 03-2 to 03-15 (Caltrans) for further detail.

Comment No. 03-2

1. Caltrans submitted a comment letter dated May 18, 2011, on the Notice of Preparation (NOP) and met with the developer's consultant on September 15, 2011, to discuss Caltrans' concerns about the project's impact on the US-101 freeway and on/off ramps within the 5 miles radius of the project site. The traffic consultant acknowledged Caltrans' concerns and it was understood by both parties that the traffic procedures for analyzing impacts to the state highway system would follow standard statewide procedures outlined in Caltrans Traffic Study Guide. However, the June 2012 Traffic Impact Study (TIS), which is the basis for the traffic impact discussion in the DEIR, did not follow those procedures and does not analyze the impacts to the state highway system.

Response to Comment No. 03-2

As cited in the comment, Caltrans was consulted during the NOP process. The concerns and recommendation of Caltrans were considered during the transportation analysis scoping process, including the use of the Caltrans draft procedures. Also taken into account were the concerns and recommendations of other NOP commenters, as well as the City of Los Angeles Department of Transportation (LADOT) policies and the past analyses conducted for similar projects by the City of Los Angeles (the lead agency). The comment states that the Traffic Study does not analyze the impacts to the state highway system; however, the Traffic Study analyzed key freeway ramps utilizing LADOT's signalized intersection LOS methodology and of freeway mainline segments utilizing the Congestion Management Program (CMP) recommended methodology. The Caltrans Traffic Study Guide was consulted in the preparation of the Traffic Study but it does not provide a definition of thresholds of significance; therefore, the CMP methodology was used because it defines thresholds of significance and is the standard methodology used by the lead agency for all traffic studies within the City of Los Angeles. The CMP, a state-mandated program, includes procedures and thresholds that provide a consistent evaluation of projects to address the potential impacts on the regional transportation system.

Comment No. 03-3

2. There was no analysis performed for any of the freeway elements. The TIS only used the Los Angeles County Congestion Management Program (CMP) criteria. However, the CMP fails to provide adequate information as to direct and cumulative impacts to the freeway mainline and ramps, per CEQA.

Response to Comment No. 03-3

The CMP criteria provide an initial review to determine if significant Project impacts may occur and in turn require further study. The initial review in the Traffic Study concluded that Project impacts would be less than significant, so subsequent analyses were determined to not be needed. Support for this conclusion is provided by the recently certified Hollywood Community Plan Update Environmental Impact Report which was also determined not to have a significant impact on the freeway system.

To address Caltrans' concerns, an additional model analysis was conducted. The analysis used the current Southern California Association of Governments (SCAG) model for year 2035, with LADOT refinements, for the initial future projections (the Base Model). See Appendix B, Transportation Modeling Procedures and Results, attached hereto for the model procedures and results. The model demonstrated that the Project will not result in the addition of 150 trips or more to any freeway segment. This analysis verifies that Project traffic impacts on the regional system will be less than significant.

Comment No. 03-4

3. Currently, the Level of Service (LOS) for US-101 is operating at LOS F. Any additional trips will worsen the existing freeway condition. The TIS did not include a cumulative traffic analysis tor US-101, which would consider the trips generated from the 58 related projects that are referred to in the DEIR, the

proposed NBC Universal Project, and growth from the Hollywood Community Plan (Plan). Because the TIS prepared for the Plan in 2005 determined that build-out of the Plan would result in significant transportation impacts to the US-101, the Plan created a Transportation Improvement and Mitigation Plan (TIMP) to identify future improvements to the US-101. Since the proposed project site is located within the Plan area, the identified improvements should have been taken into consideration, as well as improvements listed in Metro's Long Range Transportation Plan.

Response to Comment No. 03-4

The Project is not expected to generate more than 150 additional trips on the freeway system. Therefore, based on the CMP criteria used by the City of Los Angeles on this and other projects, the Project would not result in significant traffic impacts on the freeway mainline (see Response to Comment No. 03-3 (Caltrans) above). In addition, the Project will provide infill uses that reduce regional trip demand as called for by the Smart Growth Initiatives in the Demand Section of the Metro's Long Range Development Plan (LRDP) and in the Sustainable Community Strategies within the Regional Transportation Plan adopted by SCAG. As mitigation, the Project will participate in upgrades to the regional transportation system by funding or implementing other programs called for in the LRDP and TIMP. These programs include signal system upgrades, upgrades to the transit system (through the Project installing shelters at area bus stops, improving the pedestrian linkages to those stops, and funding of alternative mode lanes), and a TDM Program to help reduce project automobile trip demand. These mitigation measures will improve conditions on the Congestion Management Plan system, including the regional freeway system. Also, given the robust transit system in the Project's vicinity, a main focus of the transportation mitigation program is to reduce automobile trips by enhancing pedestrian and bicycle linkages to the transit system and investing in multi-modal transportation improvements. This focus is consistent with LADOT's Traffic Study Guidelines and the objectives identified in the Hollywood Community Plan Update.

Further, no applicable Hollywood Community Plan Update Transportation Improvement and Mitigation Plan (TIMP) requirements are listed in the comment and, after additional review of the TIMP, no applicable TIMP requirements or additional measures were identified. For example, the Capitol Improvement measures in the TIMP are not at locations identified as having unmitigatable significant Project impacts. Project participation in the program called for in the TIMP to "coordinate Caltrans' freeway traffic management system with the ATSAC/Adaptive Traffic Control System (ATCS) highway and street traffic signal management system" was discussed in the meeting which took place on December 4, 2012 between City, Project and Caltrans representatives but rejected by Caltrans representatives.

Comment No. 03-5

4. Page .IV.K.I-60 of the DEIR states: "'The Project would result in a less than significant impact with respect to trip generation upon CMP locations and on freeway segments. No mitigation is required." This conclusion is not based on any credible analysis that could be found anywhere in the DEIR. It is Cal

trans' opinion, based on the work that we have done in this area, that this project will result in significant impacts to the state highway system.

Response to Comment No. 03-5

The Traffic Study and the Draft EIR analyzed impacts to CMP locations and freeway segments based on the CMP criteria (see Response to Comment No. 03-2 (Caltrans)). Based on the data from this analysis, the Traffic Study concluded that Project impacts would be less than significant, so subsequent analyses were determined to not be needed. However, an additional model analysis was conducted using the current SCAG model for year 2035 for the initial future projections (the Base Model).This analysis also shows that Project traffic impacts on the freeway system will be less than significant. See the Response to Comment No.03-3 for additional details.

Comment No. 03-6

5. The submitted traffic analysis did not include the following ramp intersections that are closest to the project site, which may be significantly impacted by this development:

- SB Route 101 on-ramp from Argyle Avenue
- SB Route 101 off-ramp to Gower Avenue
- NB Route 101 off-ramp to Gower Avenue
- SB Route 101 off-ramp to Cahuenga Blvd.
- SB Route 101 on-ramp from Cahuenga Blvd.
- SB Route 101 off-ramp to Vine Street

The traffic analysis at these off-ramps needs to show projected queue build-up upstream of the off-ramp. Although most of the on-ramps are meter controlled, the analysis needs to show how the added/over-flow volume to the on-ramp may affect other nearby intersections, including off-ramps. Caltrans is concerned that the freeway ramps will back up, creating a potentially unsafe condition. To ensure the ramps do not back up, the intersections adjacent to the ramps must be able to absorb the off-ramp volumes at the same time as they serve local circulation and land uses.

Response to Comment No. 03-6

Standard City procedures as outlined in the LADOT Traffic Study Policies and Procedures, May 2012,were selected as the most appropriate for use in the Traffic Study. The study locations selected were those locations at which the Project traffic impacts have the potential to be significant and substantial. The locations at which traffic impacts may be significant are the critical capacity constraints of the area roadway system. The freeway ramps, including the meters and weave sections on the ramps, are not the roadway system constraints in the Hollywood area. Rather, the signalized intersections and the freeway mainline sections were determined to form the capacity constraints in the Hollywood area. Queues from those constraints determine the conditions on the ramps and at other non-critical locations. The more minor (STOP controlled) intersections were determined not to constrain the system capacity. Further, according to LADOT guidelines, the analysis of unsignalized intersections in traffic impact studies is solely to assess the need for future signalizing by conducting warrant analyses. Only unsignalized intersections that serve as integral elements to the project site's access and circulation plan are included in such an analysis. Here, there are no unsignalized intersections that serve as integral elements to Project access and circulation and as such, no unsignalized intersections were studied.

Comment No. 03-7

6. As shown in the DEIR, Table 5 Project Trip Generation, the project will generate a 19,486 average daily vehicle trips with 1,064/1,888 vehicle trips during the AM/PM peak hours. These volumes appear to be low and Caltrans requests that the lead agency verify them. Also, the trip reduction credits taken are not in compliance with the Caltrans Traffic Impact Study Guide and any deviation should be properly justified and substantiated. For example, the 30% reduction of the retail pass-by trips is significantly high without justification. Utilizing such high reduction rates will result in inadequate identification of traffic impacts and mitigation, thus violating CEQA.

Response to Comment No. 03-7

LADOT, the responsible department within the City of Los Angeles (the lead agency), verified that the rates, equations, and calculations used in the Traffic Study were appropriate for the Project. All but one of the base generation estimates cited in the comment were prepared using the information and procedures in Trip Generation, 8th Edition, 2008 Manual, Institute of Transportation Engineers (ITE). (Information for the rental car facility use was not available from that source, so rates incorporated into the West Los Angeles Transportation and Mitigation Specific Plan, rates previously used by the City, were utilized.) Likewise, the pass-by trip adjustment cited in the comment is specified in the LADOT Policies and Procedures, May 2012 and was in turn based on a conservative implementation of the procedures in the ITE Trip Generation Manual. The data and procedures in the ITE Trip Generation Manual are nationally-accepted guidelines utilized by most agencies in Los Angeles County and are the most appropriate source for the trip generation estimates for the Project. Also, it should be noted that the trip generation rates identified in the ITE Trip Generation Manual are based on surveys of sites in suburban areas with little to no transit use, so it is common practice to allow for trip reduction credits to allow for potential transit trips, pass-by trips, and internal trips associated with mixed-use projects. Also see Response to Comment No. 59-27 (Jordon, David) for a discussion of other adjustments.

Comment No. 03-8

To address these concerns, an analysis for the project's impacts to the freeway system should be performed based on the proposed scope of the project as described in the DEIR and would need to include all of the following to determine the actual impact of this project on the State facilities in the project vicinity:

> a. If the project will be developed in phases, the project added demand and trip assignment to US-101 should be based on each phase of the project otherwise it should be based on 100% occupancy.

Response to Comment No. 03-8

Please see Response to Comment No.03-3 (Caltrans) concerning the project freeway impacts including impacts on the US 101. The Project does not have defined phases, so no phasing analysis is appropriate. The Traffic Study, the Draft EIR, and the analysis in Response to Comment No. 03-3 above analyzed the "worst-case scenario" of 100% occupancy.

Comment No. 03-9

> b. The Trip Generation figures and its distribution need to be forecasted based on a Select Zone Analysis. Based on the magnitude of the project and its close proximity to US-101, the trip assignment appears to be unreasonably low. Please elaborate on the trip assignment methodology utilized.

Response to Comment No. 03-9

The select zone analysis recommended in the comment is not considered appropriate for the Project. A select zone analysis fails to accurately analyze urban infill projects, including the Project. In particular, a select zone analysis does not take intercepted trips into account, and intercepted trips are a major factor for urban in-fill projects. Further, urban areas (such as the Traffic Study area in Hollywood)contain numerous more minor streets with signalized intersections that are not in the regional model network. Those intersections may be significantly impacted, but the streets and the intersections would not have trips assigned to them by a select zone analysis.

A manual approach was selected as the most appropriate method to be used for the Traffic Study. The manual procedures utilized separated the Project into components by land uses and separately assigned the trips to and from those components. The assignments considered the types of land uses in the surrounding area to which the component's trips would be linked. The assignments were individually reviewed and approved by LADOT and are detailed in the Traffic Study. See Appendix K.1 of the Draft EIR.

Comment No. 03-10

> c. Trip Generation figures from other sources should be cross-referenced by the source, page number, year, and table numbers.

Response to Comment No. 03-10

Appendix D of the Traffic Study (Appendix K.1 of the Draft EIR) lists the source, land use codes (which may be within multi-page sections), source edition, and year. The land-use code and independent variable dictate the formula used. Tables were not used.

Comment No. 03-11

> d. The off ramps on NB and SB US-101, between Vermont Avenue and Highland Avenue, which would represent the most impacted area by the proposed Development, should be analyzed utilizing the Highway Capacity Manual (HCM) 85th Percentile Queuing Analysis methodology with the actual signal timings at the ramps' termini.

Response to Comment No. 03-11

The CMA methodology was selected for use in the Traffic Study for all intersections. The CMA analysis is specified for use in traffic studies by the lead agency, the City of Los Angeles. Traffic Study Policies and Procedures, May 2012published by the City of Los Angeles, Department of Transportation specifies CMA calculations as the methodology to be used in City of Los Angeles traffic studies. The CMA methodology was selected for inclusion in the City of Los Angeles manual as it is a "Planning Methodology" rather than an "Operations Methodology". It should be noted that the methodology recommended in the comment would be dependent upon the signal timing remaining fixed through 2035 for the horizon year to be accurate, whereas the computerized signal systems now being employed in the City of Los Angeles vary the signal timing on an instantaneous basis. However, additional methodologies may be required to be used during detailed mitigation design by the agency approving implementation of a mitigation measure, with appropriate adjustments being made.

Comment No. 03-12

> e. Similarly, the on ramps on NB and SB US-101, within the same area, should be analyzed utilizing the same methodology and with the actual metering rates. These rates can be obtained by contacting Ms. Afsaneh Razavi, Senior Transportation Engineer, Caltrans Ramp Metering Department at (323) 259- 1841.

Response to Comment No. 03-12

Standard City procedures as outlined in the LADOT Traffic Study Policies and Procedures, May 2012, were selected as the most appropriate for use in the Traffic Study. See Response to Comment Nos. 03-6 and 03-11 (Caltrans) for additional information.

Comment No. 03-13

> f. An HCM weaving analysis needs to be performed for both the NB and SB mainline segments, between the on and off ramps within the same area, utilizing balanced traffic demands entering and exiting the weaving segments.

Response to Comment No. 03-13

Standard City procedures as outlined in the LADOT Traffic Study Policies and Procedures, May 2012, were selected as the most appropriate for use in the Traffic Study. See Response to Comment Nos. 03-6 and 03-11 (Caltrans) for additional information.

Comment No. 03-14

Caltrans is concerned that the project impacts may result in unsafe conditions due to additional traffic congestion, unsafe queuing, and difficult maneuvering. These concerns need to be adequately addressed in the EIR.

Response to Comment No. 03-14

These concerns are adequately addressed in the Traffic Study and Section IV.K.1 Transportation-Traffic of the Draft EIR. The Traffic Study, the Draft EIR, and the additional analysis provided in Response to Comment No. 03-03 above adequately demonstrate traffic impacts resulting from the Project. See Response to Comment Nos.03-3 and 03-6 (Caltrans) for additional information.

Comment No. 03-15

In summary, without the necessary traffic analysis, Caltrans cannot recognize the TIS and DEIR as adequately identifying and mitigating the project's impacts to the State highway facilities.

If you have any questions, please feel free to contact Alan Lin the project coordinator at (213) 897-8391 and refer to IGR/CEQA No. 121036AL.

Response to Comment No. 03-15

The Traffic Study, the Draft EIR, and the additional analysis provided in Response to Comment No. 03-03 above adequately demonstrate traffic impacts resulting from the Project. See Response to Comment Nos. 03-2 through 03-11 (Caltrans) for additional information.

EXHIBIT 10

EXCERPTS FROM DEIR (PAGES IV-18 AND IV-220

Trip Caps (Total of 2 Pages)

Table IV.K.1-12
Trip Generation During Project Construction By Month Within the Construction Period

	AM Peak Hour								PM Peak Hour							
Month(s)	Phase1	Phasa2	Phasa3	Phasa4	Phasa5	Phasa6	Phasa7	Total	Phase1	Phasa2	Phasa3	Phasa4	Phasa5	Phasa6	Phasa7	Total
1	10							10	10							10
2 - 8		33						33		32						32
9		19	42					61		18	42					60
10 - 12			70					70			68					68
13 - 14			42	100				142			42	97				139
15				115				115				112				112
16 - 23				100	125	190		415				97	121	182		400
22 - 25				100	71	84	241	496				97	69	80	233	479
26 - 28					71	84	241	396					69	80	233	382
29 - 38							340	340							326	326

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* Phases -- 1 = Demolition, 2 = Excavation and Shoring, 3 =Foundation and Below Grade, 4 = Building Superstructure, 5 = Exterior Finishing, 6 = Framing / Rough In, and 7 = Finishes.

33. Page IV.K.-128 to 130, under Mitigation Measures:

MITIGATION MEASURES

Mitigation measures for the various scenarios analyzed in this Draft EIR are identified and discussed within the applicable subheadings presented above for the Project Plus Existing Conditions (2011), the Project Plus Future Conditions (2020), the Project Plus Future Horizon Year (2035), the Project with No Vine Street Access, and the Project Component Location Shifting Traffic Impact Analysis, respectively. To address the flexibility afforded by the proposed Development Agreement in building out the Project, the following provides additional information with respect to mitigation triggers for implementing the Mitigation Measures identified herein.

Off-Site Transportation Mitigation Measure Implementation Schedule

The mitigation triggers are intended to implement traffic mitigations prior to the construction or occupancy levels that would create traffic impacts. Thus, prior to issuance of any building permit, issuance of a permit allowing a change of land-use, or other approval ~~of a discretionary action~~ that would affect Project trip generation, the number of Operational Period and Construction Period trips to be generated by the Project shall be calculated using the procedures described above. The results of the calculations shall be compared to the Trip Cap value of 574 AM peak hour trips and 924 PM peak hour trips ~~1,498 AM plus PM net peak hour trips~~. No building permits shall be issued or other measures taken by the City, which would allow the Project-related trip generation to exceed the Trip Cap ~~value~~, unless other supplemental analysis is completed. The results shall also be compared to the triggers based on the trip generation level.

Table IV.K.1-7
Trip Cap Computation Factors By Construction Activity and Land-Use Type Level

Land Use/Activity		Peak Hour Trips Factor		
Construction Period		**AM**	**PM**	**Unit**
110	Construction Employee*	0.440	0.420	trips/employee
N/A	Construction Trucks**	0.625	0.625	trips/truck load
Operational Period				
220	Residential	0.358	0.328	trips/du
310	Hotel	0.476	0.504	trips/rm
492	Health/Fitness Club	0.788	1.950	trips/ksf
710	General Office	0.913	0.360	trips/ksf
820	Retail***			
	(1-25,000 sf)	1.444	5.026	trips/ksf
	(25,001+ sf)	0.559	2.604	trips/ksf
931	Restaurant	0.520	4.840	trips/ksf
N/A	Car Rental Facility	0.373	0.871	trips/ksf

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* The trip rates per peak construction worker used are the ITE Trip Generation, 8th edition manual rates for a Light Industrial site (LU 110).

** Standard City haul route conditions prohibit such truck activity during the excavation and shoring construction phase and thereby 0 truck trips are to be assumed for that phase. The 0.625 rates apply to the average trucks hauling loads to or from the site on a weekday during each other construction phase.

*** Incrementally applied to the retail building area on the site at the conclusion of a development phase.

As part of the application for the building permit, the total amount of trips shall be calculated based on the above trip generation factors and the net land-uses included on the Project Site during the development phase would be determined. For analytical purposes, the total development would be comprised of the following elements:

a) All buildings currently occupying the Project Site which were constructed after the Development Agreement was approved;

b) All buildings removed from the Site which were existing when the Development Agreement was approved (as a credit);

c) Any buildings proposed to be constructed on the Project Site for which a previous application was filed and not withdrawn, but which has not yet been constructed; and

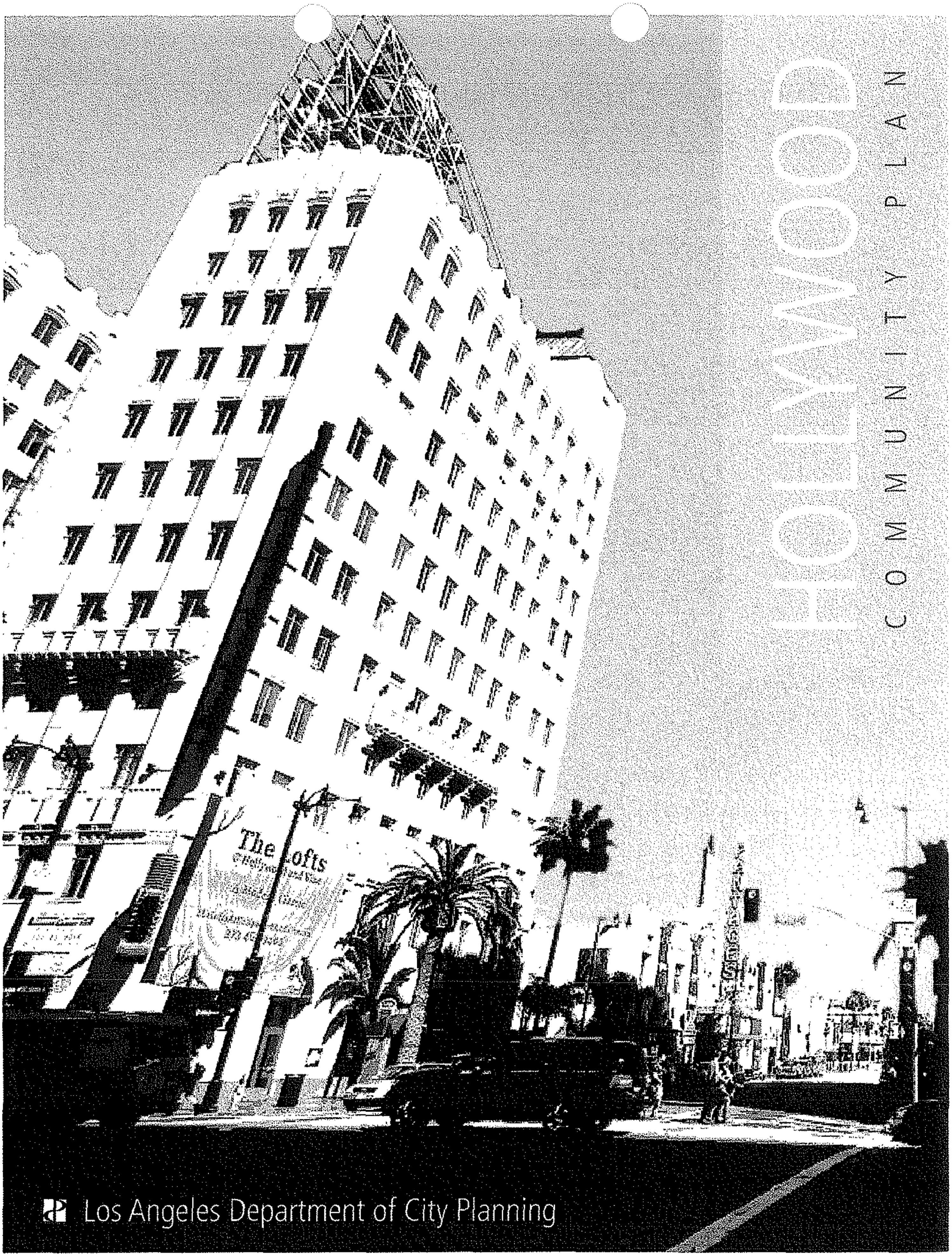
d) The current development phase being applied for.

The trip generation level for each of the four land-use elements shall be determined using the rates in Table IV.K.1-7~~8~~. The trip generation for land-use items a), b), and c) shall be the same for both the

EXHIBIT 11

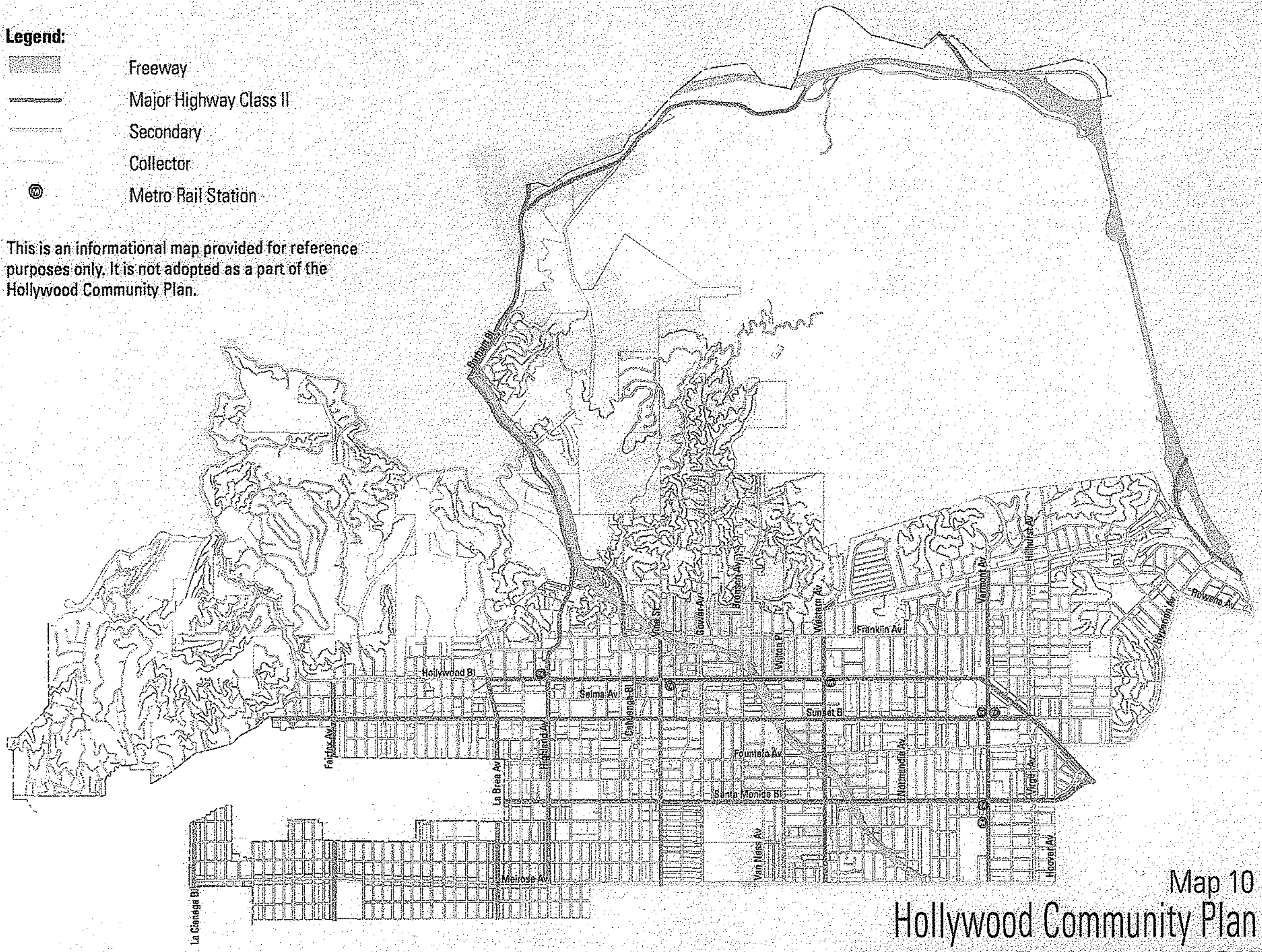
EXCERPS FROM THE HOLLYWOOD COMMUNITY PLAN

Cover Page
Map 10 Generalized Circulation
Map 32 Modified Street Standards : Central Hollywood
Figure 1 Standard and Modified Street Standards
(Total of 4 Pages)



HOLLYWOOD
COMMUNITY PLAN

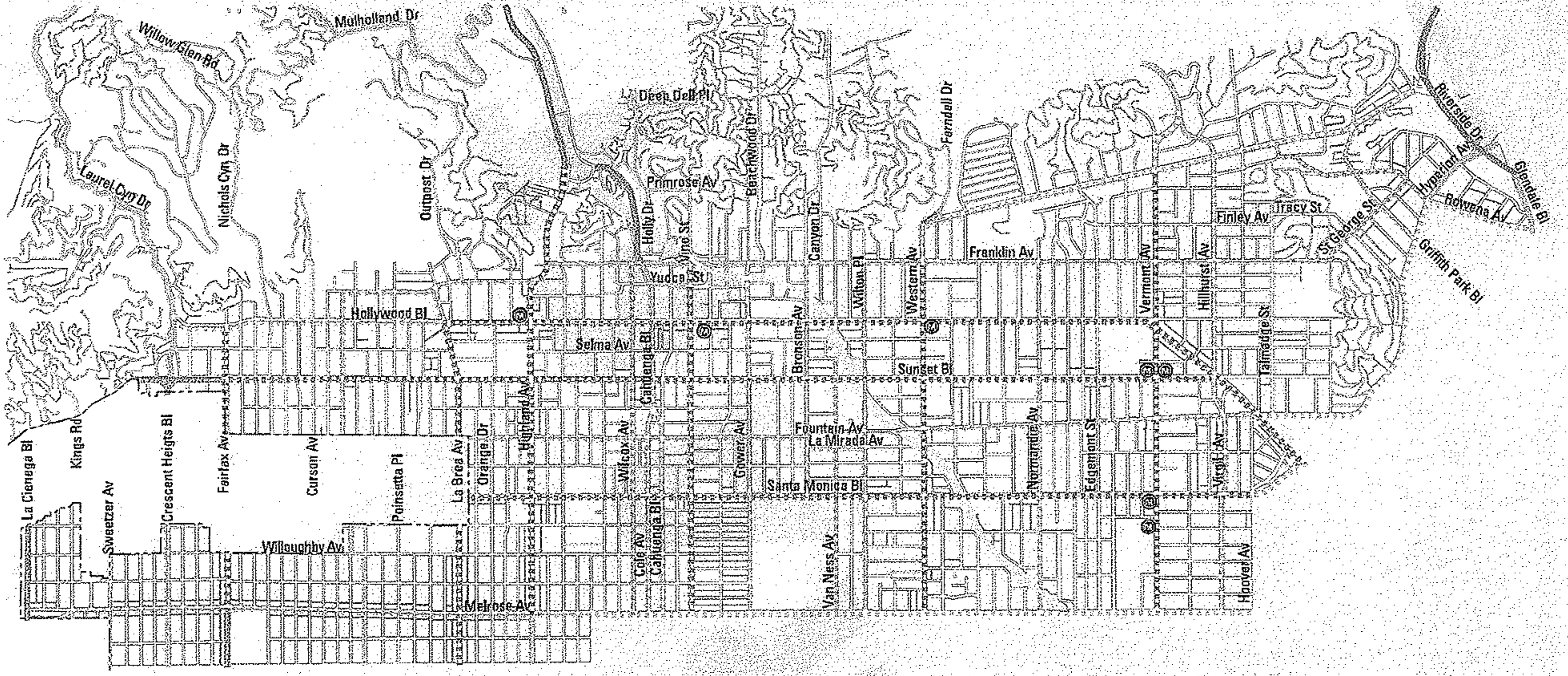
Los Angeles Department of City Planning



This is an informational map provided for reference purposes only. It is not adopted as a part of the Hollywood Community Plan.

Map 10
Hollywood Community Plan
GENERALIZED CIRCULATION

Los Angeles City Planning Department • Graphic Services Section • December 2008 Not to Scale N



Legend:

Freeway

Major Highway Class II

Modified Major Highway Class II

Secondary

Modified Secondary

Collector

Modified Collector

Ⓜ Metro Rail Portal

This is an informational map provided for reference purposes only. It is not adopted as a part of the Hollywood Community Plan.

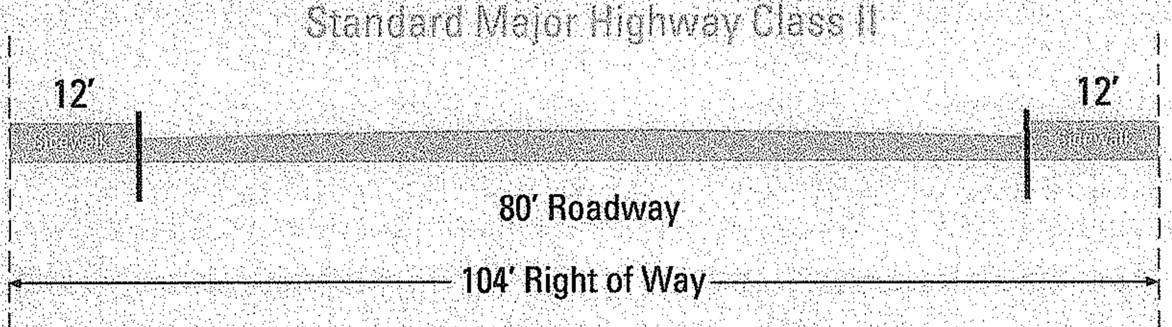
Map 32

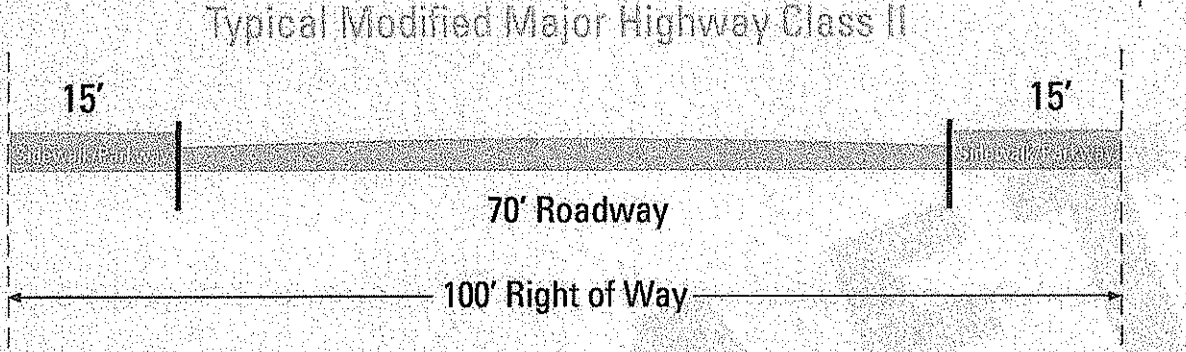
Hollywood Community Plan

MODIFIED STREET STANDARDS: CENTRAL HOLLYWOOD

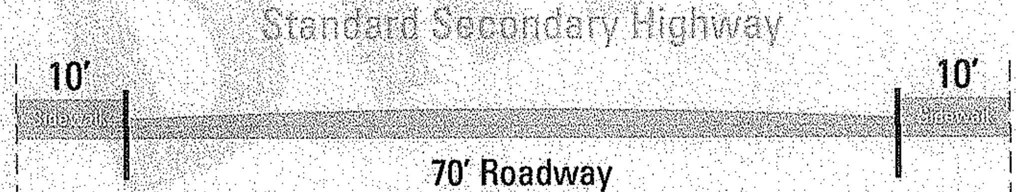
Los Angeles City Planning Department • Graphic Services Section • December 2008 Not to Scale N

Major Highway- Class II
Street Designation Standards





Secondary Highway
Street Designation Standards



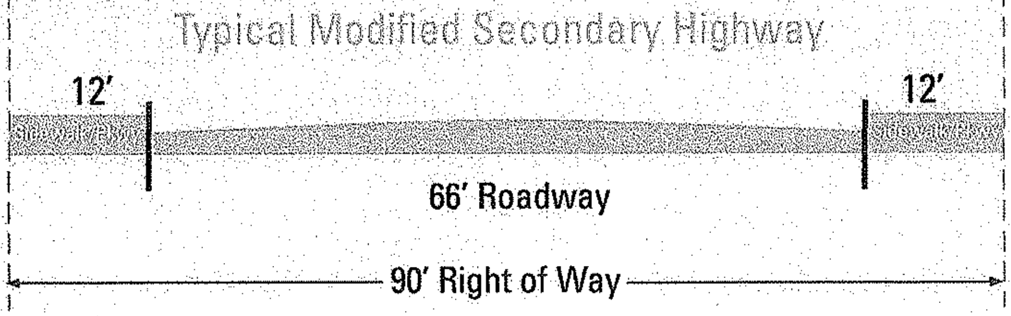


Figure 1
Hollywood Community Plan
STANDARD AND MODIFIED STREET STANDARDS

Los Angeles City Planning Department • Graphic Services Section • December 2007 | Not to Scale N

CITY OF LOS ANGELES
CALIFORNIA

JUNE LAGMAY
City Clerk

HOLLY L. WOLCOTT
Executive Officer

When making inquiries relative to
this matter, please refer to the
Council File No.

ANTONIO R. VILLARAIGOSA
MAYOR

Office of the
CITY CLERK

Council and Public Services
Room 395, City Hall
Los Angeles, CA 90012
General Information - (213) 978-1133
Fax: (213) 978-1040

www.cityclerk.lacity.org

May 23, 2011

To All Interested Parties:

The City Council adopted the action(s), as attached, under Council File No. 11-0317,

at its meeting held May 17, 2011.

June Lagmay

City Clerk
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Mayor's Time Stamp
OFFICE OF THE MAYOR
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2011 MAY 17 PM 3:14
CITY OF LOS ANGELES

TIME LIMIT FILES
ORDINANCES

FORTHWITH

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CITY CLERK
BY ____________ DEPUTY

COUNCIL FILE NUMBER 11-0317 COUNCIL DISTRICT 13

COUNCIL APPROVAL DATE MAY 17, 2011 LAST DAY FOR MAYOR TO ACT MAY 27 2011

ORDINANCE TYPE: ___ Ord of Intent X Zoning ___ Personnel ___ General

___ Improvement ___ LAMC ___ LAAC ___ CU or Var Appeals - CPC No. ____________

SUBJECT MATTER: A ZONE CHANGE AND HEIGHT DISTRICT CHANGE, AND APPEAL OF A VESTING TENTATIVE TRACT MAP, ZONING ADMINISTRATOR'S ADJUSTMENT AND SITE PLAN REVIEW FOR PROPERTY AT 6100-16 HOLLYWOOD BOULEVARD AND 1633-49 NORTH GOWER STREET

	APPROVED	DISAPPROVED
PLANNING COMMISSION	____	____
DIRECTOR OF PLANNING	____	____
CITY ATTORNEY	____	____
CITY ADMINISTRATIVE OFFICER	____	____
OTHER	____	____

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BY ____________ DEPUTY

DATE OF MAYOR [✓ APPROVAL], DEEMED APPROVED OR *VETO MAY 20 2011
(*VETOED ORDINANCES MUST BE ACCOMPANIED WITH OBJECTIONS IN WRITING PURSUANT TO CHARTER SEC. 250(b) (c)

(CITY CLERK USE ONLY PLEASE DO NOT WRITE BELOW THIS LINE)

DATE RECEIVED FROM MAYOR MAY 20 2011 ORDINANCE NO. 181726

DATE PUBLISHED ____________ DATE POSTED MAY 23 2011 EFFECTIVE DATE JUL - 2 2011

ORD OF INTENT: HEARING DATE ____________ ASSESSMENT CONFIRMATION ____________

ORDINANCE FOR DISTRIBUTION: YES ___ NO ___

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5-17-11

TO THE COUNCIL OF THE
CITY OF LOS ANGELES

FILE NO. 11-0317

Your **PLANNING AND LAND USE MANAGEMENT** **Committee**

reports as follows:

ENVIRONMENTAL IMPACT REPORT, STATEMENT OF OVERRIDING CONSIDERATIONS, MITIGATION MONITORING AND REPORTING PROGRAM, PLANNING AND LAND USE MANAGEMENT COMMITTEE REPORT, ORDINANCE relative to a Zone Change and Height District Change, and appeal of a Vesting Tentative Tract Map, Zoning Administrator's Adjustment and Site Plan Review for property at 6100-6116 Hollywood Boulevard and 1633-1649 North Gower Street,.

Recommendations for Council action, SUBJECT TO THE APPROVAL OF THE MAYOR:

1. CERTIFY that the Environmental Impact Report (EIR No. ENV-2007-5750-EIR; State Clearing House No. 2008011113) has been completed in compliance with the California Environmental Quality Act, the State Guidelines and the City Guidelines and that the City Council has reviewed the information contained therein and considered it along with other factors related to this project; that this determination reflects the independent judgment of the lead agency, City of Los Angeles; and that the documents constituting the record of proceedings in this matter are located in Council file No. 11-0317 in the custody of the City Clerk and in the files of the Department of City Planning in the custody of the Environmental Review Section; and ADOPT the Environmental Impact Report.

2. ADOPT FINDINGS made pursuant to and in accordance with Section 21081 of the Public Resources Code and the Statement of Overriding Considerations prepared by the City Planning Department and ADOPT the Statement of Overriding Considerations.

3. ADOPT FINDINGS pursuant to and in accordance with Section 21081.6 of the California State Public Resources Code, the Mitigation Monitoring and Reporting Program as the Findings of Council and ADOPT the Mitigation Monitoring and Reporting Program.

4. ADOPT FINDINGS of the Planning and Land Use Committee as the Findings of Council.

5. PRESENT and ADOPT the accompanying ORDINANCE, approved by City Planning Commission, effecting a Zone Change and Height District Change from C4-2D-SN and C4-2D to [T][Q]C4-2D-SN and [T][Q]C4-2D, respectively, with a new "D" Development Limitation to allow a maximum floor area ratio of 4.5:1 for a development resulting in a net increase of 50 or more dwelling units for the construction of a 20-story mixed-use development with 176 residential condominiums and 7,200 square feet of ground floor retail uses with 345 parking spaces in the proposed [T][Q]C4-2D-SN and [T][Q]C4-2D Zones for property located at 6100-6116 Hollywood Boulevard and 1633-1649 North Gower Street, subject to Conditions of Approval.

CPC 2008-3087-ZC-HD-ZAA-SPR
VTT 70119-1A

Applicant: 6104 Hollywood, LLC
Representative: Jessica Pakdaman, Craig Lawson and Co., LLC

6. RESOLVE TO DENY APPEAL filed by Doug Haines, La Mirada Avenue Neighborhood Association of Hollywood (Robert Silverstein, The Silverstein Law Firm, Representative) from the determinations of the CPC THEREBY APPROVING 1) Vesting Tentative Tract Map No. 70119-CN for the merger and re-subdivision of 6 lots; 2) a Zoning Administrator's Adjustment from Section 12.16-C,2 to permit a zero-foot westerly side yard (including the side yards located at the southwest corner of the site) in lieu of the required 16 feet and a 10-foot rear yard in lieu of the required 20 feet for the parking structure for residential use in the C4 Zone; and 3) Site Plan Review for property located at 6100-6116 Hollywood Boulevard and 1633-1649 North Gower Street, subject to Conditions of Approval.

7. REMOVE the "T" Tentative classification as described in detail on the sheet(s) attached to the Council file.

8. ADVISE the applicant of "Q" Qualified classification time limit as described in the Committee report.

9. ADVISE the applicant that, pursuant to California State Public Resources Code Section 21081.6, the City shall monitor or require evidence that mitigation conditions are implemented and maintained throughout the life of the project and the City may require any necessary fees to cover the cost of such monitoring.

10. ADVISE the applicant that, pursuant to State Fish and Game Code Section 711.4, a Fish and Game Fee and/or Certificate of Fee Exemption is now required to be submitted to the County Clerk prior to or concurrent with the Environmental Notice of Determination filing.

Fiscal Impact Statement: The Planning Department reports that there is no General Fund impact, as administrative costs are recovered through fees.

Community Impact Statement: Yes
Against Proposal: Hollywood Studio District Neighborhood Council

TIME LIMIT FILE - MAY 17, 2011

(LAST DAY FOR COUNCIL ACTION - MAY 17, 2011)

Summary:

At the public hearing held on May 10. 2011, the Planning and Land Use Management (PLUM) Committee considered an Environmental Impact Report, Mitigation Monitoring and Reporting Program, Statement of Overriding Considerations and related California Environmental Quality Act findings; City Planning Commission (CPC) report and Ordinance effecting a Zone Change and Height District Change from C4-2D-SN and C4-2D to [T][Q]C4-2D-SN and [T][Q]C4-2D, respectively, with a new "D" Development Limitation to allow a maximum floor area ratio of 4.5:1; and Appeal filed by Doug Haines, La Mirada Avenue Neighborhood Association of Hollywood (Robert Silverstein, The Silverstein Law Firm, Representative) from the determinations of the CPC in approving; 1) Vesting Tentative Tract Map No. 70119-CN for the merger and re-subdivision of 6 lots; 2) a Zoning Administrator's Adjustment from Section 12.16-C,2 to permit a zero-foot westerly side yard (including the side yards located at the southwest corner of the site) in lieu of the required 16 feet and a 10-foot rear yard in lieu of the required 20 feet for the parking structure for residential use in the C4 Zone; and 3) Site Plan Review for a development resulting in a net increase of 50 or more dwelling units for the construction of a 20-story mixed-use development with 176 residential condominiums and 7,200 square feet of ground floor retail uses with 345 parking spaces in the proposed [T][Q]C4-2D-SN and [T][Q]C4-2D Zones for property located at 6100-6116 Hollywood Boulevard and 1633-1649 North Gower Street, subject to Conditions of Approval.

During the discussion of this matter, Planning Department staff presented an overview of the matter and the appeal. Testimony was provided by the applicant and appellant and their respective representatives. Comments were also heard from Council District 13 staff in support of the project. After an opportunity for public comment, the PLUM Committee recommended that Council deny the appeal, adopt the ordinance effecting a Zone Change and Height District, and adopt the revised findings.

As indicated in Recommendation No. 8 and pursuant to Section 12.32-G 3 of the Los Angeles Municipal Code (LAMC), the applicant is hereby advised that:

". . . the Council may decide to impose a permanent "Q" Condition . . . identified on the zone change map by the symbol Q in brackets . . . There shall be no time limit on removal of the brackets around the [Q] Qualified designation nor on removal of the [T] Tentative designation. After the conditions of the permanent [Q] Qualified classification have been fulfilled, the brackets surrounding the Q symbol shall be removed."

Respectfully submitted,

PLANNING AND LAND USE MANAGEMENT COMMITTEE

MEMBER	VOTE
REYES:	YES
HUIZAR:	ABSENT
KREKORIAN:	YES

mge
CD 13

11-0317_rpt_plum_05-12-11

ADOPTED
MAY 17 2011
LOS ANGELES CITY COUNCIL
TO THE MAYOR FORTHWITH

- Not Official Until Council Acts -

Environmental Review Section

City Hall • 200 N. Spring Street, Room 750 • Los Angeles, CA 90012

LOS ANGELES CITY
PLANNING
DEPARTMENT

FINAL ENVIRONMENTAL IMPACT REPORT

HOLLYWOOD COMMUNITY PLAN AREA

Hollywood & Gower

Case No. ENV-2007-5750-EIR
SCH No. 2008011113

Council District No. 13

Project Address: 6100, 6104 & 6116 W. Hollywood Boulevard and 1633, 1645, 1647 & 1649 N. Gower Street, Los Angeles, CA

Project Description: The proposed project involves demolition of the existing parking lot and construction of an approximately 197,503 square foot mixed-use development that would rise to 20 stories, and would contain one subterranean parking level. The proposed building would extend approximately 270 feet in height. The proposed project would contain 7,200 square feet of retail space and 176 residential units. The proposed project would potentially include a 2-foot street dedication along Hollywood Boulevard and a 5-foot dedication along the southern half of Gower Street. A 5-foot merger is being requested along the northern half of Gower Street. As previously stated, the project site is currently zoned C4-2D-SN and C4-2D. The existing "D" limitation restricts total Floor Area Ratio (FAR) on the project site to 2:1 (per Ordinance No. 165,662, effective May 7, 1990). In order to allow for the proposed project, the Applicant proposes to rezone the project site such that the current "D" limitation of 2:1 maximum FAR would be removed and replaced with a "D" limitation allowing a maximum FAR of 4.5:1. This would permit approximately 197,503 square feet of total floor area (after dedications).

APPLICANT:
6104 Hollywood, LLC

PREPARED BY:
Christopher A. Joseph & Associates

June 2010

III. ENVIRONMENTAL SETTING

Table III-1 has been revised as follows:

Table III-1
Related Projects

No.	Location	Land Use	Size
1	1934 Cahuenga Boulevard	Gas station and mini market	8 pumps
2	6142 Franklin Avenue	Apartment	130 du
3	SWC Franklin Avenue and Gower Street	Apartment *Apartment (removed)*	126 du *-20 du*
4	1800 Argyle Avenue	Apartment Office	87 du 23,000 sf
5	6735 Yucca Street	Condominium	54 du
6	6758 Yucca Street	Apartment Retail	270 du 8,500 sf
7	1714-1736 McCadden Place	Condominium	218 du
8	6904 Hollywood Boulevard	Retail Office	29,900 sf 16,700 sf
9	6757 Hollywood Boulevard	Restaurant	13,132 sf
10	6611 Hollywood Boulevard	Retail	60,200 sf
11	6608 Hollywood Boulevard	Quality Restaurant Hotel	8,100 sf 225 room
12	6531 Hollywood Boulevard	Jazz Club Quality Restaurant	5,390 sf 931 sf
13	6523 Hollywood Boulevard	Restaurant	15,161 sf
14	6506 Hollywood Boulevard	Night Club Restaurant	12,255 sf 745 sf
15	6385 Hollywood Boulevard	Restaurant Dance Club	11,517 sf 11, 518 sf
16	1717 Vine Street	Condominium Restaurant	57 du 5,489 sf
17	SEC Hollywood Boulevard/Vine Street	Apartment Condominium Hotel Restaurant Specialty Retail *Specialty Retail (removed)* *Office (removed)* *Drinking Place (removed)* *Juice Bar (removed)* *State Motor Vehicle Dept.*	375 du 150 du 300 room 49,500 sf 12,000 sf *-5,699 sf* *-2,952 sf* *-3,260 sf* *-288 sf* *-13,680 sf*
18	6263 Hollywood Boulevard	Restaurant Dance Club	6,375 sf 6,376 sf
19	1750 Argyle Avenue	Restaurant Theater	5,273 sf 5,273 sf
20	Vine Street, between Hollywood Boulevard and Selma Avenue	Apartment	104 du
21	1645 Vine Street	Condominium	96 du
22	Hollywood Boulevard, between Argyle Avenue and Gower Street	Apartment Retail	952 du 190,770 sf

No.	Location	Land Use	Size
		Retail (removed)	*-900 sf*
		Automotive (removed)	*-25,400 sf*
		Office (removed)	*-6,820 sf*
		Night Club (removed)	*-5,920 sf*
23	6107 Hollywood Boulevard	Hotel	86 rooms
		Specialty Retail	5,000 sf
24	6021 Hollywood Boulevard	Dance Hall	17,208 sf
25	6000 Hollywood Boulevard	Auto Sales (expansion)	31,000 sf
26	6001 Carlton Way	Condominium	42 du
27	5777 Hollywood Boulevard	Fast-food Restaurant	3,236 sf
		Specialty Retail	5,275 sf
28	Hollywood Boulevard, between Western Avenue and Garfield Place	Retail	30,000 sf
		Condominium	77 du
		Apartment	76 du
		Hotel (rehabilitation)	140 rooms
		Office	19,000 sf
		Retail	26,000 sf
		Apartment	220 du
29	5555 Hollywood Boulevard	Apartment	90 du
		Retail	6,000 sf
30	1611 La Brea Avenue	Condominium	180 du
		Retail	13,700 sf
31	6726 Sunset Boulevard	Pharmacy	16,000 sf
32	6600 Sunset Boulevard	Hotel	50 rooms
33	6417 Selma Avenue	Hotel	126 room
		Restaurant/Night Club	12,840 sf
34	1430 Hudson Avenue	Office	29,000 sf
35	1430 Cahuenga Boulevard	Restaurant	12,000 sf
36	1602 Ivar Avenue	Senior Housing	106 du
		Community Center	6,500 sf
		Retail	10,000 sf
		Doolittle Theater	5,000 sf
37	1600 Vine Street	Night Club	11,884 sf
38	1538 Vine Street	Apartment	306 du
		Retail	68,000 sf
39	NWC Sunset Boulevard/Vine Street	Entertainment/Retail	30,000 sf
40	6322 De Longpre Avenue	Restaurant	12,220 sf
		Night Club	12,221 sf
41	6121 Sunset Boulevard	Condominium	400 du
		Office	380,000 sf
		Hotel	125 rooms
		Restaurant	6,000 sf
		Restaurant	6,000 sf
		Bar/Lounge	3,500 sf
		Retail	12,000 sf
42	1438 N. Gower Street	Office	115,000 sf
43	6040 Sunset Boulevard	Office	120,000 sf
44	5800 Sunset Boulevard	Office	740, 987 sf
		Sound Stage	82,500 sf
		Office (removed)	*-107, 594 sf*
45	5935 Sunset Boulevard	Condominium	331 du
		Office	40,000 sf
		Retail	5,000 sf

No.	Location	Land Use	Size
		Restaurant Public Park *Restaurant (removed)*	8,500 sf 21,177 sf *-13,500 sf*
46	1260 N. Las Palmas Avenue	Day Care Center	75 students
47	1309 N. Wilton Place	Central LA New Area HS	1,875 students
48	1541 Western Avenue	Commercial	11,864 sf
49	1115 Tamarind Avenue	Santa Monica New Primary	380 students
50	6911 Santa Monica Boulevard	Condominium Retail	374 du 15,000 sf
51	6677 Santa Monica Boulevard	Apartment Retail Restaurant	787 du 12,700 sf 9,500 sf
52	959 Seward Street	Office Restaurant	240,000 sf 4,000 sf
53	955 N. Vine Street	Vine Elementary School	230 students
54	5920 Melrose Avenue	Apartment Retail	54 du 16,000 sf
55	5663 Melrose Avenue	Condominium Retail	96 du 3,350 sf
56	5473 Santa Monica Boulevard	Apartment *Apartments (removed)*	27 du *-48 du*
57	SWC Fountain Avenue and Serrano Avenue	Middle School	891 students
58	5200 W. Virginia Avenue	Elementary School	599 students
59	5165 Fountain Avenue	Apartment	110 du
60	4747 Sunset Boulevard	Hospital (expansion)	1,000,000 sf
61	5400 Hollywood Boulevard	Apartment Retail	42 du 6,778 sf
62	922 Western Avenue	Apartment Retail	63 du 13,500 sf
63	5555 W. Hollywood Boulevard	Apartment Retail	108 du 9,937 sf
64	5420 W. Sunset Boulevard	Gas Station	10 pumps
65	5601 Santa Monica Boulevard	Apartment Retail *Retail (removed)*	437 du 377,990 sf *-161,550 sf*
66	5550 W. Hollywood Boulevard	Condominium Retail	216 du 18,353 sf
67	5245 W. Santa Monica Boulevard	Apartment (assisted living) Retail	68 du 51,674 sf
68	Highland Avenue, between Hawthorn Avenue and Selma Avenue	Condominium Hotel Retail Office *Office (removed)* *Restaurant (removed)* *Apartment (removed)*	266 du 348 rooms 47,605 sf 350,000 sf *-55,549 sf* *-1,650 sf* *-20 du*
69	6837 Hawthorn Avenue	Theater	800 seats
70	1257 Detroit Street	Apartment	5 du
71	7046 Hollywood Boulevard	Apartment	42 du
72	1782 Orange Drive	Screening/Dining Facility	270 seats
73	6700 Hollywood Boulevard	Drinking Place	7,500 sf

No.	Location	Land Use	Size
74	6253-6261 W. Hollywood Boulevard	Apartment Office Condos	60 du 5 du
75	1601 and 1605 N. Vine Street	Office Restaurant Restaurant Bar *Retail (removed)*	121,450 sf 3,850 sf 2,300 sf 2,300 sf *-800 sf*
76	1462 N. Vine Street	Apartment Retail	63 du 8,500 sf
77	1830 Bronson Avenue	Apartment	45 du
78	SWC Larchmont Boulevard and Melrose Boulevard	Apartment *Gas Station (removed)*	24 du *-8 pumps*
79	6824 W. Lexington Avenue	Condominium	93 du
80	5700 W. Melrose Avenue	Condominium	21 du
81	5825 Sunset Boulevard	Condominium Apartment Office	20 du 54 du 2,000 sf
82	5831 Sunset Boulevard	Condominium	81 du
83	1538 N. Cahuenga Boulevard	Condominium Retail	32 du 7,000 sf
84	1427 N. Cole Place	Condominium	48 du
85	1417 N. Detroit Street	Condominium	23 du
86	803 N. Wilcox Avenue	Condominium	14 du
87	1633 N. La Brea Avenue	Condominium	186 du
88	1729 N. Las Palmas Avenue	Condominium	218 du
89	2020 N. Holly Drive	Condominium	16 du
90	5806 W. Waring Avenue	Condominium	15 du
91	7060 W. Hawthorn Avenue	Condominium	18 du
92	853 N. Wilcox Avenue	Condominium	16 du
93	6931-6935 Hollywood boulevard	Commercial	44,274 sf
94	1417-1433 Cole Avenue	Condominium	50 du
95	Sunset Boulevard and Vine Street (CIM)	Condominium Retail	90 du 15,000 sf
96	Sunset Boulevard and Van Ness Avenue	LAUSD High School	1,000 students
97	Gordon Street N/O Sunset Boulevard	Condominium	60 du
98	1635 Las Palmas Avenue	Restaurant	8,000 sf
99	7021 Hollywood Boulevard	Health Club Drug Store	53,000 sf 11,000 sf
100	1411 Highland Avenue	Apartment Retail	56 du 7,000 sf
101	7072 Hawthorn Avenue	Apartment	50 du
102	6360 Sunset Boulevard	Restaurant	14,000 sf
103	6922 Hollywood Boulevard	Retail	10,000 sf
104	1545 Wilcox Avenue	Condominium	40 du
105	2775 Cahuenga Boulevard	Town Homes Single Family Housing	75 du 6 du
106	7060 Hollywood Boulevard	Condominium Theater	130 du 99 seats
107	Sunset Boulevard and Vine Street	Condominium Retail	63 du 11,000 sf
108	1800 N. Whitley Avenue	Condominium	32 du

No.	Location	Land Use	Size
109	1313 N. Vine Street	Museum and Theater	~~75,000~~ **200,000** sf
110	6200 Hollywood Boulevard	Retail Apartments	175,000 sf 1,042 du
111	6801 Hollywood Boulevard	Retail Restaurant	1,657 sf 1,587 sf
112	6215 Sunset Boulevard	Office Condominium Hotel	226,000 sf 330 du 350 rooms
113	Sunset Boulevard and Western Avenue	Target and Retail Center	~~NA~~ **192,680 sf**
114	1540 N. Vine Street	Market Apartments	69,000 sf 306 du
115	1921 Highland Avenue	Hotel	100 rooms
116	1750 N. Vine Street	Office	40,000 sf
117	5925 Sunset Boulevard	Office Condominium Retail	40,000 sf 300 du 12,000 sf
118	1800 Highland Avenue	Office (renovation)	84,000 sf
119	5936-5946 Sunset Boulevard	Restaurant and Bar	3,755 sf
120	6350 Hollywood Boulevard	Restaurant and Lounge	12,000 sf
121	1608 N. Cahuenga Boulevard	Restaurant	3,376 sf
122	1650 Schrader Boulevard	Nightclub and Lounge	NA
123	6683 Hollywood Boulevard	Restaurant	4,769 sf
124	7043 Hollywood Boulevard	Restaurant	NA
125	6669 Hollywood Boulevard	Dinner Theater	17,852 sf
126	6254 Sunset Boulevard	Apartments Retail	240 du 5,000 sf
127	1277 Wilcox Avenue	Townhomes	33 du
128	5500 Hollywood Boulevard	Apartments Condominiums Retail	16 du 226 du 15,000 sf
129	6200 Franklin Avenue	Condominiums	146 du
130	6683 Franklin Avenue	Condominiums	9 du
131	6230 Yucca Street	Condominiums Live/Work Office	85 du 10 du 14,000 sf
132	1320 Wilton Place	Condominiums Mixed-Use (retail/office)	150 du NA
133	Hawthorn Boulevard and Orange Drive	Mixed-Use (Hawthorn Block)	NA
134	1617 Cosmo Street	Condominiums	47 du
135	6290 Hollywood Boulevard	Condominiums	40 du
136	7100 Santa Monica Boulevard	Shopping Center	246,000 sf
137	6225 Hollywood Boulevard	Office	200,000 sf
138	7045 Lanewood Avenue	Condominiums Single Family Housing Apartments	43 du 1 du 8 du
139	1727-1737 McCadden Place	Affordable Housing Live/Work	27 du 8 du

Source: Hirsh/Green Transportation Consulting, Inc., September, 2008.

CITY OF LOS ANGELES
CALIFORNIA

ANTONIO R. VILLARAIGOSA
MAYOR

JUNE LAGMAY
City Clerk

HOLLY L. WOLCOTT
Executive Officer

When making inquiries relative to this matter, please refer to the Council File No.

Office of the
CITY CLERK

Council and Public Services
Room 395, City Hall
Los Angeles, CA 90012
General Information - (213) 978-1133
Fax: (213) 978-1040

SHANNON HOPPES
Council and Public Services
Division

www.cityclerk.lacity.org

December 7, 2012

To All Interested Parties:

The City Council adopted the action(s), as attached, under Council File No. 12-1604, at its meeting held November 20, 2012.

June Lagmay
City Clerk
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Mayor's Time Stamp
OFFICE OF THE MAYOR
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City Clerk's Time Stamp
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BY____________
DEPUTY

SUBJECT TO THE MAYOR'S APPROVAL

COUNCIL FILE NO. 12-1604 COUNCIL DISTRICT 13

COUNCIL APPROVAL DATE NOVEMBER 20, 2012

RE: APPEALS FOR PROPERTY AT 5500, 5510, 5516, 5520, 5526, 5544 WEST SUNSET BOULEVARD; 1417, 1431, 1433, 1435, 1437, 1439, 1441 NORTH WESTERN AVENUE; 1414 ST. ANDREWS PLACE; AND 5505, 5525 WEST DE LONGPRE AVENUE

LAST DAY FOR MAYOR TO ACT DEC 06 2012
(10 Day Charter requirement as per LAMC Section 12.24)

DO NOT WRITE BELOW THIS LINE - FOR MAYOR USE ONLY

APPROVED ✓

*DISAPPROVED __________

*Transmit objections in writing pursuant to LAMC Section 12.24

CITY CLERK'S OFFICE
RECEIVED
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CITY CLERK
BY____________
DEPUTY

DATE OF MAYOR APPROVAL OR DISAPPROVAL DEC 06 2012

MAYOR ____________________

IO

11/20/12

TO THE COUNCIL OF THE
CITY OF LOS ANGELES

FILE NO. 12-1604

Your PLANNING AND LAND USE MANAGEMENT Committee

reports as follows:

ENVIRONMENTAL IMPACT REPORT (EIR), STATEMENT OF OVERRIDING CONSIDERATIONS, MITIGATION MONITORING AND REPORTING PROGRAM, and PLANNING AND LAND USE MANAGEMENT COMMITTEE REPORT relative to appeals for property at 5500, 5510, 5516, 5520, 5526, 5544 West Sunset Boulevard; 1417, 1431, 1433, 1435, 1437, 1439, 1441 North Western Avenue; 1414 St. Andrews Place; 5505, 5525 West De Longpre Avenue.

Recommendations for Council action, SUBJECT TO THE APPROVAL OF THE MAYOR:

1. CERTIFY that the Environmental Impact Report (EIR No. ENV-2008-1421-EIR, State Clearing House No. 2010121011) has been completed in compliance with the California Environmental Quality Act, the State Guidelines and the City Guidelines and that the City Council has reviewed the information contained therein and considered it along with other factors related to this project; that this determination reflects the independent judgment of the City of Los Angeles; and that the documents constituting the record of proceedings in this matter are located in Council file No. 12-1604 in the custody of the City Clerk and in the files of the Department of City Planning in the custody of the Environmental Review Section; and ADOPT the Environmental Impact Report.

2. ADOPT the FINDINGS made pursuant to and in accordance with Section 21081 of the Public Resources Code and the Statement of Overriding Considerations prepared by the City Planning Department and ADOPT the Statement of Overriding Considerations.

3. ADOPT the FINDINGS pursuant to and in accordance with Section 21081.6 of the California State Public Resources Code, the Mitigation Monitoring and Reporting Program as the Findings of Council and ADOPT the Mitigation Monitoring and Reporting Program.

4. ADOPT the FINDINGS of the Planning and Land Use Management (PLUM) Committee, including the Environmental Findings, as the Findings of the Council.

5. RESOLVE TO GRANT IN PART / DENY IN PART THE APPEALS filed by Doug Haines on behalf of the La Mirada Avenue Neighborhood Association of Hollywood, Robert Blue of the Citizen's Coalition, Los Angeles, Aiha Nguyen on behalf of Los Angeles Alliance for a New Economy, and R. J. Comer on behalf of Target Corporation from part of and the entire determination of the Central Los Angeles Area Planning Commission (CLAAPC), THEREBY APPROVING: 1) a Conditional Use Permit to allow for the sale of beer and wine for off-site consumption in the C2 Zone, 2) a Specific Plan Project Permit Compliance with the Vermont/Western Transit Oriented District Specific Plan/Station Neighborhood Area Plan, and 3) a Site Plan Review for a project which results in an increase of 50,000 gross square feet or more of nonresidential floor area and a net increase of over 1,000 average daily trips, for the construction of a 194,749 square foot, multi-tenant commercial structure, approximately 84 feet and four inches high, that includes a 163,862 square foot retail store and 30,887 square feet of other smaller retail and food uses, for property located at 5500, 5510, 5516, 5520, 5526, 5544 West Sunset Boulevard; 1417, 1431, 1433, 1435, 1437, 1439, 1441 North Western Avenue; 1414 St. Andrews Place; 5505, 5525 West De Longpre Avenue, subject to Conditions of Approval, as modified by the PLUM Committee and attached to Council file No. 12-1604.

6. INSTRUCT City Planning Department Urban Design Studio to meet with the Applicant, prior to the issuance of building permit, to review the proposed signage and to approve a final signage plan.

7. ADVISE the applicant that, pursuant to State Fish and Game Code Section 711.4, a Fish and Game Fee and/or Certificate of Fee Exemption is now required to be submitted to the County Clerk prior to or concurrent with the Environmental Notice of Determination filing.

Fiscal Impact Statement: The CLAACPC reports that there is no General Fund impact as administrative costs are recovered through fees.

Community Impact Statement: Yes

Against proposal: Hollywood Studio District Neighborhood Council

TIME LIMIT FILE - DECEMBER 3, 2012

(LAST DAY FOR COUNCIL ACTION - NOVEMBER 21, 2012)

Summary:

At a meeting held on November 13, 2012 (continued from November 6, 2012), the PLUM Committee considered an EIR, Statement of Overriding Considerations, Mitigation Monitoring and Reporting Program and a CLAAPC report relative to appeals for property at 5500, 5510, 5516, 5520, 5526, 5544 West Sunset Boulevard; 1417, 1431, 1433, 1435, 1437, 1439, 1441 North Western Avenue; 1414 St. Andrews Place; 5505, 5525 West De Longpre Avenue. Staff from the City Planning Department and the City Attorney's Office gave the Committee background information on the matter and answered questions. Representatives of the Applicant and Appellants and City Council Office staff also provided testimony.

After an opportunity for public comment, the Committee recommended that Council to grant in part /deny in part the appeals filed by Doug Haines on behalf of the La Mirada Avenue Neighborhood Association of Hollywood, Robert Blue of the Citizen's Coalition, Los Angeles, Aiha Nguyen on behalf of Los Angeles Alliance for a New Economy, and R. J. Comer on behalf of Target Corporation from part of and the entire determination of the Central Los Angeles Area Planning Commission, thereby approving: 1) a Conditional Use Permit to allow for the sale of beer and wine for off-site consumption in the C2 Zone, 2) a Specific Plan Project Permit Compliance with the Vermont/Western Transit Oriented District Specific Plan/Station Neighborhood Area Plan, and 3) a Site Plan Review for a project which results in an increase of 50,000 gross square feet or more of nonresidential floor area and a net increase of over 1,000 average daily trips, for the construction of a 194,749 square foot, multi-tenant commercial structure, approximately 84 feet and four inches high, that includes a 163,862 square foot retail store and 30,887 square feet of other smaller retail and food uses, for property located at 5500, 5510, 5516, 5520, 5526, 5544 West Sunset Boulevard; 1417, 1431, 1433, 1435, 1437, 1439, 1441 North Western Avenue; 1414 St. Andrews Place; 5505, 5525 West De Longpre Avenue, subject to Conditions of Approval, as modified by the PLUM Committee and attached to Council file No. 12-1604. This matter is now forwarded to the Council for its consideration.

Respectfully submitted,

PLANNING AND LAND USE MANAGEMENT COMMITTEE

Ed P. Reyes

MEMBER	VOTE
REYES:	YES
HUIZAR:	ABSENT
ENGLANDER:	YES

SG
CD 13
11/14/12

#12/12-1604_rpt_11-13-12

ADOPTED
NOV 20 2012
LOS ANGELES CITY COUNCIL

- Not Official Until Council Acts -

MAYOR WITH FILE

Los Angeles City Planning Department

City Hall • 200 N. Spring Street, Room 750 • Los Angeles, CA 90012

DRAFT ENVIRONMENTAL IMPACT REPORT

HOLLYWOOD COMMUNITY PLAN AREA

Target at Sunset and Western

Case No. ENV-2008-1421-EIR
SCH No. 2010121011
Council District No. 13

THIS DOCUMENT COMPRISES THE FIRST PART OF THE ENVIRONMENTAL IMPACT REPORT (EIR) FOR THE PROPOSED PROJECT DESCRIBED. THE FINAL EIR WILL COMPRISE THE SECOND AND FINAL PART.

Project Address: 5520 West Sunset Boulevard, Los Angeles, CA 90028

Project Description: Demolition of a 59,561-square-foot single-story commercial structure, an electrical substation and a surface parking lot and construction of a three-story 194,749 square-foot multi-tenant commercial structure that includes a 163,862-square-foot retail store (Target) and 30,887 square feet of other smaller retail and food uses. The project would also include 458 at-grade and above-ground parking spaces.

APPLICANT:
Target Stores

PREPARED BY:
Environmental Review Section
Los Angeles City Planning Department

January 2012

2. RELATED PROJECTS

Sections 15126 and 15130 of the State CEQA Guidelines provide that EIRs consider the significant environmental effects of a project as well as "cumulative impacts." Cumulative impacts refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts (CEQA Guidelines Section 15355). Cumulative impacts may be analyzed by considering a list of past, present, and probable future projects producing related or cumulative impacts (CEQA Guidelines Section 15130 [b][1][A]).

All proposed (those with pending applications), recently approved, under construction, or reasonably foreseeable projects that could produce a related or cumulative impact on the local environment when considered in conjunction with the proposed project are included in this EIR. For an analysis of the cumulative impacts associated with these related projects and the proposed project, cumulative impact discussions are provided under each individual environmental impact category in Section IV (Environmental Impact Analysis) of this EIR.

The list of 51 projects (see Table III-1 [List of Related Projects]) includes all approved, under construction, proposed, or reasonably foreseeable projects within the Study Area that are expected to be completed by the anticipated proposed project buildout and occupancy.

The list of related projects is not intended to be the exclusive list of projects that may occur during the buildout period, which cannot be known in an absolute or exhaustive way. Instead, the list is intended to demonstrate the anticipated magnitude of development that may occur in the Hollywood area during this period based on projects currently on file with the City. Furthermore, the related projects list provides a conservative analysis because it is unlikely that all of the projects on the list will be developed due to various circumstances that could arise during the typical planning process. The related projects are shown on Figure III-8 (Location of Related Projects).

Table III-1
List of Related Projects

Map No.	Project	Size	Location
1	Restaurant	6,321 sf	6531 Hollywood Blvd.
2	Residential Retail	108 units 9,937 sf	5555 Hollywood Blvd. Hollywood Garfield
3	Residential Retail	216 units 18,353 sf	5550 Hollywood Blvd. Hollywood Passage
4	Residential Restaurant Coffee Shop Retail	786 units 4,000 sf 5,500 sf 12,700 sf	6677 Santa Monica Blvd. Lexington
5	Residential Office Hotel Restaurant Retail	400 units 380,000 sf 125 rooms 31,000 sf 10,300 sf	6121 Sunset Blvd. Columbia Square
6	Apartments	42 units	5400 Hollywood Blvd.

Table III-1
List of Related Projects

Map No.	Project	Size	Location
	Retail	6,778 sf	
7	Condominiums Restaurant	57 units 5,489 sf	1717 Vine St.
8	Retail Condominiums Supermarket	7,440 sf 80 units 40,000 sf	4500 Los Feliz Blvd.
9	Apartments Condominiums Restaurant Hotel (open) Specialty Retail	375 units 150 units 49,500 sf 305 units 12,000 sf	6250 Hollywood Blvd. W Hotel and Residences
10	Apartments Retail	437 units 377,900 sf	5651 Santa Monica Blvd. Paseo Plaza
11	Gas Station	10 pump	5420 Sunset Blvd.
12	Apartments Retail	952 units 190,777 sf	6200-6201 Hollywood Blvd.
13	Office Sound Stage	740,987 sf 82,500 sf	5800 Sunset KTLA
14	Apartments Retail	306 units 68,000 sf	1538 Vine St.
15	Condominiums Office Retail Restaurant	311 units 40,000 sf 5,000 sf 8,500 sf	5925 Sunset Blvd.
16	School Retail	224 student 6,400 sf	1460 Gordon St. Emerson College
17	Restaurant	15,161 sf	6523 Hollywood Blvd.
18	Restaurant	12,225 sf	6506 Hollywood Blvd.
19	Condominiums Retail	96 units 3,350 sf	5663 Melrose Ave.
20	Condominiums	42 units	6001 Carlton Way
21	Condominiums Office Live work	85 units 13,790 sf 10 units	6230 Yucca St.
22	Assisted Living Retail	68 units 51,674 sf	5245 Santa Monica Blvd.
23	Hotel	50 rooms	6600 Sunset Blvd.
24	Office	240,000 sf	959 Seward St.

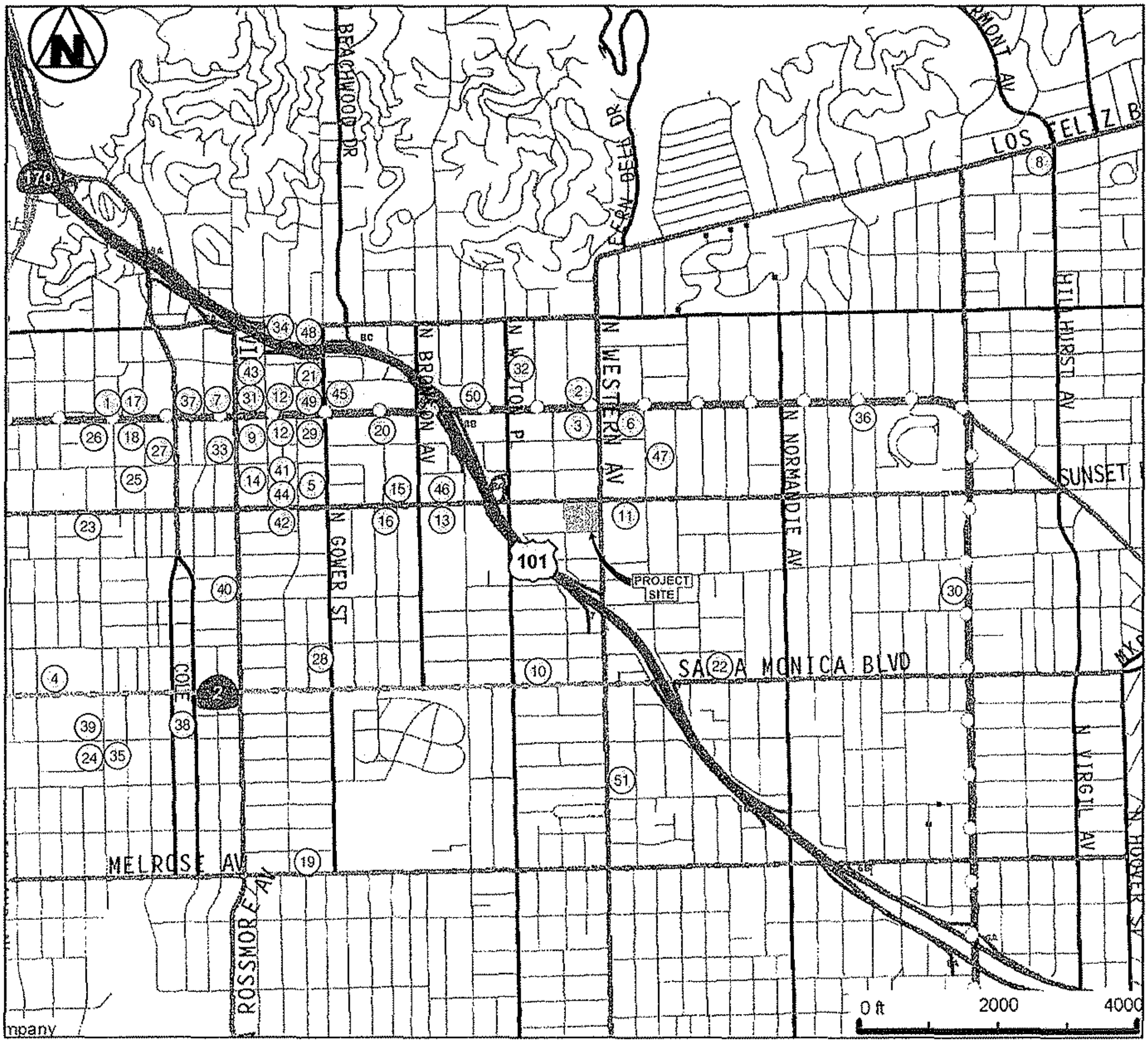
Table III-1
List of Related Projects

Map No.	Project	Size	Location
25	Office	85,000 sf	6516 Selma Ave.
26	Restaurant	8,100 sf	6608 Hollywood Blvd.
27	Hotel	136 rooms	6417 Selma Ave.
28	Residential	57 units	1149 Gower St.
29	Residential Retail	176 units 7,200 sf	6100-6116 Hollywood Blvd.
30	Condominiums Retail	24 units 8,338 sf	1225 N. Vermont Ave.
31	Office	214,000 sf	6225 Hollywood Blvd.
32	School	350 students	1717 Gramercy Pl.
33	Office Restaurant Bar	121,450 sf 6,150 sf 2,300 sf	1601 N Vine St.
34	Apartments Office	87 units 23,000 sf	1800 Argyle Ave.
35	Office	130,000 sf	956 Seward St.
36	Condominiums Hotel Retail	140 units 200 rooms 27,000 sf	4900 Hollywood Blvd.
37	Hotel Restaurant	80 units 15,290 sf	6381 Hollywood Blvd.
38	Health Club	13,112 sf	6311 Romaine St.
39	Office Storage	104,155 sf 1,970 sf	6601 Romaine St.
40	Museum	80,000 sf	1313 Vine St.
41	Office Retail	190,000 sf 25,000 sf	1546 Argyle Ave. Ametron
42	Apartments Retail	240 units 5,000 sf	6230 Sunset Blvd.
43	Office Condominiums Hotel Retail	100,000 sf 492 units 200 rooms 80,000 sf	1750 Vine St. Capitol Records (Hollywood Millenium)
44	Office Condominiums Hotel Restaurant	237,000 sf 170 units 251 rooms 12,700 sf	6215 Sunset Blvd. Palladium
45	Apartments	70 units	1720 Gower St.

Table III-1
List of Related Projects

Map No.	Project	Size	Location
46	Office	40,000 sf	5825 Sunset Blvd.
47	Apartments	42 units	1544 Serrano Ave.
48	Apartments	130 units	6142 Franklin Ave.
49	Hotel Retail	86 rooms 5,000 sf	6107 Hollywood Blvd.
50	Restaurant Retail	3,236 sf 5,275 sf	5777 Hollywood Blvd.
51	Apartments Retail	63 units 13,500 sf	922 Western Ave.

Source: Overland Traffic Consultants, Inc., 2011.



Source: Overland Traffic Consultants, Inc., December 2010.

EcoTierra

Figure III-8
Related Projects Map

History of the Alquist-Priolo Earthquake Fault Zoning Act, California, USA

WILLIAM A. BRYANT

California Geological Survey, 801 K. Street, Sacramento, CA 95814

Key Terms: ***Fault, Surface Rupture, Land-Use Planning, Alquist-Priolo***

ABSTRACT

The Alquist-Priolo Earthquake Fault Zoning (AP) Act was passed in California in 1972 following the destructive 1971 Mw 6.6 San Fernando earthquake. Surface-fault rupture hazard is addressed by prohibiting most structures for human occupancy from being placed over the trace of an active fault. Principal responsibilities under the AP Act are assigned to the following: 1) State Mining and Geology Board (SMGB), 2) State Geologist (California Geological Survey), and 3) lead agencies. The SMGB establishes specific regulations to guide lead agencies in implementing the law. The AP Act requires the State Geologist to issue maps delineating regulatory zones encompassing potentially hazardous faults that are sufficiently active (active in approximately the last 11 ka) and well defined. The first maps were issued in 1974—currently there are 547 maps affecting 36 counties and 104 cities. Lead agencies affected by the zones must regulate development "projects" in which structures for human occupancy are planned within the Earthquake Fault Zones (EFZs). Significant events in the history of the AP Act include A) the establishment of the Fault Evaluation and Zoning Program in 1976 (which also initiated the change from zoning faults with Quaternary displacement to those with Holocene displacement); B) the publication of the Reitherman-Leeds study in 1991, which evaluated the effectiveness of the AP Act; C) earthquakes associated with surface-fault rupture since the AP Act was passed, especially the 1992 Mw 7.3 Landers and 1999 Mw 7.1 Hector Mine events; D) release of digital versions of EFZ maps, Fault Evaluation Reports, and site investigation reports in 2000–2003; and E) the appeal to SMGB by the City of Camarillo, resulting in the establishment of the SMGB's Technical Advisory Committee.

INTRODUCTION

The Alquist-Priolo Earthquake Fault Zoning (AP) Act was passed into law in California following the destructive February 9, 1971, Mw 6.6 San Fernando earthquake. This earthquake was associated with a 16-km–long, complex zone of left-reverse oblique slip along traces of the San Fernando Fault Zone (Mission Wells, Sylmar, and Tujunga/Lakeview segments). Maximum left-lateral displacement of up to 2.5 m occurred along the Sylmar segment (Sharp, 1975). The lateral component of displacement was generally 1.3 times larger than the dip-slip component. Bonilla et al. (1971) reported that approximately 80 percent of buildings in the zone of surface-fault rupture associated with this earthquake had moderate to severe damage, compared to about 30 percent of the structures in immediately adjacent areas. Significantly, Bonilla et al. (1971) reported that 30 percent of the buildings within the fault zone were posted as unsafe (red-tagged), compared with only 5 percent of buildings outside of the fault zone.

Important seismic safety legislation in California typically has been enacted following destructive earthquakes. For example, the Field Act, which requires earthquake-resistant design and construction for public schools, was passed in April 1933 following the March 10, 1933, Mw 6.4 Long Beach earthquake. In addition to the AP Act, the Strong Motion Instrumentation Program and the Hospital Seismic Safety Act came into existence as a result of the San Fernando earthquake. Legislation in 1990 established the Seismic Hazards Mapping Act and hospital safety requirements (Senate Bill 1953) after the October 17, 1989, Mw 6.9 Loma Prieta earthquake. Rubin and Renda-Tanali (2006) provide a brief summary of California seismic safety legislation following significant earthquakes.

ALQUIST-PRIOLO ACT

The AP Act provided a mechanism to reduce losses from surface-fault rupture on a statewide basis (CDMG, 1976). Originally known as the Alquist-Priolo Geologic Hazard Zones Act when introduced as Senate Bill 520, the AP Act was signed into law on December 22, 1972, and went into effect on March 7, 1973. The AP Act is codified in the California Public Resources Code (CPR) as Sections 2621–2630 of Chapter 7.5, Division 2.

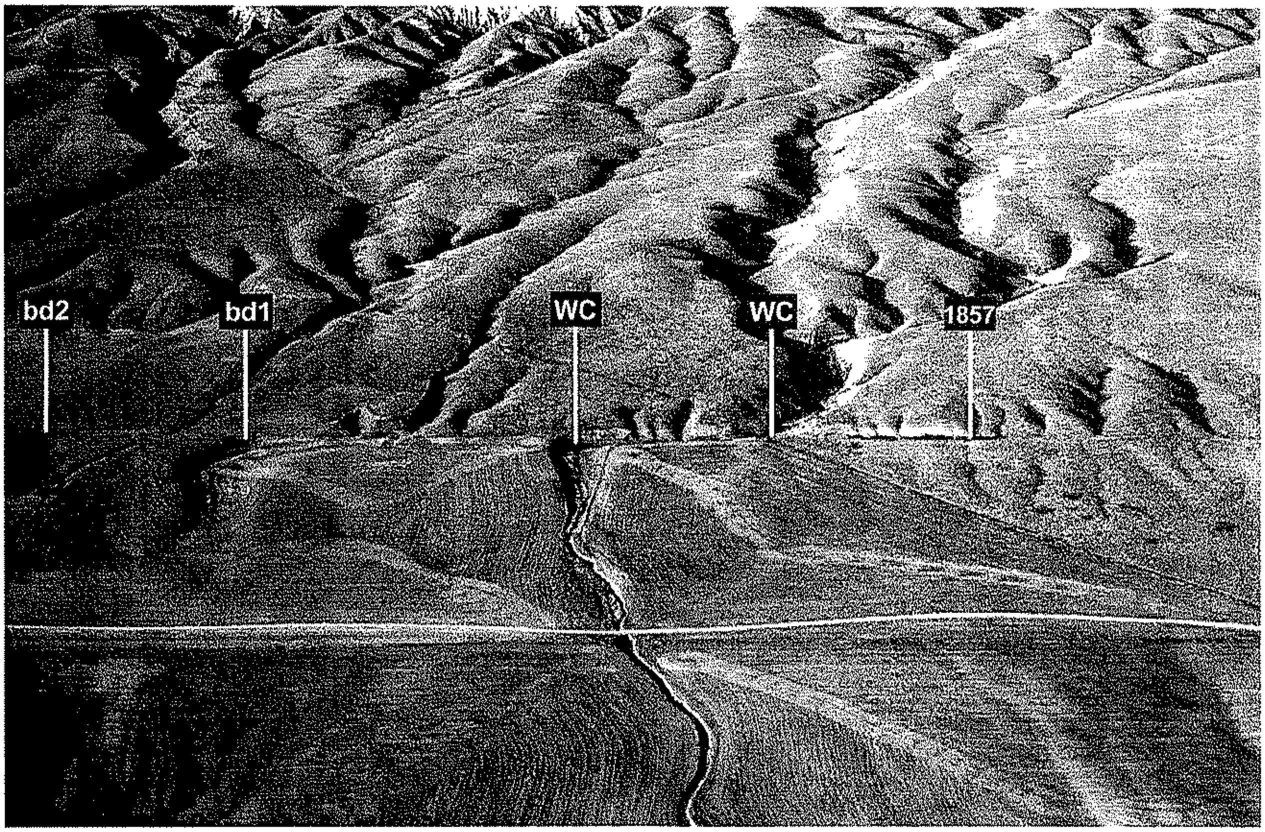


Figure 1. The San Andreas Fault strikes from left to right across the center of the image; view to the northeast. Wallace Creek has been cumulatively displaced about 130 m in the past 3,700 years (piercing points indicated by WC). If the 10–11-m dextral offset of stream channels observed after the 1857 Fort Tejon earthquake is typical of displacement along this section of the San Andreas Fault (an example is indicated by 1857), then about 14 surface-fault rupture events are recorded. The two beheaded drainages (bd1 and bd2) document older displacements of Wallace Creek. Cumulative dextral offset of bd2 and WC indicates that about 45 surface-fault rupture events have occurred in the past 13,200 years along this narrow fault zone (Sieh and Jahns, 1984; photo by R. E. Wallace).

The intent of the AP Act is to ensure public safety by prohibiting the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. The original wording in the AP Act (CPR §2621.5) stated that the Act was "… *to provide policies and criteria to assist cities, counties, and state agencies in the exercise of their responsibility to provide for the public safety in hazardous fault zones.*" Note that original wording in the AP Act (statute) did not specifically prohibit the siting of structures across active faults. This prohibition was called for in the State Mining and Geology Board's (SMGB's) policies and criteria (regulation). Paragraph A in the SMGB's original "Specific Criteria" reads as follows: "*No structure for human occupancy, public or private, shall be permitted to be placed across the trace of an active fault.*" A key part of the original AP Act gives authority to the SMGB to establish policies and criteria in order to implement the AP Act. CPR §2623 states: "*Within the special studies zones delineated pursuant to Section 2622, the site of every proposed new real estate development or structure for human occupancy shall be approved by the city or county having jurisdiction over such lands in accordance with policies and criteria established by the State Mining and Geology Board and the findings of the State Geologist*" [emphasis added]. As currently written in the AP Act, the only allowed type of mitigation for surface-fault rupture hazard is avoidance. CPR §2621.5 states that it "… *prohibit*[s] *the location of developments and structures for human occupancy across the trace of active faults.*" Section 3603(a) of the California Code of Regulations (CCR) states that "*No structure for human occupancy … shall be permitted to be placed across the trace of an active fault.*"

An important presumption of the AP Act is that future surface-fault rupture will most likely occur where previous recent displacement has taken place. Drainage channels offset by the San Andreas Fault in the Carrizo Plain help to illustrate this concept (Figure 1). Sieh (1978) observed that small drainage

Table 1. *Responsibilities under the Alquist-Priolo Earthquake Fault Zoning (AP) Act. Sections cited are from California Public Resources Code (CPR) and California Code of Regulations (CCR).*

State Mining and Geology Board	
1.	Formulates policies and criteria to guide cities and counties (CPR §2621.5 and 2623)
2.	Serves as Appeals Board (CPR §673)
State Geologist	
1.	Delineates Earthquake Fault Zones; compiles and issues maps to cities, counties, and state agencies (CPR §2622)
	a. Prepares Preliminary Review Maps
	b. Prepares Official Maps
2.	Reviews new data (CPR §2622)
	a. Revises existing maps
	b. Compiles new maps
3.	Approves requests for waivers initiated by cities and counties (CPR §2623)
Lead Agencies	
1.	Must adopt zoning laws, ordinances, rules, and regulations; primary responsibility for implementing AP Act (CPR §2621.5)
2.	Must post notices of new Earthquake Fault Zones Maps (CPR §2621.9 and 2622)
3.	Regulates specified "projects" within Earthquake Fault Zones (CPR §2623)
	a. Determines need for geologic reports prior to project approval
	b. Reviews and approves geologic reports prior to issuing development permits
	c. May initiate waiver procedures (CPR §2623)
Property Owners	
1.	Must prepare geologic report for specific projects and avoid surface-fault rupture hazard [CPR §2623.(a) and CCR §3603.(d)]
2.	Must disclose to prospective buyers if property is located within AP EFZs (CPR §2621.9)
Other	
1.	*Seismic Safety Commission*—advises State Geologist and State Mining and Geology Board (CPR §2360)
2.	*State Agencies*—prohibited from siting structures for human occupancy across active fault traces (CPR §2621.5)

channels just southwest of Wallace Creek were dextrally offset 10–11 m during the 1857 Mw 7.8 Fort Tejon earthquake. The active Wallace Creek drainage channel shows a cumulative dextral offset of about 130 m. Sieh and Jahns (1984) determined that this amount of displacement has taken 3,700 years to accumulate. To the northwest, beheaded drainage channels document older displacements of Wallace Creek. Approximately 475 m of cumulative dextral offset has occurred in the past 13,200 years (Sieh and Jahns, 1984). If one assumes that earthquakes with ground displacements of 10–11 m are typical for this section of the San Andreas Fault, then about 45 surface-fault rupture events have occurred along this very narrow fault zone over a period of 13,200 years.

Responsibilities for carrying out the Act are shared between the State Geologist (California Geological Survey), SMGB, affected lead agencies (cities, counties, and state agencies), and property owners (Table 1). These entities are discussed in the following paragraphs.

State Mining and Geology Board

Policies and criteria are developed by the SMGB to assist all concerned with implementing the AP Act. These policies and criteria were codified as Section 3600 et. seq., Division 2, Title 14 of the California Administrative Code (currently referred to as the California Code of Regulations) on January 31, 1979. The SMGB provides definitions of terms used in the AP Act, requires cities and counties to notify property owners within proposed new and revised Earthquake Fault Zones (EFZs), provides opportunity for the public to comment on preliminary review maps of EFZs, and serves as an appeals board (CPR §673).

State Geologist

The State Geologist evaluates potentially active faults (evidence of displacement in Quaternary time) and establishes regulatory zones (EFZs) encompassing those faults that are sufficiently active and well defined. Sufficiently active faults are those faults with evidence of surface displacement during Holocene time (approximately the last 11,000 years). Holocene surface displacement may be directly observed or inferred; it need not be present everywhere along a fault to qualify that fault for zoning. A fault is considered well defined if its trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The criterion of well defined is somewhat subjective and can be influenced by rock type, climate, vegetation, slip rate, and style of displacement. A critical consideration is that the fault, or some part of it, can be located in the field with sufficient precision and confidence so that the required site-specific investigation would meet with some success.

"Potentially active fault" is not defined in either the AP statute (AP Act) or the regulations (policies and criteria of the SMGB) and often has been inferred to denote a lack of Holocene displacement. The term "potentially" only appears in CPR §2622(a), which discusses zoning criteria for the State Geologist. An explanation for "potentially active fault" is found in Special Publication 42 (Bryant and Hart, 2007). This expression is generally referred to in the context of zoning criteria based on Quaternary displacement. It is important to note that the term potentially active fault does not exclude displacement in Holocene time (see figure 2 in Bryant and Hart [2007]). Therefore, it does not follow that a "potentially active fault" can be judged "inactive" unless there is evidence that supports the conclusion that the fault has not been active in Holocene time.

Preliminary Review Maps of Alquist-Priolo EFZs (AP EFZs) are issued by the State Geologist on standard U.S. Geological Survey 1:24,000-scale, 7.5-minute quadrangle maps. Following a 90-day review period, the SMGB will hold at least one public hearing to receive comments pertaining to the technical merit of the proposed AP EFZs. The State Geologist considers and incorporates review comments and issues Official Maps to affected lead agencies within 90 days of the close of the review period. Section 2622(c) requires the State Geologist to continually review new geologic and seismic data and to revise or issue additional new AP EFZ maps when warranted. To date the State Geologist has issued 551 Official Maps of EFZs. Of these, 161 maps have been revised and four have been withdrawn.

The State Geologist also has the authority to approve waiver requests submitted by lead agencies (CPR §2623). See the discussion under "Lead Agencies" (below) for further information on the waiver procedure.

Lead Agencies

Lead agencies (cities, counties, and state agencies) are responsible for ensuring that structures for human occupancy that are considered projects under the AP Act are not placed across the trace of an active fault. Affected lead agencies adopt the AP Act into their general plan. Counties specifically are required to post a notice identifying the location of AP EFZ maps in their jurisdiction and the effective date of the notice within 5 days of receiving an Official EFZ map. These notices are to be posted at the offices of the county recorder, county assessor, and county planning commission [CPR §2622(d)]. Lead agencies must require geologic investigations directed by a California-licensed Professional Geologist before building permits can be issued or subdivisions can be approved within an AP EFZ. A critical responsibility of the lead agency is to ensure that the fault-rupture hazard report is adequate by having the report reviewed by a third-party California-licensed Professional Geologist.

There may be occasions when a lead agency finds that the geologic report for a specific site may not be necessary because it determines that no undue fault rupture hazard exits. This condition typically occurs where several previous investigations in close proximity to the subject site have documented a lack of surface-fault rupture hazard. The lead agency has the option to submit a waiver request, along with accompanying documentation, to the State Geologist for approval [CPR §2623(a)]. If the State Geologist concurs that there is no undue hazard of surface-fault rupture at the site, the local lead agency may issue a building permit without the requirement of a site investigation. To date, there have been 85 waiver requests submitted to the State Geologist since the first maps were issued; 80 percent of these waiver requests have been approved.

Property Owners

Property owners and developers (applicants for building permits or subdivisions) are responsible for completing a geologic investigation and preparing a geologic report for projects within an AP EFZ. Ultimately it is the responsibility of the property owner, represented by a California-licensed Professional Geologist, to determine if the hazard of surface-fault rupture exits on the property and if so, to avoid the hazard [CPR §2623(a); CCR §3603(d)]. Property owners are also responsible for disclosing to potential buyers if their property is located in an AP EFZ (CPR §2621.9).

SIGNIFICANT HISTORICAL MILESTONES

Name Changes

The AP Act was originally named the Alquist-Priolo Geologic Hazard Zones Act and was intended to address a broader scope of seismically induced ground deformation hazards. It was decided by the original SMGB's Advisory Committee that the standard of practice in 1972 was not sufficiently developed to address ground deformation hazards other than surface-fault rupture. The AP Act was renamed the Alquist-Priolo Special Studies Zones Act in 1975 (as a result of Senate Bill 5, introduced by Senator Alquist in December 1974) and was changed to the Alquist-Priolo Earthquake Fault Zoning Act, which became effective January 1, 1994. The name change implemented in 1994 was the result of a recommendation by the Reitherman-Leeds study (Reitherman and Leeds, 1991; see discussion below).

Single-Family Dwelling Exemption

When first enacted, the AP Act did not exempt single-family wood-frame dwellings. The original text of the AP Act in CPR §2623 reads: "... *the site of every proposed new real estate development or structure for human occupancy shall be approved by the city or county having jurisdiction over such lands in accordance with policies and criteria established by the State Mining and Geology Board and the findings of the State Geologist.*" This was changed on December 2, 1974, so that single-family wood-frame dwellings, if not part of a development of four or more dwellings, were exempt [CPR §2621.6(a)(2)]. This exemption was created in part as a result of real estate lobbying and the assumed benefit/cost ratio for single-family dwellings. In 1974, State Geologist Dr. James E. Slosson estimated that the benefit/cost ratio for surface-fault rupture investigations on multi-lot tracts or at the tentative tract stage, where all geologic hazards are considered, ranged from 5:1 to 10:1 (Slosson [1974], cited in Reitherman and Leeds [1991]). Slosson, however, reported that this benefit/cost ratio seems to decrease to about 0.05:1 where studies for fault-rupture hazard only are keyed to single lots after a tract has been approved.

Fault Evaluation and Zoning Program

The initial charge to the State Geologist was to zone all potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto Faults [CPR §2622(a)]. On July 1, 1974, 175 Official Maps of Special Studies Zones were issued, based entirely on compiling existing maps. An additional 81 maps were issued January 1, 1976. These map releases established regulatory zones encompassing faults with evidence of Quaternary displacement.

In early 1976, a 10-region Fault Evaluation and Zoning Program (Figure 2) was begun to systematically evaluate for possible zoning the "... *other faults* ... [that are] *sufficiently active and well-defined as to constitute a potential hazard for structures from surface faulting or fault creep*" [CPR §2622(a)] (CDMG, 1976). The state was divided into 10 regions based on 1) the presence of known or suspected active faults and 2) developmental pressure. Initially this was planned as a 10-year project, but the schedule in some regions was extended as a result of heavy workloads. Faults evaluated included potentially active faults not yet zoned and previously zoned faults or fault segments that warranted zone revisions. Areas outside of the scheduled regions were also evaluated on an as-needed basis, typically to map fault rupture immediately after an earthquake. Although the 10-region project was completed at the end of 1991, work continues on the project at a maintenance level. The State Geologist has an ongoing responsibility to review *"new geologic and seismic data"* in order to revise AP EFZs and to *"delineate new zones when warranted by new information"* [CPR §2622(c)].

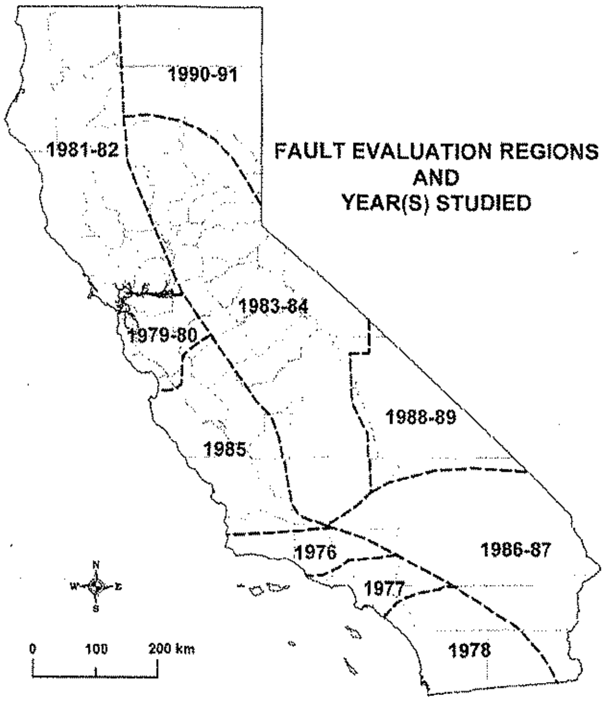


Figure 2. Map of 10-region work plan for Alquist-Priolo Fault Evaluation and Zoning Program, showing dates each region was studied.

For each fault evaluated, a Fault Evaluation Report (FER) was prepared that summarized data on the location, recency of displacement, sense and amount of displacement, and rationale for zoning decisions. Fault evaluation work consists of reviewing geologic and fault mapping by others, aerial photographic interpretation of fault-produced geomorphology, and limited field mapping. Although subsurface investigations are not budgeted, geologists at the California Geological Survey (CGS) use sub-surface data contained in site investigations submitted to the

State Geologist to augment the air photo interpretation and field mapping.

CGS geologists have produced about 250 FERs summarizing evidence for or against zoning decisions for potentially active faults throughout California. There have been 18 Official Map releases since the Fault Evaluation and Zoning Program began.

Reitherman-Leeds Study

In 1986 the California Seismic Safety Commission recommended an impartial evaluation of the AP Act. In 1991, CGS (then the Division of Mines and Geology) released the Reitherman-Leeds study (Reitherman and Leeds, 1991). This study evaluated 62 policy issues that ranged from increasing the authority and scope of the AP Act to abolishing the AP Act. Overall, Reitherman-Leeds concluded that the AP Act is effective, and they recommended implementing 27 policy issues. Most have been implemented, including the following:

1) establishing the Seismic Hazards Mapping Act,
2) more aggressive enforcement by the California Board for Geologists and Geophysicists,
3) revision of CGS Note 49 (guidelines for fault rupture hazard investigations),
4) changing the AP Act's name to the Earthquake Fault Zoning Act,
5) changing the disclosure statement (part of Natural Hazards Disclosure Act),
6) publishing a non-technical brochure explaining the AP Act, and
7) increasing the availability of FERs and consulting reports filed with the State Geologist.

One recommendation yet to be clarified is the issue of setback distance. There are varying degrees of application of setbacks among local lead agencies with respect to the interpretation of CCR §3603(a). The current language states the following:

> *No structure for human occupancy, identified as a project under Section 2621.6 of the Act, shall be permitted to be placed across the trace of an active fault. Furthermore, as the area within fifty (50) feet of such active faults shall be presumed to be underlain by active branches of that fault unless proven otherwise by an appropriate geologic investigation and report prepared as specified in Section 3603.d of this subchapter, no such structures shall be permitted in this area* [emphasis added].

Reitherman and Leeds found this language to be open to various interpretations: some lead agencies mandate a no-build zone 50 ft (15 m) from active faults, while others allow structures to be sited closer than 50 ft (15 m), if appropriate, based on site-specific investigations. As written, there is no specified minimum distance. However, the original wording of this section by the SMGB did state that 50 ft (15 m) represented a minimum standard:

> ... *Furthermore, the area within fifty (50) feet of an active fault shall be assumed to be underlain by active branches of that fault unless and until proven otherwise by an appropriate geologic investigation and submission of a report by a geologist registered in the State of California. This 50 foot standard is intended to represent minimum criteria only for all structures. It is the opinion of the Board that certain essential or critical structures, such as high-rise buildings, hospitals, and schools should be subject to more restrictive criteria at the discretion of Cities and Counties* [emphasis added].

The wording as originally written remained in effect until 1984. Local lead agencies affected by the AP Act prior to 1984 adopted the AP Act into their general plan, and some jurisdictions may have included this 50-ft (15 m) minimum distance as a mandatory requirement. This may explain why some local jurisdictions currently mandate a specific 50-ft (15 m) setback from active faults within an AP EFZ.

In concept, a setback, or no-build zone, is delineated around active faults located during a site investigation to allow an appropriate level of conservatism or factor of safety. The width of a setback zone allows for the occurrence of near-fault deformation and the inherent uncertainties of projecting the location of the fault between known data points. The width of an appropriate no-build zone can vary, based on site-specific geologic conditions, style and complexity of faulting, and number and spacing of trenches. Thus, in some circumstances it may be appropriate to site a structure closer than 50 ft (15 m), and in other situations, 50 ft (15 m) may be entirely inadequate.

Earthquakes with Surface-Fault Rupture Since the Passage of the AP Act

Twenty-five earthquakes or earthquake sequences associated with surface-fault rupture have occurred since the first AP EFZ maps were issued in 1974 (Table 2). Thirteen events occurred along faults not previously zoned: nine (69 percent) occurred prior to the CGS regional evaluation, and four (31 percent) occurred after the region had been evaluated.

The most significant surface rupturing events to date were the 1992 Mw 7.3 Landers and the 1999 Mw 7.1 Hector Mine earthquakes (Figure 3). The Landers event was associated with the largest amount of surface-fault rupture in California since the 1906 San Francisco earthquake. Approximately 85 km of surface rupture, with maximum dextral offset of about 6 m and an average dextral offset of about 3 m, was recorded (Hart et al., 1993; Sieh et al., 1993). This earthquake was unique because several faults ruptured, including the Johnson Valley, Homestead Valley, Emerson, and Camp Rock Faults (Figure 3). The rupture was especially complex, with broad zones of distributed displacement between and connecting the principal faults. Most faults that ruptured had been zoned in 1988. However, many of the stepover areas had not been zoned. Faulting sometimes extended significantly beyond those AP EFZ boundaries encompassing the ends of faults (Figure 4). Hart et al. (1993) estimated that about 55 percent of fault rupture occurred within established AP EFZs. About 31 percent was outside of AP EFZs, and the remaining 14 percent of rupture outside of the zones occurred on previously unmapped faults not appearing to meet zoning criteria (Hart et al., 1993). Many of the faults that ruptured have been shown to have relatively low slip rates (about 0.5 mm/yr) with correspondingly long recurrence intervals (between 4 ka and 12 ka) (Hecker et al., 1993; Lindvall and Rockwell, 1994; Rubin and Sieh, 1997; and Rockwell et al., 2000).

The Hector Mine earthquake was similar in complexity where traces of the Lavic Lake Fault splayed off of the Bullion Fault. AP EFZs had been established in 1988 for traces of the Bullion Fault, but the Lavic Lake Fault had not been zoned. Post-earthquake studies indicated that the Lavic Lake Fault in the Bullion Mountains had not ruptured for tens of thousands of years prior to the 1999 event (Lindvall et al., 2000).

These observations indicate that caution should be used when evaluating faults characterized by low slip rates that have not had surface displacement for a long time. It is important to understand the age of the most recent event and the recurrence intervals of these faults. Another important consideration is the complexity and width of the surface faulting observed in both the Landers and Hector Mine earthquakes. Are the rupture patterns, complexity, and width indicative of and unique to the Eastern California Shear Zone, or are these complexities typical of large surface-faulting events?

In contrast to the Landers and Hector Mine earthquakes, the 2004 Mw 6.0 Parkfield earthquake was associated with surface faulting that was very similar to the location and pattern of displacement documented in the 1966 Mw 6.1 Parkfield event (Brown et al., 1967; Rymer et al., 2006). The 2004 surface faulting, with one minor exception, was located entirely within the previously established AP EFZs.

Digital Products

One of the recommendations of the Reitherman-Leeds study was to reproduce the FERs and site investigation reports filed with CGS in compliance with the AP Act. CGS (then the Division of Mines and Geology) issued microfiche copies of the FERs and tabulated data on site investigation reports (Division of Mines and Geology, 1990a, 1990b, 1990c, 1990d, 1990e; Wong et al., 1990; and Wong, 1995). Microfiche copies of the FERs, especially the map data, were generally not optimal, and those needing to reference or review specific consulting reports were required either to obtain copies from CGS or to visit the Bay Area regional office, where the site report collection was kept on file for public access.

In the late 1990s CGS began an effort to provide digital products from the AP Program in response to the Reitherman-Leeds study. Digital images of AP EFZ maps were released as portable document format (pdf) files in 2000, followed by vector GIS files of faults and EFZs in 2001. The 1990s vintage microfiche copies of FERs were replaced in 2002 by digital images of the reports, including high-resolution pdf files of the maps (Bryant and Wong, 2002a, 2002b, 2002c). The collection of site-specific fault investigation reports was released in 2003 (Wong, 2003a, 2003b). This fault investigation report collection includes specific reports in pdf format, an interactive site index map, and GIS files of site investigation locations. Site reports filed with the State Geologist through 2000 are available on compact disk. Hard copy reports are no longer filed in the Bay Area office. Reports received after 2000 are available for reference at the Sacramento office of CGS.

Camarillo Issue and State Mining and Geology Board

The City of Camarillo requested an interpretation of SMGB regulations in late 2006. At issue was how the AP Act was interpreted with respect to the presumption of activity of faults located within EFZs. Is the entire area within an AP EFZ presumed to be underlain by active faults until demonstrated otherwise? Another issue raised was the intent of the setback language in CCR §3603(a). Did this regulation mandate that structures cannot be placed closer than 50 ft (15 m) from each fault encountered in a site investigation, or was there some degree of flexibility? Must one setback from faults with small amounts of displacement that cannot be proven inactive, or is structural mitigation allowed for such faults?

This request for clarification resulted from an investigation of a site underlain by extensively faulted Plio-Pleistocene Saugus Formation. Principal active traces of the Simi–Santa Rosa Fault Zone were located on the site and setbacks were recommended. However, the site previously had been used for borrow and lacked any remaining younger stratigra-

Table 2. *Surface faulting associated with earthquakes in California, 1974–June 2009. List excludes fault creep and faulting triggered by shaking or movement on a different fault.*[1] *See Bonilla (1970), Jennings (1985), and Grantz and Bartow (1977) for earlier faulting events.*

	Fault (county where located)	Year of Rupture	Magnitude of Associated Earthquake	Surface Rupture,[2] Maximum Displacement (cm)	Total Length[2] (km)	Main Sense of Displacement[3]	Comments
1.	Brawley (Imperial)	1975	4.7	20	10.4	N	Also ruptured in 1940 and 1979, fault creep in part.
2.	Galway Lake (San Bernardino)	1975	5.3	1.5	6.8	RL	Fault previously unknown.
3.	Cleveland Hill (Butte)	1975	5.7	5	5.7	N	Fault not previously known to be Holocene-active.
4.	Stephens Pass (Siskiyou)	1978	4.3	30	2+	N	Fault previously unknown.
5.	Homestead Valley (San Bernardino)	1979	5.2	8	3.3	RL	Also minor rupture on Johnson Valley Fault.
6.	*Calaveras (San Benito, Santa Clara)	1979	5.9	1	39 (?)	RL	Minor, discontinuous rupture, mostly in creep-active section.
7.	*Imperial *Brawley } (Imperial) Rico	1979	6.6	55 15 10	30 13 1	RL N N	Creep triggered on San Andreas and Superstition Hills Faults; also ruptured in 1940. Rico Fault not previously known.
8.	Greenville (Alameda)	1980	5.6	3	6.5	RL	Minor left-lateral slip also occurred on Las Positas Fault.
9.	Hilton Creek–Mammoth Lakes (Mono)	1980	6.0–6.5	30	20	N	Rupture on many minor faults; may relate to volcanic activity; Minor ruptures also in 1981.
10.	"Lompoc quarry" (Santa Barbara)	1981	2.5	25	0.6	R	Flexural slip on flank of syncline triggered by quarrying; do not plan to zone. Similar earthquake-associated ruptures occurred in 1985, 1988, and 1995.
11.	Little Lake (Kern)	1982	5.2	0+	10	RL/N	Fracture zones on monoclines.
12.	"Coalinga Nose" (Fresno)	1983	6.7	5	.005	R	Secondary fault (?) associated with 43 cm of anticlinal uplift; too minor to zone.
13.	Nunez (Fresno)	1983	5.2–5.9	60	3.3	R	Aftershocks associated with event (12) above.
14.	*Calaveras (Santa Clara)	1984	6.1	20 (?)	1.2	RL	Questionable faulting; triggered afterslip in 15-km–long creep zone to south.

Table 2. *Continued.*

	Fault (county where located)	Year of Rupture	Magnitude of Associated Earthquake	Surface Rupture,[2] Maximum Displacement (cm)	Total Length[2] (km)	Main Sense of Displacement[3]	Comments
15.	*Banning (Riverside)	1986	5.9	7	9	RL	Minor slip also triggered locally on Garnet Hill and Desert Hot Springs (?) Faults as well as more distant faults.
16.	*White Mountains (Mono, Inyo)	1986	6.4	11	13	RL/N	Event also associated with extensional cracks on faults in Volcanic Tableland in 40 km × 12 km area.
17.	Elmore Ranch (Imperial)	1987	6.2	12	12	LL	Event also associated with smaller left-lateral rupture on nearby faults.
18.	*Superstition Hills (Imperial)	1987	6.6	90	28	RL	Much of rupture occurred as afterslip; associated with event 17.
19.	*San Andreas (Santa Cruz)	1989	7.1	2.5	1?	RL	Surface rupture possibly triggered slip; slip also triggered on nearby Calaveras and San Andreas Faults outside of aftershock zone. Secondary faulting may have occurred with ridgetop spreading fissures.
20.	*Johnson Valley *Homestead Valley *Emerson *Camp Rock (San Bernardino)	1992	7.3	460–600	85	RL	Most significant fault rupture since 1906; ruptures connected several separate faults; triggered slip also occurred on at least 10 other faults.
21.	"Eureka Valley" (Inyo)	1993	6.1	2	5+	RL/N	Two zones of left-stepping fractures along pre-existing fault scarps; incompletely mapped; remote area, not zoned.
22.	"Stevenson Ranch" (Los Angeles)	1994	6.7	19	0.6	R	Flexural slip faults on limb of fold near Newhall; related to blind thrust faulting. Minor slip also triggered on Mission Wells Fault, which ruptured in 1971.
23.	*Airport Lake (Kern and Inyo)	1995	5.4–5.8	1	2.5	RL/N	Discontinuous cracks along pre-existing scarp.

Table 2. *Continued.*

	Fault (county where located)	Year of Rupture	Magnitude of Associated Earthquake	Surface Rupture,[2] Maximum Displacement (cm)	Total Length[2] (km)	Main Sense of Displacement[3]	Comments
24.	Lavic Lake *Bullion *Mesquite Lake (San Bernardino)	1999	7.1	525	45	RL	Bullion and Mesquite Lake Faults previously zoned; Lavic Lake had not ruptured in Holocene.
25.	*San Andreas (Monterey, San Luis Obispo)	2004	6.0	15	32	RL	Parkfield section of San Andreas Fault zone; also ruptured in 1966. Much of rupture occurred as afterslip.

[1] Tectonic (aseismic) fault creep and triggered slip have occurred along various segments of the San Andreas, Hayward, Calaveras, Concord, Green Valley, Imperial, Superstition Hills, Maacama, and Garlock Faults as well as along more than 10 other faults. Human-induced fault creep has been reported on at least 12 other faults as a result of withdrawal of groundwater or oil-field fluids. See Jennings (1994) for map locations.

[2] Includes some afterslip. Rupture length measured from distal ends of rupture, which are often discontinuous.

[3] N = normal displacement; R = reverse displacement; RL = right-lateral displacement; LL = left-lateral displacement.

* = coseismic surface faulting occurred mostly or entirely within existing Earthquake Fault Zones during 11 events.

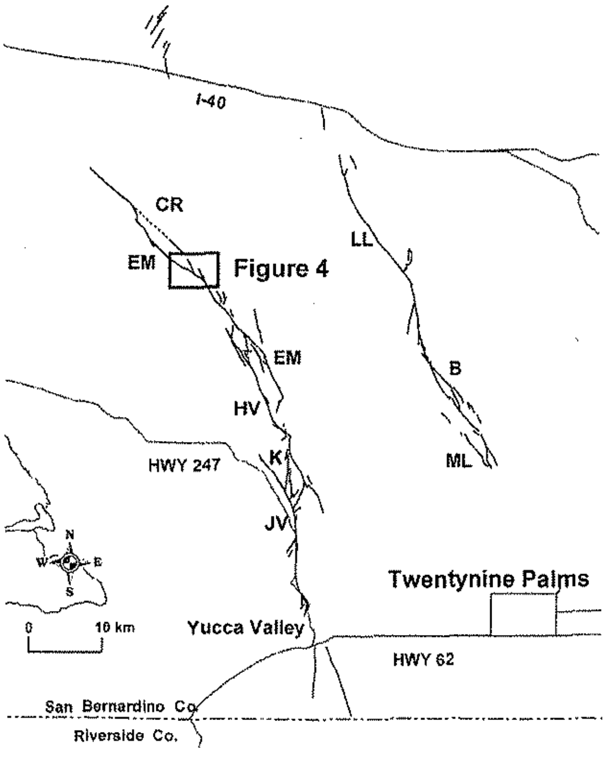


Figure 3. Map showing generalized surface-fault rupture patterns for the 1992 Mw 7.3 Landers earthquake and the 1999 Mw 7.1 Hector Mine earthquake. Principal faults that ruptured in the Landers event include the following: JV = Johnson Valley; HV = Homestead Valley; K = Kickapoo; EM = Emerson; and CR = Camp Rock. Principal faults that ruptured in the Hector Mine event include the following: LL = Lavic Lake; B = Bullion; and ML = Mesquite Lake. Box shows location of Figure 4.

phy overlying the faulted Saugus Formation. Without younger stratigraphy, it was impossible to constrain the age of most recent displacement for numerous other faults located on the site.

The SMGB's Geohazards Committee heard arguments from the city's review geologist, the developer's geologists, and the State Geologist. In mid-December 2006, the Geohazards Committee recommended that the SMGB should interpret the AP Act to mean that all faults within an Official EFZ should be considered active unless proven otherwise.

The Geohazards Committee also recommended formation of a Technical Advisory Committee (TAC) to review some of the issues raised by the Camarillo appeal and the 1991 Reitherman-Leeds study. A 16-member TAC, comprising experts and specialists in geoscience, engineering, and public administration, first met in July 2007. Some of the issues currently being reviewed by the TAC include the following: clarification of setbacks, presumption of activity within an AP EFZ, definition of an active fault, and whether mitigation methods, in addition to avoidance, can be used within an AP EFZ. The TAC will issue a report to the Geohazards Committee containing recommendations formed by a consensus of expressed expert views, based on science and engineering considerations. Recommendations by the TAC will be evaluated by the Geohazards Committee. Conclusions and recommendations made by the Geohazards Committee will be reviewed by the full SMGB, which will decide if the SMGB's regulations

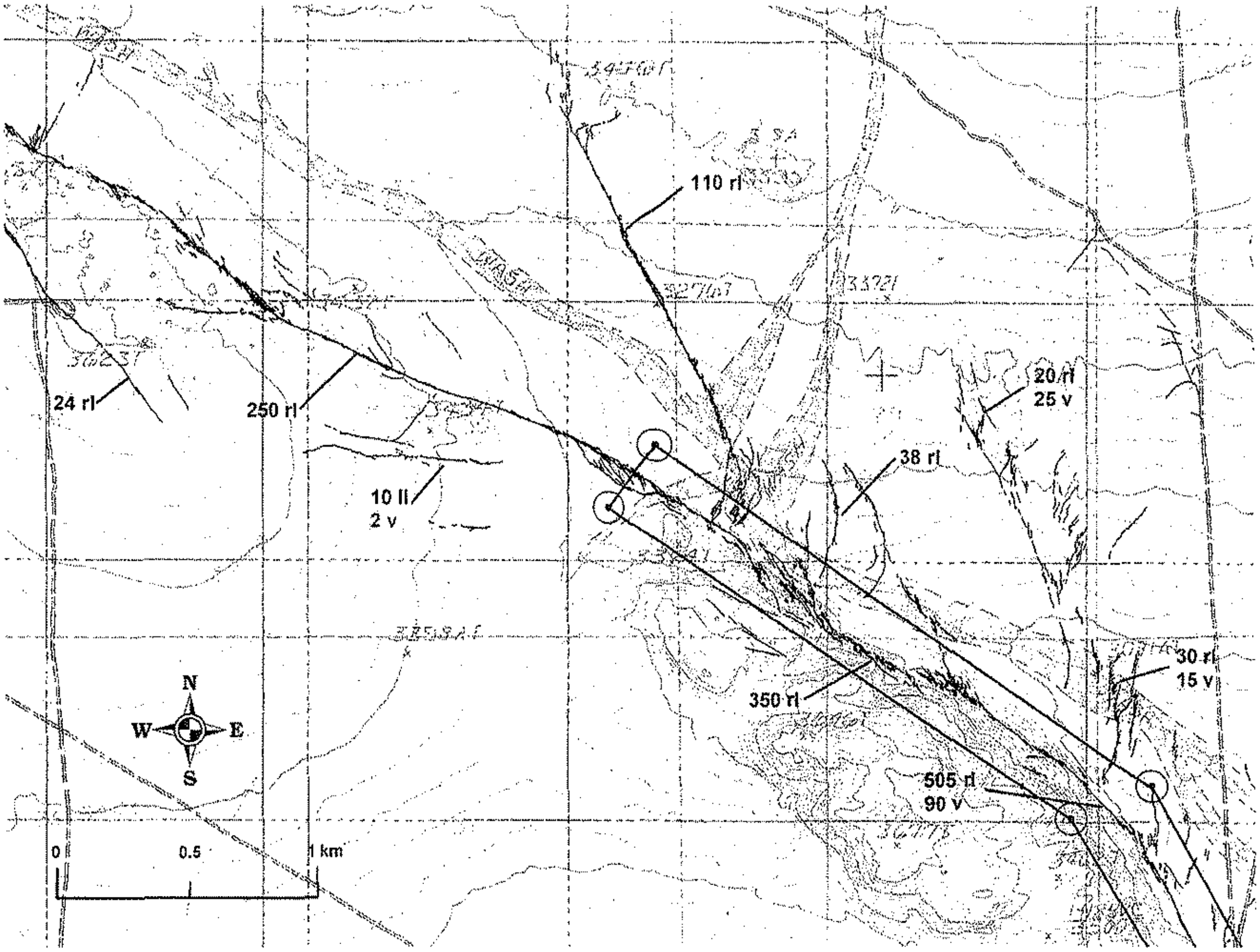


Figure 4. Detailed map of surface faulting along a portion of the Emerson Fault associated with the 1992 Landers earthquake. The numbers indicate observed slip components in centimeters (rl = right-lateral; ll = left lateral; and v = vertical). The Alquist-Priolo Earthquake Fault Zone (AP EFZ) that was in place in 1988 is depicted with circled turning points connected by straight-line segments. Pre-1992 Emerson Fault traces northwest of the AP EFZ boundary were not zoned because the complex right-step to the Camp Rock Fault (Figure 3) was generally concealed and poorly defined. Also, trench data northwest of this figure indicated that soils estimated to be 10–12 ka were not offset.

need revision or if the SGMB should recommend legislative changes to the AP Act.

SUMMARY

The AP Act addresses the geologic hazard of surface-fault rupture by prohibiting the placement of most structures for human occupancy across the traces of active faults. Responsibility for implementing the AP Act is shared by the State Geologist, SMGB, lead agencies (cities, counties, and state agencies), and property owners. Alquist-Priolo EFZs have been in effect for the past 34½ years. During that time there have been 25 earthquakes associated with surface-fault rupture, including the Mw 7.3 1992 Landers and Mw 7.1 Hector Mine earthquakes. Significantly, there has not yet been a large surface-faulting earthquake in an intensely urbanized area since the AP EFZs have been established. The AP Act generally has been considered effective in avoiding surface-fault rupture hazard (Reitherman and Leeds, 1991). However, complex sites offer unique and often difficult challenges to ensuring public safety and effective land use. Currently the SMGB's TAC is reviewing policies and criteria to clarify and possibly update regulations governing the implementation of the AP Act.

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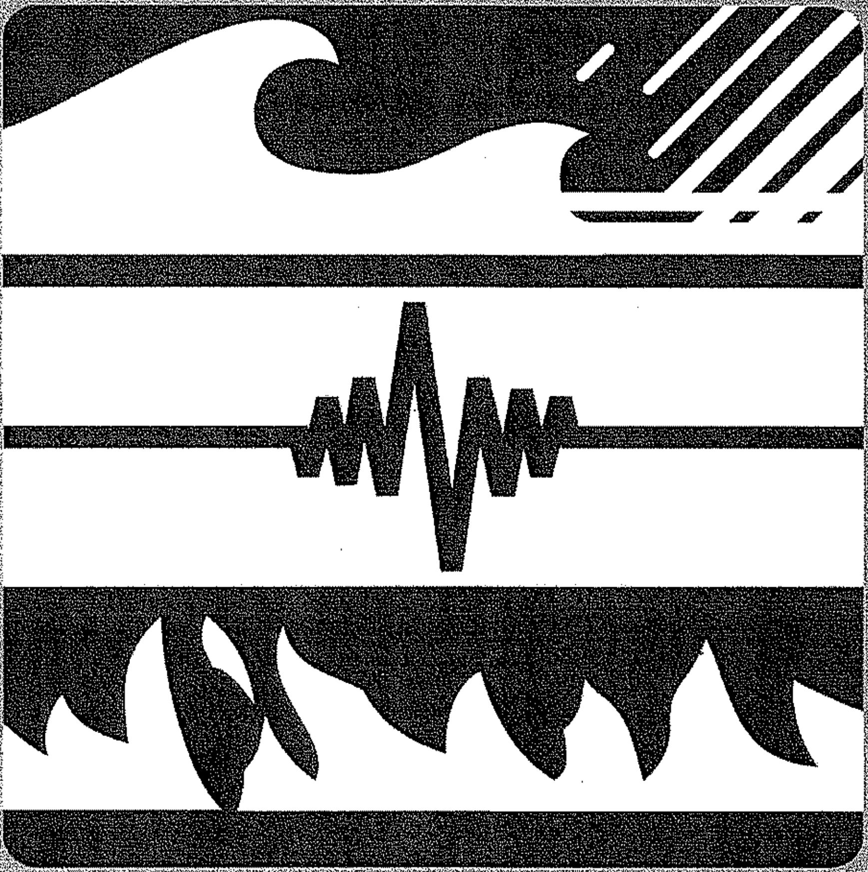
SAFETY ELEMENT



DEPARTMENT OF CITY PLANNING LOS ANGELES, CALIFORNIA

SEISMIC EVENTS

The programs associated with this Safety Element emphasize seismic safety issues because seismic events present the most widespread threat of devastation to life and property. With an earthquake, there is no containment of potential damage, as is possible with a fire or flood. Unlike a fire or flood whose path often can be generally measured and predicted, quake damage and related hazard events may be widespread and, at present, are unpredictable. Related hazard events could occur anywhere in the quake area including inundations from damaged reservoirs or release of hazardous materials, such as gas, which in turn could lead to fires or form toxic clouds.

Since 1800 there have been approximately 60 damaging seismic events, or "earthquakes," in the Los Angeles region. After a brief hiatus between major events (circa 1940-1972), the greater Los Angeles area has experienced a number of moderate events which have resulted in considerable disruption of the infrastructure, impact on social and economic life, loss of lives and extensive property damage within the City, the greater metropolitan area and the adjacent region. The most recent of these was the 6.7 magnitude 1994 Northridge earthquake which was centered in the northwest part of the City, in the general vicinity of the 1971 San Fernando (aka Sylmar) quake.

The U.S. Geological Survey has estimated the probability of a ten to thirty percent potential for a 7.5 or more magnitude quake along the southern portion of the San Andreas fault within the next five to thirty years. The Alquist-Priolo Act requires the State Geologist to map active earthquake fault zones. Those faults in the Los Angeles area typically are visible, above ground faults, *e.g.*, the San Andreas fault. The fault zones located within the City are depicted on Exhibit A. However, it is the quakes along the unmapped faults, such as the blind thrust fault associated with the Northridge earthquake, that increasingly are becoming the focus of study and concern. The concept of blind thrust faults has been recognized only recently by seismologists. The effect of such faults may dominate the geology of the Los Angeles basin in a way not previously known.

Seismic mitigation is relatively new, compared to flood and fire mitigation. Every major seismic event in the United States and abroad has provided valuable data for evaluating existing standards and techniques and improving hazard mitigation. The 6.3 magnitude Long Beach earthquake of 1933 killed 115 people and caused approximately $48 million in property damage. It demonstrated the vulnerability of unreinforced masonry structures and the hazards of parapets and unanchored facade decorations. In response, the State legislature adopted the Field Act of 1934 which set seismic building standards. Locally the reinforcement and parapet standards were adopted for new construction. The nature of damage to Seattle, Washington, due to the 1949 earthquake, persuaded Los Angeles to require removal of parapets and decorative appendages so as to prevent unreinforced masonry and concrete from falling onto streets and sidewalks during a quake. The ordinance was applicable to some 30,000 pre-1933 buildings which were located predominantly in the Central City area. The 1985 Mexico City earthquake prompted the City to upgrade and expand its urban search and rescue program (see Fire Section).Following the 1971 San Fernando quake, the City required improved anchoring of new tilt-up (concrete walls poured and tilted-up on the site) structures and retroactive reinforcement of unreinforced masonry structures. A seismic retrofit tilt-up ordinance was developed and made retroactive two weeks after the 1994 Northridge earthquake. Subsequently, the City adopted a series of ordinances which required retrofitting of certain existing structures (*e.g.*, foundation anchoring of hillside dwellings) and for new construction, as well as an ordinance which required evaluation of structures by a structural engineer during the construction process. The Northridge quake underscored the need for thorough, on-going building inspections to assure construction of buildings according to Code.

Although the Northridge earthquake was listed by seismologists as a moderate quake, it was the most costly seismic event in the United States since the 1906 San Francisco earthquake. Within the City and surrounding region, approximately 72 people died as a result of the quake (including by heart attack associated with the quake experience), thousands were physically injured, and the direct and indirect psychological toll was incalculable. Property damage was in the billions of dollars. An estimated

93,000 (as of June 1996) buildings were damaged in the City, some requiring demolition. Approximately 5,800 buildings had to be partially or totally vacated, including approximately 25,640 mostly multiple-residential dwelling units. By the autumn following the quake, some 27,000 units were deemed in danger of being lost because owners had difficulty financing repair costs.

In addition, the infrastructure (Exhibit H) of the metropolitan area was severely disrupted. Freeways collapsed, the power systems for the City and linked communities as far away as Oregon were temporarily "blacked out" and communications were disrupted. Due to abatement measures, planning, training and inter-agency and inter-jurisdictional coordination, response was much more efficient than in 1971 following the San Fernando quake. Stronger building codes and required retrofitting following the San Fernando quake contributed to a reduction in damage to structures and buildings and resulted in better containment of hazardous materials. Coordinated response resulted in more rapid identification of damage sites, extinguishing of fires, addressing of fire hazards, administering, often from battle-field like temporary facilities, to the injured and displaced and initiation of work to restore the disrupted cities and region. Closure of businesses, disruption of services and dislocation of people had a significant domino effect on the economy of the region, state and nation. The economic impact would have been greater had the quake been more severe or had disruption of the infrastructure continued for a longer period of time.

The fact that the Northridge event occurred at 4:31 a.m. January 17, 1994 on the Martin Luther King Jr. national holiday may have been the primary reason for so little loss of life and human injury. A low number of commuters were traveling on the freeways and streets and few people were in offices, industrial, commercial buildings, public garages and shopping centers, many of which suffered severe structural and non-structural damage. Many emergency and seismic experts believe that had the quake occurred at midday, instead of during the predawn, the loss of life and injury figures would have been substantially higher. Nevertheless, emergency forces were severely challenged by the event.

The Northridge quake was one of the most measured earthquakes in history due to extensive seismic instrumentation in buildings and on the ground throughout the region. Information from seismological instruments, damage reports and other data provided a wealth of information for experts to analyze. Traditional theories about land use siting and existing building code provisions were called into question. It is known that the complex Los Angeles fault system interacts with the alluvial soils and other geologic conditions in the hills and basins. This interaction appears to pose a potential seismic threat for every part of the City, regardless of the underlying geologic and soils conditions. Structural damage does not occur due to any one factor. The duration and intensity of the shaking, distance from the epicenter, composition of the soil and type of construction, all are factors in determining the extent of damage which may occur. Alluvial and artificially uncompacted soils tend to amplify the shaking. Shallow ground water, combined with uncompacted soils can result in liquefaction (quicksand effect) during a strong quake. Therefore, it is difficult to escape the impacts of a quake. During the Northridge quake, damage appeared to have a more direct relationship to building construction than did proximity to the epicenter. Largely as a result of the Northridge earthquake, the national Uniform Building Code was amended in 1994 to require that new development projects provide geotechnical reports which assess potential consequences of liquefaction and soil strength loss and propose appropriate mitigation measures, *e.g.*, walls supported by continuous footings, steel reinforcement of floor slabs, *etc.* These provisions were incorporated into the Los Angeles City Building Code, effective January 1996. Exhibit B identifies, in a general manner, areas susceptible to liquefaction. It was prepared for the General Plan Framework Element environmental impact report and is based on the County of Los Angeles 1990 Safety Element liquefaction exhibit. It identifies areas deemed to be liquefaction or potential liquefaction areas, based on occurrences of shallow ground water together with recent alluvial deposits.

One of the surprising findings following the Northridge quake was that many steel frame buildings, believed before the quake to be the safest structures, suffered unexpected welding joint damage. Such damage resulted in the evacuation of an 11-story building in West Los Angeles several months after the quake when it was determined that the damage to building joints had dangerously weakened the building structure. The building was located miles from Northridge, in the basin on the other side (south) of the Santa Monica Mountains. At the time this Safety Element was under preparation experts had not determined an acceptable method for retrofitting such buildings.

These are important findings for Los Angeles because Los Angeles is a built city. Few large tracts of land remain which have not already been developed with some use. Many key facilities, such as freeways, already follow fault lines through mountain passes. Buildings already are built on uncompacted and alluvial soils. Part of the downtown center, including its many high rise buildings, is built near the Elysian Park blind thrust fault which many seismologists believe could be the source of a major seismic event in the not so distant future. Physical expansion and change in the City will occur primarily through rehabilitation of existing structures and redevelopment of existing neighborhoods. The City's biggest challenge is how to protect an existing city and its inhabitants from future damage. Many believe this should be accomplished through improved building design instead of prohibition of construction. At the time this Element was under preparation, the City was retrofitting City Hall and some Port of Los Angeles facilities with base isolators to make the structures less prone to failure during strong ground shaking. This type of retrofitting is a step in addressing the strengthening of built structures.

Pre-seismic event land use planning with a view to reconfiguring the devastated areas though post-event changes in land use, intensity of development, *etc.* generally are not included as programs of this Safety Element. It has been the City's experience that the unpredictability of seismic events, both as to location and damage, renders such planning impractical. Devastation, while widespread, generally does not completely destroy entire blocks, neighborhoods or large geographic areas. Therefore, rebuilding tends to be more of an infill activity than an urban clearance and reconstruction enterprise. However, traditional redevelopment programs are included in the optional tools available for reconstruction of severely damaged areas and are being used to rebuild neighborhoods devastated by the Northridge quake.

Hazard assessment. The State Public Resources Code Section 2699 requires that a safety element "take into account" available seismic hazard maps prepared by the State Geologist pursuant to the Alquist-Priolo Earthquake Fault Zoning Act of 1972, subsequently amended (Public Resources Code Sections 2621-2630, originally known as the Alquist-Priolo Special Studies Zones Act) and the Seismic Hazard Mapping Act of 1990, subsequently amended (Public Resources Code Sections 2690-2699.6 and 3720-3725). The Alquist-Priolo Act was established as a direct result of the 1971 San Fernando earthquake. It requires that the State Geologist map active faults throughout the State. Those maps which are applicable to the City of Los Angeles are incorporated into Exhibit A of this Safety Element.

The Hazard Mapping Act requires the State Geologist to map areas subject to amplified ground shaking (or conditions which have potential for amplified ground shaking), liquefaction and landslide hazard areas. Following the 1994 Northridge earthquake, the hazard mapping program was revised and accelerated. The maps were under preparation concurrently with the preparation of this Safety Element. The first liquefaction and landslide hazard maps are scheduled to be released in 1996. Ground shaking maps are scheduled for release beginning in 1997. The entire mapping program is expected to be completed around 1999. Local jurisdictions are required by the Mapping Act to require additional studies and appropriate mitigation measures for development projects in areas identified as potential hazard areas by the maps. As maps are released for Los Angeles they will be utilized by the Building and Safety Department in helping to identify areas where additional soils and geology studies are needed for evaluation of hazards and imposition of appropriate mitigation measures prior to issuance of building permits. Once the entire set of maps for Los Angeles is complete it will be used to revise the soils and geology exhibits of this Safety Element. The maps, along with information being developed by private technical organizations, such as the Southern California Earthquake Center and California Institute of Technology, will assist the City in evaluating how to strengthen its land use and development codes and development permit procedures so as to better protect life and property from seismic hazards. The Building Code already has been revised utilizing data secured relative to the Northridge and other recent significant seismic events. The subject Safety Element fulfills current requirements, based upon available official maps and reliable data, relative to fault zones (Exhibit A), liquefaction areas (Exhibit B) and slope failure (Exhibit C). These exhibits will be revised following receipt of the reliable new information. In addition to the hazard mapping provisions, the State requires that property sellers or agents disclose to potential property buyers geotechnical reports and their contents.

HAZARDOUS MATERIALS

Hazardous materials have been a concern since 1900 when the City experienced its first major oil industry fire. Extraction of oil and gas deposits began in 1896 when Edward Doheny discovered oil at Second Street and Glendale Boulevard (Westlake community). By 1900 he had erected over 600 wooden oil rigs and installed hundreds of storage tanks and related facilities. In that year a family bonfire ignited the oil field at Bixel Street. An estimated 10,000 gallons of blazing oil spilled down the hills but was diverted and suppressed before it reached the densely built Central City. The saving of the downtown from a potential disaster prompted the City to purchase more fire suppression equipment and to expand the number of fire stations and personnel. Subsequent oil field fires in the Doheny and other fields throughout the City resulted in regulations to assure containment of oil fires in oil fields, refineries and oil and gas storage facilities.

Much of the area south of the Santa Monica Mountains is underlain by gas and oil deposits. Such deposits exist under other areas of the City as well (Exhibit E). Natural gas, crude oil and hydrogen sulfide can work their way to the surface or infiltrate structures, causing potential fire and health hazards. In addition, landfills are sources of methane gas. The existence of underground gas and hazardous materials deposits requires monitoring of excavations and known seepage areas. A major incident occurred in 1971 during the tunneling for the Feather River Project when a methane explosion killed 18 workers. Incidents relating to the gas seepage caused temporary safety shutdowns of the Metro Rail subway tunneling in 1993-95.

In the 1920s the use of chemicals and hazardous materials in the City's expanding manufacturing and commercial sectors increased the hazards for both workers and the general populace. A series of movie studio back lot fires and film processing laboratory fires occurred in the late 1920s. These incidents led to the enactment of City regulations to protect workers and the public from fires and fumes associated with highly flammable film and chemicals used in film processing as well as from hazards associated with flammable movie sets.

Today hazardous materials are used in commercial, industrial, institutional and agricultural enterprises as well as households throughout the City. Los Angeles operates both a major international airport and a major harbor within its boundaries and operates other airport facilities within and outside its boundaries. Hazardous and highly flammable materials are shipped through, stored and used (especially fuels) at these facilities. They also are transported along freeways and highways and are stored in facilities throughout the City. Many hazardous materials, if released by accident or catastrophic event, could cause severe damage to human life and health and to the facilities and could disrupt activities within a radius of several miles around the release site.

During the 1994 Northridge earthquake, over 100 incidents of quake related release of hazardous materials were reported. Of these, 23 involved release of natural gas, 10 involved release of gases and liquid chemicals at educational institutions and 8 involved release of hazardous materials at medical facilities. Gas leaks or chemical reactions triggered fires which destroyed or damaged nine university science laboratories. Rupture of a high pressure natural gas line under Balboa Boulevard in Granada Hills resulted in a fire which damaged utility lines and adjacent homes. Petroleum pipeline leaks released 4,000 barrels of crude oil into the Santa Clara River north of Los Angeles and caused fires in the Mission Hills section of the City.

Fires can damage labeling and warning signs which are posted on chemical and fuel containers and on structures to identify presence of hazardous materials. Identification of hazardous materials, storage and handling sites and information about containment facilities and/or procedures are important to protect emergency personnel as well as employees and

CHAPTER III - GOALS, OBJECTIVES AND POLICIES

The Safety Element goals, objectives, policies and programs are broadly stated to reflect the comprehensive scope of the Emergency Operations Organization (EOO). The EOO is the only program that implements the Element. The Element's policies outline administrative considerations which are addressed by EOO procedures, including its Master Plan, or which are observed in the carrying out of the Plan. All City agencies are part of the EOO. All City emergency preparedness, response and recovery programs are integrated into EOO operations and are reviewed and revised continuously.

Because City codes and regulations contain standards for water, streets, *etc.*, the Safety Element programs generally do not contain specific standards. An exception is the Fire Code policy which contains standards which, at the time this Element was under preparation, were contained only in the 1979 Fire Protection and Prevention Element of the General Plan. Until the standards are incorporated into the Fire Code or other regulations or plans, this is the only place where they are located. They are needed to guide City development actions. Other standards which were listed in the 1979 Fire Protection and Prevention Element have been incorporated into City Codes or superseded by other regulations or procedures.

HAZARD MITIGATION

GOAL 1

A city where potential injury, loss of life, property damage and disruption of the social and economic life of the City due to fire, water related hazard, seismic event, geologic conditions or release of hazardous materials disasters is minimized.

Objective 1.1

Implement comprehensive hazard mitigation plans and programs that are integrated with each other and with the City's comprehensive emergency response and recovery plans and programs.

Policies

1.1.1 Coordination. Coordinate information gathering, program formulation and program implementation between City agencies, other jurisdictions and appropriate public and private entities to achieve the maximum mutual benefit with the greatest efficiency of funds and staff. [All EOO hazard mitigation programs involving cooperative efforts between entities implement this policy.]

1.1.2 Disruption reduction. Reduce, to the greatest extent feasible and within the resources available, potential critical facility, governmental functions, infrastructure and information resource disruption due to natural disaster. [All EOO programs involving mitigation of disruption of essential infrastructure, services and governmental operations systems and prepare personnel for quickly reestablishing damaged systems implement this policy.]

1.1.3 Facility/systems maintenance. Provide redundancy (back-up) systems and strategies for continuation of adequate critical infrastructure systems and services so as to assure adequate circulation, communications, power, transportation, water and other services for emergency response in the event of disaster related systems disruptions. [All EOO programs that involve provision of back up systems and procedures for reestablishment of essential infrastructure, services and governmental operations which are disrupted implement this policy.]

1.1.4 Health/environmental protection. Protect the public and workers from the release of hazardous materials and protect City water supplies and resources from contamination resulting from accidental release or intrusion resulting from a disaster event, including protection of the environment and public from potential health and safety hazards associated with program implementation. [All EOO hazardous materials hazard and water pollution mitigation programs implement this policy.]

1.1.5 Risk reduction. Reduce potential risk hazards due to natural disaster to the greatest extent feasible within the resources available, including provision of information and training. [All programs that incorporate current data, knowledge and technology in revising and implementing plans (including this Safety Element), codes, standards and procedures that are designed to reduce potential hazards and risk from hazards potentially associated with natural disasters implement this policy.]

1.1.6 State and federal regulations. Assure compliance with applicable state and federal planning and development regulations, *e.g.*, Alquist-Priolo Earthquake Fault Zoning Act, State Mapping Act and Cobey-Alquist Flood Plain Management Act. [All EOO natural hazard enforcement and implementation programs relative to non-City regulations implement this policy.]

EMERGENCY RESPONSE (Multi-Hazard)

GOAL 2

A city that responds with the maximum feasible speed and efficiency to disaster events so as to minimize injury, loss of life, property damage and disruption of the social and economic life of the City and its immediate environs.

Objective 2.1

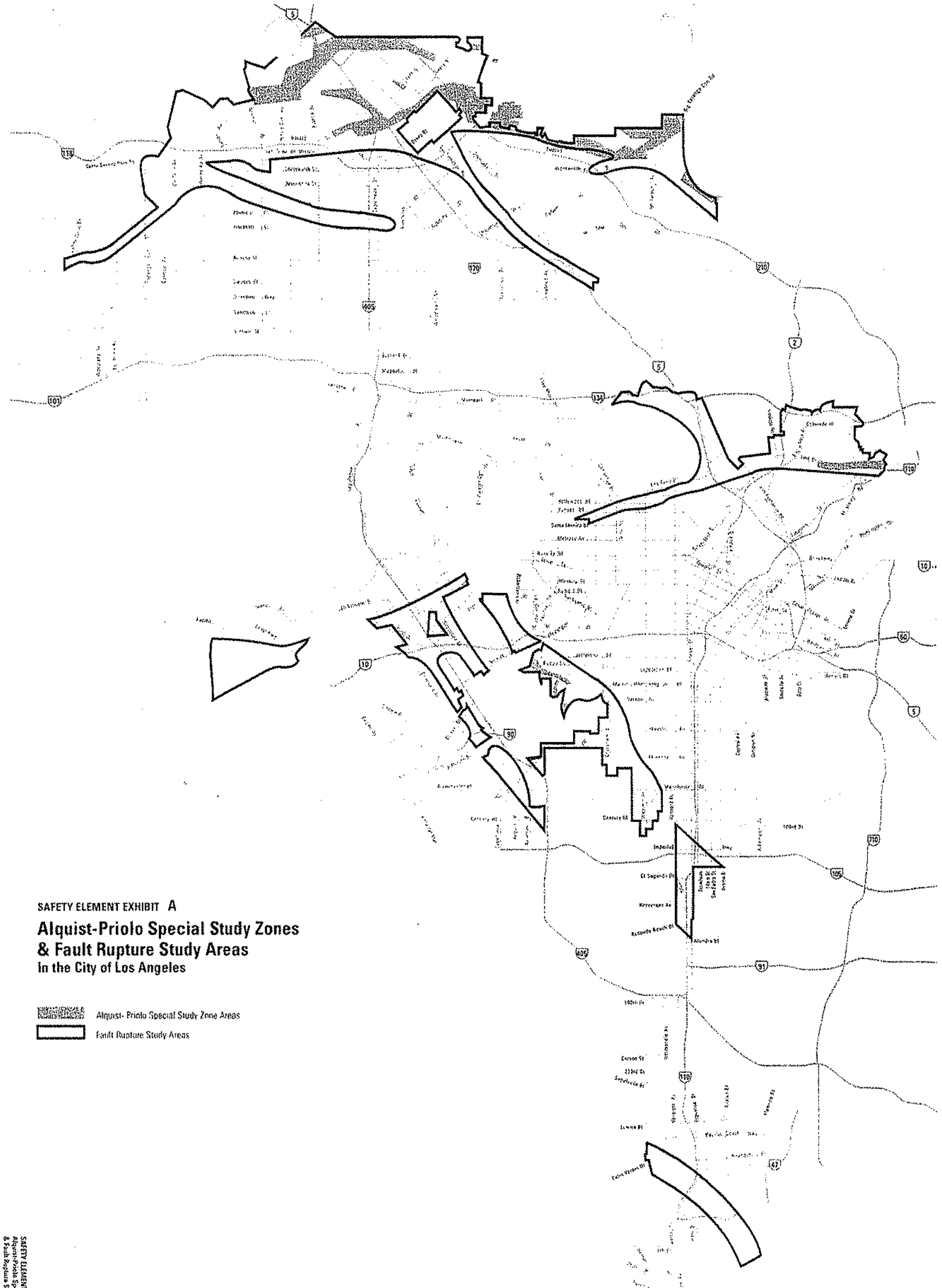
Develop and implement comprehensive emergency response plans and programs that are integrated with each other and with the City's comprehensive hazard mitigation and recovery plans and programs.

Policies

2.1.1 Coordination. Coordinate program formulation and implementation between City agencies, adjacent jurisdictions and appropriate private and public entities so as to achieve, to the greatest extent feasible and within the resources available, the maximum mutual benefit with the greatest efficiency of funds and staff. [All EOO response programs involving cooperative efforts between entities implement this policy.]

2.1.2 Health and environmental protection. Develop and implement procedures to protect the environment and public, including animal control and care, to the greatest extent feasible within the resources available, from potential health and safety hazards associated with hazard mitigation and disaster recovery efforts. [All EOO emergency response and recovery programs that mitigate environmental impacts or provide care and control of animals injured or released by an emergency situation implement this policy.]

2.1.3 Information. develop and implement, within the resources available, training programs and informational materials designed to assist the general public in handling disaster situations in lieu of or until emergency personnel can provide assistance. [All EOO response programs involving training, collection and dissemination of warning, guidance and assistance information to the public implement this policy.]



SAFETY ELEMENT EXHIBIT A

Alquist-Priolo Special Study Zones & Fault Rupture Study Areas
in the City of Los Angeles

▨	Alquist-Priolo Special Study Zone Areas
☐	Fault Rupture Study Areas

SAFETY ELEMENT EXHIBIT A
Alquist-Priolo Special Study Zones
& Fault Rupture Study Areas

NOTES

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Sources: [illegible]

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SPECIAL PUBLICATION 42
Interim Revision 2007

FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA

Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones[1] Maps

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[1] Name changed from Special Studies Zones January 1, 1994

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SPECIAL PUBLICATION 42

FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA

Alquist-Priolo Earthquake Fault Zoning Act
With Index to Earthquake Fault Zones Maps

by

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Geologists

Interim Revision 2007

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PREFACE

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to regulate development near active faults so as to mitigate the hazard of surface fault rupture.

This report summarizes the various responsibilities under the Act and details the actions taken by the State Geologist and his staff to implement the Act.

This is the eleventh revision of Special Publication 42, which was first issued in December 1973 as an "Index to Maps of Special Studies Zones." A text was added in 1975 and subsequent revisions were made in 1976, 1977, 1980, 1985, 1988, 1990, 1992, 1994, and 1997. The 2007 revision is an interim version, available in electronic format only, that has been updated to reflect changes in the index map and listing of additional affected cities. In response to requests from various users of Alquist-Priolo maps and reports, several digital products are now available, including digital raster graphic (pdf) and Geographic Information System (GIS) files of the Earthquake Fault Zones maps, and digital files of Fault Evaluation Reports and site reports submitted to the California Geological Survey in compliance with the Alquist-Priolo Act (see Appendix E).

On January 1, 1994, the name of the Alquist-Priolo Special Studies Zones Act was changed to the Alquist-Priolo Earthquake Fault Zoning Act, and the name Special Studies Zones was changed to Earthquake Fault Zones as a result of a July 25, 1993 amendment.

Information on new and revised Earthquake Fault Zones maps will be provided as supplements until the next revision of this report.

CONTENTS

FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA

By

William A. Bryant and Earl W. Hart

INTRODUCTION

The Alquist-Priolo Earthquake Fault Zoning Act was signed into law December 22, 1972, and went into effect March 7, 1973. The Act, codified in the Public Resources Code as Division 2, Chapter 7.5, has been amended ten times. A complete text of the Act is provided in Appendix A. The purpose of this Act is to prohibit the location of most structures for human occupancy across the traces of active faults and to thereby mitigate the hazard of fault rupture (Section 2621.5).

This law initially was designated as the Alquist-Priolo Geologic Hazard Zones Act. The Act was renamed the Alquist-Priolo Special Studies Zones Act effective May 4, 1975 and the Alquist-Priolo Earthquake Fault Zoning Act effective January 1, 1994. The original designation "Special Studies Zones" was changed to "Earthquake Fault Zones" when the Act was last renamed.

Under the Act, the State Geologist (Chief of the California Geological Survey [CGS]) is required to delineate "Earthquake Fault Zones" (EFZs) along known active faults in California. Cities and counties affected by the zones must regulate certain development "projects" within the zones. They must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting. The State Mining and Geology Board provides additional regulations (Policies and Criteria) to guide cities and counties in their implementation of the law (California Code of Regulations, Title 14, Div. 2). A summary of principal responsibilities and functions required by the Alquist-Priolo Act is given in Table 1. The Policies and Criteria are summarized in Table 2, and the complete text is provided in Appendix B.

This publication identifies and describes (1) actions taken by the State Geologist to delineate Earthquake Fault Zones, (2) policies used to make zoning decisions, and (3) Official Maps of Earthquake Fault Zones issued to date. A continuing program to evaluate faults for future zoning or zone revision also is summarized. Other aspects of the Alquist-Priolo Earthquake Fault Zoning Act and its implementation are discussed by Hart (1978 and 1986). The effectiveness of the AP Act and program was evaluated by Reitherman and Leeds (1990). The program is implementing many of the recommendations in that report.

Information presented here is based on various in-house documents and publications of the authors and others of the CGS (see Appendix E).

Table 1. Summary of responsibilities and functions under the Alquist-Priolo Earthquake Fault Zoning Act (see Appendix A for full text of Act).

State Mining and Geology Board

1. Formulates policies and criteria to guide cities and counties (Sec. 2621.5 and 2623). (See Appendix B.)
2. Serves as Appeals Board (Sec. 673).

State Geologist

1. Delineates Earthquake Fault Zones; compiles and issues maps to cities, counties, and state agencies (Sec. 2622).
    a. Preliminary Review Maps.
    b. Official Maps.
2. Reviews new data (Sec. 2622).
    a. Revises existing maps.
    b. Compiles new maps.
3. Approves requests for waivers initiated by cities and counties (Sec. 2623).

Cities and Counties

1. Must adopt zoning laws, ordinances, rules, and regulations; primary responsibility for implementing Act (Sec. 2621.5).
2. Must post notices of new Earthquake Fault Zones Maps (Sec. 2621.9 and 2622).
3. Regulates specified "projects" within Earthquake Fault Zones (Sec. 2623).
    a. Determines need for geologic reports prior to project development.
    b. Approves geologic reports prior to issuing development permits.
    c. May initiate waiver procedures. (See Appendix F.)

Other

1. *Seismic Safety Commission* - advises State Geologist and State Mining and Geology Board (Sec. 2630).
2. *State Agencies* - prohibited from siting structures for human occupancy across active fault traces (Sec. 2621.5).
3. *Disclosure* - prospective buyers of any real property located within an Earthquake Fault Zone must be notified of that fact (Sec. 2621.9).

Table 2. Summary of policies and criteria adopted by the State Mining and Geology Board and codified in California Code of Regulations (see Appendix B for full text).

Policies

1. Defines active fault (equals potential hazard) as a fault that has had surface displacement during Holocene time (last 11,000 years) (Sec. 3601).
2. Defines "structure for human occupancy" and other terms (Sec. 3601).
3. Requires cities and counties to notify property owners within proposed new and revised Earthquake Fault Zones (Sec. 3602).
4. Provides opportunity for public to comment on Preliminary Review Maps of Earthquake Fault Zones (Sec. 3602).
5. Provides for comments and recommendations to State Geologist regarding Preliminary Review Maps (Sec. 3602).

Specific Criteria for Lead Agencies (Sec. 3603)

1. No structure for human occupancy defined as a "project" is permitted on the trace of an active fault. Unless proven otherwise, the area within 50 feet of an active fault is presumed to be underlain by active branches of the fault.
2. Requires disclosure of Earthquake Fault Zones to the public.
3. Requires that buildings converted to structures for human occupancy comply with provisions of the Act.
4. Requires geologic reports directed at the problem of potential surface faulting for all projects defined by the Act.
5. Requires cities and counties to review geologic reports for adequacy.
6. Requires that geologic reports be submitted to the State Geologist for open-file.

PROGRAM FOR ZONING AND EVALUATING FAULTS

Requirements of the Act

Section 2622 of the Alquist-Priolo Earthquake Fault Zoning Act (Appendix A) requires the State Geologist to:

1. "Delineate ... appropriately wide earthquake fault zones to encompass all potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults, and such other faults, or segments thereof, as the State Geologist determines to be sufficiently active and well-defined as to constitute a potential hazard to structures from surface faulting or fault creep."

2. Compile maps of Earthquake Fault Zones and submit such maps to affected cities, counties, and state agencies for their review and comment. Following appropriate reviews, the State Geologist must provide Official Maps to the affected cities, counties, and state agencies.

3. Continually review new geologic and seismic data to revise the Earthquake Fault Zones or delineate additional zones.

These requirements constitute the basis for the State Geologist's fault-zoning program and for many of the policies devised to implement the program.

Initial Program for Zoning Faults

As required under the Act, the State Geologist initiated a program early in 1973 to delineate Earthquake Fault Zones to encompass potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults, and to compile and distribute maps of these zones. A project team was established within the CGS to develop and conduct a program for delineation of the zones.

Initially, 175 maps of Earthquake Fault Zones were delineated for the four named faults. These zone maps, issued as Preliminary Review Maps, were distributed for review by local and state government agencies on December 31, 1973. Following prescribed 90-day review and revision periods, Official Maps were issued on July 1, 1974. At that time, the Earthquake Fault Zones became effective and the affected cities and counties were required to implement programs to regulate development within the mapped zones. A second set of Official Maps -- 81 maps of new zones and five maps of revised zones -- was issued on January 1, 1976 to delineate new and revised zones. Additional Official Maps of new and revised zones were issued in succeeding years, as summarized in Table 3.

Table 3. Official Maps of Earthquake Fault Zones issued 1974 through August 2007.

DATE OF ISSUE	NEW MAPS	REVISED MAPS	WITHDRAWN MAPS
July 1, 1974	175	-	-
January 1, 1976	81	5	-
January 1, 1977	4	3	-
January 1, 1978	1	-	-
July 26, 1978	2	-	-
January 1, 1979	4	7	-
January 1, 1980	21	9	-
January 1, 1982	13	27	2
July 1, 1983	18	12	-
January 1, 1985	33	10	-
July 1, 1986	18	14	-
March 1, 1988	58	4	-
January 1, 1990	60	25	-
November 1, 1991	46	8	-
July 1, 1993	1	10	2
June 1, 1995	8	13	-
May 1, 1998	2	1	-
May 1, 1999	3	1	-
May 1, 2003	3	11	-
August 16, 2007	-	1	-
Totals	551	161	4

As of August 16, 2007, 551 Official Maps of Earthquake Fault Zones have been issued. Of these, 161 have been revised since their initial issue and four have been withdrawn. The maps are identified by quadrangle map name and the date of issue or revision on the Index to Maps of Earthquake Fault Zones (Figure 4).

The maps delineate regulatory zones for the faults generally identified in Figure 1. Additional faults will be zoned in the future, and some zones will be revised. Thirty-six counties and 104 cities are affected by the existing Earthquake Fault Zones. These jurisdictions are listed in Table 4.

Definitions, Policies, Rationale

For the State Geologist to carry out the mandate to establish regulatory zones, certain terms identified in Section 2622 of the Act had to be defined and policies had to be developed to provide a consistent and reasonable approach to zoning. After the zoning program was underway and the surface fault-rupture process was better understood, other terms were defined and some zoning policies were modified.

Fault and Fault Zone

A *fault* is defined as a fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side. Most faults are the result of repeated displacement that may have taken place suddenly and/or by slow creep. A fault is distinguished from those fractures or shears caused by landsliding or other gravity-induced surficial failures. A *fault zone* is a zone of related faults that commonly are braided and subparallel, but may be branching and divergent. A fault zone has significant width (with respect to the scale at which the fault is being considered, portrayed, or investigated), ranging from a few feet to several miles.

*Table 4. Cities and counties affected by Earthquake Fault Zones as of August 16, 2007**

CITIES (104)**

American Canyon
Arcadia
Arcata
Arvin
Bakersfield
Banning
Barstow
Beaumont
Benicia
Berkeley
Bishop
Brea
Calimesa
Camarillo
Carson
Cathedral City
Chino Hills
Coachella
Colton
Compton
Concord
Corona
Coronado
Culver City
Daly City
Danville
Desert Hot Springs
Dublin
El Cerrito
Fairfield
Fontana
Fortuna
Fremont
Gardena
Glendale
Hayward
Hemet
Highland
Hollister
Huntington Beach
Indio
Inglewood
La Habra
La Habra Heights
Lake Elsinore
Livermore
Loma Linda
Long Beach
Los Angeles
Malibu
Mammoth Lakes
Milpitas
Monrovia
Moorpark
Moreno Valley
Morgan Hill
Murrieta
Oakland
Pacifica
Palmdale
Palm Springs
Palo Alto
Pasadena
Pleasanton
Portola Valley
Rancho Cucamonga
Redlands
Rialto
Richmond
Ridgecrest
Rosemead
San Bernardino
San Bruno
San Diego
San Fernando
San Jacinto
San Jose
San Juan Bautista
San Leandro
San Luis Obispo
San Marino
San Pablo
San Ramon
Santa Clarita
Santa Rosa
Seal Beach
Signal Hill
Simi Valley
South Pasadena
South San Francisco
Temecula
Trinidad
Twentynine Palms
Union City
Upland
Ventura (San Buenaventura)
Walnut Creek
Whittier
Willits
Windsor
Woodside
Yorba Linda
Yucaipa
Yucca Valley

COUNTIES (36)

Alameda
Alpine
Butte
Contra Costa
Fresno
Humboldt
Imperial
Inyo
Kern
Lake
Lassen
Los Angeles
Marin
Mendocino
Merced
Modoc
Mono
Monterey
Napa
Orange
Riverside
San Benito
San Bernardino
San Diego
San Luis Obispo
San Mateo
Santa Barbara
Santa Clara
Santa Cruz
Shasta
Siskiyou
Solano
Sonoma
Stanislaus
Ventura
Yolo

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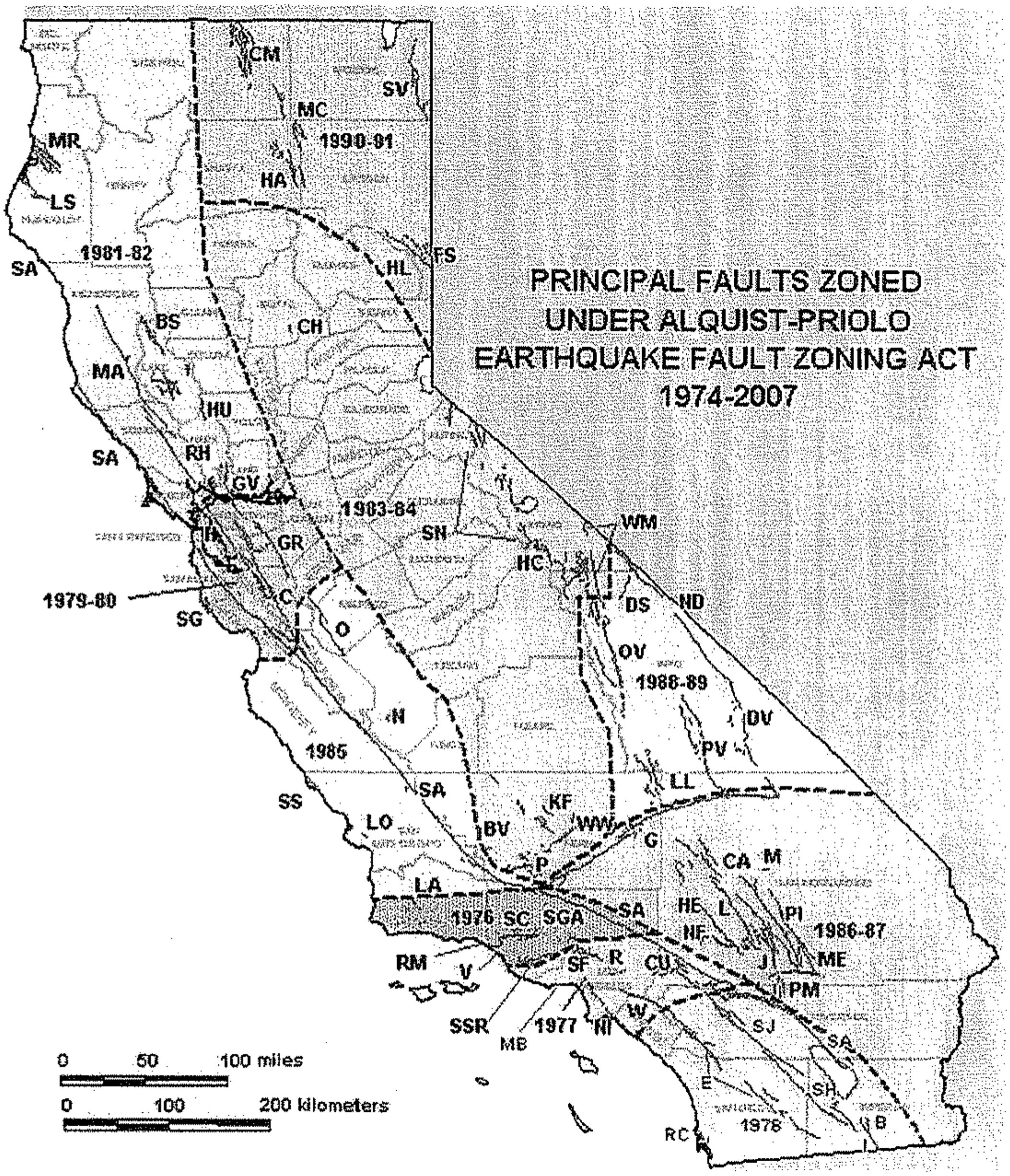
* To inquire about local government policies and regulations or to consult (obtain) copies of specific Earthquake Fault Zones maps, address the Planning Director of each county or city. Some jurisdictions have replotted the EFZ boundaries on large-scale parcel maps.

** Additional cities may be affected by the zones as new cities are created, city boundaries are expanded, or new zones are established

MAP SYMBOL	NAME OF PRINCIPAL FAULT
B	*Brawley
BS	Bartlett Springs
BV	*Buena Vista
C	*Calaveras
CA	Calico
CH	*Cleveland Hill
CM	Cedar Mtn.
CU	Cucamonga
DS	Deep Springs
DV	Death Valley
E	Elsinore
FS	*Fort Sage
G	*Garlock
GR	*Greenville
GV	*Green Valley and Concord
H	*Hayward
HA	Hat Creek
HC	*Hilton Creek & related
HE	Helendale
HL	Honey Lake
HU	Hunting Creek
I	*Imperial
J	*Johnson Valley & related
KF	*Kern Front & related
L	Lenwood
LA	Los Alamos
LL	*Little Lake
LO	Los Osos
LS	Little Salmon
M	*Manix
MA	*Maacama
MB	Malibu
MC	McArthur
ME	Mesquite Lake
MR	Mad River
N	*Nunez
ND	Northern Death Valley
NF	North Frontal
NI	*Newport-Inglewood
O	Ortigalita
OV	*Owens Valley
P	Pleito & Wheeler Ridge
PI	*Pisgah-Bullion
PM	Pinto Mountain
PV	Panamint Valley
R	Raymond Hill
RC	Rose Canyon
RH	Rodgers Creek-Healdsburg
RM	Red Mountain
SA	*San Andreas
SC	San Cayetano
SF	*San Fernando
SG	San Gregorio
SGA	San Gabriel
SH	*Superstition Hills
SJ	*San Jacinto
SN	Sierra Nevada (zone)
SS	San Simeon
SSR	Simi-Santa Rosa
SV	Surprise Valley
W	Whittier
WM	*White Mtns
WW	*White Wolf
V	Ventura



—— **Faults zoned through August 2007**

- - - - **Approximate boundaries of work-plan regions and year studied**

Note: Other faults may be zoned in the future and existing zones may be revised when warranted by new fault data

Figure 1. Principal active faults in California zoned under the Alquist-Priolo Earthquake Fault Zoning Act. Asterisk indicates faults with historic surface rupture.

Fault Trace

A *fault trace* is the line formed by the intersection of a fault and the earth's surface. It is the representation of a fault as depicted on a map, including maps of the Earthquake Fault Zones.

Active Fault

For the purposes of this Act, an *active fault* is defined by the State Mining and Geology Board as one which has "had surface displacement within Holocene time (about the last 11,000 years)" (see Appendix B, Section 3601). This definition does not, of course, mean that faults lacking evidence for surface displacement within Holocene time are necessarily inactive. A fault may be presumed to be inactive based on satisfactory geologic evidence; however, the evidence necessary to prove inactivity sometimes is difficult to obtain and locally may not exist.

Potentially Active Fault

Because the Alquist-Priolo Act requires the State Geologist to establish Earthquake Fault Zones to encompass all "potentially and recently active" traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults, additional definitions were needed (Section 2622). Initially, faults were defined as *potentially active*, and were zoned, if they showed evidence of surface displacement during Quaternary time (last 1.6 million years, Figure 2). Exceptions were made for certain Quaternary (i.e., Pleistocene) faults that were presumed to be inactive based on direct geologic evidence of inactivity during all of Holocene time or longer. The term "recently active" was not defined, as it was considered to be covered by the term "potentially active." Beginning in 1977, evidence of Quaternary surface displacement was no longer used as a criterion for zoning. However, the term "potentially active" continued to be used as a descriptive term on map explanations on EFZ maps until 1988.

Sufficiently Active and Well-defined

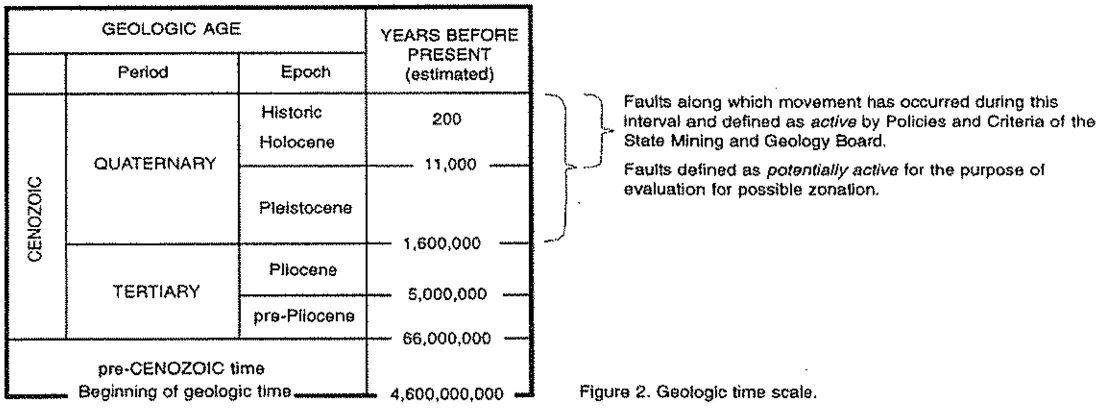
A major objective of the CGS's continuing Fault Evaluation and Zoning Program is to evaluate the hundreds of remaining potentially active faults in California for zoning consideration. However, it became apparent as the program progressed that there are so many potentially active (i.e., Quaternary) faults in the state (Jennings, 1975) that it would be meaningless to zone all of them. In late 1975, the State Geologist made a policy decision to zone only those potentially active faults that have a relatively high potential for ground rupture. To facilitate this, the terms "sufficiently active" and "well-defined," from Section 2622 of the Act, were defined for application in zoning faults other than the four named in the Act. These two terms constitute the present criteria used by the State Geologist in determining if a given fault should be zoned under the Alquist-Priolo Act.

Sufficiently active. A fault is deemed sufficiently active if there is evidence of Holocene surface displacement along one or more of its segments or branches. Holocene surface displacement may be directly observable or inferred; it need not be present everywhere along a fault to qualify that fault for zoning.

Well-defined. A fault is considered well-defined if its trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The fault may be identified by direct observation or by indirect methods (e.g., geomorphic evidence; Appendix C). The critical consideration is that the fault, or some part of it, can be located in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

Determining if a fault is sufficiently active and well-defined is a matter of judgment. However, these definitions provide standard, workable guidelines for establishing Earthquake Fault Zones under the Act.

The evaluation of faults for zoning purposes is done with the realization that not all active faults can be identified. Furthermore, certain faults considered to be active at depth, because of known seismic activity, are so poorly defined at the surface that zoning is impractical. Although the map explanation indicates that "potentially active" (i.e., Quaternary) faults are identified and zoned (with exceptions) on the Official Maps of Earthquake Fault Zones until 1988, this is basically true only for those maps issued July 1, 1974 and January 1, 1976. Even so, all of the principal faults zoned in 1974 and 1976 were active during Holocene time, if not historically. Beginning with the maps of January 1, 1977, all faults zoned meet the criteria of "sufficiently active and well-defined."



GEOLOGIC AGE			YEARS BEFORE PRESENT (estimated)
	Period	Epoch	
CENOZOIC	QUATERNARY	Historic	200
		Holocene	11,000
		Pleistocene	1,600,000
	TERTIARY	Pliocene	5,000,000
		pre-Pliocene	66,000,000
pre-CENOZOIC time Beginning of geologic time			4,600,000,000

Faults along which movement has occurred during this interval and defined as *active* by Policies and Criteria of the State Mining and Geology Board.

Faults defined as *potentially active* for the purpose of evaluation for possible zonation.

Figure 2. Geologic time scale.

Delineating the Earthquake Fault Zones

Earthquake Fault Zones are delineated on U.S. Geological Survey topographic base maps at a scale of 1:24,000 (1 inch equals 2,000 feet). The zone boundaries are straight-line segments defined by turning points (Figure 3). Most of the turning points are intended to coincide with locatable features on the ground (e.g., bench marks, roads, streams). Neither the turning points nor the connecting zone boundaries have been surveyed to verify their mapped locations.

Locations of Earthquake Fault Zone boundaries are controlled by the position of fault traces shown on the Official Maps of Earthquake Fault Zones. With few exceptions, the faults shown on the 1974 and 1976 Earthquake Fault Zones maps were not field-checked during the compilation of these maps. However, nearly all faults zoned since January 1, 1977 have been evaluated in the field or on aerial photographs to verify that they do meet the criteria of being sufficiently active and well-defined.

Zone boundaries on early maps were positioned about 660 feet (200 meters) away from the fault traces to accommodate imprecise locations of the faults and possible existence of active branches. The policy since 1977 is to position the EFZ boundary about 500 feet (150 meters) away from major active faults and about 200 to 300 feet (60 to 90 meters) away from well-defined, minor faults. Exceptions to this policy exist where faults are locally complex or where faults are not vertical.

Fault Evaluation and Zoning Program

The Fault Evaluation and Zoning Program was initiated in early 1976 for the purpose of evaluating those "other faults" identified in the Act as "sufficiently active and well-defined" (see definition above) after it was recognized that effective future zoning could not rely solely on the limited fault data of others. Justification of this program is discussed in more detail in Special Publication 47 of the Division of Mines and Geology (1976; also see Hart, 1978).

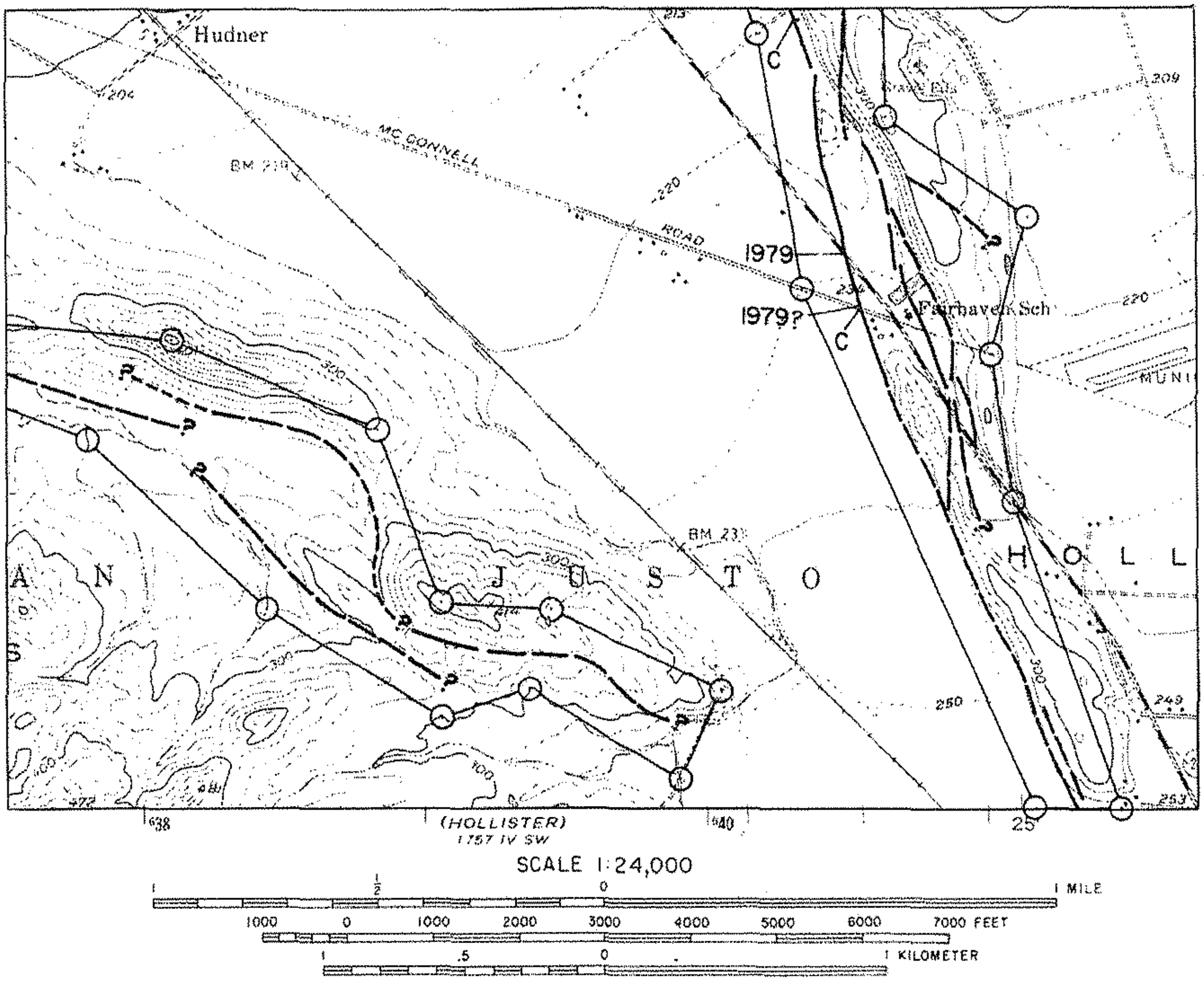
The program was originally scheduled over a 10-year period. The state was divided into 10 regions or work areas (Figure 1), with one region scheduled for evaluation each year. However, the work in some regions was extended due to heavy workloads. Fault evaluation work includes interpretation of aerial photographs and limited field mapping, as well as the use of other geologists' work. A list of faults to be evaluated in a target region was prepared and priorities assigned. The list included potentially active faults not yet zoned, as well as previously zoned faults or fault-segments that warranted zone revisions (change or deletion). Faults also were evaluated in areas outside of scheduled regions, as the need arose (e.g., to map fault rupture immediately after an earthquake). The fault evaluation work was completed in early 1991. The work is summarized for each region in Open-File Reports (OFR) 77-8, 78-10, 79-10, 81-3, 83-10, 84-52, 86-3, 88-1, 89-16, and 91-9 (see Appendix E). Appendix E is a complete list of publications and products of the Fault Evaluation and Zoning Program.

For each fault evaluated, a Fault Evaluation Report (FER) was prepared, summarizing data on the location, recency of activity, and sense and magnitude of displacement. Each FER contains recommendations for or against zoning. These in-house reports are filed at the CGS Sacramento Regional Office at 801 K Street, MS 12-31, Sacramento, 95814, where they are available for reference. Reference copies of the FERs are filed in the CGS's Los Angeles and San Francisco Bay regional offices. An index to FERs prepared 1976 to April 1989 is available as OFR 90-9 (see Appendix E). This list and an index map identify the faults that have been evaluated. Digital files of all FER's are available in pdf format (CGS CD 2002-01; CD 2002-02; CD 2002-03) (see Appendix E).

Under the AP Act (Sec. 2622), the State Geologist has an on-going responsibility to review "new geologic and seismic data" in order to revise the Earthquake Fault Zones and to delineate new zones "when warranted by new information."

As a result of the fault evaluations made since 1976, 295 new and 155 revised Earthquake Fault Zones Maps have been issued and four maps have been withdrawn (Table 3). The faults zoned since 1976 are considered to meet the criteria of "sufficiently active and well-defined" (see Definitions above). Many other faults did not appear to meet the criteria and were not zoned. It is important to note that it is sometimes difficult to distinguish between slightly active faults and inactive ones, because the surface features formed as a result of minor, infrequent rupture are easily obliterated by geologic processes (erosion, sedimentation, mass wasting) or people's activities. Even large scale fault-rupture can be obscured in complex geologic terranes or high-energy environments. Recent fault-rupture also is difficult to detect where it is distributed as numerous breaks or warps in broad zones of deformation. As a consequence of these problems, it is not possible to identify and zone all active faults in California. For the most part, rupture on faults not identified as active is expected to be minor.

Since zones were first established in 1974, there have been 25 earthquakes or earthquake sequences associated with surface faulting in various parts of California (Table 5). This is an average of 0.75 fault-rupture events per year. Most of the recent surface faulting has been relatively minor; either in terms of amount of displacement or length of surface rupture (Table 5). However, one foot (30 cm) or more displacement occurred during seven events. Earlier records (incomplete) suggest that displacements of 3 feet (one meter) or more occur at least once every 15 to 20 years in California (Bonilla, 1970; Grantz and Bartow, 1977). Many of the recent coseismic events occurred on faults that were not yet zoned, and a few were on faults not considered to be potentially active or not even mapped. However, coseismic rupture also occurred on faults mostly or entirely within the Earthquake Fault Zones in nine of the rupture events (Table 5). A sequence of four rupture events occurred in the Lompoc diatomite quarry and presumably was triggered by quarrying (see event #10, Table 5). In addition, aseismic fault creep has occurred on many zoned faults in the last 30 years (see footnote, Table 5). Most fault creep is tectonically induced, although some is induced by people (mainly by fluid withdrawal).



MAP EXPLANATION

Active Faults

1906 C

Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainity. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Earthquake Fault Zone Boundaries

⊙——⊙ These are delineated as straight-line segments that connect encircled turning points so as to define earthquake fault zone segments.

— — —⊙ Seaward projection of zone boundary.

Figure 3. Example of Earthquake Fault Zones map and explanation of map symbols.

Table 5. Surface faulting associated with earthquakes in California, 1974-June 2007. List excludes fault creep and faulting triggered by shaking or movement on a different fault[1]. See Bonilla (1970), Jennings (1985), and Grantz and Bartow (1977) for earlier faulting events.

Fault (County where located)	Year of rupture	Magnitude of associated earthquake	Surface rupture[2] Max. displacement (cm)	Total length[2] (km)	Main sense of displacement[3]	Comments
1. Brawley (Imperial)	1975	4.7	20	10.4	N	Also ruptured in 1940 and 1979; fault creep in part.
2. Galway Lake (San Bernardino)	1975	5.3	1.5	6.8	RL	Fault previously unknown.
3. Cleveland Hill (Butte)	1975	5.7	5	5.7	N	Fault not previously known to be Holocene-active.
4. Stephens Pass (Siskiyou)	1978	4.3	30	2+	N	Fault previously unknown.
5. Homestead Valley (San Bernardino)	1979	5.2	8	3.3	RL	Also minor rupture on Johnson Valley fault.
6. *Calaveras (San Benito, Santa Clara)	1979	5.9	1	39 (?)	RL	Minor, discontinuous rupture mostly in creep-active segment.
7. *Imperial *Brawley (Imperial) Rico	1979	6.6	55 15 10	30 13 1	RL N N	Creep triggered on San Andreas and Superstition Hills faults; also ruptured in 1940. Rico fault not previously known.
8. Greenville (Alameda)	1980	5.8	3	6.5	RL	Minor left-lateral slip also occurred on Las Positas fault.
9. Hilton Creek-Mammoth Lakes (Mono)	1980	6.0-6.5	30	20	N	Rupture on many minor faults; may relate to volcanic activity. Minor ruptures also in 1981.
10. "Lompoc quarry" (Santa Barbara)	1981	2.5	25	0.6	R	Flexural slip on flank of syncline triggered by quarrying; do not plan to zone. Similar earthquake-associated ruptures occurred in 1985, 1988, and 1995.
11. Little Lake (Kern)	1982	5.2	0+	10	RL/N	Fracture zones on monoclines.
12. "Coalinga Nose" (Fresno)	1983	6.7	5	.005	R	Secondary fault (?) associated with 43 cm of anticlinal uplift; too minor to zone.
13. Nunez (Fresno)	1983	5.2-5.9	60	3.3	R	Aftershocks associated with event (12) above.
14. *Calaveras (Santa Clara)	1984	6.1	20 (?)	1.2	RL	Questionable faulting; triggered afterslip in 15-km long creep-zone to south.
15. *Banning (Riverside)	1986	5.9	7	9	RL	Minor slip also triggered locally on Garnet Hill and Desert Hot Springs (?) faults as well as more distant faults.
16. *White Mountains (Mono, Inyo)	1986	6.4	11	13	RL/N	Also extensional cracks on faults in Volcanic Tableland in 40km x 12km area.
17. Elmore Ranch (Imperial)	1987	6.2	12	12	LL	Also lesser left-lateral rupture on nearby faults.
18. *Superstition Hills (Imperial)	1987	6.6	90	28	RL	Much of rupture occurred as afterslip; associated with event 17.
19. *San Andreas (Santa Cruz)	1989	7.1	2.5	1?	RL	Surface rupture possibly triggered slip; slip also triggered on nearby Calaveras and San Andreas faults outside of aftershock zone. Secondary faulting may have occurred with ridgetop spreading fissures.
20. *Johnson Valley *Homestead Valley *Emerson (San Bernardino) *Camp Rock	1992	7.3	460-600	85	RL	Most significant fault rupture since 1906; ruptures connected several separate faults; triggered slip also occurred on at least 10 other faults.
21. *Eureka Valley* (Inyo)	1993	6.1	2	5+	RL/N	Two zones of left-stepping fractures along pre-existing fault scarps; incompletely mapped; remote area, not zoned.
22. *Stevenson Ranch* (Los Angeles)	1994	6.7	19	0.6	R	Flexural slip faults on limb of fold near Newhall; related to blind thrust faulting. Minor slip also triggered on Mission Wells fault, which ruptured in 1971.
23. Airport Lake (Kern and Inyo)	1995	5.4-5.8	1	2.5	RL/N	Discontinuous cracks along pre-existing scarp.
24. Lavic Lake *Bullion *Mesquite Lake (San Bernardino)	1999	7.1	525	45	RL	Bullion and Mesquite Lake faults previously zoned; Lavic Lake had not ruptured in Holocene.
25. *San Andreas (Monterey, San Luis Obispo)	2004	6.0	15	32	RL	Parkfield section of San Andreas fault zone; also ruptured in 1966. Much of rupture occurred as afterslip.

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[1] Tectonic (aseismic) fault-creep and triggered slip have occurred along various segments of the San Andreas, Hayward, Calaveras, Concord, Green Valley, Imperial, Superstition Hills, Maacama, Garlock, and more than 10 other faults. People-induced fault-creep has been reported on at least 12 other faults due to withdrawal of groundwater or oilfield fluids. See Jennings (1994) for map locations.

[2] Includes some afterslip. Rupture length measured from distal ends of rupture, which often is discontinuous.

[3] N=normal displacement; R=reverse displacement; RL=right-lateral displacement; LL=left-lateral displacement.

* Coseismic surface faulting occurred mostly or entirely within existing Earthquake Fault Zones during eight events

In addition to evaluating and zoning faults, program staff also perform other functions necessary to the implementation of the APEFZ Act. Regulations (Section 3603, Appendix B) require that cities and counties file geologic reports for "project" sites in Earthquake Fault Zones with the State Geologist. By the middle of 2006, over 4000 site-specific geologic reports investigating the hazard of surface-fault rupture had been filed for public reference. Site reports on file with CGS through 2000 are available as digital images in pdf format (CGS CD 2003-01; CD 2003-02). Reports filed after 2000 are available for reference at the Geologic Information and Publications Office in Sacramento (see Appendix E).

In order to improve the quality of site investigations and reports, guidelines were prepared in 1975 to assist others in evaluating faults. These guidelines have been revised and appear as Appendix C.

General guidelines for reviewing geologic reports for adequacy, required by Section 3603 of the regulations, are provided in Appendix D.

If a city or county considers that a geologic investigation of a proposed "project" is unnecessary, it may request a waiver from the State Geologist (Section 2623, Appendix A). A waiver form detailing the procedures used is provided in Appendix F. Through 2006, 84 waiver requests have been processed by program staff.

Another important activity is to provide information on the APEFZ Act, the Division's Fault Evaluation and Zoning Program, and fault-rupture hazards to both the public and private sectors. Program staff responds to about 1,500 inquiries each year from geologists, planners, building officials, developers, realtors, financial institutions, and others.

Uses and Limitations of Earthquake Fault Zones Maps

The Earthquake Fault Zones are delineated to define those areas within which fault-rupture hazard investigations are required prior to building structures for human occupancy. Traces of faults are shown on the maps mainly to justify the locations of zone boundaries. These fault traces are plotted as accurately as the sources of data permit; yet the plots are not sufficiently accurate to be used as the basis for building set-back requirements, and they should not be so used.

The fault information shown on the maps is not sufficient to meet the requirement for fault-rupture hazard investigations. Local governmental units must require developers to have project sites within the Earthquake Fault Zones evaluated to determine if a potential hazard from any fault, whether heretofore recognized or not, exists with regard to proposed structures and their occupants.

The surface fault-ruptures associated with historic earthquake and creep events are identified where known. However, no degree of relative potential for future surface displacement or degree of hazard is implied for the faults shown. Surface ruptures resulting from the secondary effects of seismic shaking (e.g., landsliding, differential settlement, liquefaction) are omitted from the map and do not serve as a basis for zoning.

Active faults may exist outside the Earthquake Fault Zones on any zone map. Therefore, fault investigations are recommended for all critical and important developments proposed outside the Earthquake Fault Zones.

INDEX TO MAPS OF EARTHQUAKE FAULT ZONES

The following pages (Figures 4A to 4J) indicate the names and locations of the Official Maps of Earthquake Fault Zones delineated by the California Geological Survey under the Alquist-Priolo Earthquake Fault Zoning Act (Appendix A). These index pages identify all Official Maps of Earthquake Fault Zones released by the State Geologist through August 2007. The official maps are compiled on U.S. Geological Survey 7.5-minute topographic quadrangle maps at a scale of 1 inch equals 2,000 feet (Figure 3). Cities and counties affected by these maps are listed in Table 4.

Because Earthquake Fault Zones maps are issued every year or two to delineate revised and additional zones, users of these maps should check with the California Geological Survey for up-to-date information on new and revised Earthquake Fault Zones maps. A change in zones also may affect different local governments. This index to Official Maps of Earthquake Fault Zones (Figures 4A to 4J) will be revised in future years as new maps are issued.

The Earthquake Fault Zones maps are available for purchase as indicated under Availability of Earthquake Fault Zones Maps. Also, they may be consulted at any office of the California Geological Survey and at the planning departments of all cities and counties affected locally by Earthquake Fault Zones (Table 4).

Availability of Earthquake Fault Zones Maps

Reproducible masters, from which copies of local Earthquake Fault Zones maps (scale 1:24,000) can be made, have been provided to each of the cities and counties affected by the zones. Requests for copies of particular Earthquake Fault Zones maps of local areas should be directed to the Planning Director of the appropriate city or county. Refer to the index of Earthquake Fault Zones maps for the quadrangle names of the maps needed.

Arrangements also have been made with ARC-Bryant (formerly BPS Reprographic Services), San Francisco, to provide paper copies of the Earthquake Fault Zones maps to those who cannot get them conveniently from the cities and counties.

ARC-Bryant
945 Bryant Street
San Francisco, CA 94103
Telephone: (415) 495-8700

Each map must be ordered by quadrangle name as shown on the index map. The cost of the maps is nominal; handling and C.O.D. charges are extra. These maps are not sold by the California Geological Survey.

Digital files of the maps can be obtained from the California Geological Survey in both digital raster (pdf) and Geographic Information System (GIS) format. Refer to Appendix E for more information on obtaining digital files of the maps.

REFERENCES

(See Appendix E for Complete List of AP Products)

Bonilla, M.G., 1970, Surface faulting and related effects, *in* Wiegel, R.L, editor, Earthquake Engineering: Prentice-Hall, Inc., Englewood Cliffs, New Jersey, p. 47-74.

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Hart, E.W., 1978, Zoning for the hazard of surface fault rupture in California: International Conference on Microzonation, 2nd, San Francisco, 1978, Proceedings, v. 2, p. 635-646.

Hart, E.W., 1986, Zoning for the hazard of surface faulting in California, *in* Proceedings Conference XXXII -- Workshop on future directions in evaluating earthquake hazards in southern California, November 12-13, 1985: U.S. Geological Survey Open-File Report 86-401, p. 74-83.

Jennings, C.W., 1975, Fault map of California with locations of volcanoes, thermal springs, and thermal wells: California Division of Mines and Geology Data Map No. 1, scale 1:750,000.

Jennings, C.W., 1985, An explanatory text to accompany the 1:750,000 scale Fault and Geologic Maps of California: Division of Mines and Geology Bulletin 201, 197 p., 2 plates.

Jennings, C.W., 1994, Fault activity map of California and adjacent areas: California Department of Conservation, Division of Mines and Geology Geologic Data Map No. 6, scale 1:750,000 (appendices).

Reitherman, R. and Leeds, D.J., 1990, A study of the effectiveness of the Alquist-Priolo program: California Division of Mines and Geology Open-File Report 90-18, 131 p.

APPENDICES

Data are presented herein to provide city and county officials, property owners, developers, geologists, and others with specific information they may need to effectuate the Act.

Because the Act must be implemented at the local government level, it is imperative that the local entities understand its various aspects.

Appendix A
ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT[1]
Excerpts from California Public Resources Code

DIVISION 2. Geology, Mines and Mining
CHAPTER 7.5 Earthquake Fault Zones[2]

2621. This chapter shall be known and may be cited as the Alquist-Priolo Earthquake Fault Zoning Act[1].

2621.5. (a) It is the purpose of this chapter to provide for the adoption and administration of zoning laws, ordinances, rules, and regulations by cities and counties in implementation of the general plan that is in effect in any city or county. The Legislature declares that this chapter is intended to provide policies and criteria to assist cities, counties, and state agencies in the exercise of their responsibility to prohibit the location of developments and structures for human occupancy across the trace of active faults. Further, it is the intent of this chapter to provide the citizens of the state with increased safety and to minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings, including historical buildings, against ground shaking.

(b) This chapter is applicable to any project, as defined in Section 2621.6, which is located within a delineated earthquake fault zone, upon issuance of the official earthquake fault zones maps to affected local jurisdictions, except as provided in Section 2621.7.

(c) The implementation of this chapter shall be pursuant to policies and criteria established and adopted by the Board[3]

2621.6. (a) As used in this chapter, "project" means either of the following:

(1) Any subdivision of land which is subject to the Subdivision Map Act, (Division 2 (commencing with Section 66410) of Title 7 of the Government Code), and which contemplates the eventual construction of structures for human occupancy.

(2) Structures for human occupancy, with the exception of either of the following:

(A) Single-family wood-frame or steel-frame dwellings to be built on parcels of land for which geologic reports have been approved pursuant to paragraph (1).

(B) A single-family wood-frame or steel-frame dwelling not exceeding two stories when that dwelling is not part of a development of four or more dwellings.

(b) For the purposes of this chapter, a mobilehome whose body width exceeds eight feet shall be considered to be a single-family wood-frame dwelling not exceeding two stories.

2621.7. This chapter, except Section 2621.9, shall not apply to any of the following:

(a) The conversion of an existing apartment complex into a condominium.

(b) Any development or structure in existence prior to May 4, 1975, except for an alteration or addition to a structure that exceeds the value limit specified in subdivision (c).

(c) An alteration or addition to any structure if the value of the alteration or addition does not exceed 50 percent of the value of the structure.

(d) (1) Any structure located within the jurisdiction of the City of Berkeley or the City of Oakland which was

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[1] Known as the Alquist-Priolo Special Studies Zones Act prior to January 1, 1994.

[2] Know as Special Studies Zones prior to January 1, 1994.

[3] State Mining and Geology Board.

damaged by fire between October 20, 1991, and October 23, 1991, if granted an exemption pursuant to this subdivision.

(2) The city may apply to the State Geologist for an exemption and the State Geologist shall grant the exemption only if the structure located within the earthquake fault zone is not situated upon a trace of an active fault line, as delineated in an official earthquake fault zone map or in more recent geologic data, as determined by the State Geologist.

(3) When requesting an exemption, the city shall submit to the State Geologist all of the following information:

(A) Maps noting the parcel numbers of proposed building sites that are at least 50 feet from an identified fault and a statement that there is not any more recent information to indicate a geologic hazard.

(B) Identification of any sites within 50 feet of an identified fault.

(C) Proof that the property owner has been notified that the granting of an exemption is not any guarantee that a geologic hazard does not exist.

(4) The granting of an exemption does not relieve a seller of real property or an agent for the seller of the obligation to disclose to a prospective purchaser that the property is located within a delineated earthquake fault zone, as required by Section 2621.9.

(e) (1) Alterations which include seismic retrofitting, as defined in Section 8894.2 of the Government Code, to any of the following listed types of buildings in existence prior to May 4, 1975:

(A) Unreinforced masonry buildings, as described in subdivision (a) of Section 8875 of the Government Code.

(B) Concrete tilt-up buildings, as described in Section 8893 of the Government Code.

(C) Reinforced concrete moment resisting frame buildings as described in Applied Technology Council Report 21 (FEMA Report 154).

(2) The exemption granted by paragraph (1) shall not apply unless a city or county acts in accordance with all of the following:

(A) The building permit issued by the city or county for the alterations authorizes no greater human occupancy load, regardless of proposed use, than that authorized for the existing use permitted at the time the city or county grants the exemption. This may be accomplished by the city or county making a human occupancy load determination that is based on, and no greater than, the existing authorized use, and including that determination on the building permit application as well as a statement substantially as follows: "Under subparagraph (A) of paragraph (2) of subdivision (e) of Section 2621.7 of the Public Resources Code, the occupancy load is limited to the occupancy load for the last lawful use authorized or existing prior to the issuance of this building permit, as determined by the city or county."

(B) The city or county requires seismic retrofitting, as defined in Section 8894.2 of the Government Code, which is necessary to strengthen the entire structure and provide increased resistance to ground shaking from earthquakes.

(C) Exemptions granted pursuant to paragraph (1) are reported in writing to the State Geologist within 30 days of the building permit issuance date.

(3) Any structure with human occupancy restrictions under subparagraph (A) of paragraph (2) shall not be granted a new building permit that allows an increase in human occupancy unless a geologic report, prepared pursuant to subdivision (d) of Section 3603 of Title 14 of the California Code of Regulations in effect on January 1, 1994, demonstrates that the structure is not on the trace of an active fault, or the requirement of a geologic report has been waived pursuant to Section 2623.

(4) A qualified historical building within an earthquake fault zone that is exempt pursuant to this subdivision may be repaired or seismically retrofitted using the State Historical Building Code, except that, notwithstanding any provision of that building code and its implementing regulations, paragraph (2) shall apply.

2621.8. Notwithstanding Section 818.2 of the Government Code, a city or county which knowingly issues a permit that grants an exemption pursuant to subdivision (e) of Section 2621.7 that does not adhere to the requirements of paragraph (2) of subdivision (e) of Section 2621.7, may be liable for earthquake-related injuries or deaths caused by failure to so adhere.

2621.9. (a) A person who is acting as an agent for a transferor of real property that is located within a delineated earthquake fault zone, or the transferor, if he or she is acting without an agent, shall disclose to any prospective transferee the fact that the property is located within a delineated earthquake fault zone.

(b) Disclosure is required pursuant to this section only when one of the following conditions is met:

(1) The transferor, or the transferor's agent, has actual knowledge that the property is within a delineated earthquake fault zone.

(2) A map that includes the property has been provided to the city or county pursuant to Section 2622, and a notice has been posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the map and any information regarding changes to the map received by the county.

(c) In all transactions that are subject to Section 1103 of the Civil Code, the disclosure required by subdivision (a) of this section shall be provided by either of the following means:

(1) The Local Option Real Estate Transfer Disclosure Statement as provided in Section 1102.6a of the Civil Code.

(2) The Natural Hazard Disclosure Statement as provided in Section 1103.2 of the Civil Code.

(d) If the map or accompanying information is not of sufficient accuracy or scale that a reasonable person can determine if the subject real property is included in a delineated earthquake fault hazard zone, the agent shall mark "Yes" on the Natural Hazard Disclosure Statement. The agent may mark "No" on the Natural Hazard Disclosure Statement if he or she attaches a report prepared pursuant to subdivision (c) of Section 1103.4 of the Civil Code that verifies the property is not in the hazard zone. Nothing in this subdivision is intended to limit or abridge any existing duty of the transferor or the transferor's agents to exercise reasonable care in making a determination under this subdivision.

(e) For purposes of the disclosures required by this section, the following persons shall not be deemed agents of the transferor:

(1) Persons specified in Section 1103.11 of the Civil Code.

(2) Persons acting under a power of sale regulated by Section 2924 of the Civil Code.

(f) For purposes of this section, Section 1103.13 of the Civil Code shall apply.

(g) The specification of items for disclosure in this section does not limit or abridge any obligation for disclosure created by any other provision of law or that may exist in order to avoid fraud, misrepresentation, or deceit in the transfer transaction.

2622. (a) In order to assist cities and counties in their planning, zoning, and building-regulation functions, the State Geologist shall delineate, by December 31, 1973, appropriately wide earthquake fault zones to encompass all potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto Faults, and such other faults, or segments thereof, as the State Geologist determines to be sufficiently active and well-defined as to constitute a potential hazard to structures from surface faulting or fault creep. The earthquake fault zones shall ordinarily be one-quarter mile or less in width, except in circumstances which may require the State Geologist to designate a wider zone.

(b) Pursuant to this section, the State Geologist shall compile maps delineating the earthquake fault zones and shall submit the maps to all affected cities, counties, and state agencies, not later than December 31, 1973, for review and comment. Concerned jurisdictions and agencies shall submit all comments to the State Mining and Geology Board for review and consideration within 90 days. Within 90 days of such review, the State Geologist shall provide copies of the official maps to concerned state agencies and to each city or county having jurisdiction over lands lying within any such zone.

(c) The State Geologist shall continually review new geologic and seismic data and shall revise the earthquake fault zones or delineate additional earthquake fault zones when warranted by new information. The State Geologist shall submit all revised maps and additional maps to all affected cities, counties, and state agencies for their review and comment. Concerned jurisdictions and agencies shall submit all comments to the State Mining and Geology Board for review and consideration within 90 days. Within 90 days of that review, the State Geologist shall provide copies of the revised and additional official maps to concerned state agencies and to each city or county having jurisdiction over lands lying within the earthquake fault zone.

(d) In order to ensure that sellers of real property and their agents are adequately informed, any county that receives an official map pursuant to this section shall post a notice within five days of receipt of the map at the offices of the county recorder, county assessor, and county planning commission, identifying the location of the map and the effective date of the notice.

2623. (a) The approval of a project by a city or county shall be in accordance with policies and criteria established by the State Mining and Geology Board and the findings of the State Geologist. In the development of such policies and criteria, the State Mining and Geology Board shall seek the comment and advice of affected cities, counties, and state agencies. Cities and counties shall require, prior to the approval of a project, a geologic report defining and delineating any hazard of surface fault rupture. If the city or county finds that no undue hazard of that kind exists, the geologic report on the hazard may be waived, with the approval of the State Geologist.

(b) After a report has been approved or a waiver granted, subsequent geologic reports shall not be required, provided that new geologic data warranting further investigations is not recorded.

(c) The preparation of geologic reports that are required pursuant to this section for multiple projects may be undertaken by a geologic hazard abatement district.

2624. Notwithstanding any provision of this chapter, cities and counties may do any of the following:

(1) Establish policies and criteria which are stricter than those established by this chapter.

(2) Impose and collect fees in addition to those required under this chapter.

(3) Determine not to grant exemptions authorized under this chapter.

2625. (a) Each applicant for approval of a project may be charged a reasonable fee by the city or county having jurisdiction over the project.

(b) Such fees shall be set in an amount sufficient to meet, but not to exceed, the costs to the city or county of administering and complying with the provisions of this chapter.

(c) The geologic report required by Section 2623 shall be in sufficient detail to meet the criteria and policies established by the State Mining and Geology Board for individual parcels of land.

2630. In carrying out the provisions of this chapter, the State Geologist and the board shall be advised by the Seismic Safety Commission.

SIGNED INTO LAW DECEMBER 22, 1972; AMENDED SEPTEMBER 16, 1974, MAY 4, 1975, SEPTEMBER 28, 1975, SEPTEMBER 22, 1976, SEPTEMBER 27, 1979, SEPTEMBER 21, 1990, JULY 29, 1991, AUGUST 16, 1992, JULY 25, 1993, OCTOBER 7, 1993, AND OCTOBER 7, 1997

Appendix B

POLICIES AND CRITERIA OF THE STATE MINING AND GEOLOGY BOARD

With Reference to the Alquist-Priolo Earthquake Fault Zoning Act

(Excerpts from the California Code of Regulations, Title 14, Division 2)

3600. Purpose.

It is the purpose of this subchapter to set forth the policies and criteria of the State Mining and Geology Board, hereinafter referred to as the "Board," governing the exercise of city, county, and state agency responsibilities to prohibit the location of developments and structures for human occupancy across the trace of active faults in accordance with the provisions of Public Resources Code Section 2621 et seq. (Alquist-Priolo Earthquake Fault Zoning Act). The policies and criteria set forth herein shall be limited to potential hazards resulting from surface faulting or fault creep within earthquake fault zones delineated on maps officially issued by the State Geologist.

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Sections 2621-2630, Public Resources Code.

3601. Definitions.

The following definitions as used within the Act and herein shall apply:

(a) An "active fault" is a fault that has had surface displacement within Holocene time (about the last 11,000 years), hence constituting a potential hazard to structures that might be located across it.

(b) A "fault trace" is that line formed by the intersection of a fault and the earth's surface, and is the representation of a fault as depicted on a map, including maps of earthquake fault zones.

(c) A "lead agency" is the city or county with the authority to approve projects.

(d) "Earthquake fault zones" are areas delineated by the State Geologist, pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621 et seq.) and this subchapter, which encompass the traces of active faults.

(e) A "structure for human occupancy" is any structure used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year.

(f) "Story" is that portion of a building included between the upper surface of any floor and the upper surface of the floor next above, except that the topmost story shall be that portion of a building included between the upper surface of the topmost floor and the ceiling or roof above. For the purpose of the Act and this subchapter, the number of stories in a building is equal to the number of distinct floor levels, provided that any levels that differ from each other by less than two feet shall be considered as one distinct level.

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Sections 2621-2630, Public Resources Code.

3602. Review of Preliminary Maps.

(a) Within 45 days from the issuance of proposed new or revised preliminary earthquake fault zone map(s), cities and counties shall give notice of the Board's announcement of a ninety (90) day public comment period to property owners within the area of the proposed zone. The notice shall be by publication, or other means reasonably calculated to reach as many of the affected property owners as feasible. Cities and counties may also give notice to consultants who may conduct geologic studies in fault zones. The notice shall state that its purpose is to provide an opportunity for public comment including providing to the Board geologic information that may have a bearing on the proposed map(s).

(b) The Board shall also give notice by mail to those California Registered Geologists and California Registered Geophysicists on a list provided by the State Board of Registration for Geologists and Geophysicists. The notice shall indicate the affected jurisdictions and state that its purpose is to provide an opportunity to present written technical comments that may have a bearing on the proposed zone map(s) to the Board during a 90-day public comment period.

(c) The Board shall receive public comments during the 90-day public comment period. The Board shall conduct at least one public hearing on the proposed zone map(s) during the 90-day public comment period.

(d) Following the end of the 90-day public comment period, the Board shall forward its comments and recommendations with supporting data received to the State Geologist for consideration prior to the release of official earthquake fault zone map(s).

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Section 2622, Public Resources Code.

3603. Specific Criteria.

The following specific criteria shall apply within earthquake fault zones and shall be used by affected lead agencies in complying with the provisions of the Act:

(a) No structure for human occupancy, identified as a project under Section 2621.6 of the Act, shall be permitted to be placed across the trace of an active fault. Furthermore, as the area within fifty (50) feet of such active faults shall be presumed to be underlain by active branches of that fault unless proven otherwise by an appropriate geologic investigation and report prepared as specified in Section 3603(d) of this subchapter, no such structures shall be permitted in this area.

(b) Affected lead agencies, upon receipt of official earthquake fault zones maps, shall provide for disclosure of delineated earthquake fault zones to the public. Such disclosure may be by reference in general plans, specific plans, property maps, or other appropriate local maps.

(c) No change in use or character of occupancy, which results in the conversion of a building or structure from one not used for human occupancy to one that is so used, shall be permitted unless the building or structure complies with the provisions of the Act.

(d) Application for a development permit for any project within a delineated earthquake fault zone shall be accompanied by a geologic report prepared by a geologist registered in the State of California, which is directed to the problem of potential surface fault displacement through the project site, unless such report is waived pursuant to Section 2623 of the Act. The required report shall be based on a geologic investigation designed to identify the location, recency, and nature of faulting that may have affected the project site in the past and may affect the project site in the future. The report may be combined with other geological or geotechnical reports.

(e) A geologist registered in the State of California, within or retained by each lead agency, shall evaluate the geologic reports required herein and advise the lead agency.

(f) One (1) copy of all such geologic reports shall be filed with the State Geologist by the lead agency within thirty (30) days following the report's acceptance. The State Geologist shall place such reports on open file.

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Sections 2621.5, 2622, 2623, and 2625(c), Public Resources Code.

ADOPTED NOVEMBER 23, 1973; REVISED JULY 1, 1974, AND JUNE 26, 1975.
CODIFIED IN CALIFORNIA CODE OF REGULATIONS JANUARY 31, 1979;
REVISED OCTOBER 18, 1984, JANUARY 5, 1996, AND APRIL 1, 1997.

Appendix C

GUIDELINES FOR EVALUATING THE HAZARD OF SURFACE RUPTURE

(These guidelines, also published as DMG Note 49 (1997), are not part of the Policies and Criteria of the State Mining and Geology Board. Similar guidelines were adopted by the Board for advisory purposes in 1996.)

These guidelines are to assist geologists who investigate faults relative to the hazard of surface fault rupture. Subsequent to the passage of the Alquist-Priolo Earthquake Fault Zoning Act (1972), it became apparent that many fault investigations conducted in California were incomplete or otherwise inadequate for the purpose of evaluating the potential of surface fault rupture. It was further apparent that statewide standards for investigating faults would be beneficial. These guidelines were initially prepared in 1975 as DMG Note 49 and have been revised several times since then.

The investigation of sites for the possible hazard of surface fault rupture is a deceptively difficult geologic task. Many active faults are complex, consisting of multiple breaks. Yet the evidence for identifying active fault traces is generally subtle or obscure and the distinction between recently active and long-inactive faults may be difficult to make. It is impractical from an economic, engineering, and architectural point of view to design a structure to withstand serious damage under the stress of surface fault rupture. Once a structure is sited astride an active fault, the resulting fault-rupture hazard cannot be mitigated unless the structure is relocated, whereas when a structure is placed on a landslide, the potential hazard from landsliding often can be mitigated. Most surface faulting is confined to a relatively narrow zone a few feet to a few tens of feet wide, making avoidance (i.e., building setbacks) the most appropriate mitigation method. However, in some cases primary fault rupture or rupture along branch faults can be distributed across zones hundreds of feet wide or manifested as broad warps, suggesting that engineering strengthening or design may be of additional mitigative value (e.g., Lazarte and others, 1994).

No single investigative method will be the best, or even useful, at all sites, because of the complexity of evaluating surface and near surface faults and because of the infinite variety of site conditions. Nonetheless, certain investigative methods are more helpful than others in locating faults and evaluating the recency of activity.

The evaluation of a given site with regard to the potential hazard of surface fault rupture is based extensively on the concepts of *recency* and *recurrence* of faulting along existing faults. In a general way, the more recent the faulting the greater the probability for future faulting (Allen, 1975). Stated another way, faults of known historic activity during the last 200 years, as a class, have a greater probability for future activity than faults classified as Holocene age (last 11,000 years) and a much greater probability of future activity than faults classified as Quaternary age (last 1.6 million years). However, it should be kept in mind that certain faults have recurrent activity measured in tens or hundreds of years whereas other faults may be inactive for thousands of years before being reactivated. Other faults may be characterized by creep-type rupture that is more or less on-going. The magnitude, sense, and nature of fault rupture also vary for different faults or even along different strands of the same fault. Even so, future faulting generally is expected to recur along pre-existing faults (Bonilla, 1970, p. 68). The development of a new fault or reactivation of a long-inactive fault is relatively uncommon and generally need not be a concern in site development.

As a practical matter, fault investigations should be directed at the problem of locating existing faults and then attempting to evaluate the recency of their activity. Data should be obtained both from the site and outside the site area. The most useful and direct method of evaluating recency is to observe (in a trench or road cut) the youngest geologic unit faulted and the oldest unit that is not faulted. Even so, active faults may be subtle or discontinuous and consequently overlooked in trench exposures (Bonilla and Lienkaemper, 1991). Therefore, careful logging is essential and trenching needs to be conducted in conjunction with other methods. For example, recently active faults may also be identified by direct observation of young, fault-related geomorphic (i.e., topographic) features in the field or on aerial photographs. Other indirect and more interpretive methods are identified in the outline below. Some of these methods are discussed in Bonilla (1982), Carver and McCalpin (1996), Hatheway and Leighton (1979), McCalpin

(1996a, b, c), National Research Council (1986), Sherard and others (1974), Slemmons (1977), Slemmons and dePolo (1986), Taylor and Cluff (1973), the Utah Section of the Association of Engineering Geologists (1987), Wallace (1977), Weldon and others (1996), and Yeats and others (1997). McCalpin (1996b) contains a particularly useful discussion of various field techniques. Many other useful references are listed in the bibliographies of the references cited here.

The purpose, scope, and methods of investigation for fault investigations will vary depending on conditions at specific sites and the nature of the projects. Contents and scope of the investigation also may vary based on guidelines and review criteria of agencies or political organizations having regulatory responsibility. However, there are topics that should be considered in all comprehensive fault investigations and geologic reports on faults. For a given site some topics may be addressed in more detail than at other sites because of the difference in the geologic and/or tectonic setting and/or site conditions. These investigative considerations should apply to any comprehensive fault investigation and may be applied to any project site, large or small. Suggested topics, considerations, and guidelines for fault investigations and reports on faults are provided in the following annotated outline. Fault investigations may be conducted in conjunction with other geologic and geotechnical investigations (see DMG Notes 42 and 44; also California Department of Conservation, Division of Mines and Geology, 1997). Although not all investigative techniques need to be or can be employed in evaluating a given site, the outline provides a checklist for preparing complete and well-documented reports. Most reports on fault investigations are reviewed by local or state government agencies. Therefore it is necessary that the reports be documented adequately and written carefully to facilitate that review. The importance of the review process is emphasized here, because it is the reviewer who must evaluate the adequacy of reports, interpret or set standards where they are unclear, and advise the governing agency as to their acceptability (Hart and Williams, 1978; DMG Note 41).

The scope of the investigation is dependent not only on the complexity and economics of a project, but also on the level of risk acceptable for the proposed structure or development. A more detailed investigation should be made for hospitals, high-rise buildings, and other critical or sensitive structures than for low-occupancy structures such as wood-frame dwellings that are comparatively safe. The conclusions drawn from any given set of data, however, must be consistent and unbiased. Recommendations must be clearly separated from conclusions, because recommendations are not totally dependent on geologic factors. The final decision as to whether, or how, a given project should be developed lies in the hands of the owner and the governing body that must review and approve the project.

CONTENTS OF GEOLOGIC REPORTS ON FAULTS

Suggested topics, considerations, and guidelines for investigations and reports

The following topics should be considered and addressed in detail where essential to support opinions, conclusions, and recommendations, in any geologic report on faults. It is not expected that all of the topics or investigative methods would be necessary in a single investigation. In specific cases it may be necessary to extend some of the investigative methods well beyond the site or property being investigated. Particularly helpful references are cited parenthetically below.

I. Text.

  A. Purpose and scope of investigation; description of proposed development.

  B. Geologic and tectonic setting. Include seismicity and earthquake history.

  C. Site description and conditions, including dates of site visits and observations. Include information on geologic units, graded and filled areas, vegetation, existing structures, and other factors that may affect the choice of investigative methods and the interpretation of data.

  D. Methods of investigation.

    1. Review of published and unpublished literature, maps, and records concerning geologic units, faults, ground-water barriers, and other factors.

    2. Stereoscopic interpretation of aerial photographs and other remotely sensed images to detect fault-related topography (geomorphic features), vegetation and soil contrasts, and other lineaments of possible fault origin. The area interpreted usually should extend beyond the site boundaries.

    3. Surface observations, including mapping of geologic and soil units, geologic structures, geomorphic features and surfaces, springs, deformation of engineered structures due to fault creep, both on and beyond the site.

    4. Subsurface investigations.

   a. Trenching and other excavations to permit detailed and direct observation of continuously exposed geologic units, soils, and structures; must be of adequate depth and be carefully logged (see Taylor and Cluff, 1973; Hatheway and Leighton, 1979; McCalpin, 1996b).

   b. Borings and test pits to permit collection of data on geologic units and ground water at specific locations. Data points must be sufficient in number and spaced adequately to permit valid correlations and interpretations.

   c. Cone penetrometer testing (CPT) (Grant and others, 1997; Edelman and others, 1996). CPT must be done in conjunction with continuously logged borings to correlate CPT results with on-site materials. The number of borings and spacing of CPT soundings should be sufficient to adequately image site stratigraphy. The existence and location of a fault based on CPT data are interpretative.

5. Geophysical investigations. These are indirect methods that require a knowledge of specific geologic conditions for reliable interpretations. They should seldom, if ever, be employed alone without knowledge of the geology (Chase and Chapman, 1976). Geophysical methods alone never prove the absence of a fault nor do they identify the recency of activity. The types of equipment and techniques used should be described and supporting data presented (California Board of Registration for Geologists and Geophysicists, 1993).

   a. High resolution seismic reflection (Stephenson and others, 1995; McCalpin, 1996b).

   b. Ground penetrating radar (Cai and others, 1996).

   c. Other methods include: seismic refraction, magnetic profiling, electrical resistivity, and gravity (McCalpin, 1996b).

6. Age-dating techniques are essential for determining the ages of geologic units, soils, and surfaces that bracket the time(s) of faulting (Pierce, 1986; Birkeland and others, 1991; Rutter and Catto, 1995; McCalpin, 1996a).

   a. Radiometric dating (especially ^{14}C).

   b. Soil-profile development.

   c. Rock and mineral weathering.

   d. Landform development.

   e. Stratigraphic correlation of rocks/minerals/fossils.

   f. Other methods -- artifacts, historical records, tephrochronology, fault scarp modeling, thermoluminescence, lichenometery, paleomagnetism, dendrochronology, etc.

7. Other methods should be included when special conditions permit or requirements for critical structures demand a more intensive investigation.

   a. Aerial reconnaissance overflights.

   b. Geodetic and strain measurements.

   c. Microseismicity monitoring.

E. Conclusions.

1. Location and existence (or absence) of hazardous faults on or adjacent to the site; ages of past rupture events.

2. Type of faults and nature of anticipated offset, including sense and magnitude of displacement, if possible.

3. Distribution of primary and secondary faulting (fault zone width) and fault-related deformation.

4. Probability of or relative potential for future surface displacement. The likelihood of future ground rupture seldom can be stated mathematically, but may be stated in semiquantitative terms such as low, moderate, or high, or in terms of slip rates determined for specific fault segments.

5. Degree of confidence in and limitations of data and conclusions.

F. Recommendations.

1. Setback distances of proposed structures from hazardous faults. The setback distance generally will depend on the quality of data and type and complexity of fault(s) encountered at the site. In order to establish an appropriate setback distance from a fault located by indirect or interpretative methods (e.g. borings or cone penetrometer testing), the area between data points also should be considered underlain by a fault unless additional data are used to more precisely locate the fault. State and local regulations may dictate minimum distances (e.g., Sec. 3603 of California Code of Regulations, Appendix B).

2. Additional measures (e.g., strengthened foundations, engineering design, flexible utility connections) to accommodate warping and distributive deformation associated with faulting (Lazarte and others, 1994).

3. Risk evaluation relative to the proposed development.

4. Limitations of the investigation; need for additional studies.

II. References.

A. Literature and records cited or reviewed; citations should be complete.

B. Aerial photographs or images interpreted -- list type, date, scale, source, and index numbers.

C. Other sources of information, including well records, personal communications, and other data sources.

III. Illustrations -- these are essential to the understanding of the report and to reduce the length of text.

A. Location map -- identify site locality, significant faults, geographic features, regional geology, seismic epicenters, and other pertinent data; 1:24,000 scale is recommended. If the site investigation is done in compliance with the Alquist-Priolo Act, show site location on the appropriate Official Map of Earthquake Fault Zones.

B. Site development map -- show site boundaries, existing and proposed structures, graded areas, streets, exploratory trenches, borings, geophysical traverses, locations of faults, and other data; recommended scale is 1:2,400 (1 inch equals 200 feet), or larger.

C. Geologic map -- show distribution of geologic units (if more than one), faults and other structures, geomorphic features, aerial photographic lineaments, and springs; on topographic map 1:24,000 scale or larger; can be combined with III(A) or III(B).

D. Geologic cross-sections, if needed, to provide 3-dimensional picture.

E. Logs of exploratory trenches and borings -- show details of observed features and conditions; should not be generalized or diagrammatic. Trench logs should show topographic profile and geologic structure at a 1:1 horizontal to vertical scale; scale should be 1:60 (1 inch = 5 feet) or larger.

F. Geophysical data and geologic interpretations.

IV. Appendix: Supporting data not included above (e.g., water well data, photographs, aerial photographs).

V. Authentication: Investigating geologist's signature and registration number with expiration date.

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Appendix D

GENERAL GUIDELINES FOR REVIEWING GEOLOGIC REPORTS

(These general guidelines are published as DMG Note 41 (1997). Similar guidelines were adopted by the State Mining and Geology Board for advisory purposes in 1996).

The purpose of this article is to provide general guidance for those geologists who review geologic reports of consultants on behalf of agencies having approval authority over specific developments. These general guidelines are modified from an article titled, "Geologic Review Process" by Hart and Williams (1978).

The geologic review is a critical part of the evaluation process of a proposed development. It is the responsibility of the reviewer to assure that each geologic investigation, and the resulting report, adequately addresses the geologic conditions that exist at a given site. In addition to geologic reports for tentative tracts and site development, a reviewer evaluates Environmental Impact Reports, Seismic Safety and Public Safety Elements of General Plans, Reclamation Plans, as-graded geologic reports, and final, as-built geologic maps and reports. In a sense, the geologic reviewer enforces existing laws, agency policies, and regulations to assure that significant geologic factors (hazards, mineral and water resources, geologic processes) are properly considered, and potential problems are mitigated prior to project development. Generally, the reviewer acts at the discretion or request of, and on behalf of a governing agency -- city, county, regional, state, federal -- not only to protect the government's interest but also to protect the interest of the community at large. Examples of the review process in a state agency are described by Stewart and others (1976). Review at the local level has been discussed by Leighton (1975), Berkland (1992), Larson (1992), and others. Grading codes, inspections, and the review process are discussed in detail by Scullin (1983). Nelson and Christenson (1992) specifically discuss review guidelines for reports on surface faulting.

THE REVIEWER

Qualifications

In order to make appropriate evaluations of geologic reports, the reviewer should be an experienced geologist familiar with the investigative methods employed and the techniques available to the profession. Even so, the reviewer must know his or her limitations, and at times ask for the opinions of others more qualified in specialty fields (e.g., geophysics, mineral exploitation and economics, ground water, foundation and seismic engineering, seismology). In California, the reviewer must be licensed by the State Board of Registration for Geologists and Geophysicists in order to practice (Wolfe, 1975). The Board also certifies engineering geologists and hydrogeologists, and licenses geophysicists. Local and regional agencies may have additional requirements.

The reviewer must have the courage of his or her convictions and should not approve reports if an inadequate investigation has been conducted. Like any review process, there is a certain "give-and-take" involved between the reviewer and investigator. If there is clear evidence of incompetence or misrepresentation in a report, this fact should be reported to the reviewing agency or licensing board. California Civil Code Section 47 provides an immunity for statements made "in the initiation or course of any other proceedings authorized by law." Courts have interpreted this section as providing immunity to letters of complaint written to provide a public agency or board, including licensing boards, with information that the public board or agency may want to investigate (see *King v. Borges*, 28 Cal. App. 3d 27 [1972]; and *Brody v. Montalbano*, 87 Cal. App. 3d 725 [1978]). Clearly, the reviewer needs to have the support of his or her agency in order to carry out these duties.

The reviewer should bear in mind that some geologic investigators are not accomplished writers, and almost all are working with restricted budgets. Also, the reviewer may by limited by their agency's policies, procedures, and fee structures. Thus, while a reviewer should demand that certain standards be met, he or she should avoid running rough-shod over the investigator. The mark of a good reviewer is the ability to sort out the important from the insignificant and to make constructive comments and recommendations.

A reviewer may be employed full time by the reviewing agency or part-time as a consultant. Also, one reviewing agency (such as a city) may contract with another agency (such as a county) to perform geologic reviews. The best reviews generally are performed by experienced reviewers. Thus, the use of multiple, part-time reviewers by a given agency tends to prevent development of consistently high-quality and efficient reviews. One of the reasons for this is that different reviewers have different standards, which results in inconsistent treatment of development projects. The primary purpose of the review procedure should always be kept in mind -- namely, to assure the adequacy of geologic investigations.

Other Review Functions

Aside from his or her duties as a reviewer, the reviewing geologist also must interpret the geologic data reported to other agency personnel who regulate development (e.g., planners, engineers, inspectors). Also, the reviewing geologist sometimes is called upon to make investigations for his or her own agency. This is common where a city or county employs only one geologist. In fact, some reviewers routinely divide their activities between reviewing the reports of others and performing one or several other tasks for the employing agency (such as advising other agency staff and boards on geologic matters; making public presentations) (see Leighton, 1975).

Conflict of Interest

In cases where a reviewing geologist also must perform geologic investigations, he or she should never be placed in the position of reviewing his or her own report, for that is no review at all. A different type of conflict commonly exists in a jurisdiction where the geologic review is performed by a consulting geologist who also is practicing commercially (performing geologic investigations) within the same jurisdictional area. Such situations should be avoided, if at all possible.

GEOLOGIC REVIEW

The Report

The critical item in evaluating specific site investigations for adequacy is the resulting geologic report. A report that is incomplete or poorly written cannot be evaluated and should not be approved. As an expediency, some reviewers do accept inadequate or incomplete reports because of their personal knowledge of the site. However, unless good reasons can be provided in writing, it is recommended that a report not be accepted until it presents the pertinent facts correctly and completely.

The conclusions presented in the report regarding the geologic hazards or problems must be separate from and supported by the investigative data. An indication regarding the level of confidence in the conclusions should be provided. Recommendations based on the conclusions should be made to mitigate those geology-related problems which would have an impact on the proposed development. Recommendations also should be made concerning the need for additional geologic investigations.

Report Guidelines and Standards

An investigating geologist may save a great deal of time (and the client's money), and avoid misunderstandings, if he or she contacts the reviewing geologist at the initiation of the investigation. The reviewer should not only be familiar with the local geology and sources of information, he or she also should be able to provide specific guidelines for investigative reports and procedures to be followed. Guidelines and check-lists for geologic or geotechnical reports have been prepared by a number of reviewing agencies and are available to assist the reviewer in his or her evaluation of reports (e.g., DMG Notes 42, 44, 46, 48, and 49; California Department of Conservation, Division of

Mines and Geology, 1997). A reviewer also may wish to prepare his or her own guidelines or check-lists for specific types of reviews.

If a reviewer has questions about an investigation, these questions must be communicated in writing to the investigator for response. After the reviewer is satisfied that the investigation and resulting conclusions are adequate, this should be clearly indicated in writing to the reviewing agency so that the proposed development application may be processed promptly. The last and one of the more important responsibilities of the reviewer should be implementation of requirements assuring report recommendations are incorporated and appropriate consultant inspections are made.

The biggest problem the reviewer faces is the identification of standards. These questions must be asked: "Are the methods of investigation appropriate for a given site?" and "Was the investigation conducted according to existing standards of practice?" Answers to these questions lie in the report being reviewed. For example, a reported landslide should be portrayed on a geologic map of the site. The conclusion that a hazard is absent, where previously reported or suspected, should be documented by stating which investigative steps were taken and precisely what was seen. The reviewer must evaluate each investigative step according to existing standards. It should be recognized that existing standards of practice generally set minimum requirements (Keaton, 1993). Often the reviewer is forced to clarify the standards, or even introduce new ones, for a specific purpose.

Depth (Intensity) of Review

The depth of the review is determined primarily by the need to assure that an investigation and resulting conclusions are adequate, but too often the depth of review is controlled by the time and funds available. A report on a subdivision (e.g., for an EIR or preliminary report) may be simply evaluated against a check-list to make certain it is complete and well-documented. Additionally, the reviewer may wish to check cited references or other sources of data, such as aerial photographs and unpublished records.

Reviewers also may inspect the development site and examine excavations and borehole samples. Ideally, a field visit may not be necessary if the report is complete and well-documented. However, field inspections are of value, and generally are necessary to determine if field data are reported accurately and completely. Also, if the reviewer is not familiar with the general site conditions, a brief field visit provides perspective and a visual check on the reported conditions. Whether or not on-site reviews are made, it is important to note that the geologic review process is not intended to replace routine grading inspections that may be required by the reviewing agency to assure performance according to an approved development plan.

Review Records

For each report and development project reviewed, a clear, concise, and logical written record should be developed. This review record may be as detailed as is necessary, depending upon the complexity of the project, the geology, and the quality and completeness of the reports submitted. At a minimum, the record should:

1. Identify the project, permits, applicant, consultants, reports, and plans reviewed;

2. Include a clear statement of the requirements to be met by the parties involved, data required, and the plan, phase, project, or report being considered or denied;

3. Contain summaries of the reviewer's field observations, associated literature and aerial photographic review, and oral communications with the applicant and the consultant;

4. Contain copies of any pertinent written correspondence; and

5. The reviewer's name and license number(s), with expiration dates.

The report, plans, and review record should be kept in perpetuity to document that compliance with local requirements was achieved and for reference during future development, remodeling, or rebuilding. Such records also can be a valuable resource for land-use planning and real-estate disclosure.

Appeals

In cases where the reviewer is not able to approve a geologic report, or can accept it only on a conditional basis, the developer may wish to appeal the review decision or recommendations. However, every effort should be made to resolve problems informally prior to making a formal appeal. An appeal should be handled through existing local procedures (such as a hearing by a County Board of Supervisors or a City Council) or by a specially appointed Technical Appeals and Review Panel comprised of geoscientists, engineers, and other appropriate professionals. Adequate notice should be given to allow time for both sides to prepare their cases. After an appropriate hearing, the appeals decision should be in writing as part of the permanent record.

Another way to remedy conflicts between the investigator and the reviewer is by means of a third party review. Such a review can take different paths ranging from the review of existing reports to in-depth field investigations. Third party reviews are usually done by consultants not normally associated with the reviewing/permitting agency.

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DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

HOLLYWOOD COMMUNITY PLAN AREA

Hollywood Community Plan Update

ENV-2005-2158-EIR
CPC no. 97-0043
State Clearinghouse No. 2002041009
Council Districts 4, 5 and 13

Project Location: The Hollywood Community Plan covers 25 square miles, extending roughly south of the Cities of Burbank and Glendale and the Ventura Freeway, west of the Golden State Freeway, north of Melrose Avenue and east of Mulholland Drive and the Cities of West Hollywood and Beverly Hills, including a strip of land south of the City of West Hollywood and north of Rosewood Avenue, between La Cienega Boulevard and La Brea Avenue.

Project Description: The Proposed Hollywood Community Plan (Proposed Plan) includes changes in land use designations and zones that are intended to accommodate growth anticipated in the SCAG 2030 Forecast and allow for additional development. Hollywood is a prime location for transit-oriented development. The investment in transit infrastructure in Hollywood provides an opportunity for integrating transportation planning with land use planning. The recommended pattern of land use directs future growth to areas of Hollywood where new development can be supported by transportation infrastructure and different types of land uses can be intermingled to reduce the length and number of vehicle trips. Mixed-use development around Metro stations and transit corridors would give residents and visitors mobility choices that would enable reduction in the number and length of vehicle trips thus reducing greenhouse gas emissions associated with travel behavior, in accordance with recent legislation (SB 375). As part of redirecting growth, the Proposed Plan includes removing and/or revising development limitations on commercial zones and multi-family residential zones that were imposed during the previous Update in 1988. The Proposed Plan also contains policies and programs to protect the character of low-scale residential neighborhoods and the rich built history of key buildings and places that are considered historically and culturally significant. Modified street standards are proposed to align standards with existing conditions and use of streets, as well as accommodate features of streets that are identified as Historic-Cultural Monuments, such as the Hollywood Walk of Fame. Proposed land use changes would be implemented by Plan amendments, zone changes, and height district changes and other long-range implementation programs.

PREPARED BY:
Los Angeles City Planning Department
March 2011

American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

Alquist-Priolo Earthquake Fault Zoning Act: The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act) signed into law in December of 1972, requires the delineation of zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy across these traces. Cities and counties must regulate certain development projects within the zones, which include withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement. Surface fault rupture is not necessarily restricted within an Alquist-Priolo Zone. As mentioned above, the project area is not located within or immediately adjacent to an Alquist-Priolo fault zone.

Seismic Hazards Mapping Act: The California Geographical Survey provides guidance with regard to seismic hazards. Under California's Geographical Survey's Seismic Hazards Mapping Act, seismic hazard zones are identified and mapped to assist local governments in land use planning. The intent of this act is to protect the public from the effects of strong ground shaking, liquefaction, landslides, ground failure, or other hazards caused by earthquakes. In addition, California Geographical Survey's Special Publication, Guidelines for Evaluating and Mitigating Seismic Hazards in California, provides guidance for the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations.

Local Standards

The existing City of Los Angeles regulates development in hillside areas (Planning and Zoning Code Section 12.21(A)17).

IMPACT ASSESSMENT

Threshold of Significance

According to Appendix G, the impacts from the proposed Plan would be considered significant if it would:

June 17, 2013

Robert P. Silverstein, Esq.
The Silverstein Law Firm, APC
215 N. Marengo Avenue, 3rd Floor
Pasadena, CA 91101

SUBJECT: **Review and Analysis of Millennium Hollywood Project Fault Investigation Study Dated November 30, 2012 by Langan Engineering & Environmental Services**

Dear Mr. Silverstein:

INTRODUCTION, QUALIFICATIONS AND REPORT ORGANIZATION

This firm was retained by your office to review the Fault Investigation Report dated November 30, 2012 prepared by Langan Engineering & Environmental Services (November Langan Report--(see **Exhibit A**). We understand from you that the November Langan Report was not included by the City of Los Angeles as part of the Draft or Final EIR for the Millennium Hollywood Project (Millennium Project), or otherwise distributed to the public, and that it was discovered and obtained by your office on or about June 4, 2013. For this review, we also utilized other available reports to determine the adequacy of the subject fault investigation described in the November Langan Report. The other reports accessed included: 1) the draft (DEIR) and final (FEIR) environmental impact reports for the Millennium Project; 2) the May 2012 Langan Preliminary Geotechnical Report for the Millennium Project; 3) the City of Los Angeles Safety Element (1996); 4) two fault investigation reports focused on the property by Crook and Proctor (1992) and Dolan and others (1997); and 5) other readily available maps and reports relating to the potential for active earthquake faults to exist near, at, and/or on the Millennium Project Site. Items 4 references are attached (see **Exhibit B**).

I have been a licensed Professional Geologist and Certified Engineering Geologist in the State of California since 1972. My resume is attached as **Exhibit C**.

This letter report includes: 1) a brief description of the proposed project as we understand it; 2) brief comments on the DEIR and the FEIR as related to fault rupture, which is a specific issue called out in the CEQA Appendix G Guidelines for environmental impact studies; 3) brief comments on the May 2, 2012 Langan report; and 4) comments on the subject November Langan report. For item 4, subsections refer to topics/issues from the subject November Langan Report.

MILLENNIUM PROJECT DESCRIPTION

The Millennium Project Site is located in the Hollywood area of the City of Los Angeles, California. The Site lies between Ivar Avenue to the west, Yucca Street to the north, Argyle Avenue to the east, and the Pantages Theatre and other office or hotel buildings to the south. Vine Street bisects the Project Site into a "West Site" and an "East Site." The Capitol Records Building and other historic structures are located on the East Site.

The Millennium Project, located on these 4.47 acres, proposes a total of 1,166,970 square feet of developed floor area and more than 800,000 square feet of underground and above-ground parking. The Millennium Project Applicant indicates that the Concept Plan includes podium buildings rising up to 12 stories, a possible hotel tower, and two towers of offices or residential use up to 55 stories or 585 feet.

For the East Site, the proposed new construction is to be placed on the southern portion of the property down to the southern property line so as to provide a separation distance from the historic Capital Records Building which is located on the northern half of the East Site. The proposed 585-foot tower on the East Site would be at or adjacent to the southern property line, and in most scenarios, facing Vine Street.

For the West Site, the proposed new construction, including a potential 200-room hotel tower, would run from the northwest corner at Ivar Avenue and Yucca Street southeast to the portion of the property that faces Vine Street. The proposed 585-foot tower on the West Site would be set back somewhat from Vine Street but rise out of a podium structure up to 12 stories high.

THE DEIR AND FEIR FOR THE MILLENNIUM HOLLYWOOD PROJECT

DEIR: The DEIR contains one paragraph devoted to fault rupture (page IV.D-2). Citations to supporting information, data, and maps are direct and indirect with the assumption that the May 2, 2012 Langan report (May Langan Report) is the primary source. This report is not a fault investigation report, but is a preliminary geotechnical engineering study that has this single paragraph devoted to fault rupture. In the DEIR and the May Langan Report, reliance for the "closest fault" being "0.4 miles from the Project Site" is not specific as to what fault or what direction from the Project Site. From the references cited we can determine:

1. The May Langan Report shows only the 1996 City of Los Angeles Safety Element Fault Rupture Study Area (FRSA) Map, but shows no actual fault, however suggesting it is south of the Millennium Project Site within the FRSA;
2. The City of Los Angeles ZIMAS system shows no fault locations and only provides a GIS computed distance to the Hollywood fault, which we determined from the system to be 0.49 to 0.60 mile depending upon the parcel selected. This suggests (by selecting progressively more southerly parcels) the fault is programmed into the City's ZIMAS system as north of the Project Site;
3. A reference to CDMH 2002 (likely intended to be CDMG (2002)) is to an outdated regional fault map with no detailed information on the Hollywood fault location.
4. An unspecified reference to CGS is likely to something called "Active Near-Source Fault Zones map" noted in the May Langan Report and in the April 28, 2011 City of Los Angeles Initial Study where the 0.4 miles (0.63 km) may first appear, but the source for the statement that the fault is 0.4 miles from the Site is unspecified and thus unknown.

Our conclusion from the DEIR paragraph and the May Langan Report is that the City Initial Study Geology and Soils item a.1 (fault rupture) discussion was used nearly intact and considered no other research. In fact, we believe none of the sources fully cited in the DEIR show a fault location.

In 2010, the California Geological Survey (CGS) published its 2010 Fault Activity Map of California, which became the primary source for determining if a location in California might be underlain by an active or potentially active fault. In the pamphlet accompanying the map, one can determine what reports were utilized to make the location determination for each fault. A copy of the statewide CGS 2010 Fault Activity Map of California (available online at http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html) and relevant excepts from the accompanying pamphlet are attached as **Exhibit D**. The Hollywood fault (Fault No. 392) is listed and shows several reports that form the basis for the State's most recent and credible active fault location map. This authoritative source was not used for the DEIR or the May Langan Report.

FEIR: The November Langan Report documenting the fault investigation was prepared, based on its date, at least 3 months prior to the publication of the FEIR and discusses the potential for faulting through the West and East Sites south of Yucca Street and crossing Vine Street. The FEIR does not mention this November Langan Report or its findings. The November Langan Report is not attached as one of the A through J appendices, and Responses appear to only refer to the DEIR and the May Langan Report used to prepare the Geology and Soils section for the DEIR (see above). At least two fault rupture related comments (Nos. 24-4 and 45-9) were responded to in the FEIR, but the November Langan Report findings are not mentioned in support of the Responses. In fact, the commenter for Comment No. 45-9 seems to recognize (without specifically citing) the existence of the technical studies and maps (Crook and Proctor, 1992; Dolan and others, 1997) mentioned in the November Langan Report.

> **"Comment No. 45-9**
> *Since there is a major earthquake fault at Yucca and Vine Street*, it is a danger to build these skyscrapers in that vicinity. I believe further study should be done on this. In the event of a major earthquake, those skyscrapers would create a huge problem. Large numbers of people would rush out of the buildings into the street, creating even more of a challenge for fire and police vehicles to get through.
>
> **Response to Comment No. 45-9**
> For additional information regarding fault rupture and the potential for a major earthquake to occur, please refer to Response to Comment 24-4 (Anderson, Robert) above."

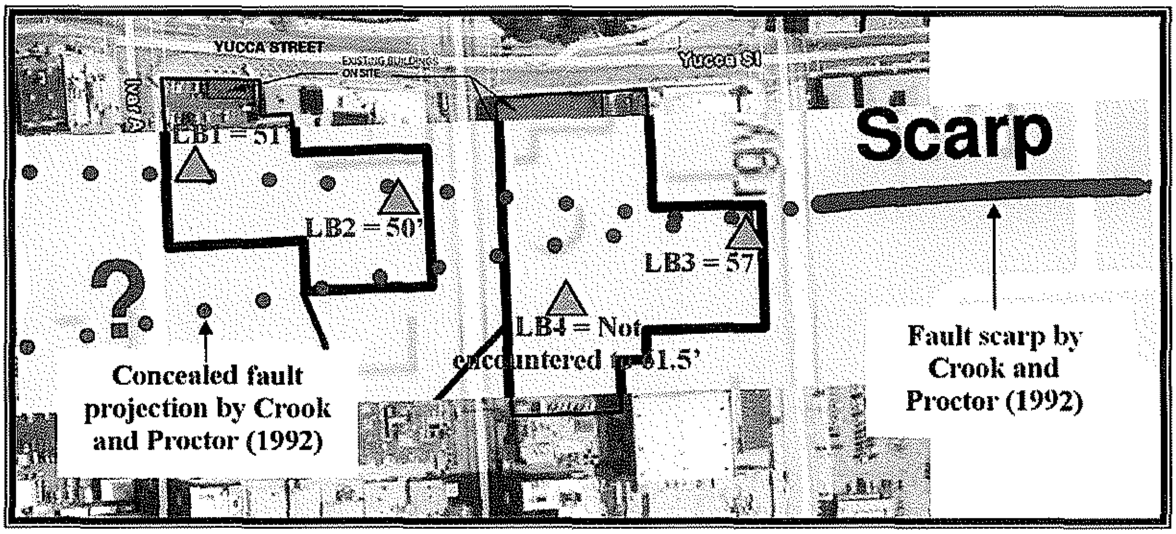
It seems inappropriate that the November Langan Report was not available to the public prior to or in conjunction with the DEIR and that the November Langan Report was not referenced in the Responses to Comments No. 24-4 and 45-9 in the FEIR. As discussed for the DEIR, the 2010 CGS Fault Activity Map of California also was not used in the FEIR.

THE MAY 2012 PRELIMINARY GEOTECHNICAL STUDY

General Observations: The May and November Langan Engineering geotechnical and fault investigation reports do not contain key information available at the time from the 2010 CGS Fault Activity Map of California and its cited references. This is discussed above and in our opinion leads to conclusions in both reports related to the location and character of the Hollywood fault that are incomplete with regard to the Millennium Project Site. Also noted above, and as you indicated, the November Langan Report was not released to the public or included with the DEIR or FEIR and is the only report we are aware of that supports what we believe is the incorrect DEIR/FEIR conclusions that no active faults exist on the Project Site. In addition, the November Langan Report only investigated the West Site and no fault investigation was conducted for the East Site.

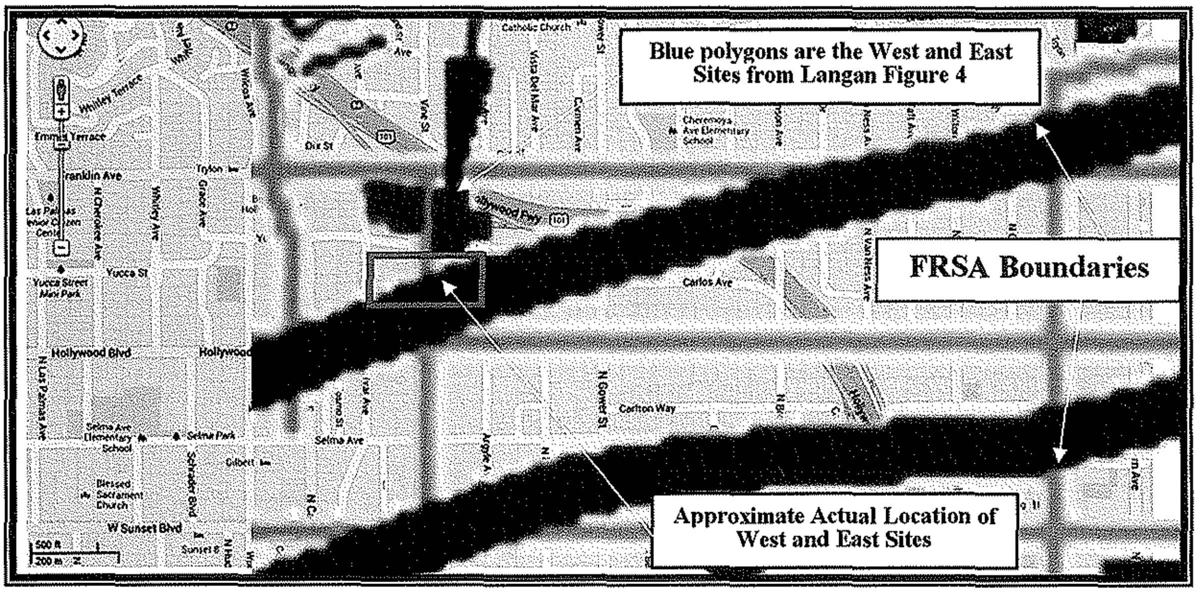
Potential Groundwater Barrier: As indicated in the DEIR and FEIR discussions above, the statement that the Hollywood fault is 0.4 miles from the Project Site is not supported by the references cited in the May Langan Report. One aspect of the May Langan Report not discussed in the report or the DEIR/FEIR with respect to faulting is the information from the hollow stem auger borings LB1 through LB4. The borings appear to have been laid out on the site for geotechnical investigation purposes to be within potential building footprints. They were oriented parallel to the Hollywood fault trend, not perpendicular as would be required for a fault study. However, an important finding was not reported (see Figure 1 above) as discussed below.

FIGURE 1 – Crook and Proctor Fault Scarps with Langan May 2012 LB Borings Superimposed



One of the important features of the Hollywood fault, in some locations, is it often serves as a groundwater barrier. Because at some locations the fault creates a clay-rich gouge material, water flowing southward from the Santa Monica Mountains on the north is trapped behind the fault, which causes shallower water immediately north of the fault compared to immediately south of the fault. Groundwater levels are often many tens of feet deeper on the south. The May Langan Report (their Figures 1 and 2, and the boring logs) shows that groundwater was detected at consistent depths in borings LB1, LB2, and LB4 at 50 to 57 feet deep. These locations are clearly north of the Crook and Proctor (1992) fault locations, except for LB4, which is almost on the fault. LB3 (shows as groundwater not encountered to 61.5 feet) is clearly south of the mapped faults. The most straightforward explanation for this is the presence of a fault along the Crook and Proctor trend backing up groundwater north of the Hollywood fault. Had LB4 been considered in the fault investigation program, it should have been deepened to determine actual groundwater depth at this location. We believe that LB3 groundwater depth indicates the fault to be just south of its mapped location.

FIGURE 2 – Langan May 2012 Project Location and City Fault Rupture Study Area (FRSA) Superimposed Over Street Map



Blue polygons are the West and East Sites from Langan Figure 4

FRSA Boundaries

Approximate Actual Location of West and East Sites

Project Site Location Relative to the FRSA Boundary: In the May Langan Report, the blue polygons, used to represent the Millennium Project's West and East Site locations, are shifted some 850 feet to the north of their actual location south of Yucca Street. If one takes the lines and streets of Langan's Figure 4 and overlays it on a scaled map of Hollywood, it shows Langan drew the Millennium Project Site just south of Franklin Avenue where the Hollywood freeway is located. Figure 2 above shows the FRSA, the Langan-drawn blue polygon locations, and a red rectangle that we have included showing the Millennium Project Site location, which is south of Yucca Street.

NOVEMBER 30, 2012 FAULT INVESTIGATION REPORT

It is our understanding that Langan prepared a Fault Investigation Report for the Project Site after, in response to the May Langan Report discussed above, the City Building and Safety Department decided to require preparation of such a study. Contrasted with the May Langan Report, Figures 3 and 4 of the Fault Investigation Report are substantially similar to Figures 4 and 5 of the May Langan Report. As with the May Langan Report, there is no neighborhood-level analysis of the location of the Hollywood fault lines or an accurate depiction of the Fault Rupture Study Area (FRSA) northern boundary line crossing the property. Following are observations regarding the Fault Investigation Report analysis and some of the documentation it relies upon.

Introduction (Page 1): The second sentence of the Introduction of the November Langan Report on page 1 again indicates that that Project Site is "not located within a current state or city mandated fault investigation zone". As explained relative to the May Langan Report, this Figure 3 once again shows the Project Site adjacent to Franklin Avenue rather than within the northern boundary of the FRSA. If this was recognized by City of Los Angeles staff, their fault investigation requirement would be consistent with discovering the depiction of the Project location in the Figure 3 of the May Langan Report. Given this set of facts, as you indicated it is unclear why it is stated that the City's requirement to investigate for on-site faults was based solely on Section 1803.5.11 of the Los Angeles Building Code since the Project Site "is located within 500 feet of the Hollywood fault trace (as mapped by the California Geologic Survey (CGS) and the United States Geological Survey (USGS))." This seems to be inconsistent with the statement that the Hollywood Fault is 0.4 miles from the Project Site. It is unclear if the City realized that reliable maps show (though not in the Langan Reports) fault traces mapped directly through the Project Site. This issue is discussed further in relation to other figures in the November Langan Report.

Hollywood Fault (page 4): The discussion of the Hollywood fault begins with Langan again stating that the ". . .fault is reportedly located approximately 0.4 miles from the Site", which as discussed above is not accurate based on references fully cited. Once again, there is no citation to any authoritative information source that can be independently verified.

Summary of Prior Fault Studies (pages 4-5): In this portion of the November Langan Report, there are brief summaries of prior studies of the locations and characteristics of the Hollywood fault. Crook and Proctor (1992) used aerial photograph evidence of scarp features and observations in borings to project two fault traces directly through the Project Site (Plate 1). A copy of the Crook and Proctor study is attached as part of **Exhibit B**.

The November Langan Report's description and discussion of the Dolan and others (1997) study is incomplete. Dolan and others did not perform an aerial photographic review as indicated in the November Langan Report (the words "aerial", "photograph", and "photo" do not appear in the Dolan report). Their geomorphic study was based on using 1920s topographic maps to map fault scarps (a steeper slope between two flatter areas – the fault is below and in front of the scarp) and then they field checked the topographic results to confirm a scarp existed. They accounted for possible grading and ruled that out as a means to form the scarps. There is no statement by Langan that Figure 4 of the Dolan and others 1997 study depicts a fault scarp trace through the northern portion of the Project Site. Dolan and others also presented evidence of data to the west where there is a groundwater barrier along the trend of the scarps (darker shading in Figure 4 of Dolan and others 1997 study); this is not reported in the November Langan Report. Additionally, the November Langan Report does not mention that the Dolan and others (1997) study confirmed the 1992 report of Crook and Proctor, in particular that they agreed with the existence of the southern Crook and Proctor fault strand, which traverses the center of the Millennium East Site and the southern edge of the West Site (see Figure 1 above).

Based upon review of the November Langan Report descriptions of the work of Crook and Proctor (1992) and Dolan and others (1997), it appears that significant aspects of those two key studies are not included or not completely summarized. Crook and Proctor have worked in this portion of southern California for well over 45 years and have numerous peer-reviewed publications and geologic maps. Dolan is a key technical contributor to the Southern California Earthquake Center and has numerous papers published in peer-reviewed journals, others dealing with faulting along the Santa Monica Mountains. With respect to Crook and Proctor (1992) the November Langan Report states:

> *"One (1) of the Metro Rail boring encountered a rock fragment overlying alluvium, which the authors interpreted as Miocene age sedimentary rock overlies alluvium; thereby suggesting two (2) east-west trending branches of the Hollywood fault could project through the Site. Note that their conclusions are based on limited subsurface data and additional sampling was not performed to confirm if the rock fragment was from a bedrock unit or from a boulder within the alluvium."*

In our opinion, this diminishes Crook and Proctor's work, when in fact their report states that Metro Rail boring 28B encountered 10 feet of fault breccia (not a single rock fragment) consisting of brecciated sandstone, alluvium, and siltstone, at 122 feet deep in a hole otherwise consisting of entirely alluvium to 220 feet deep as shown on their Figure 2b. In other situations we have seen, such a description may well have prompted a program of trenching, geophysics, and properly placed bore holes to prove or disprove these observations.

Plate 1 – Hollywood Fault Locales: Plate 1 depicts two traces of the Hollywood fault, one lying approximately 800 feet north of the Project Site (USGS, 2005) and another fault trace is shown south of Franklin Avenue within approximately 400 feet of the Project Site attributed to Crook and Proctor. The Crook and Proctor report clearly shows in their Figures 1 and 2a that they map the two other fault scarp traces of the Hollywood Fault through the Millennium Project Site, both East and West Sites. In this case, once again, Langan's maps confirm that these faults are much closer than 0.4 miles (2112 feet) from the Millennium Project Site. In fact, they are located on the Project Site.

Plate 1 also depicts existing scarps, bore holes, and other data by Crook and Proctor (1992) that support their suspected location of fault traces through the Project Site. Had this Plate been part of the Geology and Soils data analyzed as part of the Draft EIR and reviewed by City staff with the May Langan Report, in our professional opinion it is likely that a full fault investigation of the entire Project Site would have been required including borings, trenching, geophysical surveys, and other modern techniques to determine whether and where active faults are located on the Project Site.

Plate 2 – Subsurface Profile A-A': The November Langan Report does not discuss the interpretation of subsurface profile (cross-section) A-A' in Plate 2, which shows the geologic units defined by analysis of the sonic drilling samples. There is mention of the general parameters of the information shown on cross-section A-A', but no detailed interpretation and analysis of what bedding or structural features are present, and how these may relate to the presence or lack of faulting. The only comment is that there appears to be no offset of the groundwater surface as shown in the sonic borings. This may be significant, but the Hollywood Fault (indeed many faults) are not everywhere a perfect barrier to water flow. Also, more reliable water levels were obtained for the May Langan Report discussed earlier. Therefore, the groundwater surface alone is not dispositive with regard to fault activity.

Other interesting information is shown in cross-section A-A' but not discussed in the November Langan Report text. There is no discussion of the elevation difference of the base of the young alluvium (Qya) where it overlies the top of the older alluvium (Qoa). On the north side of the section, this geologic contact is nearly a perfect straight line through Borings B4, B3, and B6.

But, at Borings B2 and B5, the surface suddenly jumps up some 4 to 5 feet, only to then drop down again about 12 feet at Boring B1. From the level surface defined by B4, B3, and B6 to the surface at B1, there is a drop of 8 feet with a high point in between. Since the Hollywood fault has a movement of up on the north side, this 8 feet of "up-on-the-north" elevation difference must be explained, and a reverse fault may be the best explanation. The 8 feet, if it is fault displacement is at the low end of the projections of Dolan and others' observations of roughly 9 to 21 feet.

In addition, in this same geologically questionable area between Borings B2/B5 and B1, there is almost no correlation of the sedimentary units, to the extent they were fully mapped by Langan. Units in Boring B1 are predominantly CL (a clay-rich material) and the materials in the area of Borings B2/B5 at the same elevations (roughly 320 to 355 feet elevation) are SP, SW, and SM (various types of sand). These two type of materials are laid down in completely different environments (e.g., a lake for clay versus a river for sand) so should not normally be juxtaposed against one another. While some other explanation may be suggested, this juxtaposition of unlike deposits combined with the drop in the base on the Qya immediately above, and the deeper groundwater in LB3 indicates that north-side-up offset on the Hollywood fault a logical explanation. The November Langan Report does not recognize or discuss either significant geologic feature.

CALIFORNIA GEOLOGICAL SURVEY 2010 FAULT ACTIVITY MAP OF CALIFORNIA

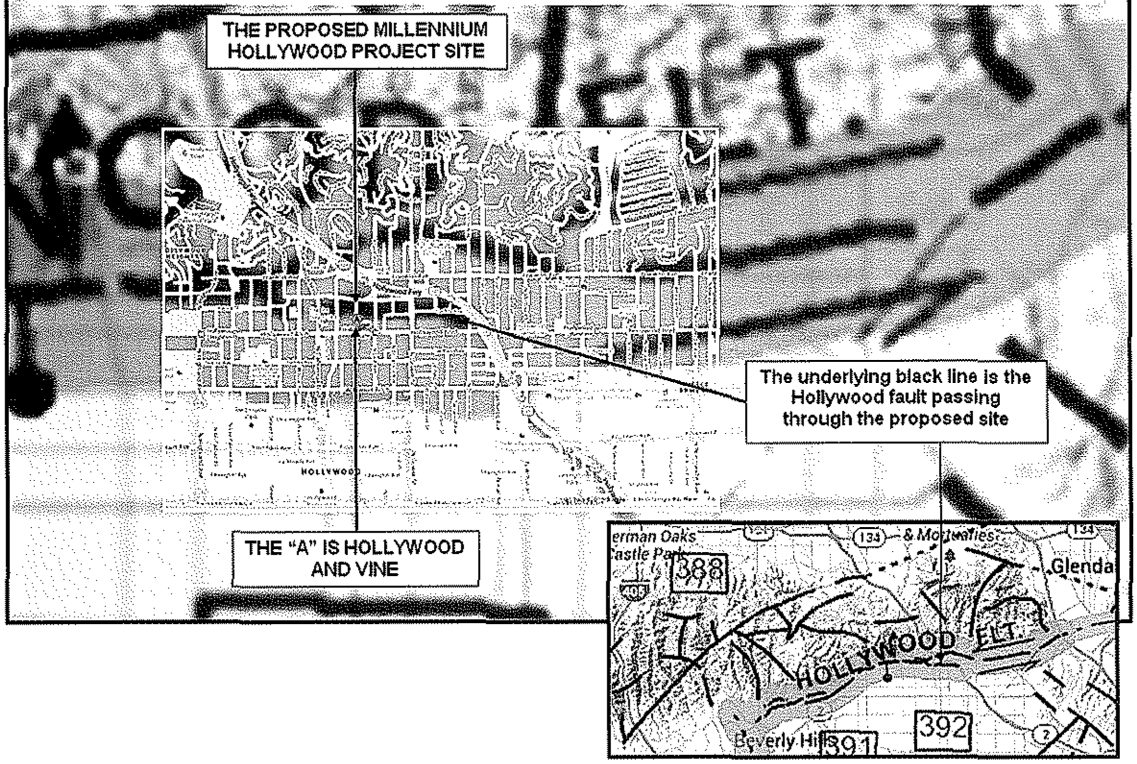
As mentioned above, the California Geological Survey published in 2010 its Fault Activity Map of California, which has become the primary source for determining if a location in California might be underlain by an active or potentially active fault. The Hollywood Fault (Fault No. 392) is shown on the map, but this recent comprehensive source was not used for the DEIR, the May Langan Report, the November Langan Report, or the FEIR. As shown in Figure 3 below, this State map shows the Hollywood fault potentially passing through the Hollywood Millennium Project Site as documented by Crook and Proctor (1992). The description of the orange band around the fault classifies it as "Holocene fault displacement during past 11,700 years without historic record." Most consider the presence of this fault on the 2010 CGS Fault Map as evidence of its existence and active status unless proven otherwise.

CONCLUSIONS

Considering all of the foregoing discussion, we conclude that:

1. The fault investigation technical studies supporting the DEIR and FEIR have not adequately considered all relevant existing data describing possible or probable locations of the Hollywood fault at and near the Hollywood Millennium Project Site;
2. For the fault location data cited there are inconsistencies in the stated distance from the Hollywood Millennium Project Site to the Hollywood fault, which may have affected studies required by the City;

FIGURE 3 – City Street Map Superimposed over 2010 California State Fault Activity Map Showing Hollywood Fault (No. 392)


THE PROPOSED MILLENNIUM HOLLYWOOD PROJECT SITE

The underlying black line is the Hollywood fault passing through the proposed site

THE "A" IS HOLLYWOOD AND VINE

3. May Langan Report investigations have provided information suggesting a possible groundwater barrier south of their borings LB1, LB 2, and LB4;
4. November Langan Report investigations have provided information suggesting a possible offset of the young and older alluvium contact and possible fault juxtaposition of unlike geologic layering between borings B2/B5 and B1;
5. The FEIR does not reference the November Langan Report or the Crook and Proctor (1992) and Dolan and others (1997) studies or the California Geological Survey 2010 Fault Activity Map of California, which individually and collectively provide sufficient data to suspect active faulting through the Hollywood Millennium Project Site.

Thank you for the opportunity to participate in this process and to offer the above comments.

Respectfully Submitted,
Wilson Geosciences Inc.

Kenneth A. Wilson

Kenneth Wilson, Principal Geologist
Professional Geologist No. 3175
Certified Engineering Geologist No. 928

EXHIBIT A

FAULT INVESTIGATION REPORT

for the

HOLLYWOOD DEVELOPMENT
VESTING TENTATIVE TRACT 71837
1720-1770 N. VINE STREET
1745-1753 N. VINE STREET
6236-6334 W. YUCCA STREET
1733-1741, N. ARGYLE AVENUE
1746-1764 N. IVAR STREET
HOLLYWOOD, CALIFORNIA

Prepared For:

Millennium Partners
301 Mission Street, Level B1
San Francisco, California 94105

Prepared By:

Langan Engineering & Environmental Services
18662 MacArthur Boulevard, Suite 456
Irvine, California 92612

DAN ROYDEN EBERHART
No. 965

Dan R. Eberhart, PG, CEG
Associate
CEG #965

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

30 November 2012
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TABLES

FIGURES

APPENDICES

PLATES

INTRODUCTION

As requested by Millennium Hollywood, LLC (Millennium) and Sheppard Mullin Richter & Hampton, LLP (Sheppard Mullin), we completed a fault investigation for the proposed Millennium Hollywood Development (Site) in Hollywood, California. The fault investigation was performed because although fault investigations have not been traditionally required by the City of Los Angeles' (City) Department of Building and Safety within or immediately adjacent to the Site and the Site is not located within a current state or city mandated fault investigation zone, the City has required a fault investigation be performed within the Site in accordance with Section 1803.5.11 of the Los Angeles Building Code since it is located within 500 feet of the Hollywood fault trace (as mapped by the California Geologic Survey (CGS) and the United States Geological Survey (USGS).

The purposes of this report are to:

- Summarize our understanding of the current development plans for the Site,
- Provide an overview of available information on active faults in the immediate vicinity of the Site, and
- Present the details and results of our fault investigation within the Site.

An active fault, as defined by the CGS and Los Angeles County Department of Public Works is a fault that has ruptured in the most recent 11,000 years (Holocene age). New constructions intended for human occupancy are prohibited from spanning active faults per the Alquist-Priolo Special Study Zones Act of 1972.

Previously, Langan performed a limited geotechnical field investigation within the Site in support of the project Environmental Impact Report (EIR). The results of the previous investigation are presented under a separate cover, "Preliminary Geotechnical Engineering Study, Millennium Hollywood Development, Hollywood, California," dated 2 May 2012.

SITE LOCATION AND DESCRIPTION

The Site is located within the Hollywood Community Plan Area in the City of Hollywood. The Site is bound by Yucca Street in the north, Ivar Avenue in the west, Argyle Avenue in the east, and mixed-use structures in the south. The Site is bisected by Vine Street, which thereby creates two development sub-areas referred to as the West Site and the East Site. Refer to Figure 1 – Site Location Map. The West Site is approximately 78,629 square feet (1.81 acres) and the East Site is approximately 115,866 square feet (2.66 acres), for a combined lot area of approximately 194,495 square feet (4.47 acres).

West Site

The West Site is bound by Yucca Street and two (2) mixed-use buildings to the north, Ivar Avenue on the west, Vine Street to the east, and two (2) mixed-use buildings to the south. The two (2) buildings bordering the West Site to the north include a two- (2) story art-deco building with retail, office, and residential uses and the five- (5) story Marsha Toy building at the southwest corner of Yucca Street and Vine Street. The Marsha Toy building is currently occupied by the American Musical and Dramatic Academy (AMDA). The buildings bordering the West Site to the south include the two- (2) story Avalon Theater building fronting Vine Street, and a one- (1) story commercial office building fronting Ivar Avenue.

The West Site is presently occupied by an at-grade parking lot and an Enterprise Rent-A-Car facility. The Enterprise property is located on the southeast corner of Yucca Street and Ivar Avenue and consists of a one- (1) story building, a car wash and detailing area under a canopy, and an at-grade parking lot. The remainder of the West Site is an asphalt-paved parking lot, portions of which are (i) operated by Coast Parking, LLC and accessible to the public for a fee, (ii) permit parking for Capitol Records employees, and (iii) reserved parking for Galpin Studio Rentals of Hollywood. Elevations within the West Site were inferred from a topographic map prepared by Hall & Foreman, Inc. to be sloping southeastward from approximately el. 406 feet near the northwest corner to approximately el. 387 feet near the southeast corner of the West Site. As much as approximately 10 feet of elevation change occurs at the boundary between the Enterprise site and the remainder of the West Site, south of the Enterprise property; the change in grade is facilitated by a south-facing slope, between one (1) foot high in the west and three (3) feet high at the east end and a three (3) to 10 foot high concrete masonry unit (CMU) retaining wall located east of the slope. The height of the CMU wall increases toward the east.

East Site

The East Site is bound by Yucca Street and the former KFWB radio station property to the north, Vine Street to the west, Argyle Avenue to the east, and two (2) buildings to the south. The two (2) buildings to the south include the Pantages Theater building at the northwest corner of Hollywood Boulevard and Argyle Avenue and a one- (1) story restaurant building known as the Lexington Social House fronting Vine Street..

The East Site is presently occupied by two (2) buildings and an at-grade parking lot. The Capitol Records building, (1750 North Vine Street), a 13-story building with single story below-grade reverb chambers is located in the northwest portion of the Site and the two- (2) story Gogerty office building is located north of the Capitol Records building along Yucca Street. The remainder of the East Site is an asphalt-paved parking lot accessible to the public for a fee. There are small sheds and a small guard booth associated with the on-site parking operations and several planting areas on the East Site. Elevations within the East Site were inferred from a topographic map prepared by Hall & Foreman, Inc. to be sloping southward from approximately el. 407 feet near the northeast corner to approximately el. 382 and 384 feet near the southwest and southeast corners of the East Site, respectively.

Proposed Development

The Project involves the construction and operation of a new mixed-use and transit-oriented development anchored by the historic Capitol Records Tower building that would transform the series of under-utilized parcels into a pedestrian-friendly development located on approximately 4.47 acres in the Hollywood area of the City of Los Angeles.

According to the Concept Plan project description provided by Millennium a total of approximately 1,166,970 square feet of developed floor area will be constructed. The uses will include residential, commercial, retail, and hotel. The Project will include the construction of towers placed within the development envelope on the East and West Sites. Towers up to 220 feet above ground surface will be located on the northwest portion of the West Site and the east side of the East Site. Towers up to 585 feet above ground surface will be located on the eastern half of the West Site and on the west side of the East Site (south of the Capitol Records building). Up to six (6) levels of excavation are proposed beneath the West and East Sites.

Final structure heights, specific building footprints within the development envelope, final foundation loads, and design lifespan will be refined upon final project design and according to the Project's Development Guidelines and Standards.

Regional Geology and Groundwater

The Site is located in the Central Block of the Los Angeles Basin which is a sedimentary-filled basin in the Peninsular Range geomorphic province. The Central block is bordered by the Santa Monica Mountains to the north, Beverly Hills to the west, the Elysian Hills to the east, and Baldwin Hills and the Central Plain to the south.

Based on the USGS Map of the Los Angeles Quadrangle (2005) and the Dibblee Foundation Map of the Hollywood Quadrangle (1991), the Site is underlain by alluvial fan deposits consisting of Holocene and late Pleistocene age gravel, sand and silt deposited mainly from flooding streams and debris flows. These alluvial fan deposits are reportedly underlain by older late to middle Pleistocene age alluvial fan deposits which generally consist of silt, sand and gravel deposits. Miocene age Monterey Formation sandstone and shale reportedly underlie the late Pleistocene age deposits at an unknown depth. The CGS's Geologic Compilation of Quaternary Surficial Deposits in Southern California, Los Angeles 30' x 60' Quadrangle (2010) map reports the Site is underlain by old alluvial fan deposits (Qof) consisting of late to middle Pleistocene moderately dissected boulder, cobble, gravel, sand and silt underlain by Tertiary age sandstone, siltstone, mudstone, shale, and siliceous and calcareous sediments.

Based on the CGS's Historically Highest Groundwater Contours and Borehole Log Data Locations, Hollywood Quadrangle map, dated 1998, the depth to groundwater within the Site and immediate vicinity is greater than 80 feet below the ground surface and displays a regional trend of increasing depth northward toward the Santa Monica Mountains. Refer to Figure 2 – Historic Groundwater Level Map to observe the reported groundwater trend and approximate Site location.

LOCAL FAULTS

A portion of the Site is located adjacent to the northern boundary of a Fault Rupture Study Area defined in the Safety Element of the City's General Plan (1996). Refer to Figure 3 – City Fault Rupture Study Zone Map. The Site is also located in close proximity to the Puente Hills and Elysian Park thrust faults and the Hollywood fault. Figure 4 – Quaternary Fault Map shows the location of the Site in relation to active faults in southern California.

Puente Hills and Elysian Park Thrust Faults

Data published by the CGS (formerly CDMG) in 2002 indicates the Puente Hills and the Elysian Park blind thrust faults are present more than 1 mile beneath the Site. Blind thrust faults are shallow-dipping (less than 45 degrees) reverse faults that terminate before they reach the ground surface. Since Puente Hills and Elysian Park Thrust faults do not extend to the surface, surface rupture from these faults within the Site is considered to be unlikely.

Hollywood Fault

The CGS's Active Near-Source Fault zone map and the City's ZIMAS system indicate the Santa Monica/Hollywood fault is the closest fault to the Site with the potential for fault rupture; the fault is reportedly located approximately 0.4 miles from the Site. The CGS reports this fault is a sinistral (left-lateral) strike-slip fault with a reverse oblique component of movement and a dip angle of 70 degrees to the north.

The USGS reports the Hollywood fault is an active, sinistral-reverse oblique fault that is an integral part of the east-west frontal fault system (EWFFZ). The fault is reportedly 14 kilometers in length with an average strike of North 76 degrees East (N76E). The dip angle of the fault varies between 25 and 90 degrees to the north.

Additional characteristic subsurface features of the Hollywood fault include:

- The fault acts as a groundwater barrier, producing higher groundwater levels north of the fault than south of the fault and
- The fault juxtaposes Tertiary-age bedrock or Pleistocene-age older alluvial deposits against Holocene-age alluvial deposits of the Los Angeles Basin.

The Hollywood fault is typically reported to be located at the base of the Santa Monica Mountains, south of Franklin Avenue and north of Yucca Street in the vicinity of the Site; however one (1) study indicates that the fault could be located south of Yucca Street. A brief summary of prior publications that discuss the Hollywood fault within the Site and vicinity are presented in the following paragraphs. Refer to the References for additional documents that were reviewed as part of our investigation.

<u>Crook and Proctor</u>

Crook and Proctor (1992) discuss the location and seismic activity of the Hollywood fault as determined by several scarps and observations of two (2) trenches, four (4) borings, and two (2) building excavations at the base of the Santa Monica Mountains in the cities of Los Angeles and Hollywood. The subsurface investigations referenced by Crook and Proctor occurred between 1981 and 1992. The only data south of Yucca Street is from four (4) borings (identified as 28, 28-2, 28A, and 28B) drilled on Cahuenga Boulevard, north of Hollywood Boulevard for the Los Angeles Metro Rail subway alignment in 1981 through 1983. One (1) of the Metro Rail borings encountered a rock fragment overlying alluvium, which the authors interpreted as Miocene age sedimentary rock overlies alluvium; thereby suggesting two (2) east-west trending branches of the Hollywood fault could project through the Site. Note that their conclusions are based on limited subsurface data and additional sampling was not performed to confirm if the rock fragment was from a bedrock unit or from a boulder within the alluvium.

Beyond the limits of the Site, the authors concluded the Hollywood fault trends northeasterly at the base of the Santa Monica Mountains, between Beverly Hills and the Los Angeles River.

Evidence of the Hollywood fault was not proven to exist between the western limit of the city of Beverly Hills and the Pacific Ocean. Refer to Plate 1 – Hollywood Fault Locales for approximate locations of these reported fault scarps in the vicinity of the Site.

Dolan et al.

Dolan et al. (1997) performed an aerial photograph review and concluded that two possible fault scarps were present east and west of the Site. Due to the potential fault scarps, they inferred that buried traces of the Hollywood fault could traverse the Site. Their conclusions are based on geomorphic data available at the time and did not include a subsurface investigation to confirm if buried fault traces were present.

Law/Crandall

Law/Crandall performed a fault investigation on the property located at 1840 North Highland Avenue in 2000. This property is located approximately ½ mile northwest of the Site. Based on this investigation, they identified four (4) active fault strands attributed to the Hollywood fault were located in the northern portion of the property. Active faulting was not detected in the southern portion of this property.

GeoPentech

GeoPentech performed an investigation in 2001 to refine the location of two (2) of the previously identified active faults within the northern portion of the property located at 1840 North Highland Avenue. This consultant further investigated the northern portion of this property in 2004 and identified two (2) other fault strands traverse the northern portion of the property.

Leighton Consulting, Inc.

Leighton Consulting performed a fault investigation at 1805 Highland Avenue in 2011. Based on this investigation, they identified four (4) east-west trending secondary strands attributed the Hollywood fault system. The fault strands were determined to be consistent with the mapped location of the Hollywood fault and its general trend in the region, however the consultant commented that additional investigation would be required to precisely locate the significant active secondary faults within the site.

Stereographic Aerial Photographs

We reviewed various stereographic aerial photographs depicting the Site, taken between 1952 and 1998. Evidence of discernable faulting was not observed within the Site in the photographs. Our interpretation of the photographs suggests the Hollywood fault trends generally east-west and is located beyond the northern limit of the Site.

FAULT INVESTIGATION

As agreed upon with the City on 2 July 2012, we performed a fault investigation using sonic borings within the West Site to investigate for active faulting and limited our investigation to the West Site. A total of six (6) sonic borings, four (4) battered sonic borings (B1 though B4) and two (2) vertical sonic borings (B5 and B6) were performed at the Site as part of our fault investigation. Refer to Figure 5 – Boring and Cross Section Location Map for approximate boring locations. The battered borings were drilled at angles between approximately 30 and 32 degrees from vertical toward the south by Cascade Drilling between 16 July and 21 July 2012 and the vertical sonic borings were drilled by BC2 Drilling on 11 October 2012. Each boring was drilled under the full-time observation of a Langan Geologist to depths between approximately 50 and 98.6 feet below existing grade. Refer to Table 1 – Summary of Sonic Borings for an overview of the boring details. Prior to drilling, Underground Service Alert of Southern California (DigAlert) was contacted and the boring locations were checked for the presence of subsurface utilities by Pacific Coast Locators.

Sampling was performed continuously using high frequency resonant energy to advance a double-cased system. Groundwater levels were measured in each boring at completion of drilling. Each borehole was backfilled with cement grout using the tremie method and capped with rapid set concrete upon completion. The soil cuttings were containerized in 55-gallon drums that were stored on site until the material was characterized as non-hazardous waste and subsequently disposed of at an appropriate facility

Following completion of the fieldwork, the core samples were transported to a storage facility where a Certified Engineering Geologist examined each core using hand lenses and a Munsell Soil Color Chart. The materials were classified using the Unified Soil Classification System (USCS). Refer to Appendix A for the sonic boring logs.

FINDINGS

Subsurface Conditions

The sonic core data indicates the subsurface soils consist of a fill stratum overlying young alluvium (Qya) (less than 11,000 years in age) over old alluvium (Qoa) (greater than 11,000 years in age). Our interpretation of the subsurface material and groundwater conditions observed in the sonic borings is summarized in the following paragraphs. Refer to Plate 2 – Subsurface Profile A-A' for a profile of the subsurface conditions developed from the sonic borings.

Artificial Fill (Af)

A surficial layer of asphalt pavement ranging in thickness from approximately two (2) to three (3) inches was encountered in each sonic boring. An approximately five (5) to eight and a half (8½) foot thick fill stratum (Af) was encountered below the asphalt pavement. The fill primarily consisted of very loose to loose, brown, silty very fine to medium grained sand with a lesser amount of soft to medium stiff sandy silt. Fragments of asphalt and concrete were scattered throughout the fill. Low sample recoveries (between 0 to 50 percent) were retrieved within the fill stratum likely due to the loose nature of the material.

Young Alluvium (Qya)

Young alluvial fan deposits (Qya) were encountered below the fill material to depths between approximately 17½ and 34 feet below existing grade. This unit was the youngest natural unit encountered during our investigation and consisted primarily of loose to medium dense, medium brown to orange brown, silty very fine to fine grained sand with lesser amounts of silty medium to coarse grained sand. Scattered clayey sands, silts, and poorly and well graded sands were interbedded within the silty sands. Low sample recoveries (less than 50 percent) were retrieved within the upper loose materials. Contacts within the strata of unit Qya were generally gradational. The contact between Qya and underlying Qoa was an erosional unconformity.

Old Alluvium (Qoa)

Older alluvial fan deposits (Qoa) were encountered below Qya to the maximum depth explored during this investigation. Overall, Qoa displayed an overall trend of fining particle size from north to south; coarse grained materials (gravels and sands) were encountered in the northern portion of the Site grading to finer size particles (silts and clays) southward, away from the material source, the Santa Monica Mountains. Contacts within the strata of unit Qoa were primarily gradational.

Groundwater

Groundwater was measured upon completion of each boring at depths ranging from approximately 43 feet (B1) to 54½ feet (B4) below existing grade. The measured depths show a trend of increasing depth to groundwater northward within the Site and are approximately 35 to 47 feet higher than the historically highest groundwater levels.

Laboratory Testing

BETA Analytical Inc performed radiocarbon dating using Single-Stage Accelerator Mass Spectrometry (SSAMS) technology on 22 soil samples selected from the cores, to age date the subsurface units within the Site. SSAMS measures the ratio of carbon 14 (^{14}C) and carbon 13/12 ($^{13/12}$C) isotopes in samples. Information on SSAMS dating technology is provided in Appendix B. Separable macrofossils (charcoal, plant, shell, etc) were not found in any of the core samples, therefore sediment was age dated. The results of the SSAMS dating are summarized in Table 2 – Results of Radiocarbon Dating and full details are provided in Appendix C.

Uncertainties in SSAMS Dating of Sediment

The following uncertainties were considered when the age date results were reviewed:

- The sample size required for SSAMS dating is significantly small relative to the size of the subsurface that underlies the Site and the surrounding geographic region; therefore the relationship between the sample size, test results, and the nature of the region's geologic environment from which the sample was collected were considered when the SSAMS test results were applied to specific portions of the subsurface of the Site.
- The carbon content of sediment fluctuates as carbon is transported through the subsurface profile by various processes including, not limited to the following:
    - Reworking, incorporation, and redeposition of older sediment into younger sediment and
    - Transportation of humic acids through sediments by fluctuations in groundwater and percolation of surface water through the subsurface profile, which can introduce carbon of varying ages into the sedimentary units.
- As acids migrate to increasing depths in the subsurface profile, apparent ages of the affected sediment generally report younger ages. This is common of sediments that are not well drained, organic-rich, and/or where water ponds in sediment.

- Climate and biotic and physical/chemical factors affect the rate at which carbon cycles through sediment.

- Sediments that are very low in carbon content at the time of their deposition are generally susceptible to humic acid contamination.

Results of SSAMS Dating

As shown on Table 2, the general trend of the age dated samples indicates increasing sediment age with increasing depth in the sonic borings. In general, the apparent ages reported for samples collected within the shallow alluvium confirm this unit is less than 11,000 years in age; confirming recent alluvium extends to between 17½ and 34 feet below ground surface within the Site. Apparent ages of the deeper alluvium determined the material is greater than 11,000 years in age and therefore older than recent age. Based on these apparent ages, young alluvium overlies old alluvium within the Site. The following anomalies were identified in the sample results:

- Boring B2: An inconsistent apparent date (older material over younger material) was reported at approximately 20 feet below ground surface in boring B2. The soils at this depth were further explored with two (2) additional sonic borings, B5 and B6, cored in the immediate vicinity of sonic boring B2. Apparent age results from borings B5 and B6 samples confirmed the sample results at 20 feet from boring B2 were not representative of the overall stratigraphic environment. The anomalous ages from boring B2 were likely due to sample contamination from portions of the fill stratum falling into the core from shallower depths during coring.

- Boring B5: Groundwater was encountered in boring B5 at approximately 46.5 feet below ground surface and the groundwater bearing sediment was selected for laboratory analysis to determine the effect of groundwater on age dated sediment. The young apparent age reported for this sample with respect to apparent ages of overlying samples, is attributed to the presence of acid(s) that was transported by groundwater to the sediment and lingered in the sample after pretreatment. The age of the analyzed sediment is understood to be older than the apparent age.

- Boring B6: The reported apparent age of the sample from approximately 22 feet below ground surface was likely complicated by fluctuations in carbon content of sediments as carbon cycles through the subsurface profile during reworking, incorporation, and redeposition of older sediment into younger sediment.

DISCUSSION AND EVALUATION

The thin fill horizon present across the surface of the West Site was not considered significant in this evaluation of recent faulting within the Site, therefore only the alluvial units encountered below the fill stratum were examined in depth. Characteristics of alluvial fan environments, regional geologic findings by others, the regional groundwater trend, and apparent ages reported by single-stage radiocarbon dating technology were employed during this evaluation of the subsurface conditions within the Site. Our findings are as follows:

1. The Site is located on a broad alluvial plain at the base of the Santa Monica Mountains. The underlying alluvium was transported from the Santa Monica Mountains and deposited within the Site by gravity and water. As such, the underlying stratigraphic units slope gently away from the mountains and exhibit a trend in fining particle size from north to south, consistent with the character of an alluvial depositional environment at the base of a mountain range. Visual evidence of faulting and/or shearing was not observed in the samples recovered as part of our investigation, therefore changes in alluvial thickness and locale across the Site were attributed to irregularities associated with the alluvial depositional environment and related erosion and not faulting.

2. Geologic publications have been issued by others regarding the location and seismic activity of the Hollywood fault; however urbanization of Hollywood and neighboring cities at the base of the Santa Monica Mountains has obscured the fault trace at the surface. Urbanization of the area has also limited the locations where subsurface explorations can be performed to delineate the fault. Literature by Dolan et al. indicates traces of the Hollywood fault are suspected to be located in the vicinity of the Site; however, the specific location of the fault traces are not well defined and a subsurface investigation was not performed within the Site, prior to this investigation to explore the possible fault traces. The only published studies involving field documented evidence of active faults are for sites north of Franklin Street.

3. The regional trend in historical high groundwater indicates the depth to groundwater increases northward toward the Santa Monica Mountains, of which was observed within the Site. Evidence of a groundwater barrier(s) between borings was not observed within the Site. As such, groundwater within the Site corresponds with the regional trend for groundwater without any interruption attributed to faulting.

4. Detailed inspection of the continuous cores indicate young alluvium consistently overlies older alluvium and revealed no visual evidence of shearing that would be associated with faulting. Radiocarbon dating confirmed that sediments increase in age with depth.

CONCLUSIONS

Based on the results of our investigation, we have concluded that active faulting is not present within the limits of our investigation within the Site as shown on Figure 5.

LIMITATIONS

The findings and conclusions provided in this report are our best judgment, to a reasonable degree of certainty and are based on subsurface conditions inferred from a limited number of borings as well as project information provided by Millennium Partners to date. This report has been prepared for use by Millennium Partners and their project team in their determination of the feasibility of the proposed development. The information in this report cannot be utilized or relied upon for adjacent properties which are beyond the limits of that which is the specific subject of this report.

REFERENCES

Stereographic Aerial Photographs

Date	Index/Photo No.	Scale
11-04-1952	AXJ-4K-160 & -161	1":1,666'
10-27-1954	AXJ-20K-46 & -47	1":1,666'
03-04-1969	25-16-87	1":2,500'
01-30-1970	60-4-118 & -119	1":4,000'
11-07-1976	76162 200 & 201	1":2,000'
05-12-1979	5-164	1":2,800'
07-07-1988	19265 & 19266	1":2,166'
07-07-1988	19290 & 19291	1":2,166'
05-25-1990	C81 9-45 & 9-46	1":2,800'
05-13-1993	C89-21-218 & -219	1":2,000'
07-11-1995	C115-26-34 & -35	1":2,000'
10-18-1998	C128-26-14 & -15	1":2,000'

Source: Continental Aerial Photo, Inc

Reports

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15. City of Los Angeles Zoning Information and Map Access System website, available at http://zimas.lacity.org/map.asp.

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Personal Communications

1. Personal Communication with Dana Prevost and Jeffrey Wilson, 2 July 2012.

2. Personal Communication with Dana Prevost and Jeffrey Wilson, 8 November 2012.

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TABLES

Table 1 – Summary of Borings

Number	Approximate Total		Inclination & Direction	Sample Interval as a Function of Depth (feet)
	Length (feet)	Depth Below Ground Surface (feet)		
B1	115	98.6	31°, N1E	0.5 to 98.6
B2	110	93.3	32°, N3W	0.5 to 93.3
B3	100	86.6	30°, N1W	0.5 to 86.6
B4	111	96	30°, N2W	0.5 to 96
B5	50	50	90°	0.5 to 50
B6	50	50	90°	0.5 to 50

Table 2 – Apparent Age Results Reported by SSAMS Dating

Boring Number	Approximate Sample Depth (bgs[1])	Approximate Sample Length	2 Sigma Calibration Age[2]
B1	14 feet	16 feet to 17 feet	5610 to 5880 year BP
B1	22 feet	26 feet to 27.6 feet	7180 to 7410 year BP
B1	23 feet	27.6 feet to 28	7420 to 7560 year BP
B1	24 feet	28 to 29.5 feet	8040 to 8290 year BP
B1	26 feet	29.5 feet to 32 feet	7670 to 7830 year BP
B1	30 feet	34 feet to 35 feet	11260 to 11760 year BP
B1	38 feet	43 feet to 45 feet	26820 to 27660 year BP
B1	47 feet	55 feet to 56 feet	32790 to 33470 year BP
B2	20 feet	23 feet to 25 feet	17980 to 18490 year BP
B2	26 feet	30 feet to 31 feet	8380 to 8540 year BP
B2	38 feet	45 feet to 47 feet	13110 to 13280 year BP
B3	18 feet	22 feet to 24 feet	9550 to 9890 year BP
B3	26 feet	30 feet to 32.5 feet	12640 to 12770 year BP
B4	22 feet	25 feet to 25.5 feet	9450 to 9540 year BP
B4	27 feet	31 feet to 34 feet	14220 to 15010 year BP
B4	40 feet	45.5 feet to 46.5 feet	21210 to 21460 year BP
B5	18.5 feet	18.5 feet	13260 to 13400 year BP
B5	23 feet	23 feet	23290 to 23540 year BP
B5	29 feet	29 feet	23690 to 23970 year BP
B5	46.5 feet	46.5 feet	11980 to 12390 year BP
B6	22 feet	22 feet	34530 to 34770 year BP
B6	34 feet	34 feet	22590 to 23320 year BP

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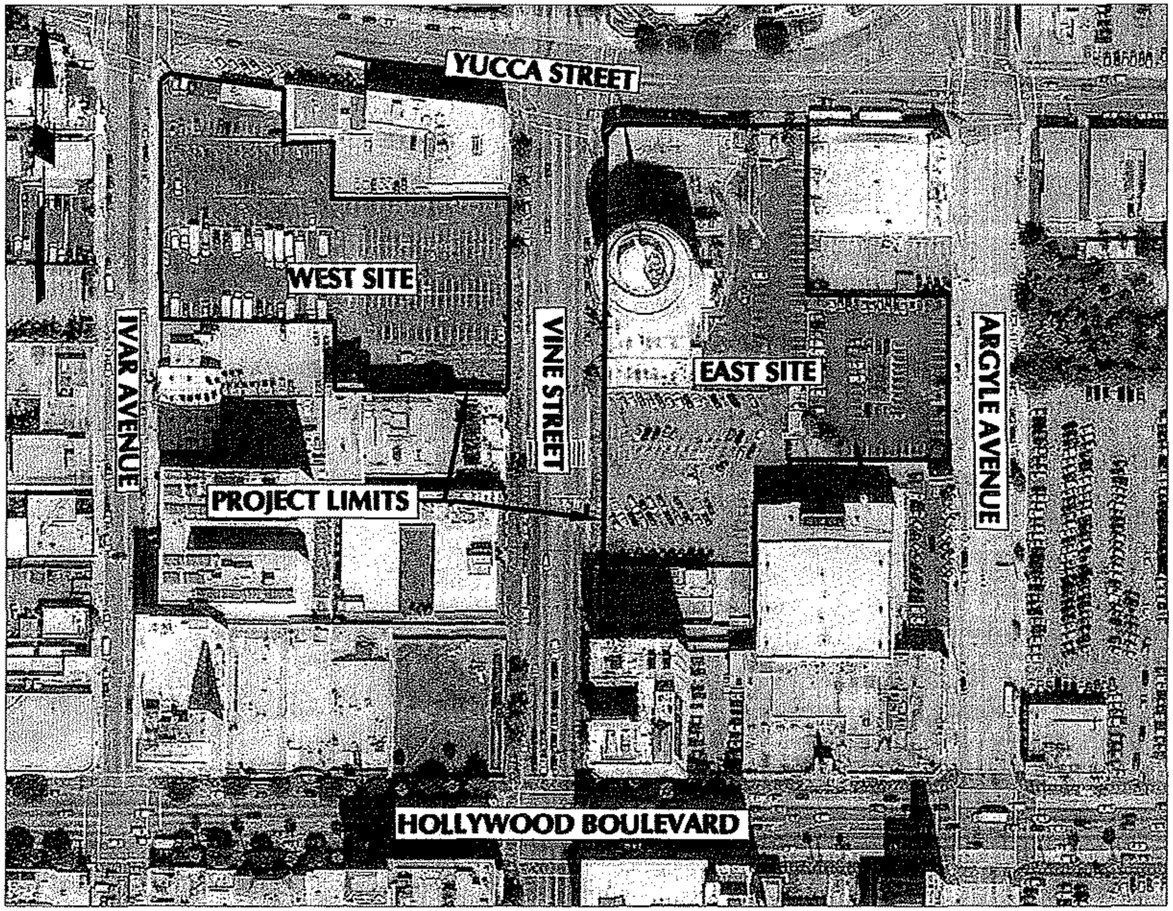
[1] bgs – below ground surface

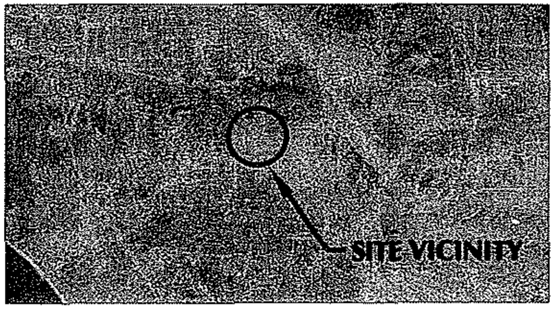
[2] Two Sigma Calibration Age is calculated as two (2) standard deviations from the measured radiocarbon age

FIGURES



PROJECT SITE

LOS ANGELES/HOLLYWOOD AREA



NOTES:

1. BASE MAP TAKEN FROM DATADOORS DESKTOP ON 8 AUGUST 2012.
2. SITE LIMITS ARE APPROXIMATE

LEGEND:

— APPROXIMATE PROJECT LIMITS

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Project
FAULT INVESTIGATION
HOLLYWOOD
LOS ANGELES COUNTY CALIFORNIA

Figure Title
SITE LOCATION MAP

Project No.
700019502
Date
11-30-2012
Scale
NTS
Drawn By
SAC
Submission Date
11-30-2012

Figure No.
1
Sheet 1 of 1

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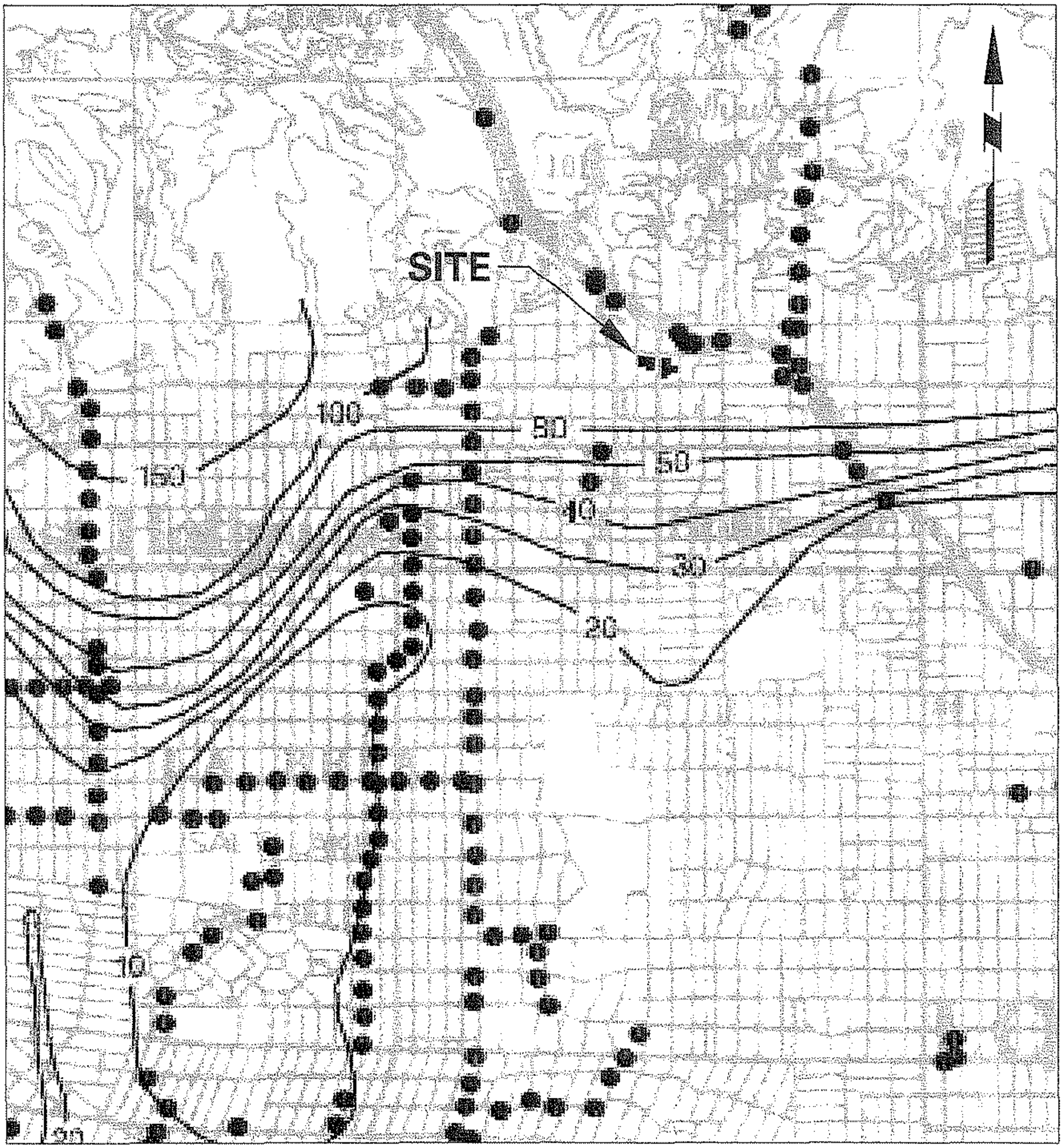

Notes:

1. Base Map reproduced from "Historically Highest Groundwater Contours and Borehole Log Data Locations, Hollywood Quadrangle" from Seismic Hazard Zone Report 026, by State of California Department of Conservation Division of Mines and Geology, dated 1998.

2. Contour lines indicate depth to groundwater in feet.

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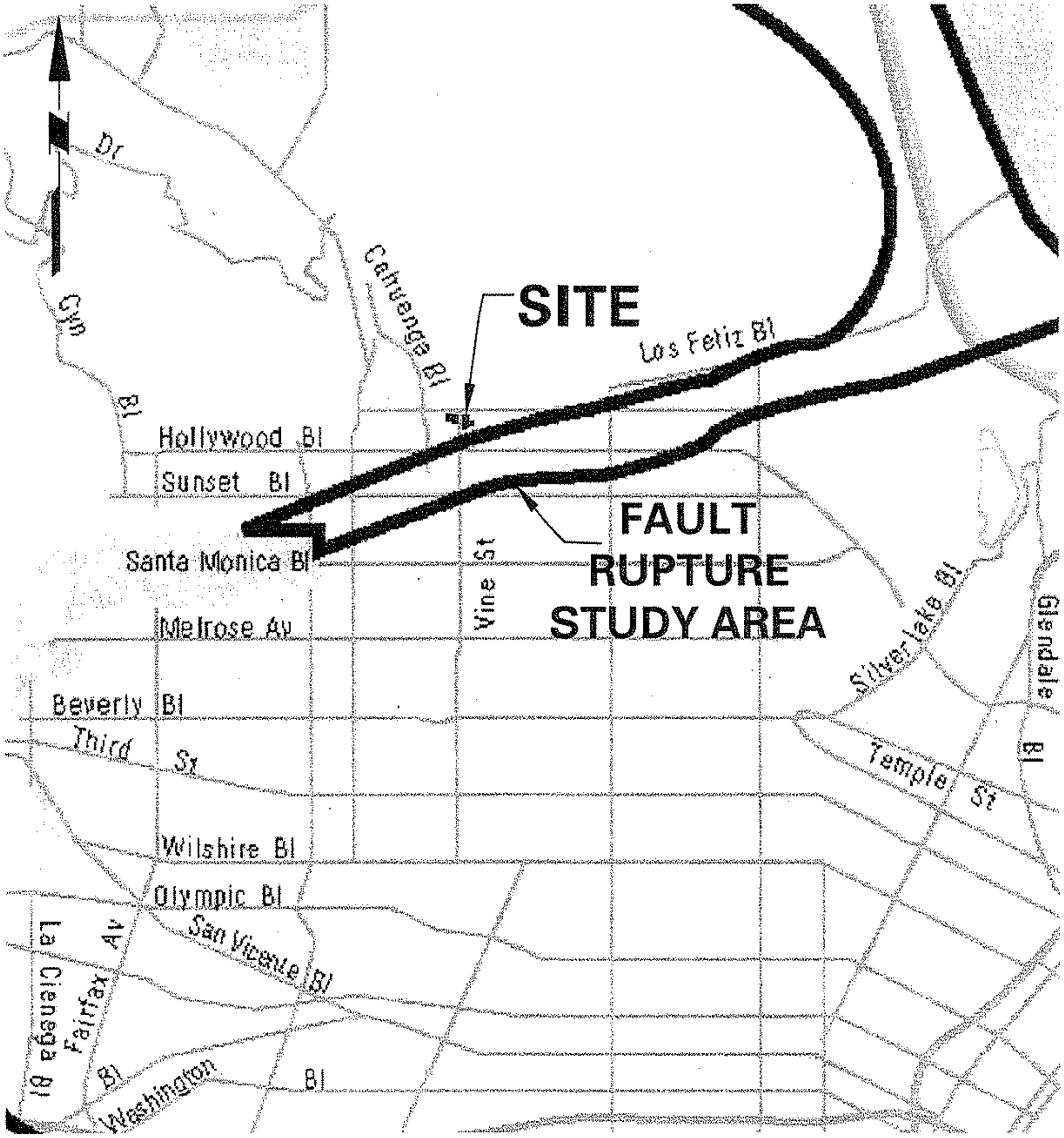
Project	Figure Title		
FAULT RUPTURE INVESTIGATION HOLLYWOOD LOS ANGELES COUNTY CALIFORNIA	HISTORIC GROUNDWATER LEVEL MAP	Project No. 700019502 Date 11-30-2012 Scale NTS Drawn By JAB Revision Date 11-30-2012	Figure No. 2 Sheet 1 of 1



Notes:
1. Base figure reproduced from "Safety Element of the City of Los Angeles General Plan Exhibit A "Alquist-Priolo Special Study Zones & Fault Rupture Study Areas", 1996.

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Project
FAULT
INVESTIGATION
HOLLYWOOD
LOS ANGELES COUNTY CALIFORNIA

Figure Title
CITY FAULT
RUPTURE STUDY
ZONE MAP

Project No.
700019502
Date
11-30-2012
Scale
NTS
Drawn By
JAB
Revision Date
11-30-2012

Figure No.
3

Sheet 1 of 1

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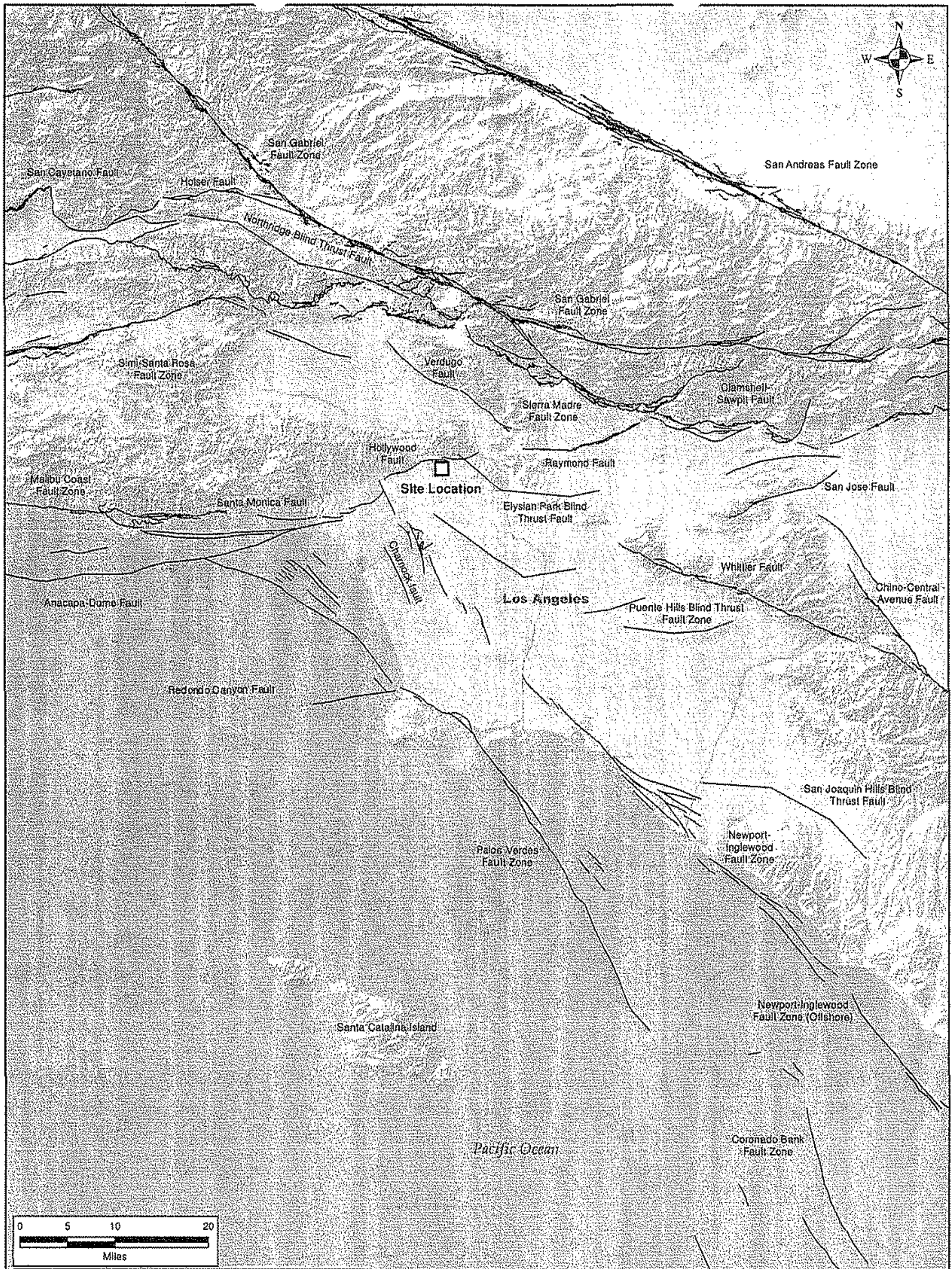

Notes:

1. Quaternary faults sourced from United States Geological Survey (USGS).
2. Active faults, fault zones, and fault systems listed have shown signs of movement over the last 11,000 years.
3. Blind thrust faults sourced from the 2007 Working Group on California Earthquake Probabilities (WGCEP) 2007 seismic source model.
4. World Shaded Relief Map provided by ESRI Resource Center

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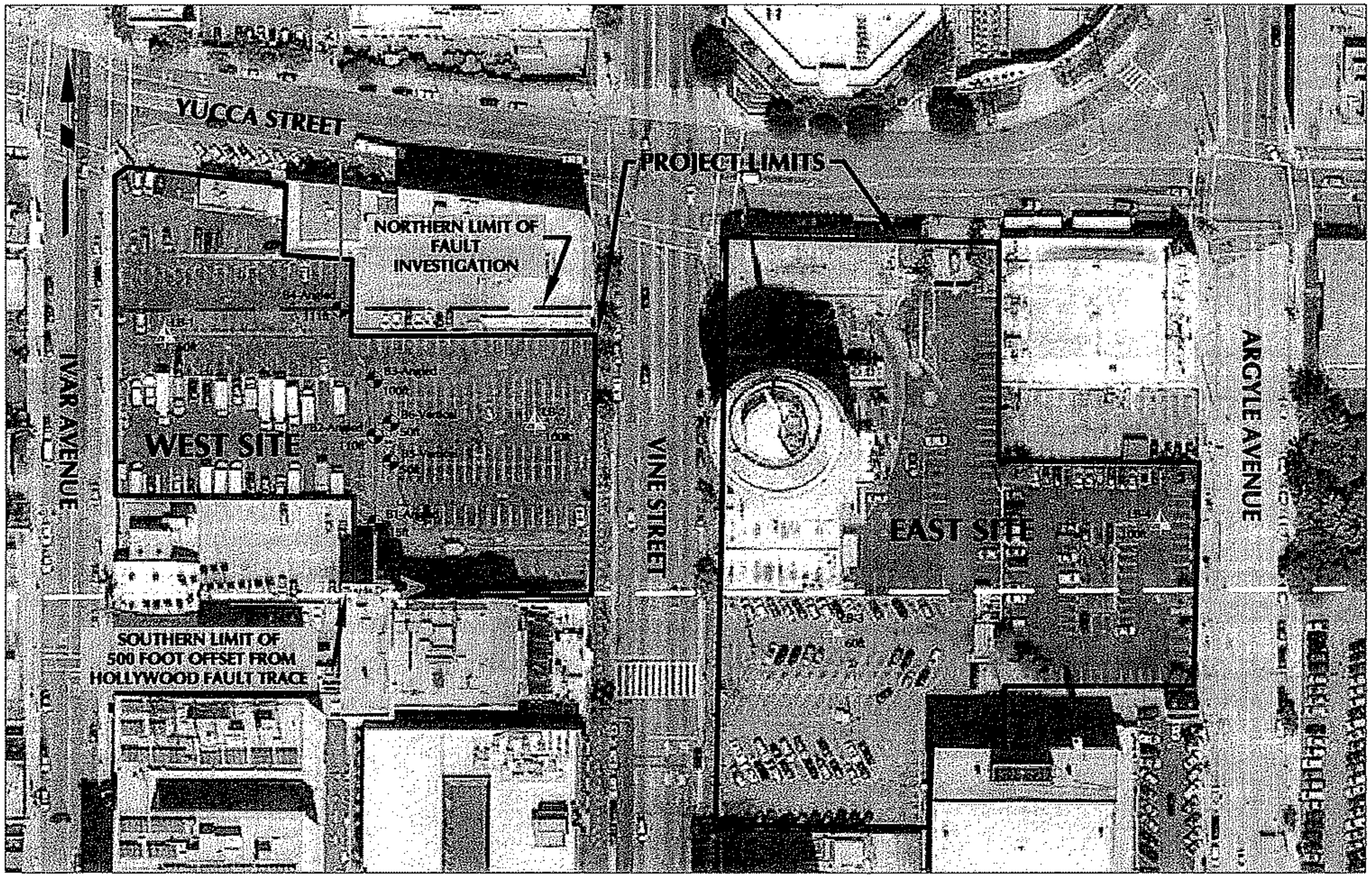
NJ Certificate of Authorization No: 24GA27996400

QUATERNARY FAULT MAP

MILLENIUM HOLLYWOOD DEVELOPMENT

HOLLYWOOD CA

Project No.	Date	Scale	Drawn by	Figure
700019502	11-30-2012	1 " = 10 mi	TAC	4



LEGEND:

▭	APPROXIMATE PROJECT LIMITS
LB-4 **100ft**	HOLLOWSTEM BORING (LANGAN PRELIMINARY GEOTECHNICAL ENGINEERING STUDY, 2012) BORING IDENTIFICATION BORING LENGTH
⊕ **B6-Vertical/ Angled** **111ft**	SONIC BORING (LANGAN, 2012) BORING IDENTIFICATION BORING LENGTH
———	CROSS SECTION (A–A') (2012)
	SOUTHERN LIMIT OF 500 FOOT OFFSET FROM HOLLYWOOD FAULT TRACE
— —	NORTHERN LIMIT OF FAULT INVESTIGATION (LANGAN FAULT INVESTIGATION, 2012)

NOTES:

1. BASE MAP TAKEN FROM DATADOORS DESKTOP ON 8 AUGUST 2012.
2. SITE LIMITS ARE APPROXIMATE.
3. BORINGS B1–B4 WERE DRILLED BETWEEN 16 JULY AND 21 JULY 2012 UNDER FULL-TIME OBSERVATION OF LANGAN PERSONNEL.
4. BORINGS B5–B6 WERE DRILLED ON 11 OCTOBER 2012 UNDER FULL-TIME OBSERVATION OF LANGAN PERSONNEL.
5. SUBSURFACE PROFILE A–A' IS SHOWN ON PLATE 2.

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Project
FAULT INVESTIGATION
HOLLYWOOD
LOS ANGELES COUNTY CALIFORNIA

Drawing Title
BORING & CROSS SECTION LOCATION MAP

Project No. 700019502
Date 11-30-2012
Scale NOT TO SCALE
Drawn By SAC
Submission Date 11-30-2012
Drawing No. 5
Sheet 1 of 1

APPENDICES

APPENDIX A
BORING LOGS

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Log of Boring B1 Sheet 1 of 5

Project: Millennium Hollywood	Plunge (deg): -59	Project No.: 700019502	
Location: Hollywood, CA	Bearing (deg): 181	Elevation and Datum: Approximately 388	
Drilling Company: Cascade Drilling, LP		Date Started: 7/16/12	Date Finished: 7/18/12
Drilling Equipment: Sonic Drill Rig		Completion Length: 115 ft	Rock Depth: -
Size and Type of Bit: -		Number of Samples	Disturbed: - Undisturbed: - Core: -
Casing Diameter (in): -	Casing Depth (ft): -	Water Level (ft.)	First ▽ 53 Completion ▼ 50.5 24 HR. ▼ 50.5
Casing Hammer: -	Weight (lbs): - Drop (in): -	Drilling Foreman: Jason Klipfel	
Sampler: Continuous Core		Inspecting Engineer: D.Eberhart, S. Montgomery, & J.Goff	
Sampler Hammer: -	Weight (lbs): - Drop (in): -		

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Length Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+388.0		0						
	+387.7	Asphalt Pavement							
		Soft, 10YR 2/1, SILT, trace coarse and fine grained sand, trace clay, scattered asphalt concrete fragments, damp [FILL]	1 2 3 4 5	1	CORE	18			##YR #/# Soil Color based on Munsell Soil Color Chart
	+382.9	**YOUNG ALLUVIUM** Loose, 10YR 4/3, silty fine grained SAND, slightly moist (SM)	6	2	CORE	13.5			
	+382.0	Loose, 10YR 4/4, fine grained pooly graded SAND, trace medium to coarse grained sand, slightly moist (SP)	7 8 9						
	+379.4	Medium Dense, 10YR 4/6, clayey fine grained SAND, wet (SC)	10	3	CORE	11			
	+378.6	Dense, 10YR 3/3, silty very fine and fine grained SAND, wet (SM)	11	4	CORE	20			
	+377.7	Medium Dense, 10YR 3/4, very fine and fine grained poorly graded SAND, trace silt, moist (SP)	12						
		Medium dense to dense, 10YR 4/3, very fine to medium grained poorly graded SAND, trace coarse grained sand, slightly moist (SP)	13 14 15	5	CORE	20			
	+374.3	Medium stiff, 10YR 4/3, SILT, scattered fine subangular gravel, slightly moist to moist (ML)	16	6	CORE	20			
	+373.4	Medium dense, 10YR 4/3, silty very fine and fine grained SAND, moist (SM)	17 18						
		Medium dense, 10YR 3/2, silty very fine to medium grained SAND, trace coarse grained sand, moist (SM)	19 20						

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Log of Boring B1 Sheet 2 of 5

Project Millennium Hollywood	Plunge (deg) -59	Project No. 700019502
Location Hollywood, CA	Bearing (deg) 181	Elevation and Datum Approximately 388

MATERIAL SYMBOL	Elev. (ft)	Sample Description
		Dense, 10YR 4/4, silty very fine grained SAND, slightly moist (SM)
		Medium dense, 10YR 4/3, silty very fine to medium grained SAND, slightly moist to moist (SM)
		Medium dense, 10YR 3/3, silty very fine and fine grained SAND, moist to wet (SM)
		Medium dense, 10YR 3/4, silty very fine grained SAND, trace fine to coarse grained sand, wet (SM)
		Dense, 10YR 3/3, silty very fine to fine grained SAND, trace fine subrounded gravel, moist (SM)
	365.7	Medium dense, 10YR 4/3, silty very fine to fine grained SAND, trace fine subrounded gravel, trace medium and coarse grained sand, slightly moist (SM)
	364.9	Medium dense, 10YR 3/6, fine to coarse grained well graded SAND, trace fine subangular to subrounded gravel, slightly moist (SW)
	364.0	Medium dense, 10YR 4/6, very fine to fine grained poorly graded SAND, slightly moist (SP)
		Medium dense to dense, 10YR 4/6, silty very fine to fine grained SAND, slightly moist (SM)
		Medium dense, 10YR 4/6, silty very fine to fine grained SAND, slightly moist (SM)
		Dense, 10YR 3/6, silty very fine to fine grained SAND, trace coarse grained sand, slightly moist (SM)
		Medium dense, 10YR 3/3, silty fine grained SAND, slightly moist to moist (SM)
	360.6	Medium dense, 10YR 3/4, silty very fine to fine grained SAND, slightly moist (SM)
	359.7	Dense, 10YR 4/6, very fine to fine grained poorly graded SAND, slightly moist (SP)
	358.9	Medium stiff, 10YR 4/3, very fine grained sandy SILT, slightly moist (ML)
	358.5	**OLD ALLUVIUM**
	358.2 358.0	Medium dense, 10YR 4/3, clayey very fine to fine grained SAND, wet (SC)
	357.1	Medium dense, 10YR 3/4, silty very fine grained SAND, moist (SM)
		Medium stiff, 5YR 3/4, very fine grained sandy CLAY, scattered fine to coarse subrounded gravel, moist (CL)
		Stiff, 5YR 3/3, silty CLAY, slightly moist (CL)
	355.9	Dense, 10YR 3/3, silty very fine to fine grained SAND, trace fine subangular gravel, trace clay, wet (SM)
		Medium dense to dense, 10YR 3/3, silty very fine to fine grained SAND, wet (SM)
	354.6	Stiff, 7.5YR 3/3, silty CLAY, trace coarse grained sand, moist (CL)
		Medium dense to dense, 10YR 3.5/4, silty very fine to medium grained SAND, trace coarse grained sand, scattered clayey lenses, moist (SM)
	352.0	Medium stiff, 7.5YR 3/3, silty CLAY, scattered very fine grained sandy lenses, moist (CL)
	350.3	Stiff to very stiff, 7.5YR 3/3, CLAY, scattered very fine and coarse grained sandy lenses, slightly moist (CL)
	349.4	

Length Scale: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

Sample Data

Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40
6	CORE	20		
7	CORE	20		
8	CORE	5		
9	CORE	17		
10	CORE	20		
11	CORE	20		
12	CORE	20		
13	CORE	7		
14	CORE	20		
15	CORE	12		
16	CORE	20		
17	CORE	20		
18	CORE	20		
19	CORE	9		
20	CORE	8		
21	CORE	20		
22	CORE	20		
23	CORE	14.75		
24	CORE	20		
25	CORE	20		

Remarks
(Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)

Log of Boring **B1** Sheet 3 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-59	700019502

Location	Bearing (deg)	Elevation and Datum
Hollywood, CA	181	Approximately 388

Material Symbol	Elev. (ft)	Sample Description	Length Scale	Sample Data: Number	Sample Data: Type	Sample Data: Recov. (in)	Sample Data: Penetr. resist BL/6in	Sample Data: N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Stiff, 7.5YR 3/3, very fine grained sandy CLAY, moist (CL)	45	26	CORE	6.5			
	349.0	Medium stiff to stiff, 7.5YR 3/3, silty CLAY, trace medium grained sand, slightly moist to moist (CL)	46	27	CORE	20			
	347.7	Medium stiff, 7.5YR 3/4, CLAY, scattered silty lenses, slightly moist (CL)	47 48	28	CORE	20			
		Medium stiff to stiff, 5YR 3/4, CLAY, trace fine subrounded gravel, slightly moist (CL)	49	29	CORE	20			
		Stiff, 7.5YR 3/3, CLAY, trace coarse grained sand, moist (CL)	▼ 50 51	30	CORE	22			
		Medium stiff, 7.5YR 3/2, CLAY, scattered silty lenses, moist (CL)	52 ▽ 53 54 55 56	31	CORE	58			
		Stiff to hard, 5YR 3/2, CLAY, trace coarse grained sand, scattered silty and fine grained sandy lenses, moist (CL)	57 58 59 60 61	32	CORE	59			
		Stiff, 5YR 3/3, CLAY, trace coarse grained sand, moist (CL)	62 63 64	33	CORE	54			
	332.3	Medium stiff, 5YR 4/6, very fine to fine grained sandy CLAY, trace coarse grained sand, scattered silty fine to medium grained sandy lenses, slightly moist (CL)	65 66						
	330.6	Stiff to hard, 5YR 3/4, CLAY, trace coarse grained sand, slightly moist (CL)	67 68 69 70	34	CORE	59			

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Log of Boring **B1** Sheet 4 of 5

Project Millennium Hollywood	Plunge (deg) -59	Project No. 700019502
Location Hollywood, CA	Bearing (deg) 181	Elevation and Datum Approximately 388

Elev. (ft)	Sample Description	Length Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		70 – 72	34	CORE	59			
326.3	Medium stiff, 7.5YR 3/4, very fine grained sandy CLAY, trace silt, slightly moist (CL)	72 – 77	35	CORE	45			
323.7	Very stiff to hard, 7.5YR 4/4, CLAY, trace coarse grained sand, moist (CL)							
	Soft, 5YR 3/2, CLAY, trace fine and coarse grained sand, moist (CL)	77 – 82	36	CORE	60			
320.3	Loose to medium dense, 10YR 3/4, silty very fine to fine grained SAND, slightly moist (SM)							
319.4	Very stiff to hard, 5YR 3/4, CLAY, trace coarse grained SAND, slightly moist (CL)							
317.7	Medium dense to dense, 10YR 4/6, silty very fine to coarse grained SAND, slightly moist to moist (SM)	82 – 87	37	CORE	20			
	No Recovery (87 to 92 feet)	87 – 92		NR	0			
	Loose, 10YR 3/3, silty fine grained SAND, wet (SM)	92 – 95	38	CORE	60			

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Log of Boring **B1** Sheet 5 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-59	700019502
Location	**Bearing (deg)**	**Elevation and Datum**
Hollywood, CA	181	Approximately 388

Elev. (ft)	Sample Description	Length Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		95						
	Medium dense, 10YR 4/6, silty fine grained SAND, trace fine subrounded gravel, moist (SM)	96						
		97	38	CORE	60			
		98						
		99						
302.7	Soft, 10YR 3/1, CLAY, trace fine grained sand, wet (CL)							
		100						
		101						
		102	39	CORE	58			
300.1	Medium dense, 10YR 4/4, silty fine grained SAND, trace clay, moist (SM)							
299.7	Loose, 10YR 5/6, very fine to fine grained poorly graded SAND, trace silt, wet (SP)	103						
		104						
	Loose, 10YR 4.5/6, very fine to medium grained poorly graded SAND, trace coarse grained sand, wet (SP)	105						
		106						
		107	40	CORE	42			
		108						
		109						
	Loose, 10YR 5/6, fine grained poorly graded SAND, trace coarse grained sand, wet (SP)	110						
		111						
		112	41	CORE	53			
		113						
		114						
289.4		115						
		116						
	Boring terminated at 115 feet length Boring backfilled with cement grout Surface patched with black-dyed rapid set concrete	117						
		118						
		119						
		120						

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Log of Boring **B2** Sheet 1 of 5

Project: Millennium Hollywood	Plunge (deg): -58	Project No.: 700019502	
Location: Hollywood, CA	Bearing (deg): 177	Elevation and Datum: Approximately 388.2	
Drilling Company: Cascade Drilling, LP		Date Started: 7/18/12	Date Finished: 7/19/12
Drilling Equipment: Sonic Drill Rig		Completion Length: 110 ft	Rock Depth: -
Size and Type of Bit: -		Number of Samples: Disturbed: - Undisturbed: -	Core: -
Casing Diameter (in): -	Casing Depth (ft): -	Water Level (ft.): First ▽ 54; Completion ▼ 52	24 HR. ▼ 52
Casing Hammer: - Weight (lbs): -	Drop (in): -	Drilling Foreman: Jason Klipfel	
Sampler: Continuous Core		Inspecting Engineer: D.Eberhart, S. Montgomery, & J.Goff	
Sampler Hammer: - Weight (lbs): -	Drop (in): -		

Elev. (ft)	Sample Description	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
388.2							
387.9	Asphalt Pavement						
	Loose, 10YR 2/2, silty fine grained SAND, slightly moist [FILL]	1	CORE	30			##YR ##/# Soil Color based on Munsell Soil Color Chart
	Very loose to loose, 10YR 2/2, silty fine grained SAND, slightly moist [FILL]	2	CORE	20			
381.8	**YOUNG ALLUVIUM** Loose to medium dense, 10YR 4/4, silty very fine to fine grained SAND, slightly moist (SM)						
	Loose, 10YR 4/4, silty very fine to coarse grained SAND, moist (SM)	3	CORE	21			
377.6	Loose, 10YR 4/6, very fine to fine grained poorly graded SAND, some medium grained sand, slightly moist (SP)						
374.6	Medium dense, 10YR 5.5/4, silty very fine grained SAND, slightly moist (SM)	4	CORE	32			
372.9	Soft, 10YR 4/4, very fine grained sandy SILT, slightly moist (ML)						

Length Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Log of Boring **B2** Sheet 2 of 5

Project Millennium Hollywood	Plunge (deg) -58	Project No. 700019502	
Location Hollywood, CA	Bearing (deg) 177	Elevation and Datum Approximately 388.2	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Length Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	370.8	Soft, 10YR 4/4, very fine grained sandy SILT, slightly moist (ML)	20	5	CORE	44			
		Medium dense, 7.5YR 3/3, silty very fine grained SAND, trace fine subangular gravel, slightly moist (SM)	21						
	368.7	**OLD ALLUVIUM** Stiff, 7.5YR 4/3, CLAY, trace medium to coarse grained sand, trace silt, slightly moist (CL)	23						
	367.0	Very stiff, 7.5YR 3/3, very fine grained sandy CLAY, moist (CL)	25	6	CORE	58			
	365.3	Dense, 7.5YR 4/6, clayey fine grained SAND, trace fine to coarse subangular gravel, moist (SC)	27						
		Loose to medium dense, 7.5YR 4/4, clayey very fine grained SAND, moist to very moist (SC)	30	7	CORE	36			
	361.9	Loose, 10YR 4/4, fine to medium grained poorly graded SAND, trace coarse grained sand, trace fine subrounded gravel, some clay, wet (SP)	31						
	360.2	Loose, 7.5YR 5/8, fine to coarse grained well graded SAND, trace fine subangular gravel, slightly moist (SW)	33						
	358.5	Medium dense, 7.5YR 4/6, silty fine to coarse grained SAND, trace fine subangular gravel, trace clay, slightly moist (SM)	35	8	CORE	12			
	354.3	Medium stiff to stiff, 7.5YR 3/3, very fine grained sandy CLAY, slightly moist (CL)	40	9	CORE	36			
	353.0	Medium dense, 10YR 3/6, silty fine grained SAND, slightly moist (SM)	41						
		Loose, 10YR 4.5/6, silty very fine to fine grained SAND, trace fine angular to subangular gravel, damp (SM)	43						
	350.0		45						

Log of Boring B2 Sheet 3 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-58	700019502
Location	**Bearing (deg)**	**Elevation and Datum**
Hollywood, CA	177	Approximately 388.2

Elev. (ft)	Sample Description	Length Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	Dense, 10YR 3/6, clayey very fine grained SAND, slightly moist (CL)	45						
		46						
348.3	Medium dense, 10YR 4/4, silty very fine to fine grained SAND, slightly moist (SM)	47	10	CORE	30			
		48						
		49						
	Medium dense, 10YR 4/4, silty very fine to medium grained SAND, trace coarse grained sand, trace clay, slightly moist (SM)	50	11	CORE	40			
		51						
		▼ 52						
		53						
342.4	Dense, 7.5YR 4/4, clayey very fine and coarse grained SAND, slightly moist (SC)	▽ 54						
341.6	Loose, 10YR 3/4, silty fine to medium grained SAND, trace coarse grained sand, wet (SM)	55	12	CORE	12			
		56						
	Loose, 10YR 3/4, silty fine to medium grained SAND, trace coarse grained sand, moist (SM)	57						
		58						
	Loose, 10YR 4/6, silty fine grained SAND, wet (SM)	59						
		60	13	CORE	46			
336.5	Loose, 10YR 4/4, very fine to fine grained poorly graded SAND, trace silt, wet (SP)	61						
		62						
334.8	Medium dense, 10YR 3/4, fine to coarse grained well graded SAND, scattered coarse subrounded gravel, wet (SW)	63						
		64						
	Medium dense, 10YR 3/4, fine to coarse grained well graded SAND, scattered coarse subrounded gravel, wet (SW)	65	14	CORE	44			
		66						
		67						
	Medium dense, 10YR 3/4, fine to coarse grained well graded SAND, wet (SW)	68						
		69						
		70						

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Log of Boring B2 Sheet 4 of 5

Project Millennium Hollywood	Plunge (deg) -58	Project No. 700019502	
Location Hollywood, CA	Bearing (deg) 177	Elevation and Datum Approximately 388.2	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Length Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, 10YR 4/6, fine to coarse grained well graded SAND, trace fine subangular gravel, wet (SW)	70						
			71						
	327.1	Loose to medium, 10YR 4/6, fine to medium grained poorly graded SAND, wet (SP)	72	15	CORE	54			
	326.3	Loose to medium, 10YR 4/4, clayey very fine to fine grained SAND, wet (SC)	73						
			74						
	324.6	Loose, 10YR 5/6, silty fine and medium grained SAND, wet (SM)	75						
			76						
	322.9	Very dense, 10YR 3/6, clayey very fine to medium grained SAND, moist (SC)	77	16	CORE	58			
			78						
			79						
		Dense, 10YR 3/6, clayey very fine to fine grained SAND, wet (SC)	80						
		Dense to very dense, 10YR 4/4, clayey very fine to fine grained SAND, trace coarse grained sand, moist (SC)	81						
			82	17	CORE	53			
			83						
			84						
			85						
	315.3	Loose to medium dense, 10YR 4/4, silty fine to coarse grained SAND, trace fine subangular gravel, trace clay, slightly moist (SM)	86						
			87	18	CORE	48			
			88						
			89						
		Loose, 10YR 4/4, silty fine to coarse grained SAND, trace fine subangular gravel, trace silty lenses, wet (SM)	90						
			91						
			92	19	CORE	45			
		Loose, 10YR 3/4, silty very fine grained SAND, slightly moist (SM)	93						
			94						
			95						

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Log of Boring B2 Sheet 5 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-58	700019502
Location	**Bearing (deg)**	**Elevation and Datum**
Hollywood, CA	177	Approximately 388.2

Material Symbol	Elev. (ft)	Sample Description	Length Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Loose, 10YR 4/4, silty fine to coarse grained SAND, trace fine subrounded gravel, wet (SM)	95						
			97	20	CORE	46			
		Medium dense, 10YR 4/6, silty very fine to fine grained SAND, slightly moist to moist (SM)	98						
		Loose, 10YR 5/4, silty fine to medium grained SAND, trace coarse grained sand, wet (SM)	100						
		Loose to medium dense, 10YR 4/4, silty very fine to fine grained SAND, wet (SM)	102	21	CORE	46			
		Medium dense, 10YR 4/4, silty very fine grained SAND, moist (SM)	103						
		Medium dense, 10YR 5/8, silty very fine to fine grained SAND, trace fine subangular to subrounded gravel, moist (SM)	105						
			107	22	CORE	39			
	294.9		110						
		Boring terminated at 110 feet length Boring backfilled with cement grout Surface patched with black-dyed rapid set concrete	112						
			120						

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Log of Boring **B3** Sheet 1 of 5

Project: Millennium Hollywood	Plunge (deg): -60	Project No.: 700019502	
Location: Hollywood, CA	Bearing (deg): 179	Elevation and Datum: Approximately 389	
Drilling Company: Cascade Drilling, LP		Date Started: 7/19/12	Date Finished: 7/20/12
Drilling Equipment: Sonic Drill Rig		Completion Length: 100 ft	Rock Depth: -
Size and Type of Bit: -		Number of Samples	Disturbed: - Undisturbed: - Core: -
Casing Diameter (in): -	Casing Depth (ft): -	Water Level (ft.)	First ∇ 56 Completion ▼ 55 24 HR. ▼ 55
Casing Hammer: -	Weight (lbs): - Drop (in): -	Drilling Foreman: Jason Klipfel	
Sampler: Continuous Core		Inspecting Engineer: D.Eberhart, S. Montgomery, & J.Goff	
Sampler Hammer: -	Weight (lbs): - Drop (in): -		

Elev. (ft)	Sample Description	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
389.0							
388.7	Asphalt Pavement						
	Loose, 5YR 3/2, silty fine to medium grained SAND, damp to slightly moist [FILL]	1a	CORE	12			##YR ##/# Soil Color based on Munsell Soil Color Chart
	Loose, 5YR 7/1, silty fine to medium grained SAND, damp [FILL]	1b	CORE	12			
	No Recovery (5 to 7.5 feet)		NRC	0			
382.5	**YOUNG ALLUVIUM** Loose, 10YR 5/8, silty fine grained SAND, trace medium grained sand, trace fine subrounded gravel, slightly moist (SM)						
		2	CORE	18			
377.7	Loose, 10YR 4/4, very fine to fine grained poorly graded SAND, trace fine subangular gravel, damp (SP)	3	CORE	15			
	No Recovery (15 to 18 feet)		NRC	0			
373.4	Loose, 10YR 3/4, silty very fine to fine grained SAND, scattered clayey lenses, slightly moist (SM)						

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Log of Boring B3 Sheet 2 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-60	700019502
Location	**Bearing (deg)**	**Elevation and Datum**
Hollywood, CA	179	Approximately 389

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Length Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			20						
			21	4	CORE	14			
		Loose, 7.5YR 3/4, silty very fine to fine grained SAND, trace fine subrounded gravel, trace coarse grained sand, some clay, slightly moist (SM)	22						
			23	5	CORE	38			
	368.2	**OLD ALLUVIUM** Medium dense, 7.5YR 4/4, silty clayey very fine to fine grained SAND, slightly moist to moist (SC) Loose to medium dense, 7.5YR 4/6, silty clayey very fine grained SAND, moist (SC)	24						
			25						
			26						
			27	6	CORE	28			
	364.8	Medium dense, 7.5YR 4/4, very fine to fine grained poorly graded SAND, trace fine subrounded gravel, trace silt, slightly moist (SP)	28						
			29						
	363.0	Soft, 7.5YR 4/6, very fine grained sandy SILT, moist (ML)	30						
			31						
	360.9	Medium dense, 7.5YR 4/6, silty very fine to fine grained SAND, moist (SM)	32	7	CORE	18			
			33						
			34						
		Medium dense, 7.5YR 3.5/4, silty very fine to fine grained SAND, trace fine subangular gravel, trace medium and coarse sand, trace clay, slightly moist (SM)	35						
			36	8	CORE	24			
			37						
		Loose, 10YR 3/4, silty very fine grained SAND, slightly moist (SM)	38						
			39	9	CORE	12			
		Loose to medium dense, 10YR 3/4, silty very fine to fine grained SAND, moist (SM)	40						
			41	10	CORE	17			
			42						
	351.8	Medium dense, 7.5YR 3/4, clayey very fine to fine grained SAND, trace silt, slightly moist to moist (SC)	43						
			44	11	CORE	16			
	350.0		45						

Log of Boring **B3** Sheet 3 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-60	700019502
Location	**Bearing (deg)**	**Elevation and Datum**
Hollywood, CA	179	Approximately 389

Elev. (ft)	Sample Description
	Loose, 7.5YR 3/4, silty very fine grained SAND, gradational contact, slightly moist (SM)
347.4	Loose, 7.5YR 4/6, very fine grained poorly graded SAND, trace fine to coarse subrounded gravel, gradational contact, damp (SP)
345.7	Medium dense, 7.5YR 4/6, silty very fine to medium grained SAND, slightly moist (SM)
344.4	Medium dense, 7.5YR 4.5/4, very fine to coarse grained well graded SAND, scattered fine subrounded gravel, damp (SW)
343.1	Loose to medium dense, 7.5YR 3/4, silty very fine grained SAND, slightly moist (SM)
342.7	Medium dense, 10YR 4/6, very fine to medium grained poorly graded SAND, trace fine to coarse subangular gravel, slightly moist (SP) Medium dense, 10YR 4/4, very fine to medium grained poorly graded SAND, trace fine subangular gravel, wet (SP)
339.6	Medium dense, 10YR 3/6, silty very fine to fine grained SAND, trace fine subangular gravel, trace coarse grained sand, moist to wet (SM)
338.8	Loose, 10YR 5/4, very fine to fine grained poorly graded SAND, trace fine to coarse subangular gravel, damp to slightly moist (SP)
338.3	Loose, 10YR 4/6, fine to coarse grained well graded SAND, wet (SW)
337.5	Medium dense, 10YR 4/4, silty very fine grained SAND, trace fine subangular gravel, wet (SM)
336.2	Loose, 10YR 4/6, very fine to medium grained SAND, some coarse grained sand, wet (SP) Loose, 10YR 3/4, very fine to medium grained poorly graded SAND, trace fine subangular gravel, wet (SP)
334.9	Medium dense, 10YR 3/6, silty very fine to fine grained SAND, trace coarse grained sand, wet (SM)
333.6	Soft, 10YR 3/6, very fine to fine grained sandy CLAY, trace coarse grained sand, wet (CL)
331.8	Medium stiff, 10YR 3.5/5, CLAY, trace coarse grained sand, moist (CL)
331.0	Loose, 7.5YR 3/4, clayey very fine to fine grained SAND, trace coarse grained sand, wet (SC)
330.1	Loose, 7.5YR 4/6, fine to coarse grained well graded SAND, wet (SW)
329.9	Stiff, 10YR 4/6, silty CLAY, trace coarse grained sand, slightly moist to moist (CL)
328.4	

Length Scale: 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70

Sample Data

Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40
12	CORE	14		
13	CORE	34		
14	CORE	21		
15	CORE	20		
16	CORE	37		
17	CORE	30		
18	CORE	36		
19	CORE	36		

Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)

Project	Plunge (deg)	Project No.
Millennium Hollywood	-60	700019502

Location	Bearing (deg)	Elevation and Datum
Hollywood, CA	179	Approximately 389

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Length Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Loose, 10YR 3/6, clayey fine to coarse grained SAND, scattered silty lenses, wet (SC)	70 71						
	326.6	Loose to medium dense, 10YR 3/4, clayey silty very fine grained SAND, trace coarse grained sand, trace fine angular gravel, moist (SM)	72 73 74	20	CORE	36			
	324.0	Loose, 10YR 3/6, clayey very fine to coarse well graded SAND, slightly silty, wet (SW)	75						
	323.2	Medium stiff, 10YR 4/3, silty CLAY, trace fine and medium grained sand, moist (CL)	76	21	CORE	36			
	322.3	Medium stiff to stiff, 10YR 3/4, CLAY, trace medium and coarse grained sand, moist (CL)	77						
	321.5	Medium dense, 10YR 3/4, silty fine to coarse grained SAND, scattered fine subangular to rounded gravel, trace clay, wet (SM) Loose to medium dense, 10YR 5/8, silty very fine to coarse grained SAND, moist to wet (SM)	78 79 80 81	22 23	CORE CORE	6 14			
	318.4	Loose, 10YR 4/6, very fine to coarse well graded SAND, scattered fine subrounded gravel, scattered silty lenses, wet (SW)	82 83 84	24	CORE	26			
		Loose, 10YR 4/6, very fine to coarse well graded SAND, scattered fine subrounded gravel, scattered silty lenses, wet (SW)	85	25	CORE	36			
	314.5	Loose to medium dense, 10YR 5/6, silty very fine to coarse grained SAND, scattered fine subangular gravel, dry to damp (SM)	86						
	313.7	Loose, 10YR 4/6, fine to coarse grained well graded SAND, moist to wet (SW)	87						
	312.8	Stiff, 10YR 3/4, silty medium and coarse grained CLAY, slightly moist (CL)	88 89	26	CORE	36			
	311.1	Loose, 7.5YR 3/3, fine to coarse grained well graded SAND, trace clay, slightly moist (SW)	90						
	310.6	Stiff to very stiff, 7.5YR 3/4, CLAY, trace coarse grained sand, moist (CL)	91 92	27	CORE	48			
	308.5	Medium dense, 10YR 3/4, clayey fine and coarse grained SAND, wet (SC)	93 94	28	CORE	18			
	306.7		95						

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Log of Boring B3 Sheet 5 of 5

Project Millennium Hollywood	Plunge (deg) -60	Project No. 700019502	
Location Hollywood, CA	Bearing (deg) 179	Elevation and Datum Approximately 389	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Length Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	305.9	Stiff, 10YR 3/6, CLAY, trace very fine grained sand, moist (CL)	95	28	CORE	18			
⁘	304.1	Loose, 10YR 4/6, fine to coarse grained well graded SAND, wet (SW)	96 97						
⁘	302.4	Medium dense, 10YR 3/6, silty very fine to fine grained SAND, moist to wet (SM)	98 99	29	CORE	28			
		Boring terminated at 100 feet length Boring backfilled with cement grout Surface patched with black-dyed rapid set concrete	100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120						

Log of Boring B4 Sheet 1 of 5

Project Millennium Hollywood	Plunge (deg) -60	Project No. 700019502			
Location Hollywood, CA	Bearing (deg) 178	Elevation and Datum Approximately 393.5			
Drilling Company Cascade Drilling, LP		Date Started 7/20/12	Date Finished 7/21/12		
Drilling Equipment Sonic Drill Rig		Completion Length 111 ft	Rock Depth -		
Size and Type of Bit -		Number of Samples	Disturbed -	Undisturbed -	Core -
Casing Diameter (in) -	Casing Depth (ft) -	Water Level (ft.)	First ▽ 62.5	Completion ▼ 62.5	24 HR. ▼ -
Casing Hammer -	Weight (lbs) - Drop (in) -	Drilling Foreman Jason Klipfel			
Sampler Continuous Core		Inspecting Engineer D.Eberhart, S. Montgomery, & J.Goff			
Sampler Hammer -	Weight (lbs) - Drop (in) -				

Elev. (ft)	Sample Description	Length Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+393.5		0						
+393.2	Asphalt Pavement							
	Loose, 10YR 3/2, silty very fine grained SAND, asphalt and concrete fragments, damp [FILL]	1	1	CORE	4			##YR ##/# Soil Color based on Munsell Soil Color Chart
	Loose, 10YR 3/2, silty fine grained SAND, scattered fine angular gravel, asphalt and concrete fragments, damp to slightly moist [FILL]	2–3	2	CORE	5			
	Loose, 10YR 3/2, silty fine grained SAND, trace fine subangular gravel, damp [FILL]	4	3	CORE	12			
+389.2	**YOUNG ALLUVIUM** Loose, 10YR 3/3, silty very fine to fine grained SAND, trace fine subangular gravel, slightly moist (SM)	5–6						
		7	4	CORE	6			
	Medium dense, 10YR 3/4, silty very fine to fine grained SAND, trace coarse grained sand, moist (SM)	8–9	5	CORE	8			
	Medium dense, 10YR 3/4, silty very fine to fine grained SAND, trace coarse grained sand, moist (SM)	10–11	6	CORE	12			
+383.1	Medium dense, 10YR 4/4, clayey fine to coarse grained SAND, trace fine subangular to subrounded gravel, some silt, dry to damp (SC)	12–13						
		14–15	7	CORE	11			
+379.6	Loose, 10YR 4/6, silty fine to coarse grained SAND, trace clay, slightly moist (SM)	16–18	8	CORE	12			
	Medium dense, 10YR 4/4, silty very fine grained SAND, slightly moist (SM)	19	9	CORE	10			
+376.2		20						

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Log of Boring B4 Sheet 2 of 5

Project Millennium Hollywood	Plunge (deg) -60	Project No. 700019502	
Location Hollywood, CA	Bearing (deg) 178	Elevation and Datum Approximately 393.5	

Elev. (ft)	Sample Description	Length Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	Loose to medium dense, 10YR 4/6, fine to coarse grained poorly graded SAND, slightly moist (SP)	20	9	CORE	10			
374.4	Medium dense, 10YR 4/6, silty fine to medium grained SAND, scattered fine subangular gravel, damp to slightly moist (SM)	22	10	CORE	10			
	Loose to medium dense, 7.5YR 4/4, silty fine to coarse grained SAND, trace fine angular gravel, moist (SM)	25	11	CORE	28			
	Medium dense to dense, 7.5YR 4/4, silty fine to coarse grained SAND, trace clay, slightly moist (SM)	26						
370.1	**OLD ALLUVIUM**	27						
	Medium dense, 7.5YR 3/3, silty fine to coarse grained SAND, slightly moist (SM)	28	12	CORE	24			
	Medium dense, 7.5YR 4/3, silty fine to medium grained SAND, trace coarse grained sand, slightly moist (SM)	29						
	Medium dense, 7.5YR 4/4, clayey silty fine to coarse grained SAND, slightly moist (SM)	31	13	CORE	26			
	Medium dense, 7.5YR 4/4, silty fine to coarse grained SAND, trace clay, slightly moist (SM)	32						
	Medium dense, 7.5YR 3/4, silty very fine to fine grained SAND, slightly moist (SM)	34	14	CORE	18			
363.6	Loose, 7.5YR 5/6, very fine to coarse grained poorly graded SAND, slightly moist (SP)	35						
361.5	Loose, 7.5YR 4/6, silty fine to medium grained SAND, trace coarse grained sand, slightly moist (SM)	37	15	CORE	20			
	Loose, 7.5YR 4/6, silty fine to medium grained SAND, slightly moist (SM)	40	16	CORE	18			
358.4	Loose, 7.5YR 4/4, fine to medium grained poorly graded SAND, trace fine subrounded gravel, slightly moist (SP)	41						
357.1	Medium dense, 7.5YR 4/6, silty very fine to fine grained SAND, slightly moist (SM)	42						
356.3	Medium dense, 10YR 3/6, clayey fine to medium grained SAND, slightly moist (SC)	43	17	CORE	21			
	Medium dense to dense, 10YR 3/4, clayey very fine to fine grained SAND, trace fine subrounded gravel, slightly moist	44						
		45						

Log of Boring **B4** Sheet 3 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-60	700019502
Location	**Bearing (deg)**	**Elevation and Datum**
Hollywood, CA	178	Approximately 393.5

Elev. (ft)	Sample Description
	(SC)
354.1	Medium dense, 10YR 3/6, clayey fine to medium grained SAND, trace silt, slightly moist (SC)
	Medium stiff, 5YR 4/4, silty CLAY, slightly moist (CL)
353.2	Loose, 7.5YR 4/6, clayey fine to medium grained SAND, trace coarse grained sand, slightly moist (SC)
	Medium dense, 7.5YR 3/4, clayey very fine grained SAND, trace coarse grained sand, slightly moist to moist (SC)
	Medium dense, 7.5YR 4.5/4, clayey fine grained SAND, slightly moist (SC)
349.3	Loose, 7.5YR 4/6, silty fine to medium grained SAND, trace fine subangular gravel, trace coarse grained sand, slightly moist (SM)
348.9	
348.5	Loose, 10YR 4/6, fine to medium grained poorly graded SAND, scattered fine to coarse subangular gravel, slightly moist (SP)
347.6	Loose, 10YR 4/6, fine to coarse grained well graded SAND, wet (SW)
	Dense, 10YR 3/6, clayey very fine grained SAND, moist (SC)
345.9	Loose, 10YR 4/6, fine to coarse grained well graded SAND, trace fine subangular gravel, wet (SW)
345.0	Stiff, 10YR 3/4, CLAY, slightly moist to moist (CL)
343.3	Medium dense, 10YR 4/6, fine to coarse grained well graded SAND, wet (SW)
342.0	Stiff, 10YR 4/4, silty CLAY, moist (CL)
340.7	Medium dense to dense, 10YR 4/4, clayey fine and coarse grained SAND, wet (SC) ▼
338.9	Medium dense, 7.5YR 4/6, gravelly fine to coarse grained well graded SAND, fine subrounded gravel, wet (SW)
335.5	Medium dense to dense, 7.5YR 4/4, very fine to fine grained poorly graded SAND, trace fine to coarse subrounded gravel, moist (SP)
334.6	Loose, 7.5YR 5/8, fine to coarse grained well graded gravel, trace fine subangular to subrounded gravel, wet (SW)
332.9	

Length Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
45	17	CORE	21			
46						
47	18	CORE	24			
48						
49						
50	19	CORE	36			
51						
52						
53	20	CORE	36			
54						
55						
56	21	CORE	46			
57						
58						
59						
60	22	CORE	60			
61						
62						
63						
64						
65	23	CORE	52			
66						
67						
68						
69	24	CORE	58			
70						

\\LANGAN.COM\DATA\IRV\DATA5\700019502\ENGINEERING DATA\GEOTECHNICAL\GINTLOGS\700019502 HOLLYWOOD LOGS B1-B4-MODIFIED.GPJ ... 11/20/2012 9:59:17 PM ... Report: Log - LANGAN ...Template TEMPLATE.GDT

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Log of Boring B4 Sheet 4 of 5

Project	Plunge (deg)	Project No.
Millennium Hollywood	-60	700019502
Location	**Bearing (deg)**	**Elevation and Datum**
Hollywood, CA	178	Approximately 393.5

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Length Scale	Sample Data: Number	Sample Data: Type	Sample Data: Recov. (in)	Sample Data: Penetr. resist BL/6in	Sample Data: N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, 7.5YR 4/6, clayey coarse grained SAND, slightly moist (SC)	70						
			71	24	CORE	58			
	331.1	Medium dense, 7.5YR 5/4, silty fine to coarse grained SAND, scattered fine to coarse subangular gravel, slightly moist (SM)	72						
	330.3	Loose, 7.5YR 5/8, gravelly fine to coarse grained well graded SAND, fine subrounded gravel, wet (SW)	73						
			74						
			75						
	328.1	Dense, 7.5YR 5/4, silty fine to coarse grained SAND, scattered fine subangular gravel, slightly moist (SM)		25	CORE	60			
			76						
			77						
	326.0	Loose, 7.5YR 5/6, fine to coarse grained well graded SAND, scattered fine subrounded gravel, wet (SW)	78						
			79						
	324.2	Dense, 5YR 3/4, silty fine to coarse grained SAND, scattered fine subangular gravel, wet (SM)	80	26	CORE	60			
			81						
	322.5	Dense, 7.5YR 3/4, clayey coarse grained SAND, trace fine angular gravel, wet (SC)	82						
	321.6	Loose, 7.5YR 4/6, fine to coarse grained well graded SAND, wet (SW)	83						
	320.8	Hard, 7.5YR 3/3, CLAY, trace coarse grained sand, trace fine subangular gravel, slightly moist (CL)	84						
			85	27	CORE	60			
			86						
			87						
	317.3	Loose, 10YR 4/6, fine to medium grained poorly graded SAND, trace fine to coarse subangular gravel, wet (SP)	88						
			89						
	315.6	Stiff, 10YR 3/4, CLAY, trace fine to coarse subangular gravel, trace coarse grained sand, slightly moist (CL)	90	28	CORE	34			
			91						
	313.8	Dense, 10YR 3/3, silty fine to medium grained SAND, slightly moist (SM)	92						
		Dense, 10YR 3/3, silty fine to coarse grained SAND, slightly moist (SM)	93						
	312.1	Medium dense, 10YR 3/4, clayey sandy well graded GRAVEL, medium and coarse grained sand, fine to coarse	94	29	CORE	58			
			95						

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Log of Boring **B4** Sheet 5 of 5

Project Millennium Hollywood	Plunge (deg) -60	Project No. 700019502	
Location Hollywood, CA	Bearing (deg) 178	Elevation and Datum Approximately 393.5	

Elev. (ft)	Sample Description	Length Scale	Number	Type	Recov. (ft)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	subangular gravel, slightly moist (GW) Loose to medium dense, 5YR 6/2, sandy well graded GRAVEL, fine to coarse angular to subangular gravel, medium to coarse grained sand, slightly moist (GW)	95	29	CORE	58			
308.6	Loose to medium dense, 7.5YR 4/4, gravelly silty SAND, fine to coarse angular to subrounded gravel, fine to medium grained sand, slightly moist (SM)	98	30	CORE	58			
306.0	Loose, 7.5YR 4/3, sandy well graded GRAVEL, fine to coarse angular to subangular gravel, very fine to fine and coarse grained sand, slightly moist (GW)	101						
304.3	Loose, 7.5YR 3/6, fine to medium grained poorly graded SAND, trace coarse grained sand, wet (SP)	103	31	CORE	32			
300.8	7.5YR 3/3, sandy well graded GRAVEL, fine and coarse grained sand, fine to coarse subangular gravel, trace clay, slightly moist to moist (GW)	107						
300.0	Loose, 7.5YR 5/6, silty fine to coarse grained SAND, trace fine subangular gravel, wet (SM)	108	32	CORE	22			
299.1	Loose, 7.5YR 4/4, clayey sandy well graded GRAVEL, medium to coarse grained sand, fine to coarse subrounded gravel, slightly moist to moist (GW)	109						
297.4	Boring terminated at 111 feet length Boring backfilled with cement grout Surface patched with black-dyed rapid set concrete	111						

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Log of Boring B5 Sheet 1 of 3

Project: Millennium Hollywood		Project No.: 700019502	
Location: Hollywood, CA		Elevation and Datum: Approximately 388	
Drilling Company: BC^2 Environmental		Date Started: 10/11/12	Date Finished: 10/11/12
Drilling Equipment: Sonic Drill Rig		Completion Depth: 50 ft	Rock Depth: -
Size and Type of Bit:		Number of Samples: Disturbed:	Undisturbed: Core:
Casing Diameter (in):	Casing Depth (ft):	Water Level (ft.): First ▽ 47	Completion ▼ 46.5 24 HR. ▼ -
Casing Hammer: Weight (lbs):	Drop (in):	Drilling Foreman: Clint Jefferson	
Sampler: Continuous Core		Inspecting Engineer: D.Eberhart & S. Montgomery	
Sampler Hammer: Weight (lbs):	Drop (in):		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+388.0 +387.7	Asphalt Pavement	0						
	Loose, 10YR 3/6, silty very fine and fine grained SAND, scattered asphalt concrete fragments, slightly moist [FILL]	1 2 3 4 5	1	CORE	36			##YR ##/## Soil Color based on Munsell Soil Color Chart
	Loose to medium dense, 10YR 3/4, silty very fine and fine grained SAND, slightly moist to moist [FILL] Medium stiff, 10YR 3/6, medium and coarse grained sandy SILT, slightly moist to moist [FILL]	6 7	2	CORE	18			
	Loose, 10YR 3/6, silty medium and coarse grained SAND, scattered asphalt concrete fragments, slightly moist to moist [FILL]	8						
+379.5	**YOUNG ALLUVIUM** Loose to medium dense, 10YR 6/6, silty very fine to coarse grained well graded SAND, trace fine subrounded gravel, scattered silty pockets, slightly moist (SM)	9 10						
+377.0	Loose to medium dense, 10YR 5/8, very fine, fine and coarse grained poorly graded SAND, trace fine subrounded gravel, scattered silty pockets, damp (SP)	11 12 13 14	3	CORE	34			
+373.0	Medium stiff, 10YR 4/6, very fine and fine grained sandy SILT, trace fine to coarse subrounded gravel, scattered silty pockets, slightly micaceous, slightly moist (ML)	15						
+372.0	Medium dense, 10YR 6/6, silty very fine grained SAND, damp to slightly moist (SM)	16 17						
+370.5	**OLD ALLUVIUM** Stiff, 10YR 3/4, CLAY, trace coarse grained sand, slightly moist to moist (CL)	18 19	4	CORE	53			
+368.0		20						

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Log of Boring **B5** Sheet 2 of 3

Project	Project No.
Millennium Hollywood	700019502
Location	**Elevation and Datum**
Hollywood, CA	Approximately 388

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	Sample Data N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	367.5	Loose, 10YR 5.5/5, silty fine to coarse grained SAND, trace fine subangular gravel, very moist to wet (SM)	20						
		Medium stiff, 7.5YR 4/4, silty very fine grained sandy CLAY, trace coarse grained sand, trace fine to coarse subrounded gravel, moist (CL)	21	5	CORE	27			
		Stiff, 10YR 4/4, silty CLAY, trace coarse grained sand, moist (CL)	22						
		Stiff to very stiff, 10YR 4/4, silty CLAY, trace fine and coarse grained sand, slightly moist to moist (CL)	23						
		Stiff to very stiff, 10YR 4/4, silty CLAY, trace fine and coarse grained sand, trace fine subangular gravel, slightly moist to moist (CL)	24 25	6	CORE	57			
	361.0	Stiff to very stiff, 10YR 4/4, silty CLAY, trace fine and coarse grained sand, slightly moist to moist (CL)	26						
	359.0	Medium dense to dense, 10YR 3.5/5, very fine and coarse grained SAND, trace clay, slightly moist to moist (SP)	27 28	7	CORE	32			
	358.0	Medium dense, 10YR 4/6, fine to coarse grained SAND, trace fine subangular gravel, slightly moist to moist (SW)	29						
	357.0	Stiff, 10YR 3/4, silty CLAY, trace coarse grained sand, slightly moist to moist (CL)	30						
	355.0	Loose to medium dense, 10YR 5/4, gravelly very fine to coarse grained well graded SAND, fine to coarse angular to subangular gravel, trace cobble, damp (SW)	31 32	8	CORE	48			
	354.0	Loose to medium dense, 10YR 3/4, very fine and fine grained poorly graded SAND, trace silt, damp to slightly moist (SP)	33						
	353.0	Medium stiff, 10YR 3/4, silty CLAY, trace fine grained sand, slightly moist to moist (CL)	34						
		Medium dense, 10YR 5/6, silty very fine to coarse grained SAND, slightly moist (SM)	35 36	9	CORE	24			
		Medium dense to dense, 10YR 4/4, silty fine to coarse grained SAND, trace coarse subangular gravel, slightly moist (SM)	37 38						
		Loose to medium dense, 10YR 5/6, silty very fine, fine and coarse grained SAND, slightly moist (SM)	39 40 41	10	CORE	44			
		Loose to medium dense, 10YR 4/4, silty very fine and fine grained SAND, scattered fine to coarse angular to subangular gravel, trace medium grained sand, damp to slightly moist (SM)	42 43 44						
		Loose to medium dense, 10YR 3/4, silty medium and	45	11		30			

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Log of Boring **B5** Sheet 3 of 3

Project Millennium Hollywood	Project No. 700019502
Location Hollywood, CA	Elevation and Datum Approximately 388

Elev. (ft)	Sample Description
	coarse grained SAND, trace fine subangular gravel, trace clay, moist (SM)
342.5	Medium dense, 10YR 4/6, clayey very fine and fine grained SAND, moist (SC)
342.0	Medium dense, 10YR 3/4, silty very fine and fine grained SAND, trace coarse grained sand, trace clay, damp to slightly moist (SM)
340.0	Medium dense, 7.5YR 4/4, silty very fine to medium grained SAND, trace coarse grained sand, trace fine to coarse subangular gravel, wet (SM)
339.0	Medium dense to dense, 7.5YR 4/4, silty fine and medium grained SAND, trace coarse subangular gravel, very moist (SM)
338.0	Stiff, 7.5YR 4/4, silty CLAY, trace coarse grained sand, moist (CL)
	Dense, 7.5YR 4/3, silty very fine and fine grained SAND, trace clay, moist (SM)

Boring terminated at 50 feet depth
Boring backfilled with cement grout
Surface patched with black-dyed rapid set concrete

Depth Scale: 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70

Sample Data				
Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40
11	CORE	30		
12	CORE	64		

Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)

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Log of Boring **B6** Sheet 1 of 3

Project Millennium Hollywood			Project No. 700019502		
Location Hollywood, CA			Elevation and Datum Approximately 388.5		
Drilling Company BC^2 Environmental			Date Started 10/11/12	Date Finished 10/11/12	
Drilling Equipment Sonic Drill Rig			Completion Depth 50 ft	Rock Depth -	
Size and Type of Bit			Number of Samples	Disturbed	Undisturbed	Core
Casing Diameter (in)		Casing Depth (ft)	Water Level (ft.)	First ▽ 46	Completion ▼ 44.8	24 HR. ▼ -
Casing Hammer	Weight (lbs)	Drop (in)	Drilling Foreman Clint Jefferson		
Sampler Continuous Core					
Sampler Hammer	Weight (lbs)	Drop (in)	Inspecting Engineer D.Eberhart & S. Montgomery		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+388.5		0						
+388.2	Asphalt Pavement							
	Loose to medium dense, 10YR 3/3, silty very fine and fine grained SAND, trace coarse grained sand, scattered brick fragments, slightly moist [FILL]	1						##YR #/# Soil Color based on Munsell Soil Color Chart
		2						
		3	1	CORE	15			
	Loose, 10YR 3/3, silty very fine and fine grained SAND, scattered asphalt and brick fragments, slightly moist [FILL]	4						
+383.5	Loose, 10YR 3/3, silty very fine and fine grained SAND, slightly moist [FILL]	5						
	YOUNG ALLUVIUM Loose to medium dense, 10YR 4/4, silty very fine, fine and coarse grained SAND, slightly moist (SM)		2	CORE	6			
		6						
		7						
		8						
		9						
	Loose, 10YR 5/4, silty very fine and fine grained SAND, silty pockets, damp to slightly moist (SM)	10	3	CORE	38			
		11						
		12						
	Loose to medium dense, silty very fine, fine and coarse grained SAND, trace fine to coarse subangular gravel, dry to damp (SM)	13						
		14						
	Medium dense, 10YR 4.5/3.5, silty very fine and fine grained SAND, trace coarse grained sand, trace coarse subangular gravel, slightly micaceous, very moist to wet (SM)	15						
		16	4	CORE	18			
	Loose, 10YR 4/4, silty very fine grained SAND, slightly micaceous, wet (SM)	17						
	Loose, 10YR 4/4, silty very fine grained SAND, slightly micaceous, slightly moist (SM)		5	CORE	24			
	Medium dense, 10YR 3/4, silty very fine and fine grained SAND, silty pockets, slightly moist (SM)	18						
	Medium dense, 10YR 3/3, silty very fine, fine and coarse grained SAND, slightly moist (SM)	19	6	CORE	50			
	Loose, 7.5YR 3/3, silty very fine and fine grained SAND,	20						

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ENGINEERING & ENVIRONMENTAL SERVICES

Log of Boring B6 Sheet 2 of 3

Project Millennium Hollywood	Project No. 700019502
Location Hollywood, CA	Elevation and Datum Approximately 388.5

Elev. (ft)	Sample Description	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	trace fine to coarse subrounded gravel, moist (SM)	20						
367.5	**OLD ALLUVIUM** Medium dense, 7.5YR 3/3, clayey very fine to coarse grained SAND, trace coarse subangular gravel, slightly moist (SC)	21 22 23 24	6	CORE	50			
364.0	Medium dense to dense, 7.5YR 4/4, silty very fine and coarse grained SAND, trace coarse angular gravel, some clay, damp to slightly moist (SM)	25						
363.5	Dense, 5YR 4/6, clayey fine, medium and coarse grained SAND, slightly moist (SC)	26	7	CORE	24			
361.5	Medium dense, 7.5YR 4/6, very fine grained sandy SILT, slightly moist (ML)	27 28	8	CORE	55			
359.5	Medium dense, 7.5YR 5/4, very fine to coarse grained SAND, some coarse subangular to rounded gravel, slightly moist (SW)	29 30						
358.5	Medium dense, 7.5YR 5/6, silty very fine grained SAND, slightly moist (SM)		9	CORE	6			
	Medium dense, 10YR 5/8, silty very fine, fine and coarse grained SAND, trace coarse angular to subangular gravel, some clay, slightly moist (SM)	31 32 33	10	CORE	40			
354.5	Medium dense, 10YR 3/4, clayey very fine to coarse grained SAND, slightly moist (SC)	34						
353.5	Medium dense, 10YR 3/4, silty very fine and fine grained SAND, trace fine angular gravel, slightly moist (SM)	35 36	11	CORE	18			
	Medium dense to dense, 10YR 3/6, silty very fine to course grained SAND, trace coarse angular gravel, slightly moist (SM)	37 38						
	Dense to very dense, 10YR 3/4, silty medium and coarse grained SAND, trace clay, slightly moist (SM)	39 40	12	CORE	36			
	Dense to very dense, 10YR 3/4, silty medium and coarse grained SAND, trace coarse subangular to rounded gravel, trace clay, slightly moist (SM)	41 42 43	13	CORE	46			
	Loose to medium dense, 10YR 5/8, silty very fine to coarse grained SAND, some fine to coarse angular to subangular ▼	44 45						

\\LANGAN.COM\DATA\IR\DATA5\700019502\ENGINEERING DATA\GEOTECHNICAL\GINT\LOGS\700019502 HOLLYWOOD LOGS B5-B6.GPJ ... 11/20/2012 10:00:06 PM ... Report: Log - LANGAN ...Template TEMPLATE.GDT

Log of Boring **B6** Sheet 3 of 3

Project Millennium Hollywood	Project No. 700019502
Location Hollywood, CA	Elevation and Datum Approximately 388.5

Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	gravel, slightly moist (SM) Medium dense, 10YR 3/6, silty very fine and fine grained SAND, some medium grained sand, slightly moist (SM) ▽	45	14	CORE	12			
	Medium dense to dense, 7.5YR 3/4, silty fine to coarse grained SAND, trace coarse angular gravel, clay pockets, slightly moist (SM)	46						
341.0		47						
340.5	Loose, 7.5YR 6/3, very fine to coarse grained well graded SAND, trace fine to coarse subangular to angular gravel, damp (SW)	48	15	CORE	48			
	Dense, 7.5YR 6/6, silty very fine and fine grained SAND, trace coarse grained sand, moist (SM)	49						
338.5	Loose, 7.5YR 5.5/5, silty very fine to medium grained SAND, trace fine to coarse rounded gravel, very moist (SM)	50						
		51						
	Boring terminated at 50 feet depth Boring backfilled with cement grout Surface patched with black-dyed rapid set concrete	52						
		53						
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APPENDIX B
INRODUCTION TO RADIOCARBON DETERMINATIONS BY AMS METHODOLOGY

BETA

Radiocarbon Dating

Consistent Accuracy
Delivered On-Time

Introduction to Radiocarbon Determinations by the Accelerator Mass Spectrometry Method

AMS Counting

The 14C Method;

There are three principal isotopes of carbon which occur naturally - C12, C13 (both stable) and C14 (unstable or radioactive). These isotopes are present in the following amounts C12 - 98.89%, C13 - 1.11% and C14 - 0.00000000010%. Thus, one carbon 14 atom exists in nature for every 1,000,000,000,000 or (1 in a trillion) C12 atoms in living material. The radiocarbon method is based on the rate of decay of the radioactive or unstable carbon isotope 14 (14C), which is formed in the upper atmosphere through the effect of cosmic ray neutrons upon nitrogen 14. The reaction is;

14N + n => 14C + p

(Where n is a neutron and p is a proton).

The 14C formed is rapidly oxidized to 14CO2 and enters the earth's plant and animal life ways through photosynthesis and the food chain. The rapidity of the dispersal of C14 into the atmosphere has been demonstrated by measurements of radioactive carbon produced from thermonuclear bomb testing. 14C also enters the Earth's oceans in an atmospheric exchange and as dissolved carbonate (the entire 14C inventory is termed the **carbon exchange reservoir** (Aitken, 1990)). Plants and animals which utilize carbon in biological food chains take up 14C during their lifetimes. They exist in equilibrium with the C14 concentration of the atmosphere, that is, the numbers of C14 atoms and non-radioactive carbon atoms stays approximately the same over time. As soon as a plant or animal dies, they cease the metabolic function of carbon uptake; there is no replenishment of radioactive carbon, only decay.

Libby, Anderson and Arnold (1949) were the first to measure the rate of this decay. They found that after 5568 years, half the C14 in the original sample will have decayed and after another 5568 years, half of that remaining material will have decayed, and so on (see figure 1 below). The **half-life** (*t* 1/2) is the name given to this value which Libby measured at 5568±30 years. This became known as the **Libby half-life**. After 10 half-lives, there is a very small amount of radioactive carbon present in a sample. At about 50 - 60 000 years, then, the limit of the technique is reached (beyond this time, other

radiometric techniques must be used for dating). By measuring the C14 concentration or residual radioactivity of a sample whose age is not known, it is possible to obtain the count rate or number of decay events per gram of Carbon. By comparing this with modern levels of activity (1890 wood corrected for decay to 1950 AD) and using the measured half-life it becomes possible to calculate a date for the death of the sample.
As 14C decays it emits a weak beta particle (*b*), or electron, which possesses an average energy of 160keV. The decay can be shown;

$$\mathbf{14C \Rightarrow 14N} + b$$

Thus, the 14C decays back to 14N. There is a quantitative relationship between the decay of 14C and the production of a beta particle. The decay is constant but spontaneous. That is, the probability of decay for an atom of 14C in a discrete sample is constant, thereby requiring the application of statistical methods for the analysis of counting data.
It follows from this that any material which is composed of carbon may be dated. Herein lies the true advantage of the radiocarbon method, it is able to be uniformly applied throughout the world on any material that contains residual carbon.
Because of this laboratories from around the world are producing radiocarbon assays for the scientific community. The C14 technique has been and continues to be applied and used in many, many different fields including hydrology, atmospheric science, oceanography, geology, palaeoclimatology, archaeology, biomedicine and materials science.

The Accelerator Mass Spectrometry method of direct C14 isotope counting was first performed in 1977 by scientific research teams at Rochester and Toronto, the General Ionex Corporation and soon after additional measurements were carried out at Simon Fraser and McMaster Universities (Gove, 1994).

Radiocarbon dating using Accelerator Mass Spectrometry (AMS) differs from the decay counting methods in that the amount of ^{14}C in the sample is measured directly, rather than by waiting for the individual radioactive decay events to occur. This makes the technique 1,000 to 10,000 times more sensitive than decay counting. The enhanced sensitivity is achieved by accelerating sample atoms as ions to high energies using a particle accelerator, and using nuclear particle detection techniques. Additionally because of the increased sensitivity counting times are greatly reduced (minutes to hours, instead of days) and sub-milligram sample sizes can be routinely measured. Because of this a greatly increased range of sample types and sizes can now be measured that previously gas-proportional or LSC counting techniques could not.

In the ^{14}C AMS technique, the element of interest (sample carbon) is chemically separated from the original sample, converted to graphite, pressed into a cathode (sample target holder) where if forms a solid graphite plug or layer and is then placed into a sputter ion source of an accelerator.

This methodology outlines the general graphite sample preparation (chemistry) and AMS counting procedures at BETA Analytic Inc., for organic and carbonate samples. Through this process the CO2 produced from carbonaceous raw materials is cryogenically purified (separated from non-combustible gases) and reduced to solid graphite for measurement in an AMS.

Conversion of Sample Carbon to Graphite;

Sample Pretreatment;

Each sample must first be pretreated or the material of interest isolated to insure that only the primary carbon of interest will be analyzed. As many different types of carbon containing compounds are present, different pretreatment regimes have been developed to concentrate and isolate the particular carbon fraction of interest prior to dating. *(See Pretreatment Glossary – Standard Pretreatment Protocols at Beta Analytic*).

CO2 Generation;

The pretreated sample carbon is first oxidized to CO2 either by combustion in an Oxygen stream or through direct reaction with reduced Cupric Oxide (metal wire / powder) for organics or through acid hydrolysis for carbonates.

Combustion

$\underset{\textbf{(Sample)}}{\text{Organic}} + O2 + \underset{(900°C)}{\Delta H} \Rightarrow CO2$

$\underset{\textbf{(Sample)}}{\text{Organic}} + CuO + \underset{(900°C)}{\Delta H} \Rightarrow CO2$

OR

Acid Hydrolysis

$\underset{\textbf{(Sample)}}{\text{Carbonate}} + HCl \Rightarrow CO2$

The CO2 generated is then cryogenically purified by removing water vapor and any non-combustible/condensable gases by passing through a series of dry-ice / Methanol water traps (~ -78°C) and depending on the sample type a series of liquid Nitrogen / Pentane slush traps (~129°C).

Conversion of CO2 to Graphite (Graphitization reaction);

To produce the small amounts of elemental carbon from CO2 for measurement in an AMS we use the **Bosch reaction** (Manning and Reid, 1977) that is a chemical reaction between carbon dioxide and hydrogen that produces elemental carbon (graphite), water and heat.

The reaction takes place as two successive reductions; first to carbon monoxide and then to carbon, which permeates and adheres to the surface of the Cobalt powder (catalyst). More details on graphitization techniques and catalysts can be found in Vogel et al, 1984.

The overall reaction is as follows;

$$CO2\,(g) + 2\,H2\,(g) \xrightarrow[\textbf{(Co Catalyst)}]{(550 \text{ to } 650°C)} C(\underline{s}) + 2\,H2O\,(\underline{l})$$

However, the above reaction is actually the result of two separate reactions. The first reaction; the water gas shift reaction is a fast one;

$$CO_2 + H_2 \rightarrow CO + H_2O$$

The second reaction controls the overall reaction rate;

$$CO + H_2 \rightarrow C + H_2O$$

During the graphitization procedure cryogenically cleaned, dry CO2 produced from the combustion or acid hydrolysis, is transferred cryogenically (with Liquid Nitrogen @ -196°C)* to a specially designed graphitization cell under vacuum that is composed of Vycor glass, Pyrex glass and Stainless Steel (modified design after Lloyd et al, 1991).

** NOTE; Prior to the introduction of the CO2 over the cobalt catalyst in the graphitization cell, the cobalt is pre-conditioned to remove any carbon contaminants by being evacuated, then purged with Hydrogen multiple times and finally reduced over ¾ atmosphere of hydrogen for 1-2 hours at 550°C to 650°C.*

The pre-conditioned graphitization cell contains either a 4.5 mg or 3.5 mg aliquot of Cobalt metal powder (a mixture of 85% Alfa Aesar -400 mesh, and 15% Alfa Aesar Puratronic -22 mesh) that is specific to the size of the sample being graphitized

Based on the amount of CO2 generated during the combustion the CO2 is cryogenically transferred to a graphitization cell containing and amount of Cobalt that is 3x greater in weight than the amount of carbon (3:1 ratio), then and aliquot of Ultra-Pure Research Grade Hydrogen is added such that the amount of Hydrogen is 3x greater in volume as the sample CO2 (3:1 ratio).

The graphitization cell is then placed into a 550°C to 650°C oven for a period of 10-12 hours while the water produced during the graphitization is continuously removed via a cold finger that is part of the graphitization cell, by a dry-ice Methanol slush (-78°C).

After 10-12 hours have passed the pressure in the graphitization cell is inspected to insure that the reaction has gone to completion (that the CO2 has been converted to graphite with a minimum yield falling in the range of 80-100%). If the reaction has not reached completion, the graphitization cell is returned to the oven, and reacted again for a period of 4-10 hrs. If the reaction does not reach an 80-100% completion following the second graphitization attempt, the sample is analyzed again starting from combustion.

If the graphitization has gone to completion, the graphitization cell is placed under a vacuum and allowed to warm to room temperature causing all water vapor formed during the graphitization reaction to be pumped away, leaving the graphite dry. The graphite is then purged 1x with ultra-pure (99.999) Argon which has passed through an ascarite molecular sieve to remove any CO2 and a silicone drying agent to remove any water vapor. This is then followed by pumping to a vacuum and then purged again with ultra-pure (99.999) Argon to equalize with atmospheric pressure.

The graphitization tube is then removed from the graphitization cell and capped with an Al-foil cover and placed in a test-tube rack ready to be loaded into a cathode for AMS counting.

AMS Cathode (Target) Loading;

The prepared graphite sample is placed into an AMS cathode (target) by pouring the graphite directly from the graphitization tube into the cathode. The graphite powder is then compressed to a minimum of 150 psi (gauge reading) in an Arbor press or by hammering with a press-pin.

The surface of the graphite (target face) is optically inspected to insure that the graphite appears to be smooth and homogenous (i.e. the graphite does not appear uneven or mottled in coloration). The cathode (target) is then placed into a cathode wheel and placed into the AMS along with the necessary Modern Standards (OXI and/or OXII, organic and carbonate blanks, TIRI known age standards (organic and or carbonate) and sufficient blind QA samples (samples previously measured by LSC and/or AMS) for C14/13 and C14/12 detection.

AMS Counting;

As is common with other kinds of mass spectrometry, AMS counting is performed by converting the atoms in the sample (graphite) into a beam of fast moving ions (charged atoms). The mass of these ions is then separated by the application of magnetic and electric fields and measured by nuclear particle detection techniques. The measurement of radiocarbon by mass spectrometry is very difficult because its concentration is less than one atom in 1,000,000,000,000 (one-trillion) atoms. Thus the accelerator is used to help remove ions that might be confused with radiocarbon before the final detection.

The sample is put into the ion source (as graphite) and is ionized by bombarding it with cesium ions and then focused into a fast-moving beam. The ions produced are negative which prevents the confusion of ^{14}C with ^{14}N since nitrogen does not form a negative ion. The first bending magnet is used in the same way as the magnet in an ordinary mass spectrometer to select ions of mass 14 (this will include large number of $^{12}CH^{2-}$ and $^{13}CH^{-}$ ions and a very few $^{14}C^{-}$ ions).

The ions then enter the accelerator. As they travel to the terminal detector they are accelerated sufficiently such that when they collide with the gas molecules in the stripper, all of the molecular ions (such as $^{12}CH_2$ and ^{13}CH) are broken up allowing most of the C ions to pass through to a second bending magnet which further separates the ions with the mass and momentum expected of ^{14}C, ^{13}C, and ^{12}C.

Finally the filtered ^{14}C ions enter the detector where their velocity and energy are checked so that the number of ^{14}C ions in the sample can be counted.

Not all of the radiocarbon atoms put into the ion source end up reaching the detector and so the stable isotopes, ^{12}C and ^{13}C are measured as well in order to monitor the detection efficiency. For each sample a ratio of $^{14}C/^{13}C$ is calculated and compared to measurements made on standards with known ratios.

Uncertainties in AMS;

Soon after the first AMS spectrometers were developed, the quality of AMS measurements was demonstrated through comparisons of the error in the mean of a series of n AMS measurements for a sample (external error) to the counting statistics of the measured total counts, N, in that series of measurements (internal error). If μ is the mean of a group of individual measurements, each with variance σ2 (here assumed equivalent for all measurements), the fractional precisions were shown to be equivalent;

$$\sigma^2{}_{\mathrm{ext}} = \sigma^2 / n(n-1)\mu^2 = \sigma^2{}_{\mathrm{int}} = 1/ N_{total}$$

Indeed, equivalence of the standard error in the mean of AMS measurements to the precision expected from counting statistics demonstrated the degree to which the spectrometer and its operation are free of systematic error. (Wölfli, et al., 1983; Donahue, Jull, & Zabel, 1984; Farwell, et al., 1984; Suter, et al., 1984).

The development of a uniform sample material for 14C AMS; filamentous or fullerene graphite (Vogel et al, 1984), provided intense ion beams for all samples and standards, bringing the internal and external uncertainties into routine equivalence for precise (σ ≤1%) AMS quantification. (Bonani, et al., 1987; Vogel, at al., 1987).

Sample Isotopic Fractionation (Stable Isotope Ratios 13/12C);

In order to provide radiocarbon determinations that are both accurate and precise, it is necessary to measure the stable isotopes of 13C and 12C and their ratio. This is performed by extracting a small amount of the CO2 generated during the combustion or acid hydrolysis and measuring the 13/12C ratio relative to the PDB mass-spectrometry standard. This ratio is later used in the calculation of the radiocarbon age and error to correct for isotopic fractionation in nature.

Fractionation during the geochemical transfer of carbon in nature produces variation in the equilibrium distribution of the isotopes of carbon (12C, 13C and 14C). Craig (1953) first identified that certain biochemical processes alter the equilibrium between the carbon isotopes. Some processes, such as photosynthesis for instance, favors one isotope over another, so after photosynthesis, the isotope C13 is depleted by 1.8% in comparison to its natural ratios in the atmosphere (Harkness, 1979). Conversely the inorganic carbon dissolved in the oceans is generally 0.7% enriched in 13C relative to atmospheric carbon dioxide. The extent of isotopic fractionation on the 14C/12C ratio which must be measured accurately, is approximately double that for the measured 13C/12C ratio. If isotopic fractionation occurs in natural processes, a correction can be made by measuring the ratio of the isotope 13C to the isotope 12C in the sample being dated. The ratio is measured using an ordinary mass spectrometer. The isotopic composition of the sample being measured is expressed as **delta13C** which represents the parts per thousand difference (per mille) between the sample carbon 13 content and the content of the international PDB standard carbonate (Keith et al., 1964; Aitken, 1990). A d13C value, then, represents the per mille (part per thousand) deviation from the PDB standard. PDB refers to the Cretaceous belemnite formation at Peedee in South Carolina, USA. This nomenclature has recently been changed to VPDB (Coplen, 1994).

In summary, then, isotopic fractionation refers to the fluctuation in the carbon isotope ratios as a result of natural biochemical processes as a function of their atomic mass (Taylor, 1987). Variations as such are unrelated to time and natural radioactive decay. It is common practice in radiocarbon laboratories to correct radiocarbon activities for sample fractionation. The resultant ages are termed "normalized", meaning the measured activity is modified with respect to -25 per mille wrt VPBD. The correction factor must be added or subtracted from the conventional radiocarbon age.

The deltaC13 value for a sample can yield important information regarding the environment from which the sample comes, or the mixtures of materials used to produce it. Because the isotope value of the sample reflects the isotopic composition of the immediate environment. In the case of shellfish for example, marine shells typically possess a dC13 value of between -1 and +4 per mille, whereas river shells possess a value of between -8 and -12 per mille, therefore, in a case where the precise environment of the shell is not known, it is possible to determine the most likely by analysis of the dC13 result.

Fractionation also describes variations in the isotopic ratios of carbon brought about by non-natural causes. For example, samples may be fractionated in the laboratory through a variety of means. Usually, this is due to lack of attention to detail and incomplete conversion of the sample from one stage to another or from one part of the laboratory to another. In Liquid Scintillation Counting, for example, incomplete synthesis of acetylene during lithium carbide preparation may result in a low yield and concurrent fractionation. Similarly, the transfer of gases in a vacuum system may involve fractionation error if the sample gas is not allowed to equilibrate throughout the total volume. Atoms of larger or smaller mass may be favored in such a situation. If, however, the entire sample is converted completely from one form to another (e.g. solid to gas, acetylene to benzene) then no fractionation will occur.

Radiocarbon Age and Error Calculation;

Much of the information presented in this section is based upon the paper Stuiver, M. and Polach, H.A. 1977. Discussion; Reporting of 14C data. *Radiocarbon* 19; 355-63.
The radiocarbon age of a sample is obtained by measurement of the residual radioactivity. This is calculated through careful measurement of the residual activity (per gram C) remaining in a sample whose age is unknown, compared with the activity present in Modern and Background samples.

Modern standard;

The principal modern radiocarbon standard is N.I.S.T (National Institute of Standards and Technology; Gaithersburg, Maryland, USA) Oxalic Acid I (C2H2O4). ***Oxalic acid I*** is N.I.S.T designation SRM 4990 B and is termed HOx1. This is the International Radiocarbon Dating Standard. Ninety-five percent of the activity of Oxalic Acid from the year 1950 is equal to the measured activity of the ***absolute radiocarbon standard which is 1890 wood.*** 1890 wood was chosen as the radiocarbon standard because it was growing prior to the fossil fuel effects of the industrial revolution. The activity of 1890 wood is corrected for radioactive decay to 1950. Thus 1950, is year 0 BP by convention in radiocarbon dating and is deemed to be the 'present'. 1950 was chosen for no particular reason other than to honor the publication of the first radiocarbon dates calculated in December 1949 (Taylor, 1987;97).

The Oxalic acid standard was made from a crop of 1955 sugar beet. There were 1000 lbs made. The isotopic ratio of HOx I is -19.3 per mille with respect to (wrt) the PBD standard belemnite (Mann, 1983). The Oxalic acid standard which was developed is no longer commercially available. Another standard, ***Oxalic Acid II*** was prepared when stocks of HOx 1 began to dwindle. The Oxalic acid II standard (HOx 2; N.I.S.T designation SRM 4990 C) was made from a crop of 1977 French beet molasses. In the early 1980's, a group of 12 laboratories measured the ratios of the two standards. The ratio of the activity of Oxalic acid II to 1 is 1.2933±0.001 (the weighted mean) (Mann, 1983). The isotopic ratio of HOx II is -17.8 per mille.

According to Stuiver and Polach (1977), all laboratories should report their results either directly related to NBS Oxalic acid or indirectly using a sub-standard which is related to it.

Background Detection;

It is vital for a radiocarbon laboratory to know the contribution to routine sample activity of non-sample radioactivity. Obviously, this activity is additional and must be removed from calculations. In order to make allowances for background counts and to evaluate the limits of detection, materials which radiocarbon specialists can be fairly sure contain no activity are measured under identical counting conditions as normal samples. Background samples usually consist of geological samples of infinite age such as coal, lignite, limestone, ancient carbonate, anthracite, marble or swamp wood. By measuring the activity of a background sample, the normal radioactivity present while a sample of unknown age is being measured can be accounted for and deducted.

Conventional radiocarbon ages (BP);

A radiocarbon measurement, termed a **conventional radiocarbon age** (or CRA) is obtained using a set of parameters outlined by Stuiver and Polach (1977), in the journal ***Radiocarbon***. A time-independent level of C14 activity for the past is assumed in the measurement of a CRA. The activity of this hypothetical level of C14 activity is equal to the activity of the absolute international radiocarbon standard.
The Conventional Radiocarbon Age BP is calculated using the radiocarbon decay equation;

$$\mathbf{t=-8033\ ln(Asn/Aon)}$$

Where -8033 represents the mean lifetime of 14C (Stuiver and Polach, 1977). Aon is the activity in counts per minute of the modern standard, Asn is the equivalent cpm for the sample. 'ln' represents the natural logarithm.
A CRA embraces the following recommended conventions;

- a half-life of 5568 years;
- the use of Oxalic acid I or II as the modern radiocarbon standard;

- correction for sample isotopic fractionation (deltaC13) to a normalized or base value of -25.0 per mille relative to the ratio of C12/C13 in the carbonate standard VPDB (more on fractionation and deltaC13);
- the use of 1950 AD as 0 BP, ie all C14 ages head back in time from 1950;
- the assumption that all C14 reservoirs have remained constant through time.

Additional terms are sometimes requested to be or reported with, or in-lieu of the standard Conventional Radiocarbon Age BP result from which all others are mathematically derived. These are the "Measured Radiocarbon Age BP", Percent Modern Carbon (pMC), Mean Biobased Result (expressed in %), Percent Mean Biogenic Carbon Content, Percent Biomass CO2, Fraction Modern Carbon (fmdn or fMC) as well as d14C, D14C, delta 14C, Δ14C and delta 13/12C (all of which are expressed in per mille notation (%) rather than per cent notation.)

d14C represents the per mille depletion in sample carbon 14 prior to isotopic fractionation correction and is measured by;

$$\textbf{d14C=((Asn/Aon) - 1)1000 per mille}$$

D14C represents the 'normalized' value of d14C. 'Normalized' means that the activity is scaled in relation to fractionation of the sample, or its deltaC13 value. All D14C values are normalized to the base value of
- 25.0 per mille with respect to the standard carbonate (VPDB). D14C is calculated using;

$$\textbf{D14C=d14C - 2(dC13 + 25)(1 + d14C/1000) per mille}$$

This value can then be used to calculate the CRA using the equation given above.

$$\textbf{Radiocarbon age=-8033 ln(1 + D14C/1000)}$$

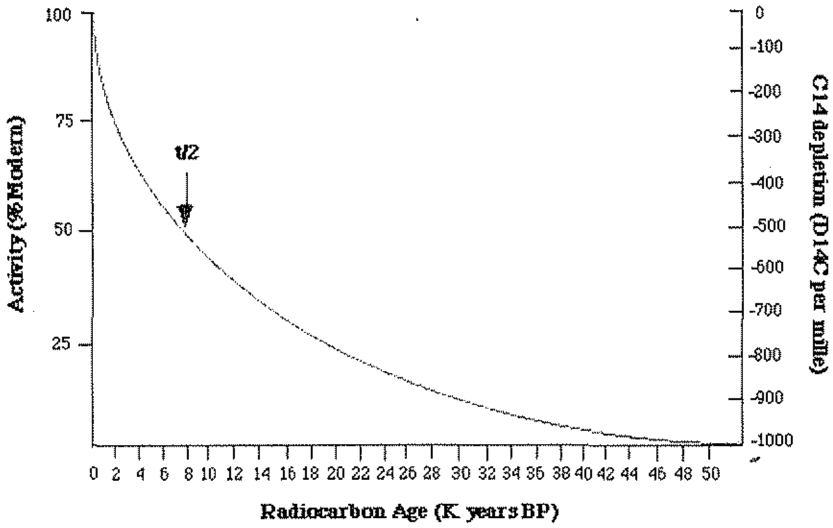

Figure 1; Decay curve for C14 showing the activity at one half-life (t/2). The terms "%Modern", or "pMC" and D14C are shown related in this diagram along with the Radiocarbon age in years BP (Before 1950 AD).

Age reporting;

If the reservoir corrected conventional radiocarbon age calculated is within the past 200 years, it should by convention be termed 'Modern' (Stuiver and Polach, 1977; 362). If a sample age falls after 1950, it is termed greater than Modern, or >Modern. Absolute percent modern (%M or pMC - 'percent modern carbon') is calculated using;

%M=100 x Asn/Aabs

or,

Asn/Aon(1/8267(y-1950)) x 100 percent

Where Aabs is the absolute international standard activity, 1/8267 is the lifetime based on the new half life (5730 yr), Y = the year of measurement of the appropriate standard. This is an expression of the ratio of the net modern activity against the residual normalized activity of the sample, expressed as a percentage and it represents the proportion of radiocarbon atoms in the sample compared to that present in the year 1950 AD. Thus, %Modern becomes a useful term in describing radiocarbon measurements for the past 45 years when, due to the influx of artificial radiocarbon into the atmosphere as a result of nuclear bomb testing the 'age' calculation becomes a 'future' calculation.

If the sample approaches D14C = -1000 per mille within 2 standard deviations, it is considered to be indistinguishable from the laboratory background, ie, not able to be separated with confidence from the laboratory count-rates which result from a sample which contains no radionuclide. In this instance, a **Greater-Than Age** is calculated. An example of a **Greater-Than Age** is >55, 000 yr or >50, 000 yr (Gupta and Polach, 1985).

Samples whose age falls between modern and background and are given finite ages. Standard errors released with each radiocarbon assay are usually rounded by convention (Stuiver and Polach, 1977). Again, not all laboratories subscribe to these conventions, some do not round up ages.

Standard Error and Sources of Error;

Statistical analysis is necessary in radiocarbon dating because the decay of C14 although constant, is spontaneous. It is not possible to measure the entire radioactivity in a given sample, hence the need for some kind of statistical analysis of counted data. The distribution of counted C14 decay events will, over time, yield a pattern. The pattern is termed a "normal distribution curve". A normal or "Gaussian" distribution describes the symmetrical bell shaped cluster of events around the average or mean of the data. In a normal distribution, 2 out of 3, or 68% of the values or counts observed will fall within one standard deviation of the average of the data. At two standard deviations, 95% of the observed counts will fall within the range and at three standard deviations, 99% of the counts which comprise the normal distribution will fall within this region. Each radiocarbon date is released as a conventional radiocarbon age with 'standard error'. This is the '±' value and by convention is ± 1 sigma. The standard error is based principally upon counting statistics, however other sources of error are possible and their effects are listed below;

Summary; The accuracy of radiocarbon dates (modified from Polach, H.A. 1976).

Sources of Error	Effect upon Age Determination	Measures to minimize the error incurred
1. Precision of age determination	Statistical; Typically ±1%Modern or less	Big samples, longer count times, repeat sample assays
2. Inherent a. C14 half-life	Libby half life 3% too low	Multiply CRA's by 1.03 if necessary
b. C13/C12 fractionation	Variable, up to 450 yr for shell.	Stable isotope analyses using Mass Spec.
c. C14 Modern standard	Variable > 80 yr	International crosscheck of secondary standards.
d. Variation in past C14 production rates	0-800 yr, beyond *ca*12 ka not determined	Tree ring calibration; otherwise interpret results in radiometric timescale.
e. Distribution of C14 in nature	Surface ocean latitudinal dependence -400 to -750 yr. Deep ocean -1800 yr.	Interpretation of results.
f. Changes of C14 concentration in the atmosphere.	Industrial effect *ca* -2.5% and atom bomb effect +160% in atmosphere	Interpretation of results
3. Contamination.	Nil to 300 yr up to 15 ka; >20 ka possible beyond 25 ka.	Interpretation of results, analysis and dating of extracted pretreated fractions.
4. Biological age of material	<10 yr to>1000 yr	Identification of species of material in the case of wood and charcoal to short lived samples only.
5. Association of sample and event	Intermediate	Interpretation of results
6. Human	Intermediate	Care in field and laboratory
7. Interpretation of results	Intermediate	Care in interpretation, interdisciplinary approach and collaboration

Accuracy and Precision in Radiocarbon Dating;

It is important to note the meaning of "accuracy" and "precision" in radiocarbon dating. Accuracy refers to the date being a 'true' estimate of the age of a sample within the range of the statistical limits or ± value of the date. Thus, for the sake of argument, if we were radiocarbon dating a sample of human bones from an individual who we knew died in

1066 AD, and obtained a date of 1040±40 AD, we would have dated the event of his death accurately. If however the date obtained were 1000±15 AD, we would be inaccurate. In terms of precision, however, the former is imprecise in comparison to the latter because of the larger stated error value. As such it can be seen that the date of 1000±15 AD while being highly precise is, in this instance, inaccurate.

Reservoir Effects;

A Conventional Radiocarbon Age or CRA does not take into account specific differences between the activity of different carbon reservoirs. A CRA is derived using an age calculation based upon the decay corrected activity of the absolute radiocarbon standard (1890 AD wood) which is in equilibrium with atmospheric radiocarbon levels (as mentioned previously, 1890 wood is no longer used as the primary radiocarbon standard, instead Oxalic Acid standards I and II were correlated with the activity of the original standard). In order to ascertain the ages of samples which were formed in equilibrium with different reservoirs to these materials, it is necessary to provide an age correction. Implicit in the Conventional Radiocarbon Age BP is the fact that it is not adjusted for this correction.

Radiocarbon samples which obtain their carbon from a different source (or reservoir) than atmospheric carbon may yield what is termed **apparent ages**. A shellfish alive today in a lake within a limestone catchment, for instance, will yield a radiocarbon date which is excessively old. The reason for this anomaly is that the limestone, which is weathered and dissolved into bicarbonate, has no radioactive carbon. Thus, it dilutes the activity of the lake meaning that the radioactivity is depleted in comparison to 14C activity elsewhere. The lake, in this case, has a different **radiocarbon reservoir** than that of the majority of the radiocarbon in the biosphere and therefore an accurate radiocarbon age requires that a correction be made to account for it.

One of the most commonly referenced reservoir effects concerns the ocean. The average difference between a radiocarbon date of a terrestrial sample such as a tree, and a shell from the marine environment is about 400 radiocarbon years (see Stuiver and Braziunas, 1993). This apparent age of oceanic water is caused both by the delay in exchange rates between atmospheric CO2 and ocean bicarbonate, and the dilution effect caused by the mixing of surface waters with upwelled deep waters which are very old (Mangerud 1972). A reservoir correction must therefore be made to any conventional shell dates to account for this difference. Human bone may be a problematic medium for dating in some instances due to human consumption of fish, whose C14 label will reflect the ocean reservoir. In such a case, it is very difficult to ascertain the precise reservoir difference and hence apply a correction to the measured radiocarbon age.

Spurious radiocarbon dates caused by volcanic emanations of radiocarbon-depleted CO2 probably also come under the category of reservoir corrections. Plants which grow in the vicinity of active volcanic fumaroles will yield a radiocarbon age which is too old. Bruns *et al.* (1980) measured the radioactivity of modern plants growing near hot springs heated by volcanic rocks in western Germany and demonstrated a deficiency in radiocarbon of up to 1500 years through comparison with modern atmospheric radiocarbon levels. Similarly, this effect has been noted for plants in the bay of Palaea Kameni near the prehistoric site of Akrotiri, which was buried by the eruption of the Thera volcano over 3500 years ago (see Weninger, 1989). The effect has been suggested as providing dates in error for the eruption of Thera which has been linked to the demise of the Minoan civilization in the Aegean. One modern plant growing near the emanations had an apparent age of 1390 yr. The volcanic effect has a limited distance however. Bruns *et al.* (1980) found that at 200 m away from the source, plants yielded an age in agreement with that expected. They suggested that the influence of depleted CO2 declined rapidly with increasing distance from the source. Radiocarbon discrepancies due to volcanic CO2 emissions are a popular source of ammunition for fundamentalist viewpoints keen to present evidence to show that the radiocarbon method is somehow fundamentally flawed.

Suess or Industrial Effect;

Since about 1890, the use of industrial and fossil fuels has resulted in large amounts of CO2 being emitted into the atmosphere. Because the source of the industrial fuels has been predominantly material of infinite geological age (*e.g.* coal, petroleum), whose radiocarbon content is nil, the radiocarbon activity of the atmosphere has been lowered in the early part of the 20th century up until the 1950's. The atmospheric radiocarbon signal has, in effect, been diluted by about 2%. Hans Suess (1955) discovered the **industrial effect** (also called after him) in the 1950's. A number of researchers found that the activity they expected from material growing since 1890 AD was lower. The logical conclusion from this was that in order to obtain a modern radiocarbon reference standard, representing the radiocarbon activity of the 'present day', one could not very well use wood which grew in the 1900's since it was affected by this industrial effect. Thus it was that 1890 wood was used as the modern radiocarbon standard, extrapolated for decay to 1950 AD

Atom Bomb Effect;

Since about 1955, thermonuclear tests have added considerably to the C14 atmospheric reservoir. This C14 is 'artificial' or 'bomb' C14, produced because nuclear bombs produce a huge thermal neutron flux. The effect of this has been to almost double the amount of C14 activity in terrestrial carbon bearing materials (Taylor, 1987).

De Vries (1958) was the first person to identify this 'Atom Bomb' effect. In the northern hemisphere the amount of artificial carbon in the atmosphere reached a peak in 1963 (in the southern hemisphere around 1965) at about 100% above normal levels. Since that time the amount has declined owing to exchange and dispersal of C14 into the Earth's carbon cycle system. The presence of bomb carbon in the earth's biosphere has enabled it to be used as a tracer to investigate the mechanics of carbon mixing and exchange processes.

APPENDIX C
SINGLE-STAGE ACCELERATOR MASS SPECTOMETRY DATING RESULTS

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Beta@radiocarbon.com
www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

August 20, 2012

Mr. Dan R. Eberhart
Langan Engineering and Environmental
18662 MacArthur Blvd.
Ste 456
Irvine, CA 92612

RE: Radiocarbon Dating Results For Samples B1-6-16 to 17 feet length, B1-17-34 to 35 feet length, B1-25-43 to 45 feet length, B1-31-55 to 56 feet length

Dear Mr. Eberhart:

Enclosed are the radiocarbon dating results for four samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. The report sheet contains the dating result, method used, material type, applied pretreatment and two-sigma calendar calibration result (where applicable) for each sample.

This report has been both mailed and sent electronically, along with a separate publication quality calendar calibration page. This is useful for incorporating directly into your reports. It is also digitally available in Windows metafile (.wmf) format upon request. Calibrations are calculated using the newest (2004) calibration database. References are quoted on the bottom of each calibration page. Multiple probability ranges may appear in some cases, due to short-term variations in the atmospheric 14C contents at certain time periods. Examining the calibration graphs will help you understand this phenomenon. Calibrations may not be included with all analyses. The upper limit is about 20,000 years, the lower limit is about 250 years and some material types are not suitable for calibration (e.g. water).

We analyzed these samples on a sole priority basis. No students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

Information pages are enclosed with the mailed copy of this report. They should answer most of questions you may have. If they do not, or if you have specific questions about the analyses, please do not hesitate to contact us. Someone is always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Dan R. Eberhart

Report Date: 8/20/2012

Langan Engineering and Environmental

Material Received: 8/10/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 328042 SAMPLE : B1-6-16 to 17 feet length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 3930 to 3870 (Cal BP 5880 to 5820) AND Cal BC 3800 to 3660 (Cal BP 5760 to 5610)	4980 +/- 40 BP	-24.8 o/oo	4980 +/- 40 BP
Beta - 328043 SAMPLE : B1-17-34 to 35 feet length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 9810 to 9310 (Cal BP 11760 to 11260)	10000 +/- 60 BP	-24.5 o/oo	10010 +/- 60 BP
Beta - 328044 SAMPLE : B1-25-43 to 45 feet length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 25710 to 24860 (Cal BP 27660 to 26820)	22480 +/- 100 BP	-23.9 o/oo	22500 +/- 100 BP
Beta - 328045 SAMPLE : B1-31-55 to 56 feet length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 31520 to 30840 (Cal BP 33470 to 32790)	28670 +/- 170 BP	-23.8 o/oo	28690 +/- 170 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.8:lab. mult=1)

Laboratory number: **Beta-328042**

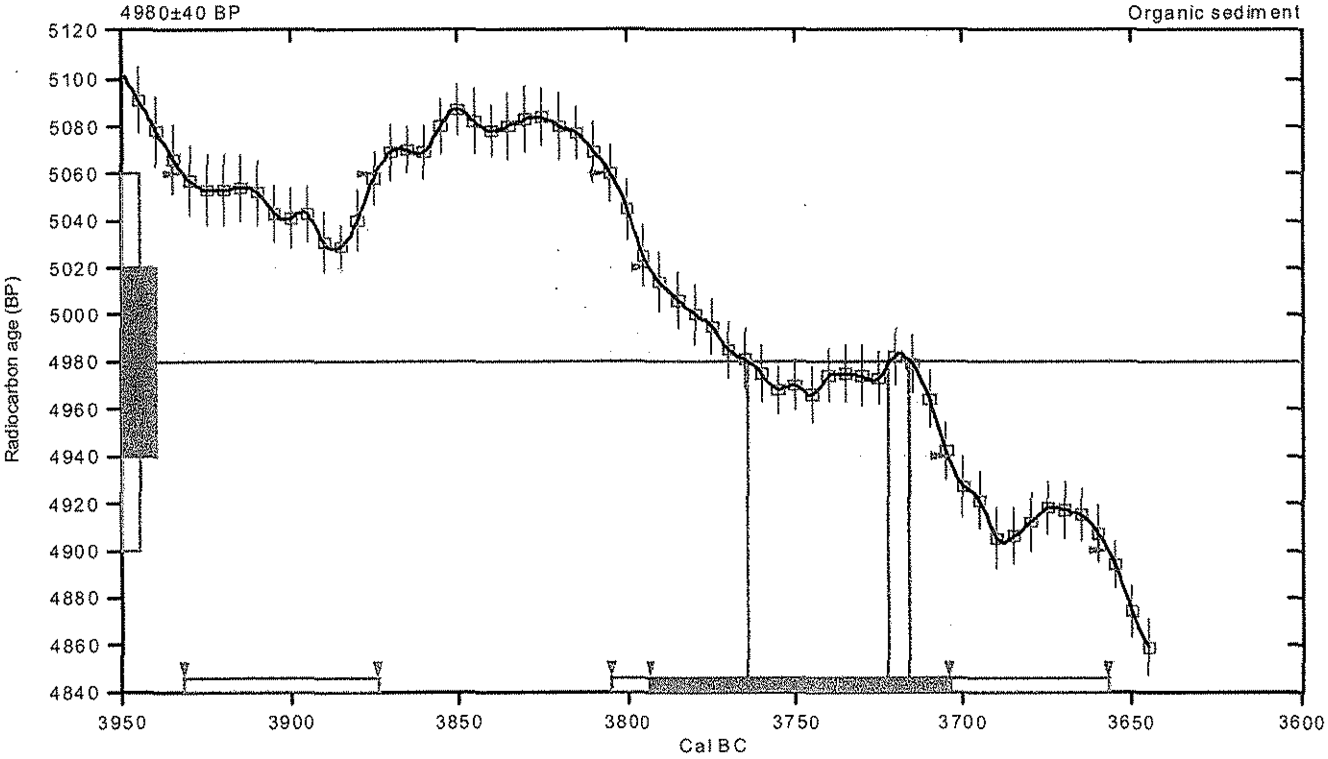
Conventional radiocarbon age: **4980±40 BP**

2 Sigma calibrated results: **Cal BC 3930 to 3870 (Cal BP 5880 to 5820) and**
(95% probability) **Cal BC 3800 to 3660 (Cal BP 5760 to 5610)**

Intercept data

Intercepts of radiocarbon age
with calibration curve: Cal BC 3760 (Cal BP 5710) and
Cal BC 3720 (Cal BP 5670) and
Cal BC 3720 (Cal BP 5670)

1 Sigma calibrated result: Cal BC 3790 to 3700 (Cal BP 5740 to 5650)
(68% probability)



References:

Database used
INTCAL09
References to INTCAL09 database
Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

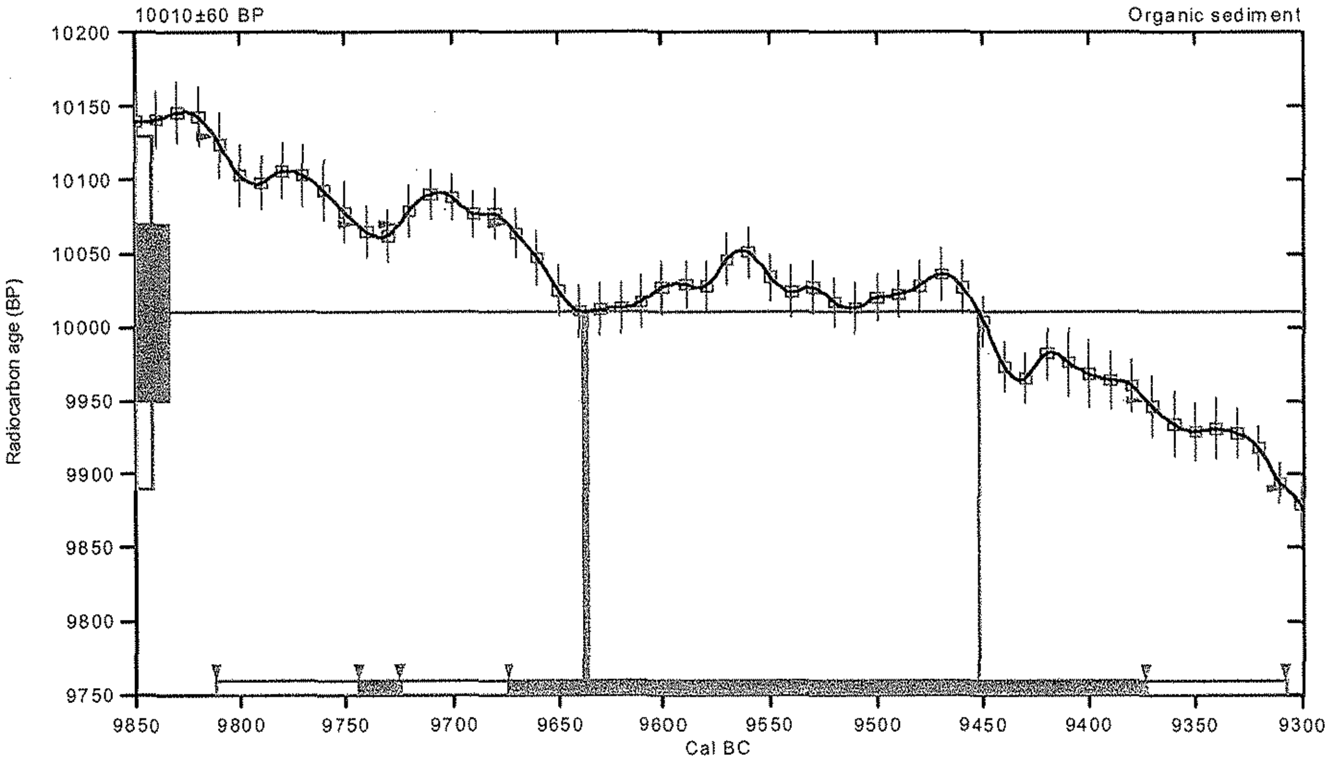
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.5:lab. mult=1)

Laboratory number:	**Beta-328043**
Conventional radiocarbon age:	**10010±60 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 9810 to 9310 (Cal BP 11760 to 11260)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 9640 (Cal BP 11590) and Cal BC 9640 (Cal BP 11590) and Cal BC 9450 (Cal BP 11400)
1 Sigma calibrated results: (68% probability)	Cal BC 9740 to 9720 (Cal BP 11690 to 11680) and Cal BC 9670 to 9370 (Cal BP 11620 to 11320)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al. 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

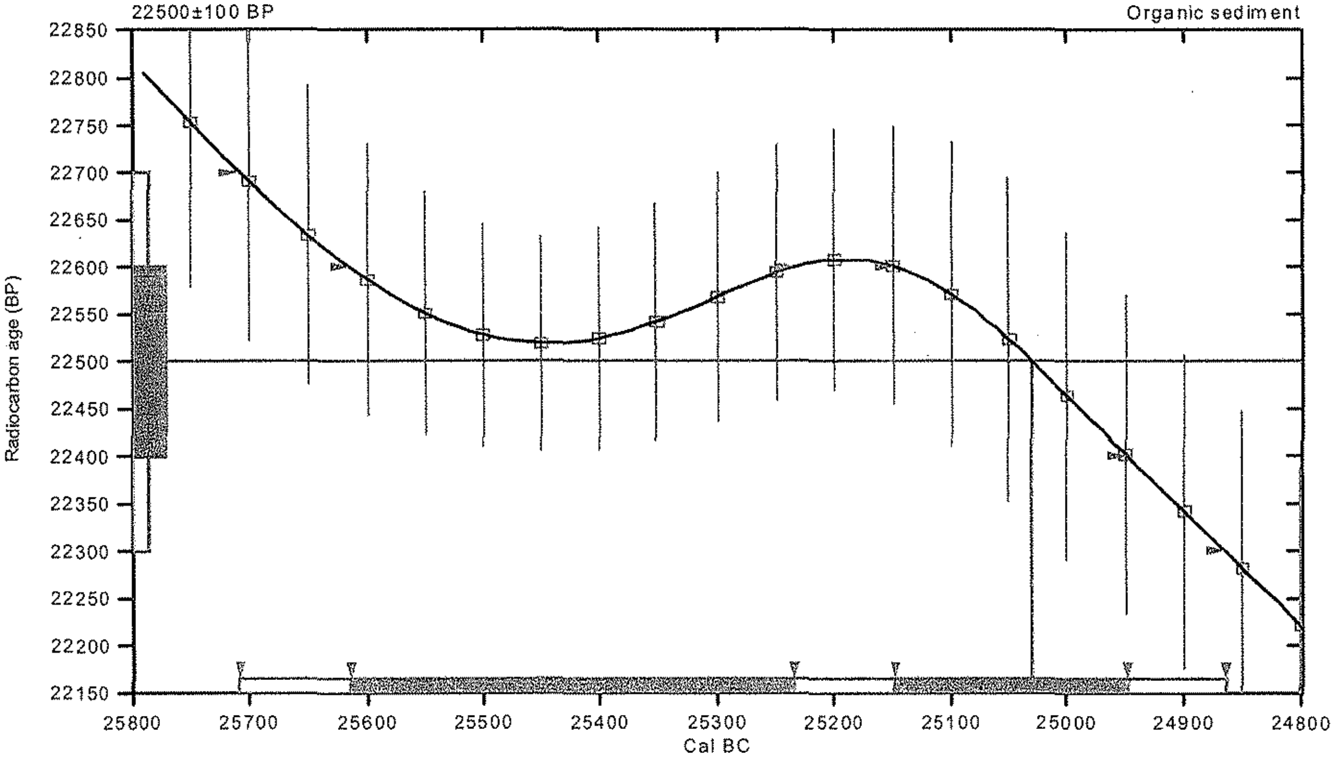
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.9:lab. mult=1)

Laboratory number:	**Beta-328044**
Conventional radiocarbon age:	**22500±100 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 25710 to 24860 (Cal BP 27660 to 26820)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 25030 (Cal BP 26980)
1 Sigma calibrated results: (68% probability)	Cal BC 25610 to 25240 (Cal BP 27560 to 27180) and Cal BC 25150 to 24950 (Cal BP 27100 to 26900)



References:

Database used
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References to INTCAL09 database
Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.8:lab. mult=1)

Laboratory number: **Beta-328045**

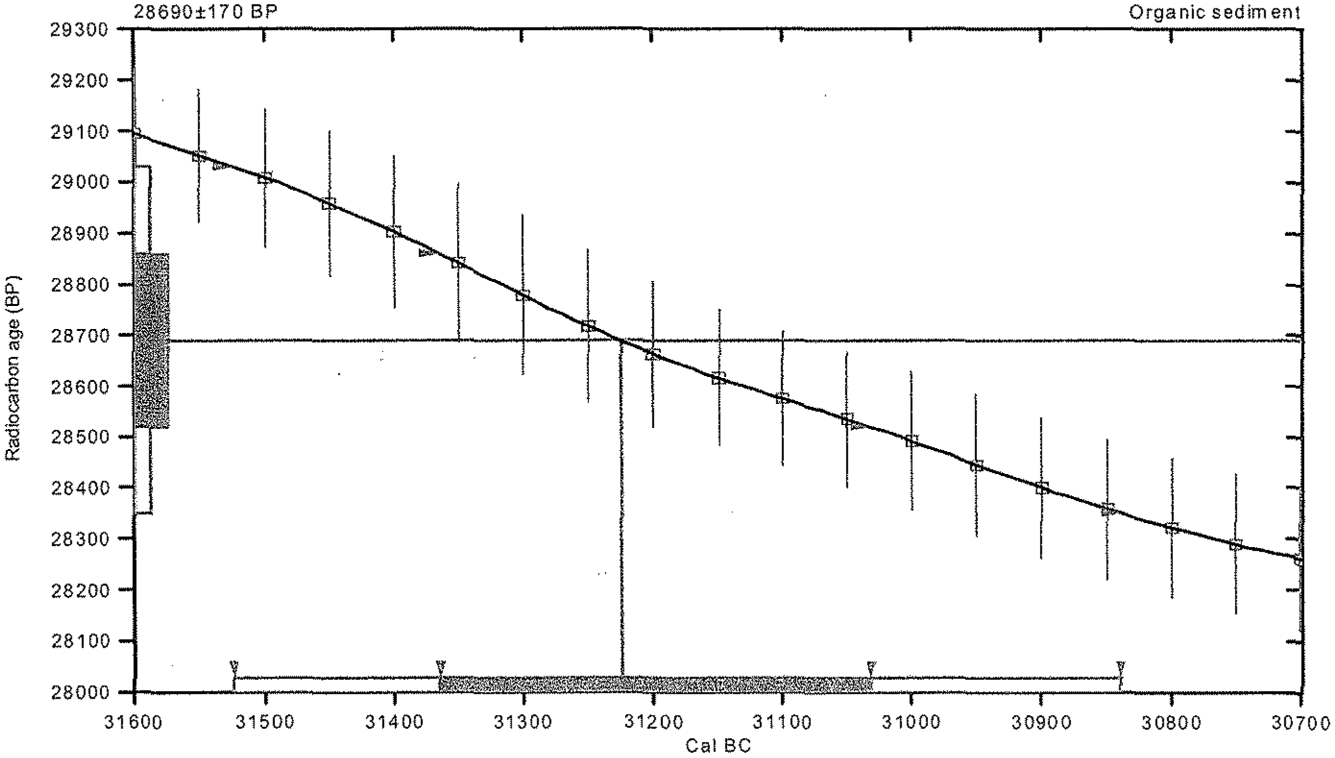
Conventional radiocarbon age: **28690±170 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 31520 to 30840 (Cal BP 33470 to 32790)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 31220 (Cal BP 33180)

1 Sigma calibrated result: (68% probability) Cal BC 31360 to 31030 (Cal BP 33320 to 32980)



References:

Database used
INTCAL09

References to INTCAL09 database
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Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

August 29, 2012

Mr. Dan R. Eberhart
Langan Engineering and Environmental
18662 MacArthur Blvd.
Ste 456
Irvine, CA 92612
USA

RE: Radiocarbon Dating Results For Samples B1-11-26to27ft 8in Length, B1-12-27ft 8in to 28ft Length, B1-12/13-28 to 29ft 6in Length, B1-14/15-29ft 6in to 32ft Length

Dear Mr. Eberhart:

Enclosed are the radiocarbon dating results for four samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Dan R. Eberhart — Report Date: 8/29/2012

Langan Engineering and Environmental — Material Received: 8/23/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 328863 SAMPLE : B1-11-26to27ft 8in Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 5460 to 5440 (Cal BP 7410 to 7390) AND Cal BC 5420 to 5410 (Cal BP 7370 to 7360) Cal BC 5380 to 5290 (Cal BP 7330 to 7240) AND Cal BC 5270 to 5230 (Cal BP 7220 to 7180)	6290 +/- 40 BP	-21.1 o/oo	6350 +/- 40 BP
Beta - 328864 SAMPLE : B1-12-27ft 8in to 28ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 5610 to 5590 (Cal BP 7560 to 7540) AND Cal BC 5570 to 5480 (Cal BP 7520 to 7420)	6550 +/- 40 BP	-23.7 o/oo	6570 +/- 40 BP
Beta - 328865 SAMPLE : B1-12/13-28 to 29ft 6in Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 6340 to 6310 (Cal BP 8290 to 8260) AND Cal BC 6260 to 6090 (Cal BP 8210 to 8040)	7320 +/- 40 BP	-23.3 o/oo	7350 +/- 40 BP
Beta - 328866 SAMPLE : B1-14/15-29ft 6in to 32ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 5880 to 5720 (Cal BP 7830 to 7670)	6860 +/- 40 BP	-22.6 o/oo	6900 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

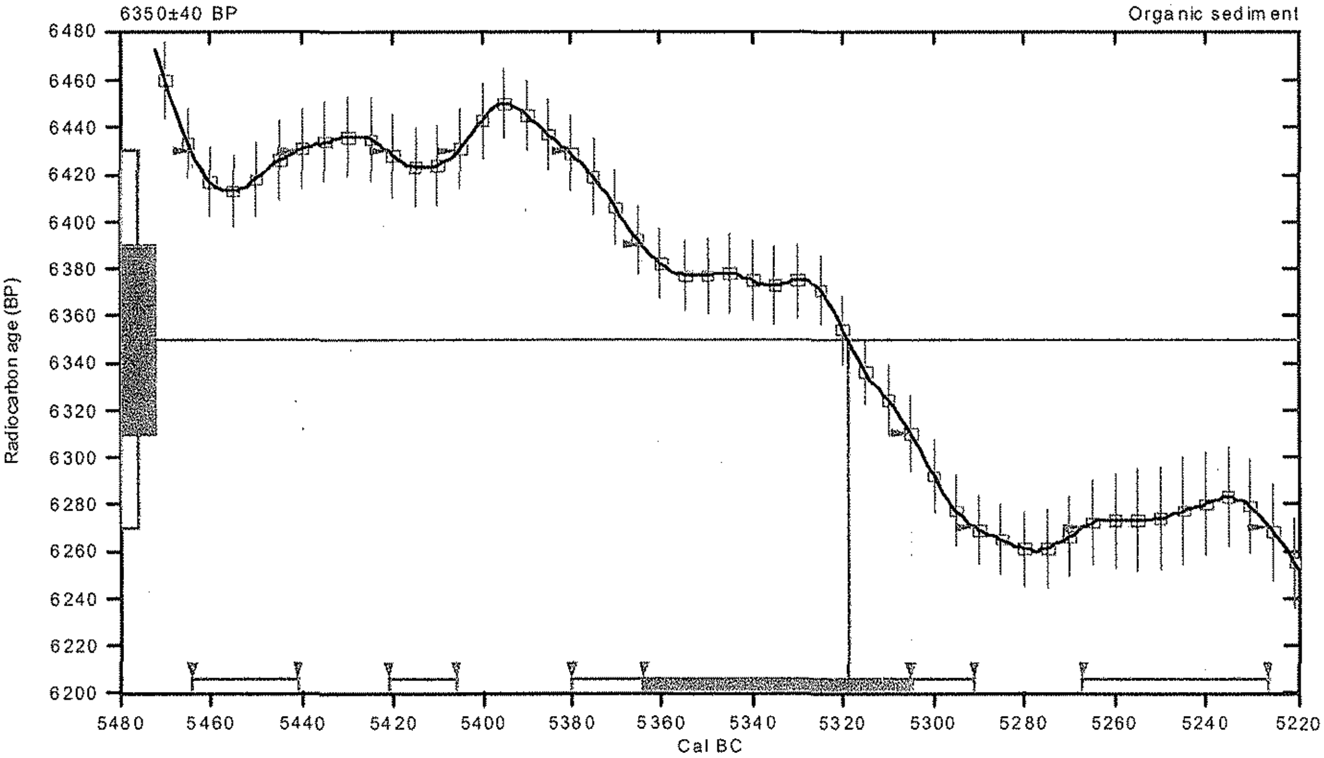
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.1:lab. mult=1)

Laboratory number:	**Beta-328863**
Conventional radiocarbon age:	**6350±40 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 5460 to 5440 (Cal BP 7410 to 7390) and** **Cal BC 5420 to 5410 (Cal BP 7370 to 7360) and** **Cal BC 5380 to 5290 (Cal BP 7330 to 7240) and** **Cal BC 5270 to 5230 (Cal BP 7220 to 7180)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 5320 (Cal BP 7270)
1 Sigma calibrated result: (68% probability)	Cal BC 5360 to 5300 (Cal BP 7310 to 7260)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.7:lab. mult=1)

Laboratory number: **Beta-328864**

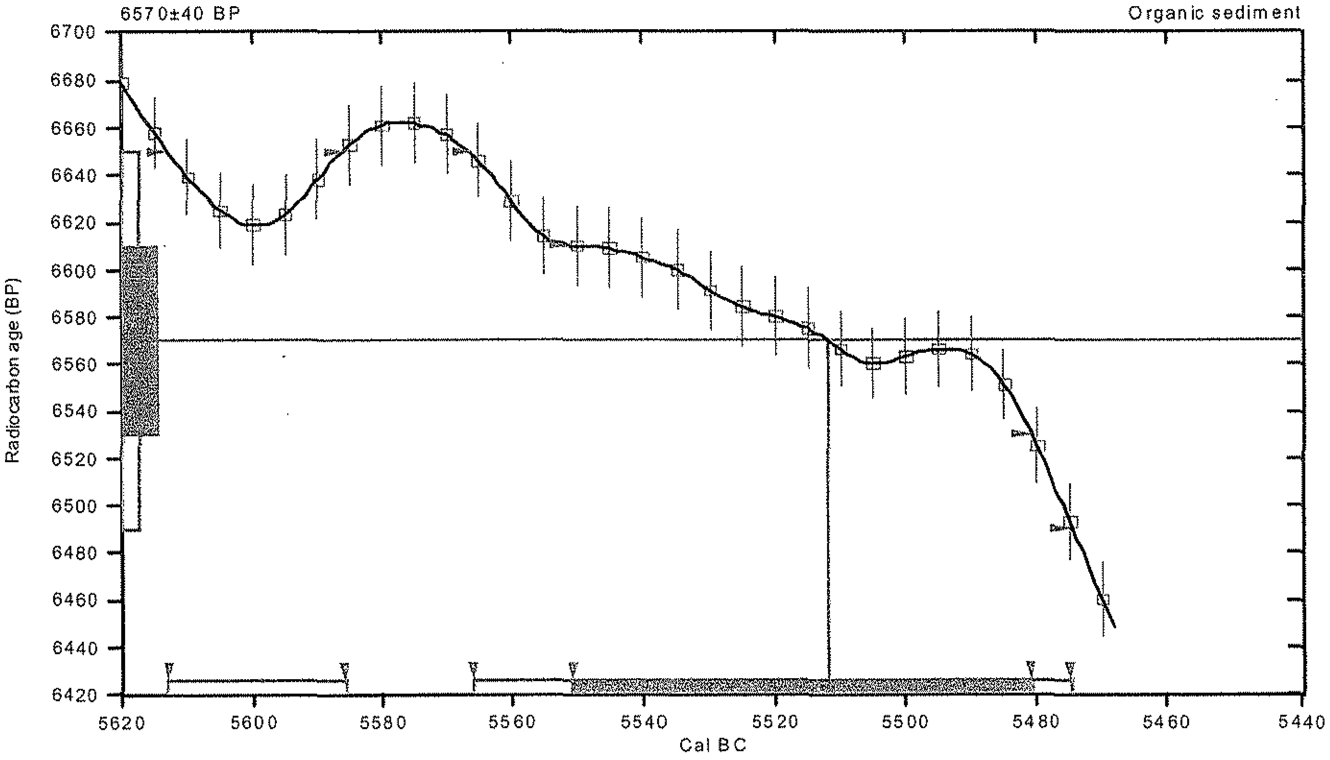
Conventional radiocarbon age: **6570±40 BP**

2 Sigma calibrated results: **Cal BC 5610 to 5590 (Cal BP 7560 to 7540) and**
(95% probability) **Cal BC 5570 to 5480 (Cal BP 7520 to 7420)**

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 5510 (Cal BP 7460)

1 Sigma calibrated result: Cal BC 5550 to 5480 (Cal BP 7500 to 7430)
(68% probability)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

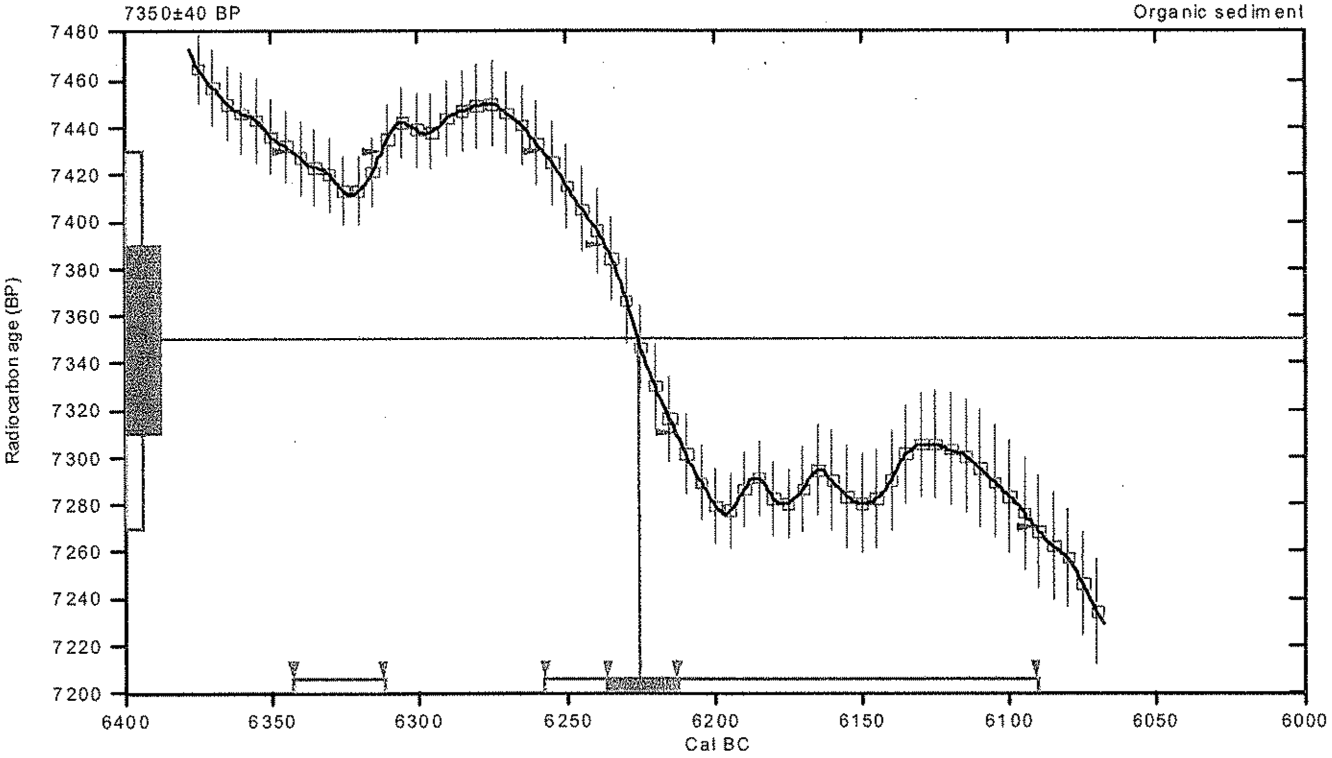
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.3:lab. mult=1)

Laboratory number:	**Beta-328865**
Conventional radiocarbon age:	**7350±40 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 6340 to 6310 (Cal BP 8290 to 8260) and** **Cal BC 6260 to 6090 (Cal BP 8210 to 8040)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 6230 (Cal BP 8180)
1 Sigma calibrated result: (68% probability)	Cal BC 6240 to 6210 (Cal BP 8190 to 8160)



References:

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References to INTCAL09 database

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Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

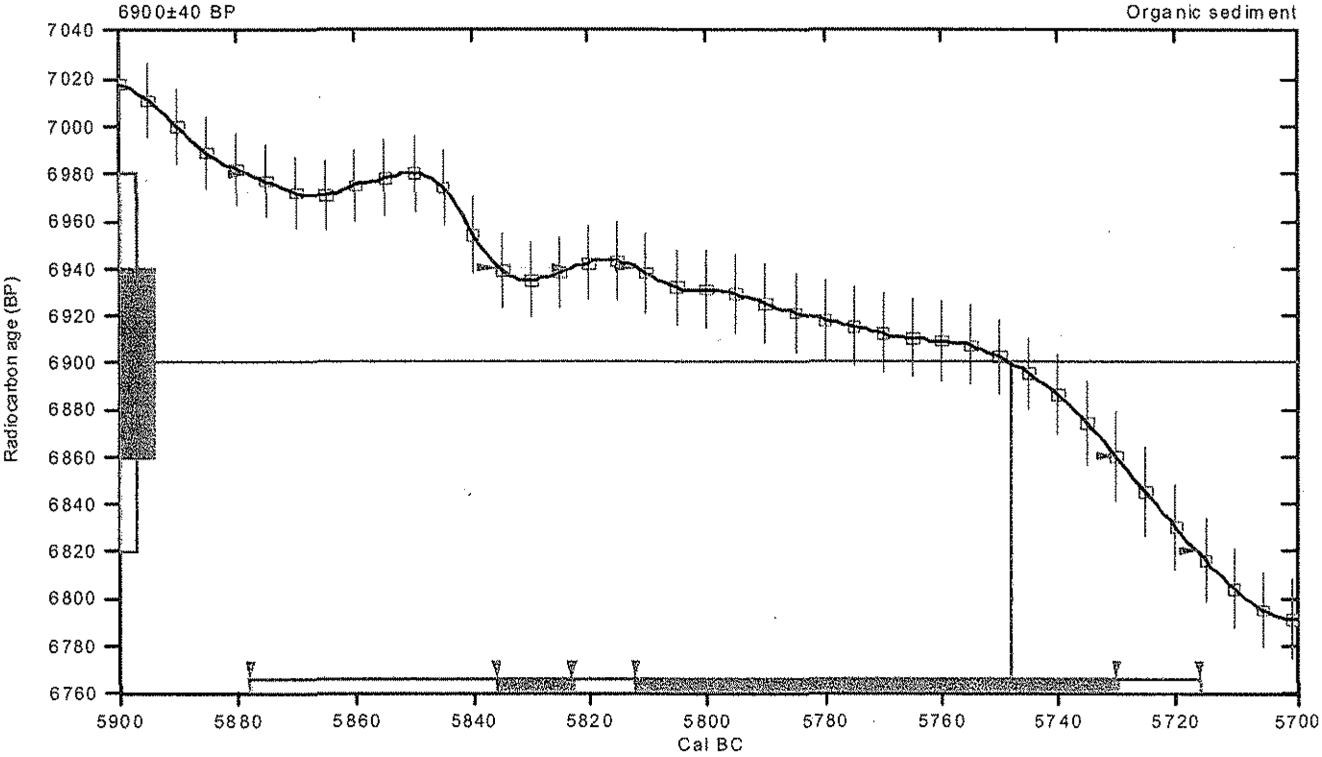
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.6:lab. mult=1)

Laboratory number:	**Beta-328866**
Conventional radiocarbon age:	**6900±40 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 5880 to 5720 (Cal BP 7830 to 7670)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 5750 (Cal BP 7700)
1 Sigma calibrated results: (68% probability)	Cal BC 5840 to 5820 (Cal BP 7790 to 7770) and Cal BC 5810 to 5730 (Cal BP 7760 to 7680)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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Beta@radiocarbon.com
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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

September 13, 2012

Mr. Dan R. Eberhart
Langan Engineering and Environmental
18662 MacArthur Blvd.
Ste 456
Irvine, CA 92612
USA

RE: Radiocarbon Dating Results For Samples B2-5-23to25ft Length, B2-7-30to31ft Length, B2-10-45to47ft Length, B3-5-22to24ft Length, B3-7-30to32.5ft Length, B4-11-25to25.5ft Length, B4-13-31to34ft Length, B4-18-45.5to46.5ft Length

Dear Mr. Eberhart:

Enclosed are the radiocarbon dating results for eight samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Dan R. Eberhart

Report Date: 9/13/2012

Langan Engineering and Environmental

Material Received: 9/5/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 329748 SAMPLE : B2-5-23to25ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 16540 to 16320 (Cal BP 18490 to 18270) AND Cal BC 16170 to 16030 (Cal BP 18120 to 17980)	14890 +/- 60 BP	-24.0 o/oo	14910 +/- 60 BP
Beta - 329749 SAMPLE : B2-7-30to31ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 6590 to 6580 (Cal BP 8540 to 8530) AND Cal BC 6570 to 6540 (Cal BP 8520 to 8490) Cal BC 6530 to 6430 (Cal BP 8480 to 8380)	7630 +/- 40 BP	-24.2 o/oo	7640 +/- 40 BP
Beta - 329750 SAMPLE : B2-10-45to47ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 11330 to 11160 (Cal BP 13280 to 13110)	11280 +/- 50 BP	-24.0 o/oo	11300 +/- 50 BP
Beta - 329751 SAMPLE : B3-5-22to24ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 7940 to 7600 (Cal BP 9890 to 9550)	8710 +/- 40 BP	-23.5 o/oo	8730 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

BETA
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DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Dan R. Eberhart

Report Date: 9/13/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 329752 SAMPLE : B3-7-30to32.5ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 10820 to 10680 (Cal BP 12770 to 12640)	10830 +/- 50 BP	-23.7 o/oo	10850 +/- 50 BP
Beta - 329753 SAMPLE : B4-11-25to25.5ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 7580 to 7500 (Cal BP 9540 to 9450)	8470 +/- 40 BP	-24.4 o/oo	8480 +/- 40 BP
Beta - 329754 SAMPLE : B4-13-31to34ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 13060 to 12270 (Cal BP 15010 to 14220)	12480 +/- 60 BP	-23.9 o/oo	12500 +/- 60 BP
Beta - 329755 SAMPLE : B4-18-45.5to46.5ft Length ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 19500 to 19260 (Cal BP 21460 to 21210)	17800 +/- 80 BP	-23.6 o/oo	17820 +/- 80 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24:lab. mult=1)

Laboratory number: **Beta-329748**

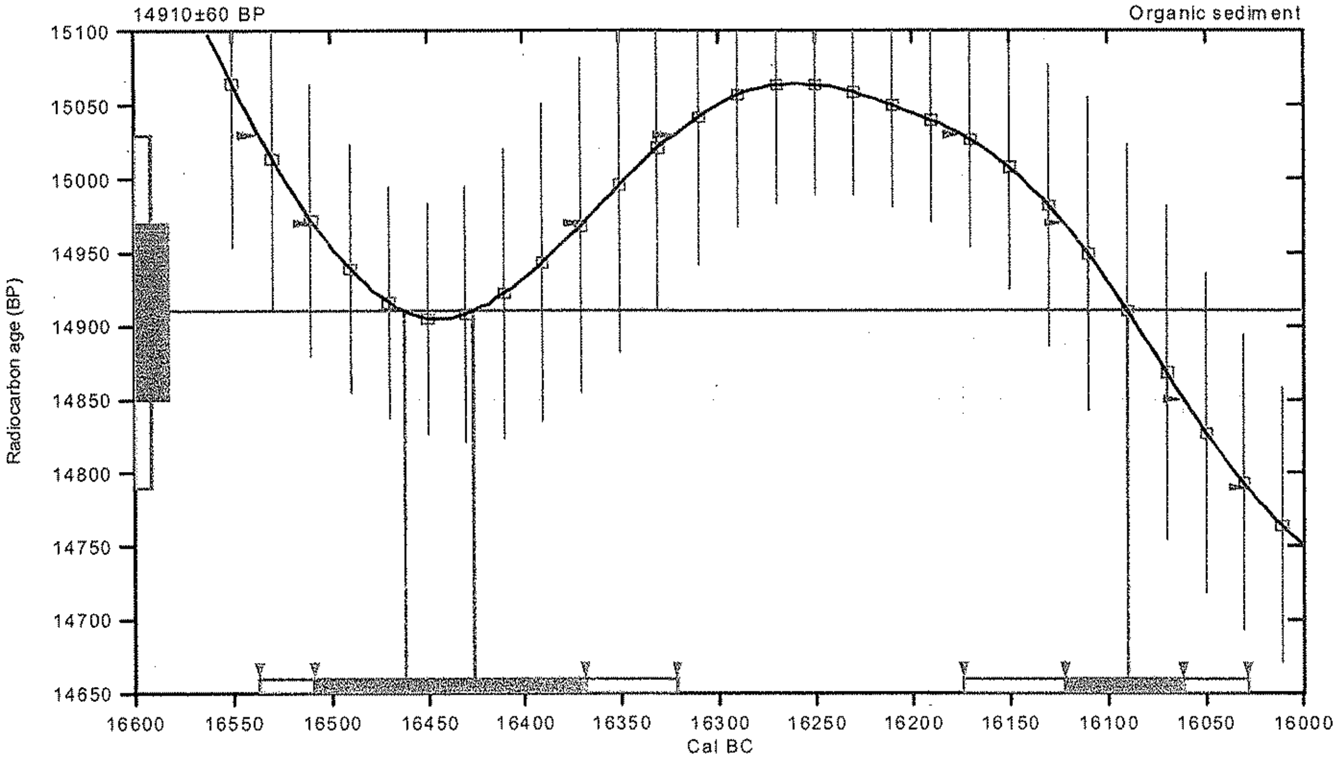
Conventional radiocarbon age: **14910±60 BP**

2 Sigma calibrated results: **Cal BC 16540 to 16320 (Cal BP 18490 to 18270) and**
(95% probability) **Cal BC 16170 to 16030 (Cal BP 18120 to 17980)**

Intercept data

Intercepts of radiocarbon age
with calibration curve: Cal BC 16460 (Cal BP 18410) and
Cal BC 16430 (Cal BP 18380) and
Cal BC 16090 (Cal BP 18040)

1 Sigma calibrated results: Cal BC 16510 to 16370 (Cal BP 18460 to 18320) and
(68% probability) Cal BC 16120 to 16060 (Cal BP 18070 to 18010)



References:

Database used
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References to INTCAL09 database
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Mathematics used for calibration scenario
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Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

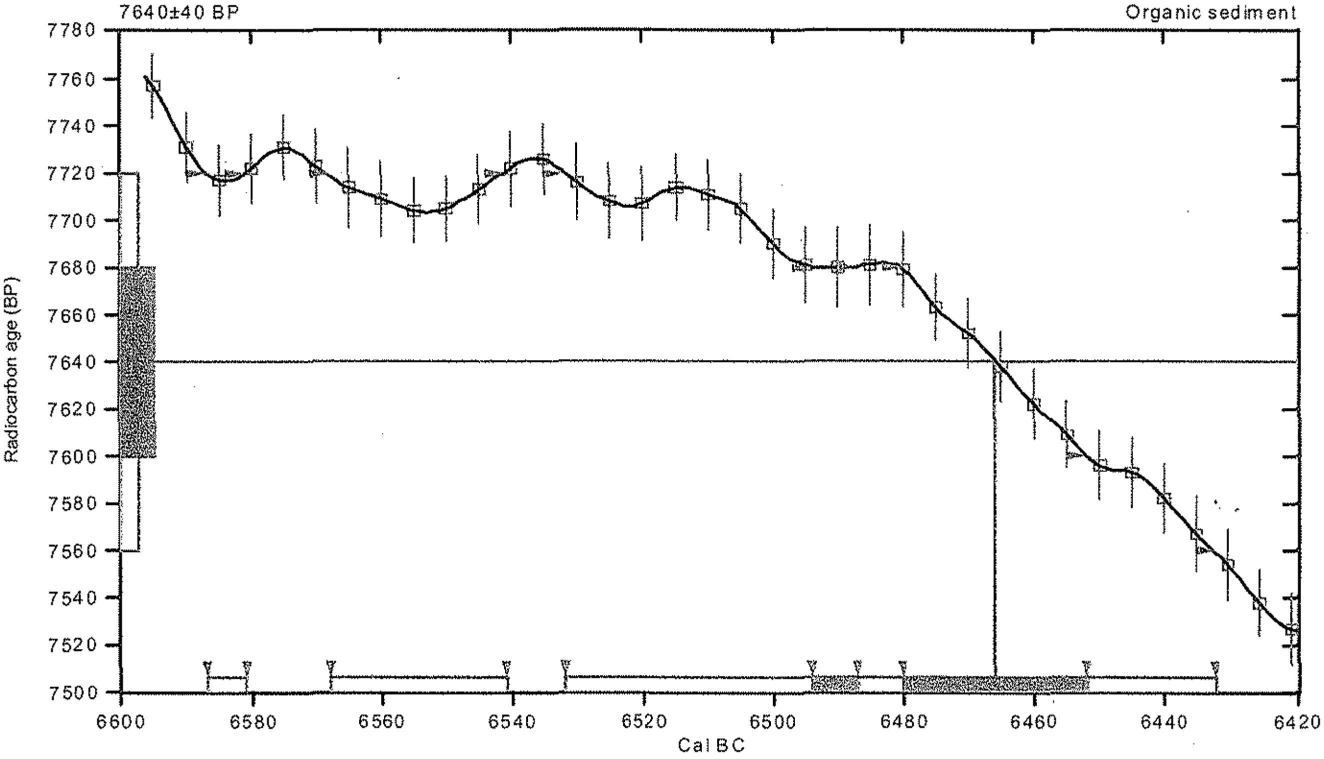
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.2:lab. mult=1)

Laboratory number:	**Beta-329749**
Conventional radiocarbon age:	**7640±40 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 6590 to 6580 (Cal BP 8540 to 8530) and** **Cal BC 6570 to 6540 (Cal BP 8520 to 8490) and** **Cal BC 6530 to 6430 (Cal BP 8480 to 8380)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 6470 (Cal BP 8420)
1 Sigma calibrated results: (68% probability)	Cal BC 6490 to 6490 (Cal BP 8440 to 8440) and Cal BC 6480 to 6450 (Cal BP 8430 to 8400)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24:lab. mult=1)

Laboratory number: **Beta-329750**

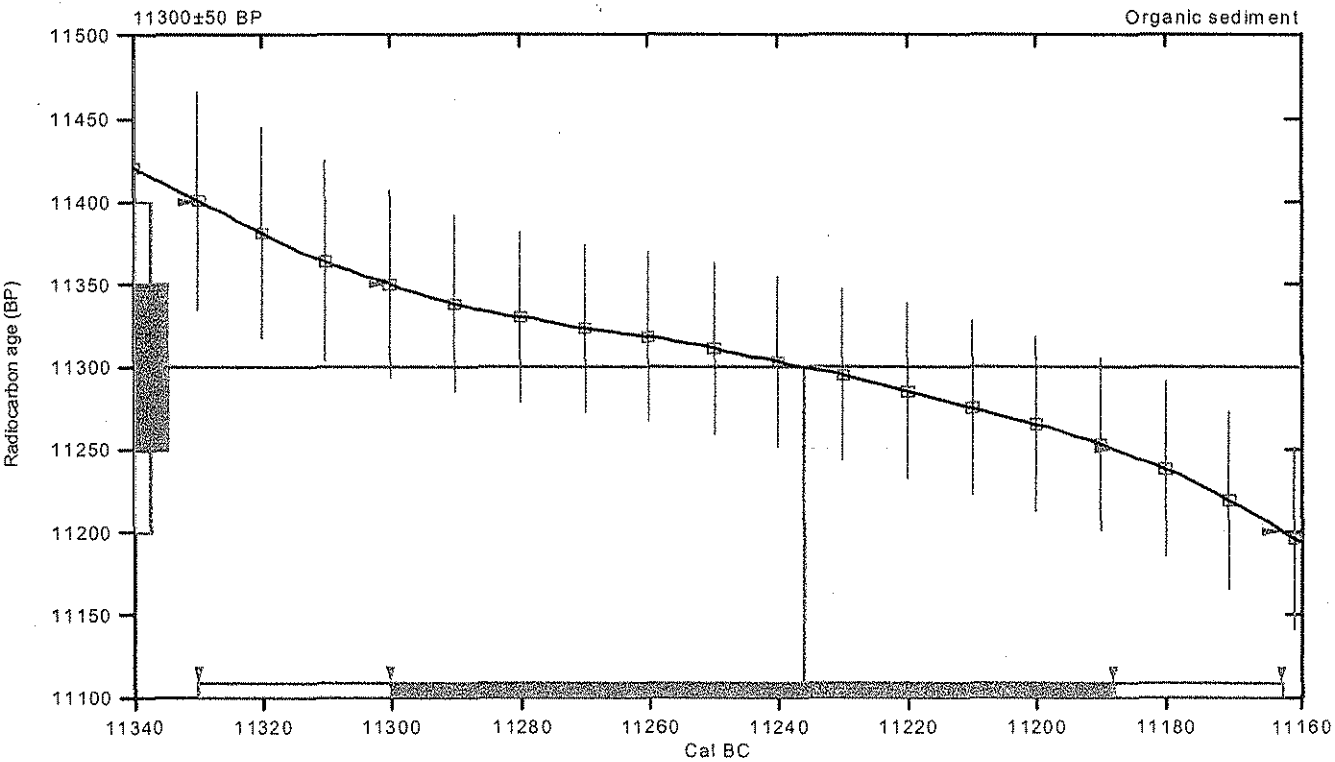
Conventional radiocarbon age: **11300±50 BP**

2 Sigma calibrated result: **Cal BC 11330 to 11160 (Cal BP 13280 to 13110)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 11240 (Cal BP 13190)

1 Sigma calibrated result: Cal BC 11300 to 11190 (Cal BP 13250 to 13140)
(68% probability)



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Mathematics used for calibration scenario
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Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.5:lab. mult=1)

Laboratory number: **Beta-329751**

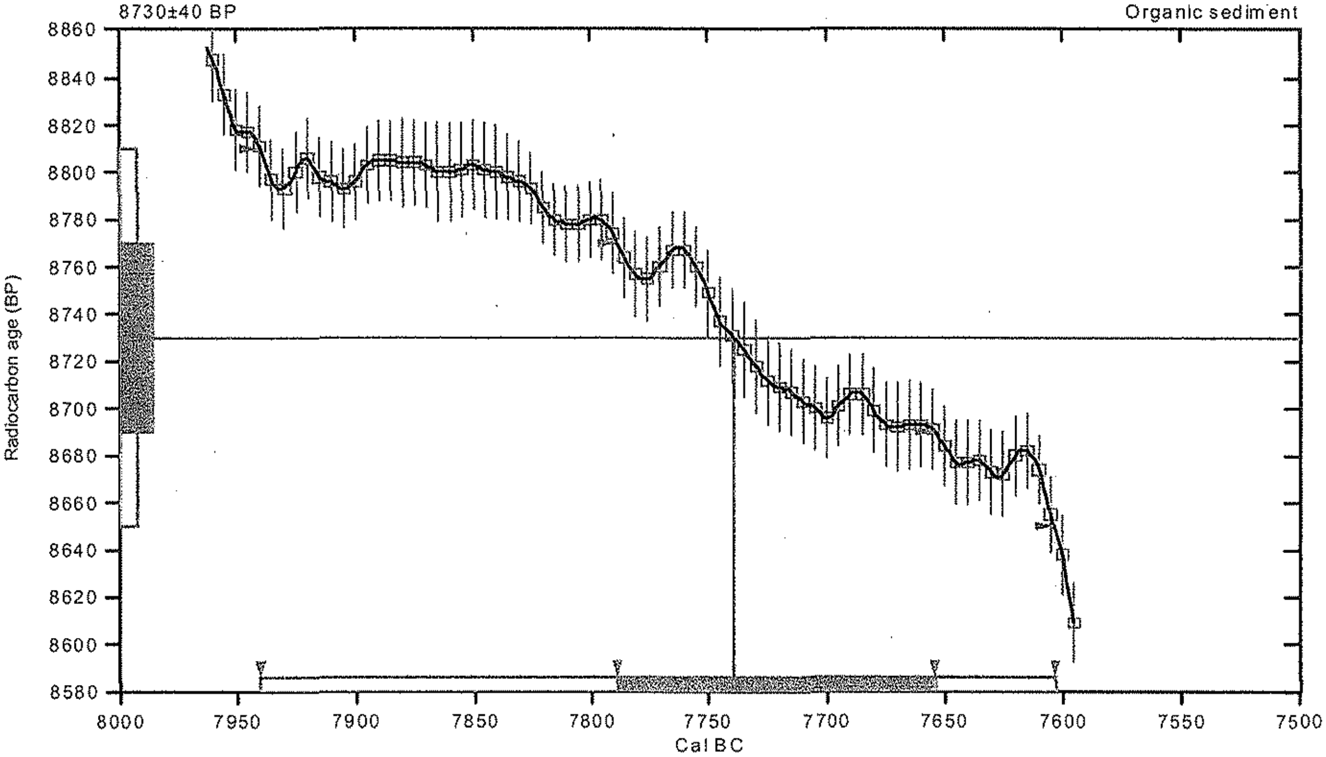
Conventional radiocarbon age: **8730±40 BP**

2 Sigma calibrated result: **Cal BC 7940 to 7600 (Cal BP 9890 to 9550)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 7740 (Cal BP 9690)

1 Sigma calibrated result: Cal BC 7790 to 7650 (Cal BP 9740 to 9600)
(68% probability)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.7:lab. mult=1)

Laboratory number: **Beta-329752**

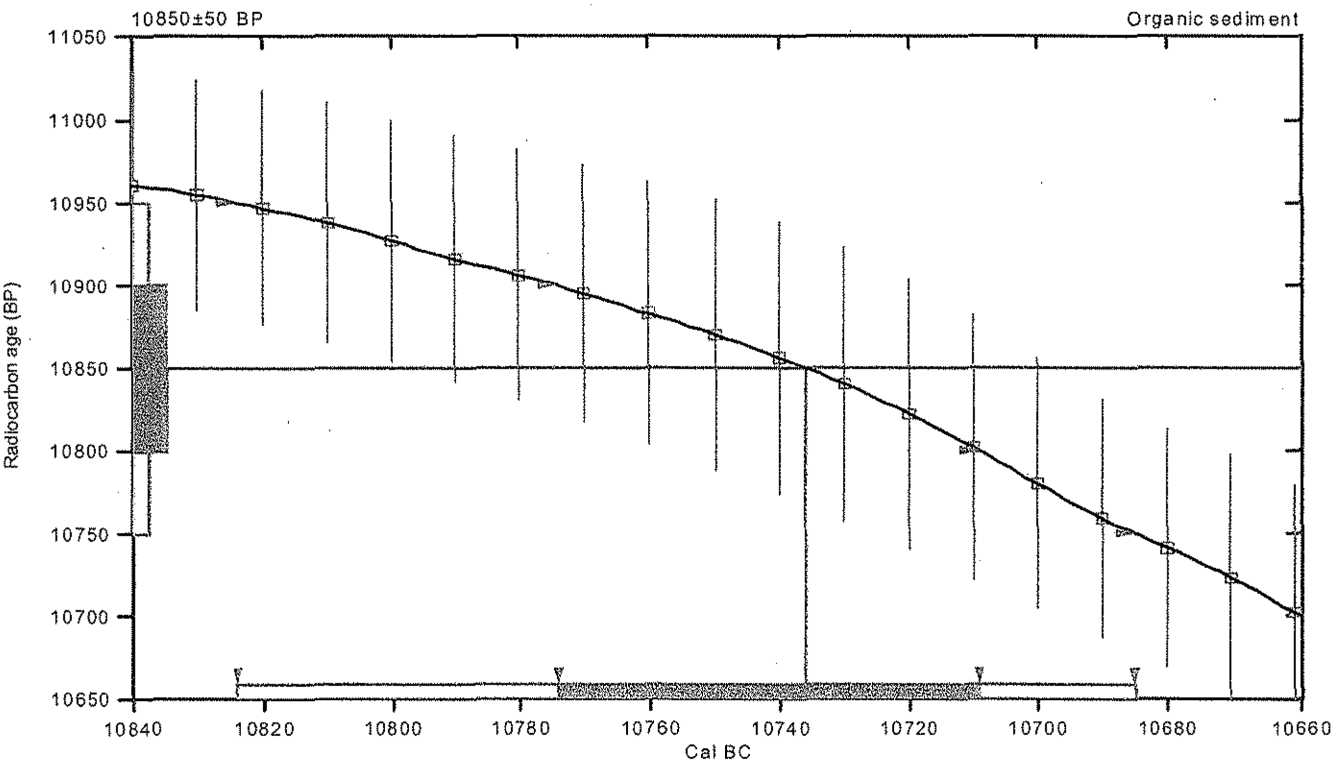
Conventional radiocarbon age: **10850±50 BP**

2 Sigma calibrated result: **Cal BC 10820 to 10680 (Cal BP 12770 to 12640)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 10740 (Cal BP 12690)

1 Sigma calibrated result: Cal BC 10770 to 10710 (Cal BP 12720 to 12660)
(68% probability)



References:

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Mathematics used for calibration scenario
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.4:lab. mult=1)

Laboratory number: **Beta-329753**

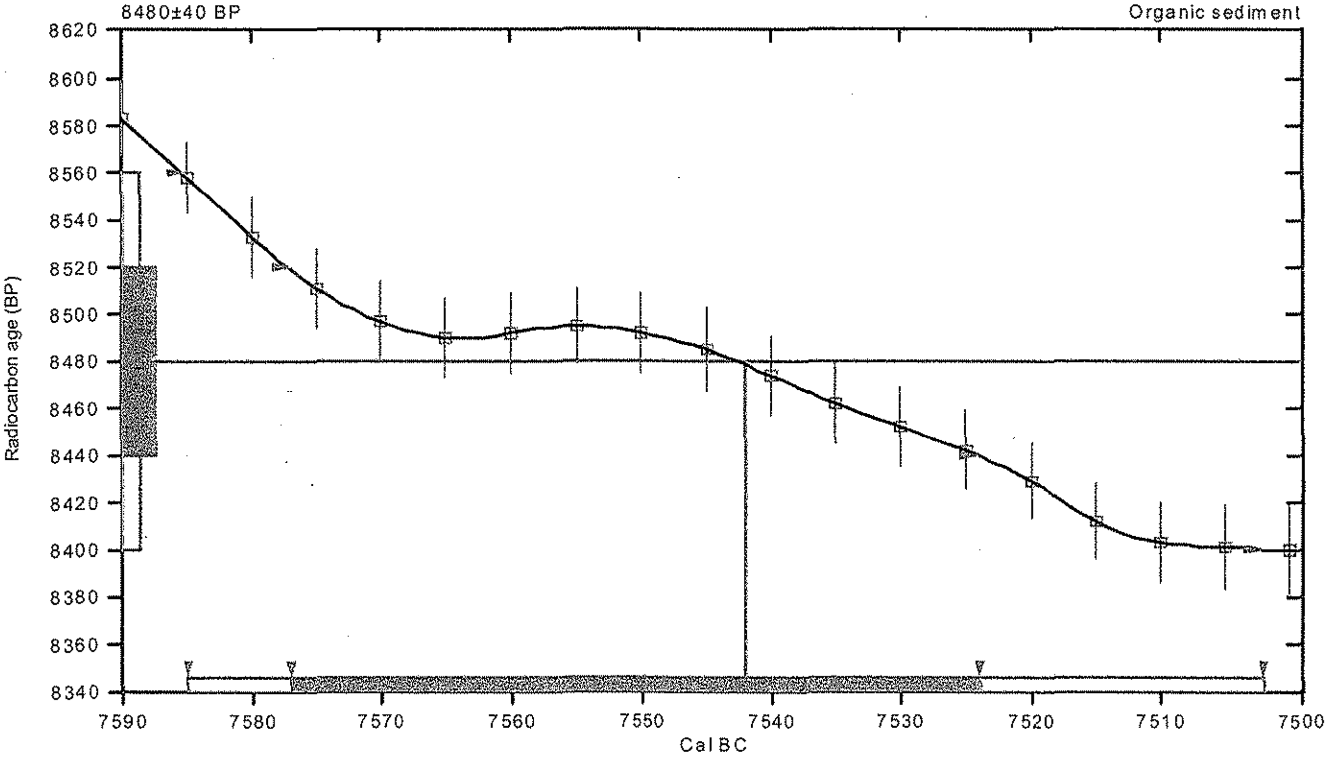
Conventional radiocarbon age: **8480±40 BP**

2 Sigma calibrated result: **Cal BC 7580 to 7500 (Cal BP 9540 to 9450)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 7540 (Cal BP 9490)

1 Sigma calibrated result: Cal BC 7580 to 7520 (Cal BP 9530 to 9470)
(68% probability)



References:

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Mathematics used for calibration scenario
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Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

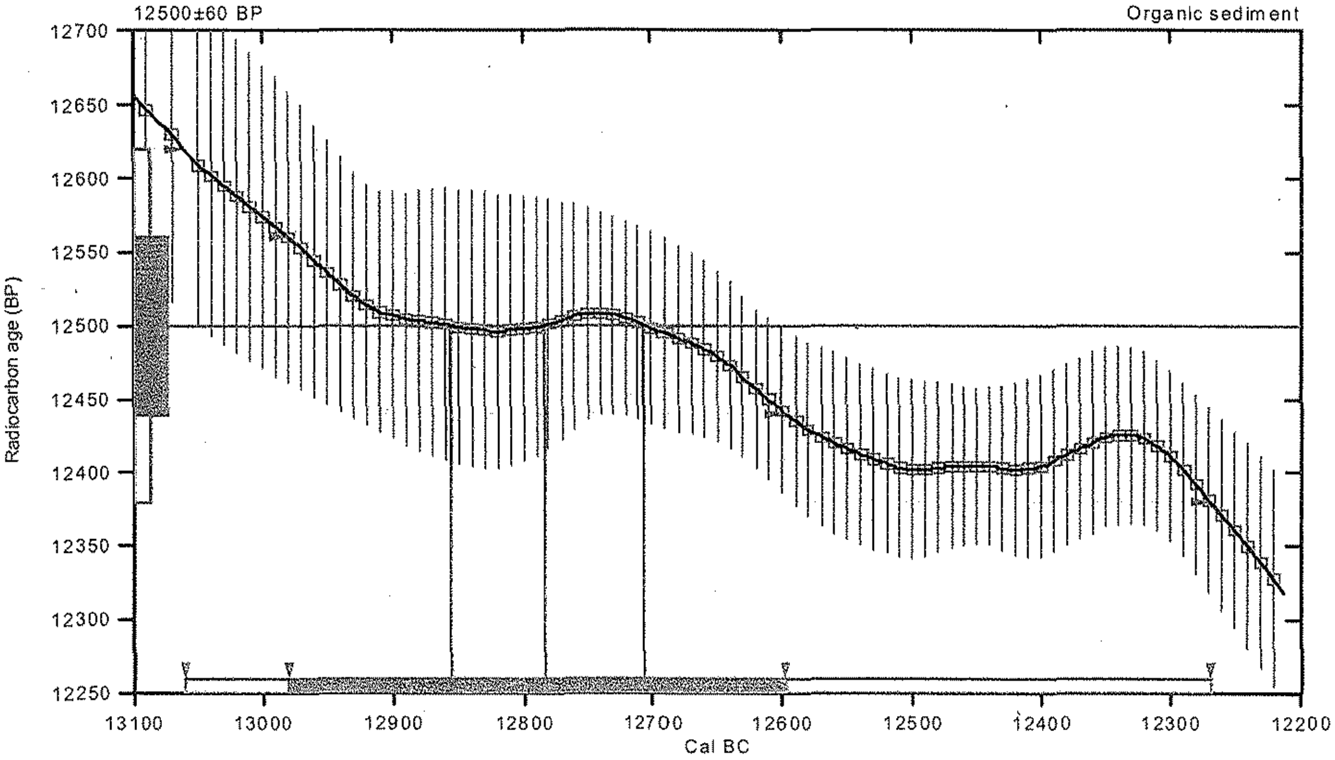
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.9:lab. mult=1)

Laboratory number:	**Beta-329754**
Conventional radiocarbon age:	**12500±60 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 13060 to 12270 (Cal BP 15010 to 14220)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 12860 (Cal BP 14810) and Cal BC 12780 (Cal BP 14730) and Cal BC 12710 (Cal BP 14660)
1 Sigma calibrated result: (68% probability)	Cal BC 12980 to 12600 (Cal BP 14930 to 14550)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.6:lab. mult=1)

Laboratory number: **Beta-329755**

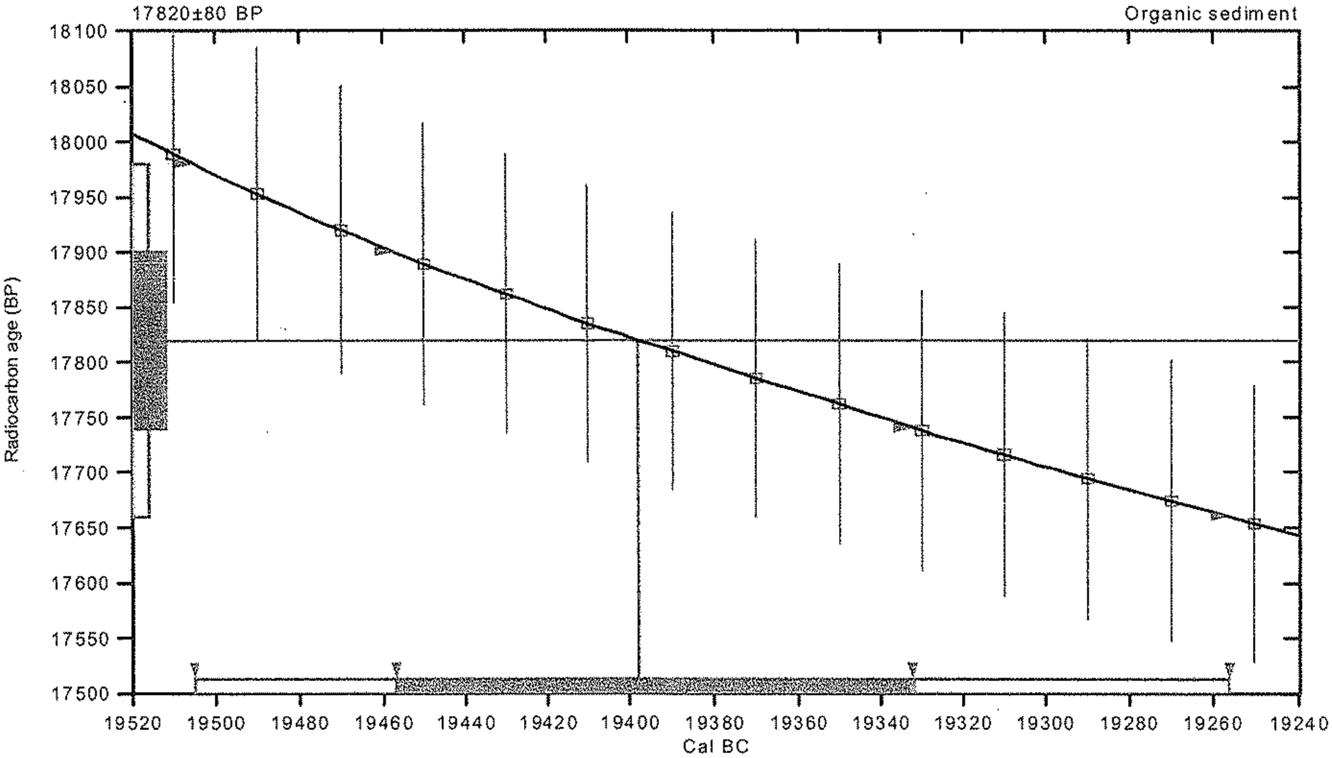
Conventional radiocarbon age: **17820±80 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 19500 to 19260 (Cal BP 21460 to 21210)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 19400 (Cal BP 21350)

1 Sigma calibrated result: (68% probability) Cal BC 19460 to 19330 (Cal BP 21410 to 21280)



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Mathematics used for calibration scenario

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

October 26, 2012

Mr. Dan R. Eberhart
Langan Engineering and Environmental
18662 MacArthur Blvd.
Ste 456
Irvine, CA 92612
USA

RE: Radiocarbon Dating Results For Samples B5-4-18.5ft depth, B5-6-23ft depth, B6-6-22ft depth, B6-10-34ft depth

Dear Mr. Eberhart:

Enclosed are the radiocarbon dating results for four samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

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MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Dan R. Eberhart

Langan Engineering and Environmental

Report Date: 10/26/2012

Material Received: 10/19/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 333263 SAMPLE : B5-4-18.5ft depth ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 11450 to 11310 (Cal BP 13400 to 13260)	11450 +/- 50 BP	-23.5 o/oo	11470 +/- 50 BP
Beta - 333264 SAMPLE : B5-6-23ft depth ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 21590 to 21340 (Cal BP 23540 to 23290)	19530 +/- 80 BP	-23.9 o/oo	19550 +/- 80 BP
Beta - 333267 SAMPLE : B6-6-22ft depth ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 32820 to 32580 (Cal BP 34770 to 34530)	29870 +/- 160 BP	-23.9 o/oo	29890 +/- 160 BP
Beta - 333268 SAMPLE : B6-10-34ft depth ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 21380 to 20640 (Cal BP 23320 to 22590)	19230 +/- 90 BP	-23.4 o/oo	19260 +/- 90 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

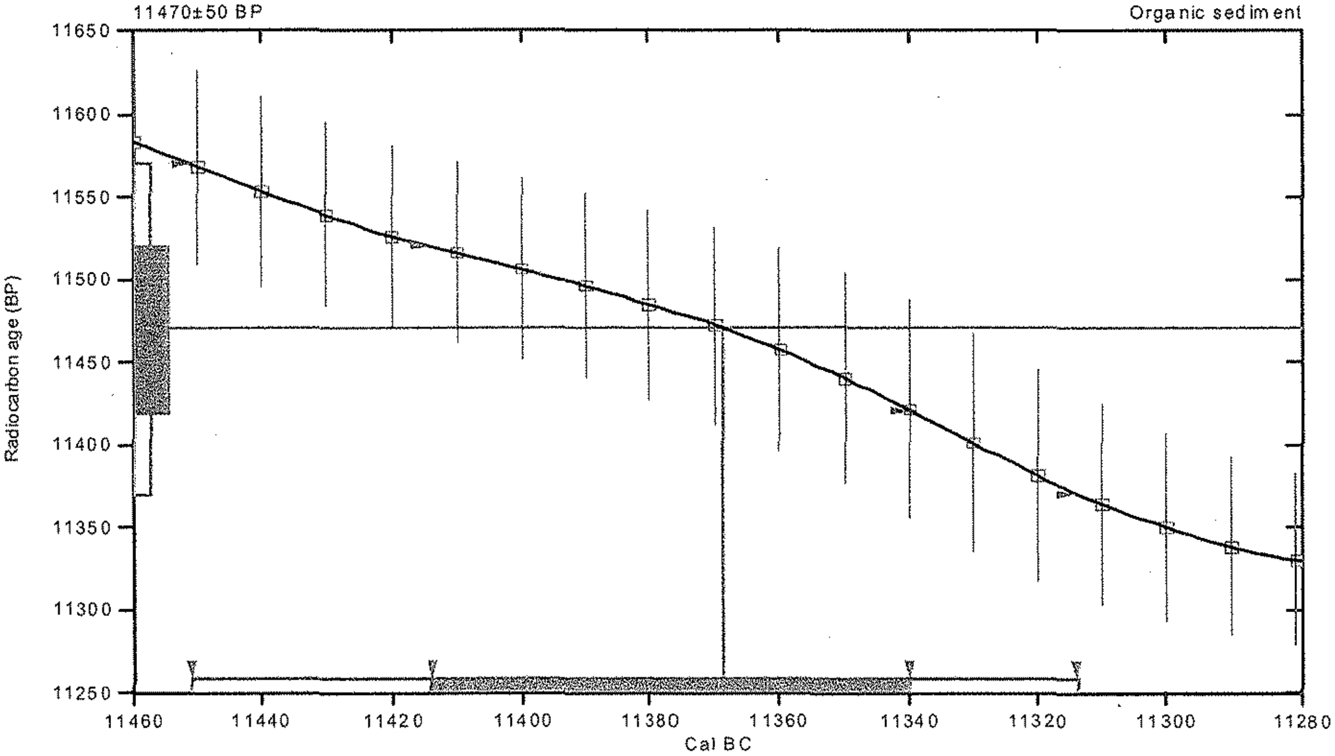
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.5:lab. mult=1)

Laboratory number:	**Beta-333263**
Conventional radiocarbon age:	**11470±50 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 11450 to 11310 (Cal BP 13400 to 13260)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 11370 (Cal BP 13320)
1 Sigma calibrated result: (68% probability)	Cal BC 11410 to 11340 (Cal BP 13360 to 13290)



References:

Database used

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Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.9:lab. mult=1)

Laboratory number: **Beta-333264**

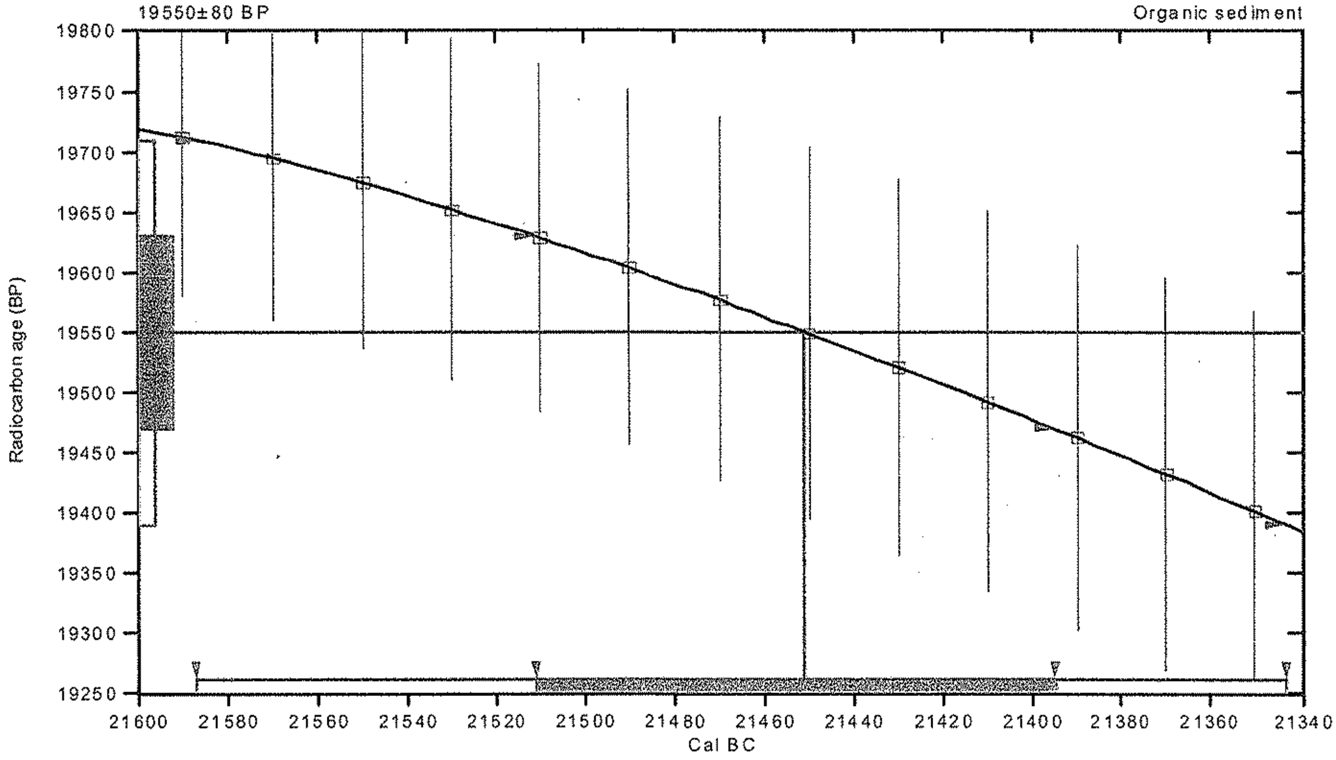
Conventional radiocarbon age: **19550±80 BP**

2 Sigma calibrated result: **Cal BC 21590 to 21340 (Cal BP 23540 to 23290)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 21450 (Cal BP 23400)

1 Sigma calibrated result: Cal BC 21510 to 21400 (Cal BP 23460 to 23340)
(68% probability)



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Mathematics used for calibration scenario

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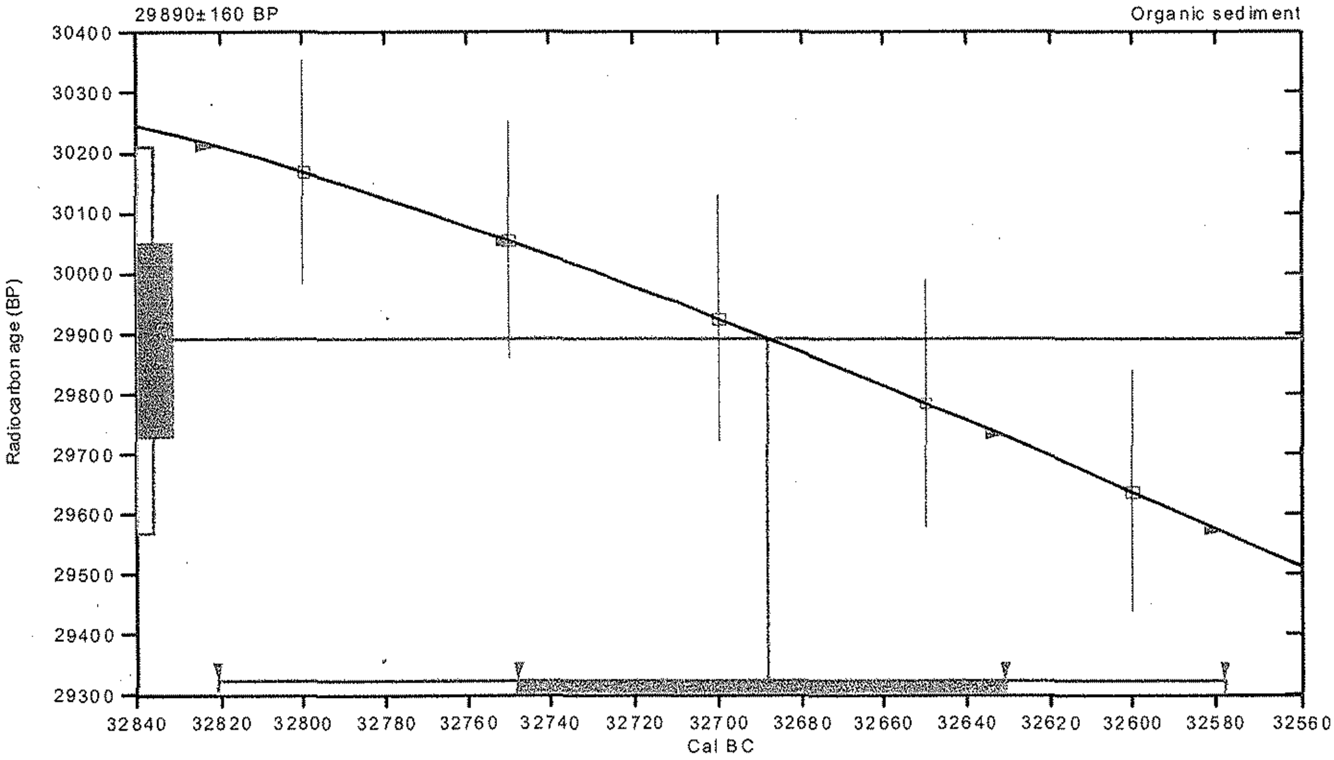
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.9:lab. mult=1)

Laboratory number:	**Beta-333267**
Conventional radiocarbon age:	**29890±160 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 32820 to 32580 (Cal BP 34770 to 34530)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 32690 (Cal BP 34640)
1 Sigma calibrated result: (68% probability)	Cal BC 32750 to 32630 (Cal BP 34700 to 34580)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

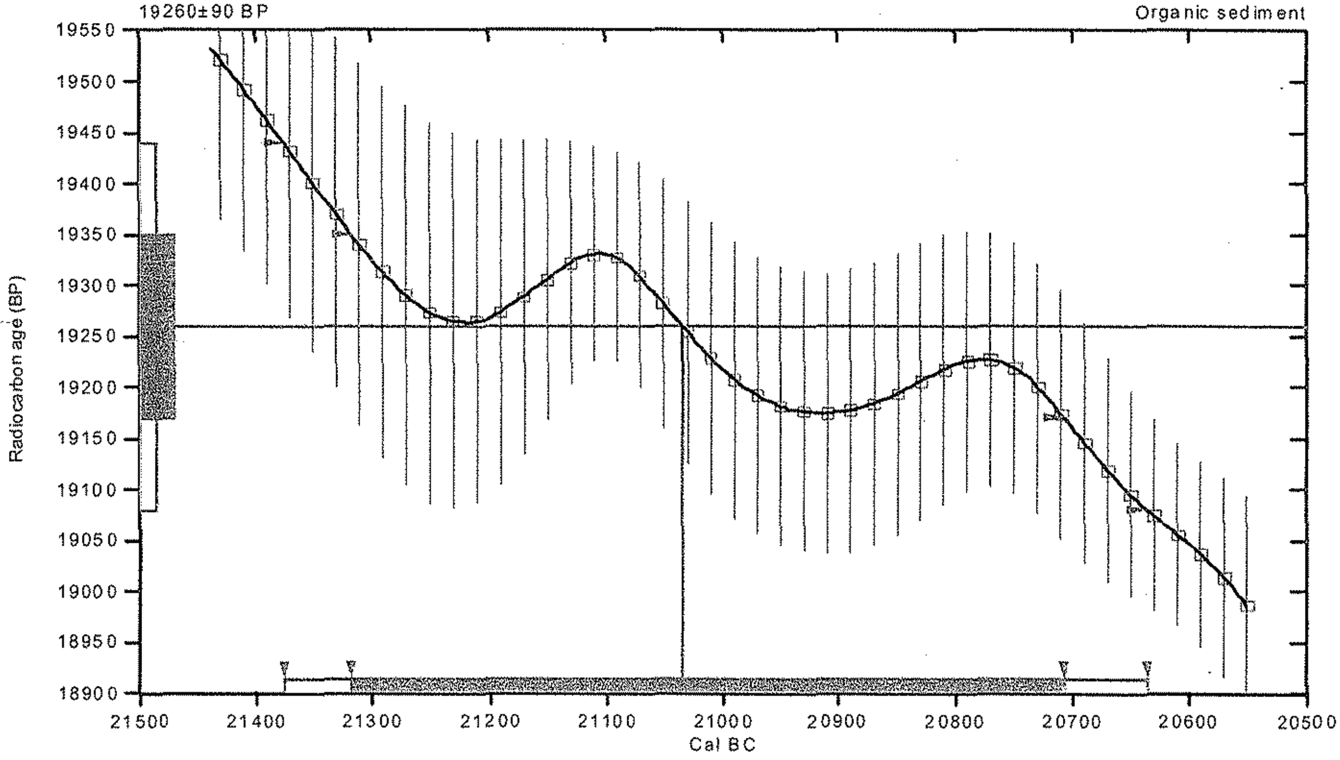
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.4:lab. mult=1)

Laboratory number:	**Beta-333268**
Conventional radiocarbon age:	**19260±90 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 21380 to 20640 (Cal BP 23320 to 22590)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 21030 (Cal BP 22980)
1 Sigma calibrated result: (68% probability)	Cal BC 21320 to 20710 (Cal BP 23270 to 22660)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

October 29, 2012

Mr. Dan R. Eberhart
Langan Engineering and Environmental
18662 MacArthur Blvd.
Ste 456
Irvine, CA 92612
USA

RE: Radiocarbon Dating Results For Samples B5-7-29ft depth, B5-11-46.5ft depth

Dear Mr. Eberhart:

Enclosed are the radiocarbon dating results for two samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of analysis was previously invoiced. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Dan R. Eberhart
Report Date: 10/29/2012

Langan Engineering and Environmental
Material Received: 10/19/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 333265 SAMPLE : B5-7-29ft depth ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 22020 to 21740 (Cal BP 23970 to 23690)	19950 +/- 80 BP	-23.5 o/oo	19970 +/- 80 BP
Beta - 333266 SAMPLE : B5-11-46.5ft depth ANALYSIS : AMS-PRIORITY delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 10440 to 10290 (Cal BP 12390 to 12240) AND Cal BC 10280 to 10030 (Cal BP 12240 to 11980)	10300 +/- 50 BP	-23.6 o/oo	10320 +/- 50 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.5:lab. mult=1)

Laboratory number: **Beta-333265**

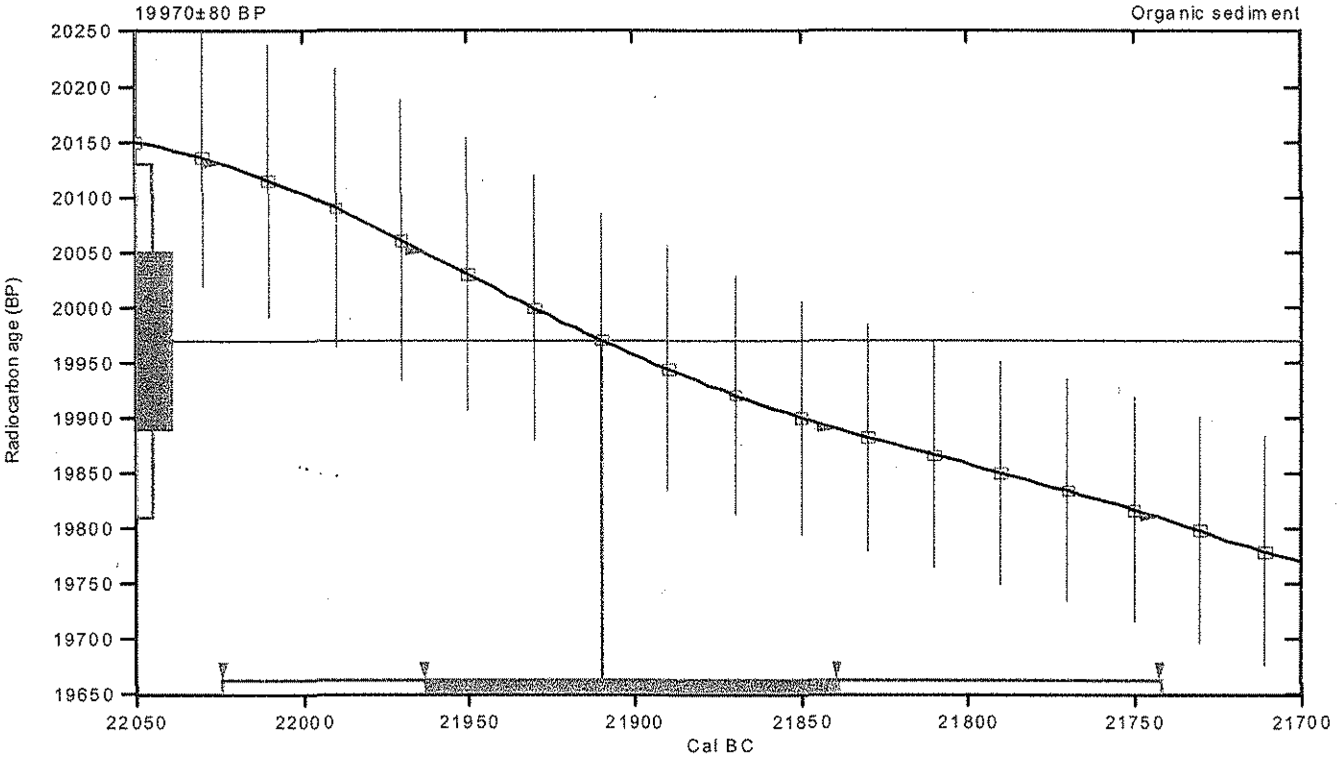
Conventional radiocarbon age: **19970±80 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 22020 to 21740 (Cal BP 23970 to 23690)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 21910 (Cal BP 23860)

1 Sigma calibrated result: (68% probability) Cal BC 21960 to 21840 (Cal BP 23910 to 23790)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al., 1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

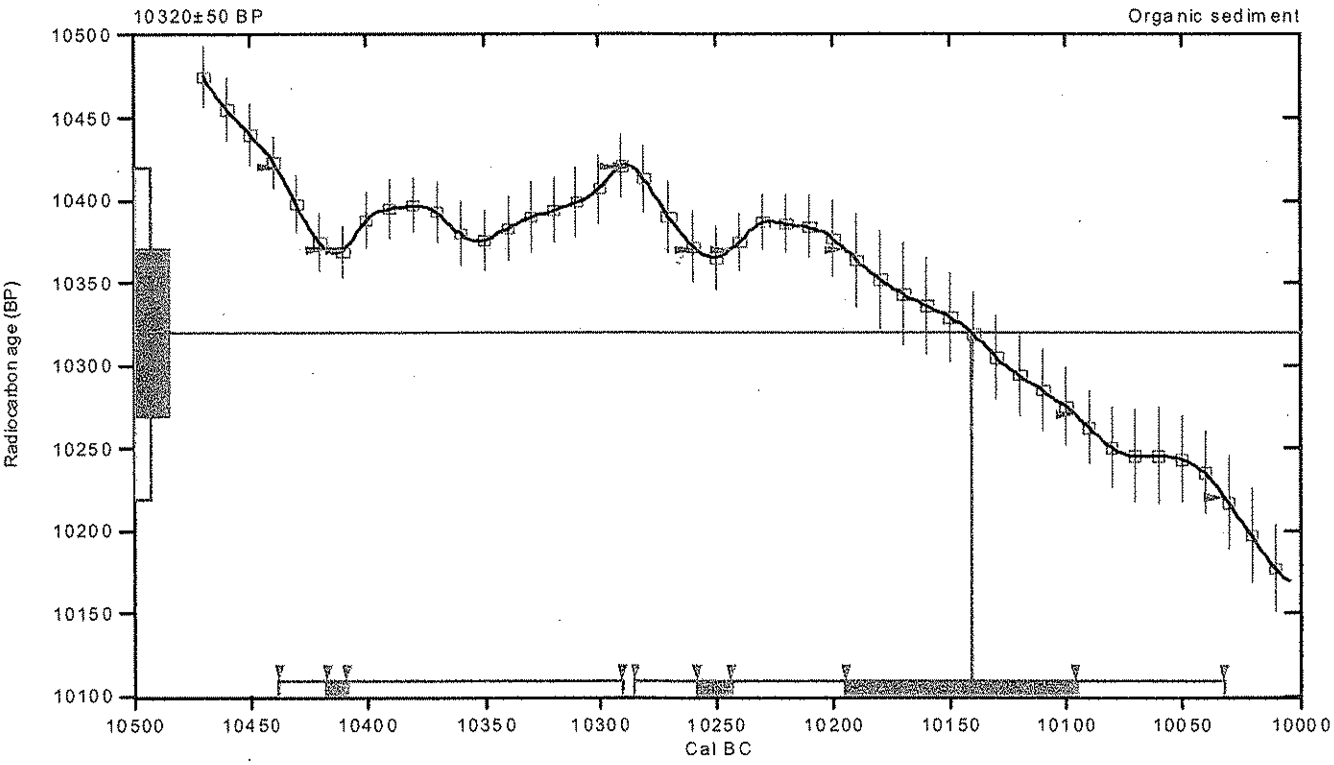
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.6:lab. mult=1)

Laboratory number:	**Beta-333266**
Conventional radiocarbon age:	**10320±50 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal BC 10440 to 10290 (Cal BP 12390 to 12240) and** **Cal BC 10280 to 10030 (Cal BP 12240 to 11980)**

Intercept data

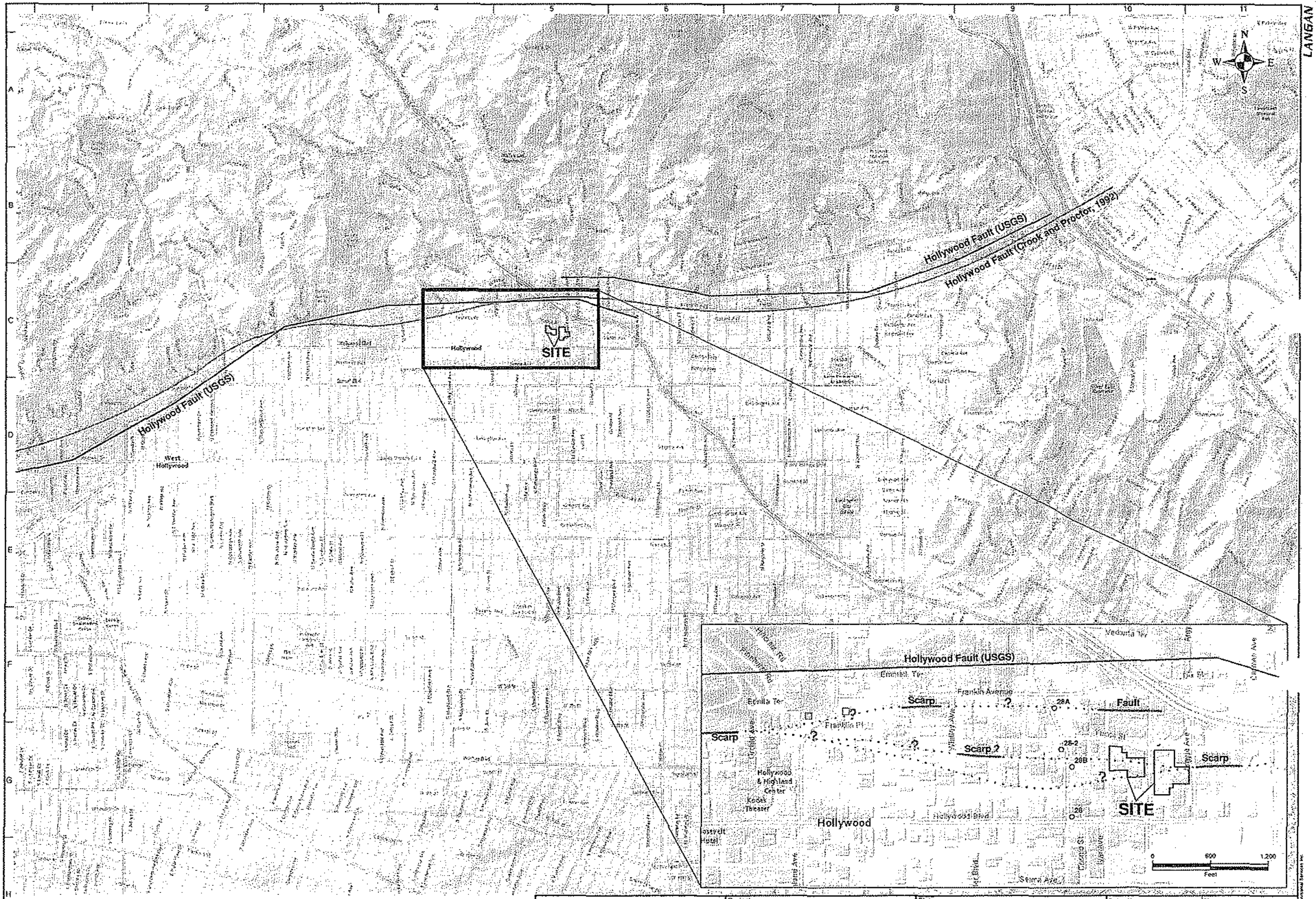
Intercept of radiocarbon age with calibration curve:	Cal BC 10140 (Cal BP 12090)
1 Sigma calibrated results: (68% probability)	Cal BC 10420 to 10410 (Cal BP 12370 to 12360) and Cal BC 10260 to 10240 (Cal BP 12210 to 12190) and Cal BC 10200 to 10100 (Cal BP 12140 to 12050)



References:

Database used
INTCAL09
References to INTCAL09 database
Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

PLATES



Legend

☐ Leighton Consulting, Inc. (2011)
1805 North Highland Avenue

☐ Law/Crandall (2000) and GeoPentech (2001)
1840 North Highland Avenue

○ Los Angeles Metro Rail Subway Borings
(1981-1983)

Hollywood Fault (USGS)

Scarp (Crook and Proctor, 1992)

· · ? · · Inferred fault (buried) (Crook and Proctor, 1992)

Limits of Project Site

0 2,000 4,000
Feet

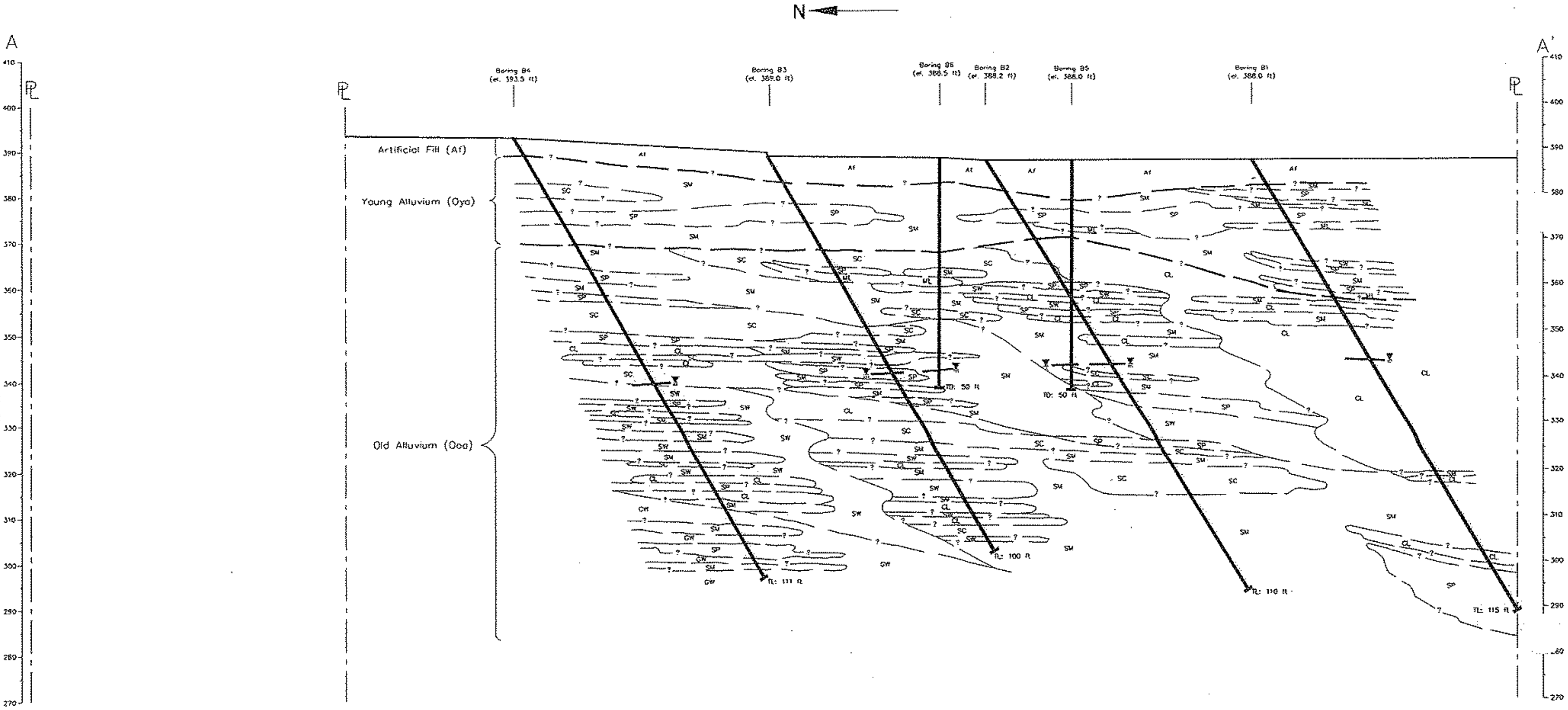
Notes:
1. Topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online. Sources: U.S. Geological Survey, Food and Agriculture Organization of the U.N., National Park Service, Environmental Protection Agency, Esri, DeLorme, Tele Atlas North America, and other suppliers.

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Project
FAULT
INVESTIGATION
LOS ANGELES CALIFORNIA

Plate
HOLLYWOOD
FAULT LOCALES

Project No. 700019502
Date 11-30-2012
Scale As Shown
Drawn By TY
Submission Date 11-30-2012
Plate 1
Sheet 1 of 1



NOTES:

1. BORINGS B1 THROUGH B4 WERE DRILLED BY CASCADE DRILLING UNDER THE FULL-TIME OBSERVATION OF LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC. BETWEEN 17 JULY AND 21 JULY 2012
2. BORINGS B5 AND B6 WERE DRILLED BY BC² ENVIRONMENTAL UNDER THE FULL-TIME OBSERVATION OF LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC. ON 11 OCTOBER 2012.

LEGEND:

TD	Total Depth of Boring (Approximate)
TL	Total Length of Boring (Approximate)
PL	Property Line (Approximate)
el.	Elevation (Approximate)
— ? —	Geologic Contact (Approximate)
━━━	Boring Path (Approximate)
— - —	Property Line (Approximate)
——▼	Groundwater (Approximate)

UNITS:

Af	Artificial Fill	SP	Poorly Graded SAND
Oya	Young Alluvium (< 11,000 years old)	SW	Well Graded SAND
Oyo	Old Alluvium (> 11,000 years old)	GW	Well Graded GRAVEL
SM	Silty SAND	GP	Poorly Graded GRAVEL
SC	Clayey SAND	ML	SILT
		CL	CLAY

10 0 2 4 10
SCALE IN FEET

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Project FAULT INVESTIGATION HOLLYWOOD LOS ANGELES COUNTY CALIFORNIA	Plate Title SUBSURFACE PROFILE A-A'	Project No. 700019502 Date 11-30-2012 Scale 1" = 10' Drawn By SAC Submission Date 11-30-2012	Plate No. 2 Sheet 1 of 1

EXHIBIT B

THE SANTA MONICA AND HOLLYWOOD FAULTS AND THE SOUTHERN BOUNDARY OF THE TRANSVERSE RANGES PROVINCE

Richard Crook, Jr.
Consulting Engineering Geologist
93 N. Sunnyside Avenue
Sierra Madre, CA 91024

Richard J. Proctor
Consulting Engineering Geologist
327 Fairview Avenue
Arcadia, CA 91007

SUMMARY

Six locations in western Los Angeles and Beverly Hills were investigated by trenching in 1982 to attempt to determine the location, characteristics and most recent time of seismic activity along the Hollywood and Santa Monica faults. In addition, recent subsurface observations by others at seven other localities are included here to present the latest information on these faults.

The Hollywood fault has been located at 8 subsurface points, in addition to the several scarps that define parts of its surface trace. These localities include two trenches, four boring locations, and two building excavations (Fig. 1).

- Wattles Park trench at Franklin and Sierra Bonita Avenue exhibited several thin, mainly southerly-dipping shears with clay gouge in diorite that are believed to be displaced and reoriented by local landsliding in the hanging wall of the fault.
- An excavation at a roadcut at the east side of Greystone Park displayed steep northerly-dipping shears where sandstone juxtaposes slate at a brecciated clay-rich zone.
- 1981-83 borings for the L. A. Metro Rail subway on Cahuenga Boulevard just north of Hollywood Boulevard revealed brecciated Miocene sedimentary rock over old alluvium (Fig. 2).
- 1991-92 borings for the subway at the north end of Camino Palmero showed diorite over gouge and old alluvium.
- At the north end of La Cienega Boulevard a boring on the south side of Sunset Boulevard was more than 200 feet deep in old alluvium, but diorite crops out on the north side of Sunset (Glenn Brown, pers. comm., 1992).
- A 30-foot difference in water levels exists in adjacent borings for a building foundation just south of Franklin Avenue at Las Palmas Avenue (Richard Slade, pers.

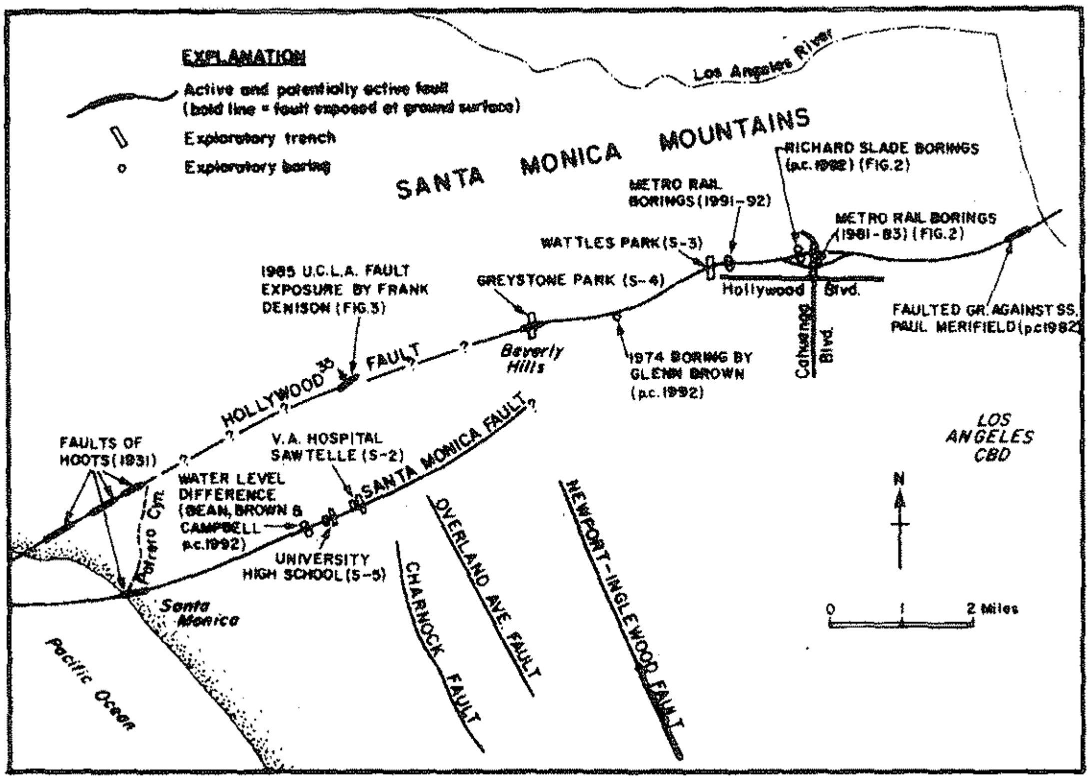


Figure 1. Location map, showing trench and boring locations, and active and potentially active faults.

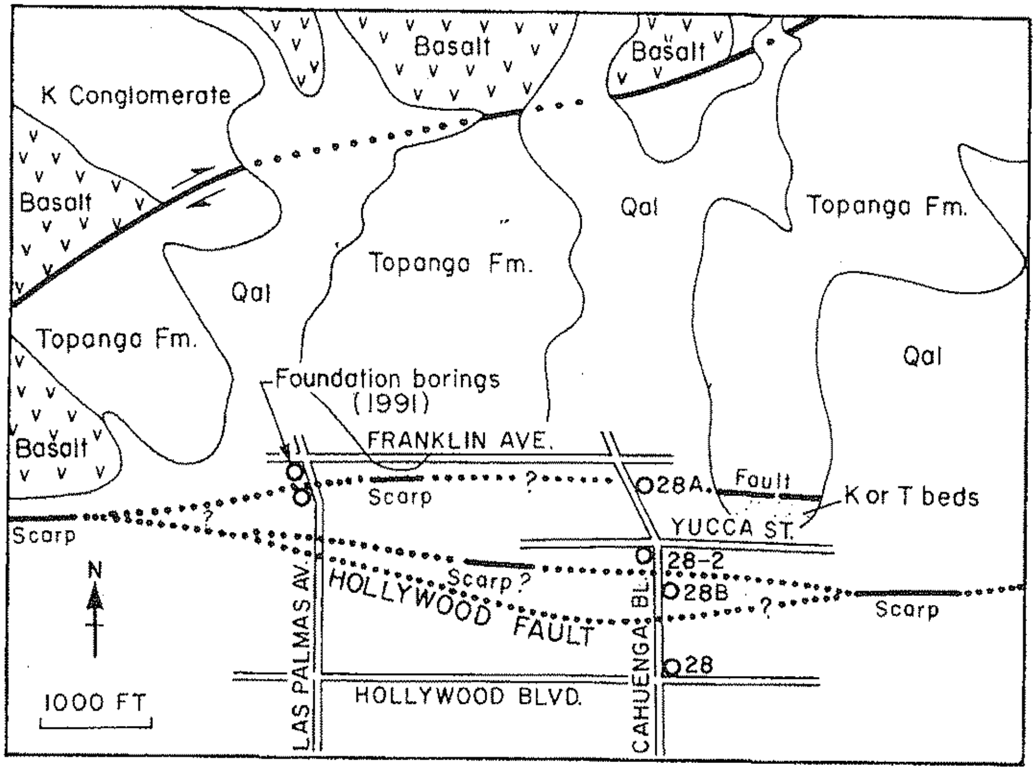
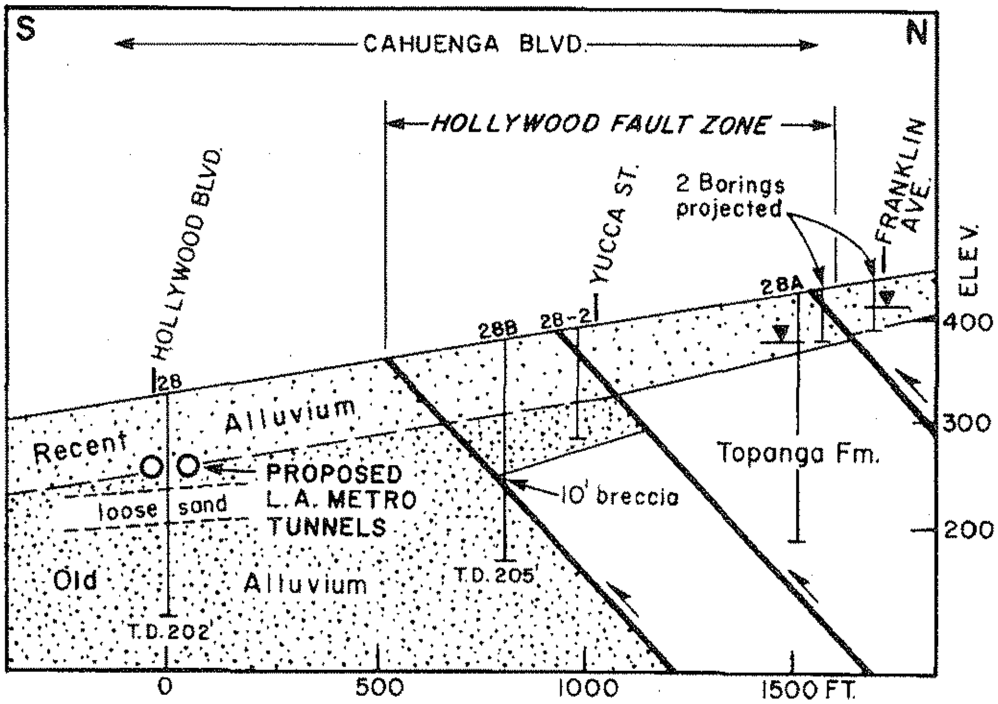


Figure 2a. Geologic map showing location of three branches of the Hollywood fault crossing Cahuenga Boulevard (former Metro subway alignment) based on borings. The borings along Cahuenga are from Converse and others (1981) and the 2 borings near Las Palmas Avenue showed a difference in water levels of 30 feet in borings about 150 feet apart in alluvium (Richard Slade, pers. comm., 1992). Surface geology from Hoots (1931), Weber and others (1980), and Dibblee (1991).



re 2b. Geologic section along Cahuenga Boulevard showing two buried Hollywood fault locations from Metro Rail borings, and a third ern branch fault from water level differences in borings projected from near Las Palmas Avenue.

comm., 1992); the northern boring reportedly encountered water at 15 feet and the southern boring at 45 feet (Fig. 3).

- Granite was seen faulted against Puente Formation sandstone in a Los Feliz district residential excavation (Paul Merifield, pers. comm., 1982).
- Frank Denison (pers. comm., 1985) mapped Modelo Formation shale faulted over Pleistocene old alluvium, with the fault striking N60E and dipping an average of 35 degrees north, in a library building excavation at the west part of the UCLA campus north of Gayley Avenue and east of Veteran Avenue (Fig. 3). This exposure is the only hard evidence that a potentially active fault exists in this reach. However, his northeast strike appears to align with a small fault mapped by Hoots (1931, Plate 16), rather than the projected westward trace of the Hollywood fault. We made a long south-trending trench at the north part of the Brentwood Hospital Veterans property, 1000 feet west of UCLA, across a stepped surface of an old fan, but found no fault.

All these localities, except at UCLA, show an 8-mile Hollywood fault segment extending northeasterly from Beverly Hills to the Los Angeles River, defining the south base of the Santa Monica Mountains. West of the west boundary of Beverly Hills, at the mouth of Benedict Canyon, the topography and geology changes to dissected large old alluvial fans, and the fault has not been proven to exist in this 6-mile segment extending to the Pacific Ocean. It should be noted that Hoots (1931) shows faults in three canyons near the coast that seem to line up with a westward extension of the Hollywood fault (Fig. 1).

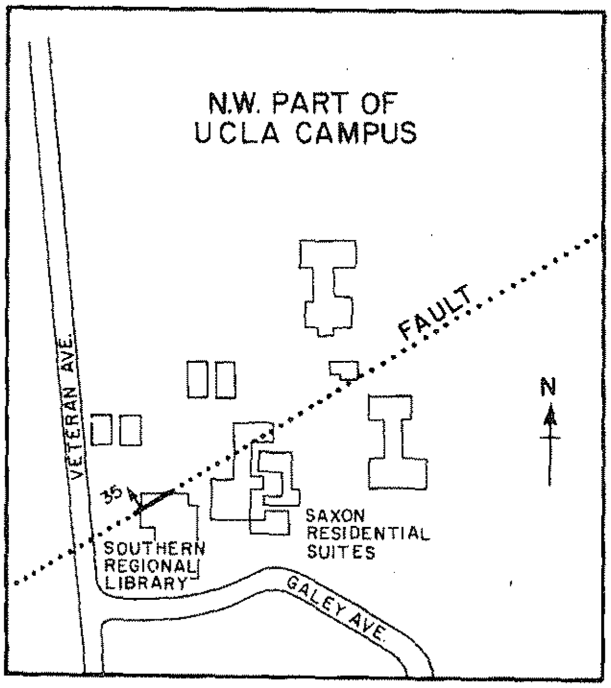


Figure 3a. Location map of western UCLA campus showing (for the first time) the location of the thrust fault exposure in the excavation for the library building mapped by Frank Denison in 1985 (personal communication). Modelo Formation shale overrides old alluvium, with two parallel faults at N60E, 35N. The location of faults in the foundations of adjacent buildings has not been reported.

Recency of displacement on the Hollywood fault could not be absolutely determined, although geomorphic expression (Weber and others, 1980; Dolan and Sieh, 1991) suggests late Quaternary movement.

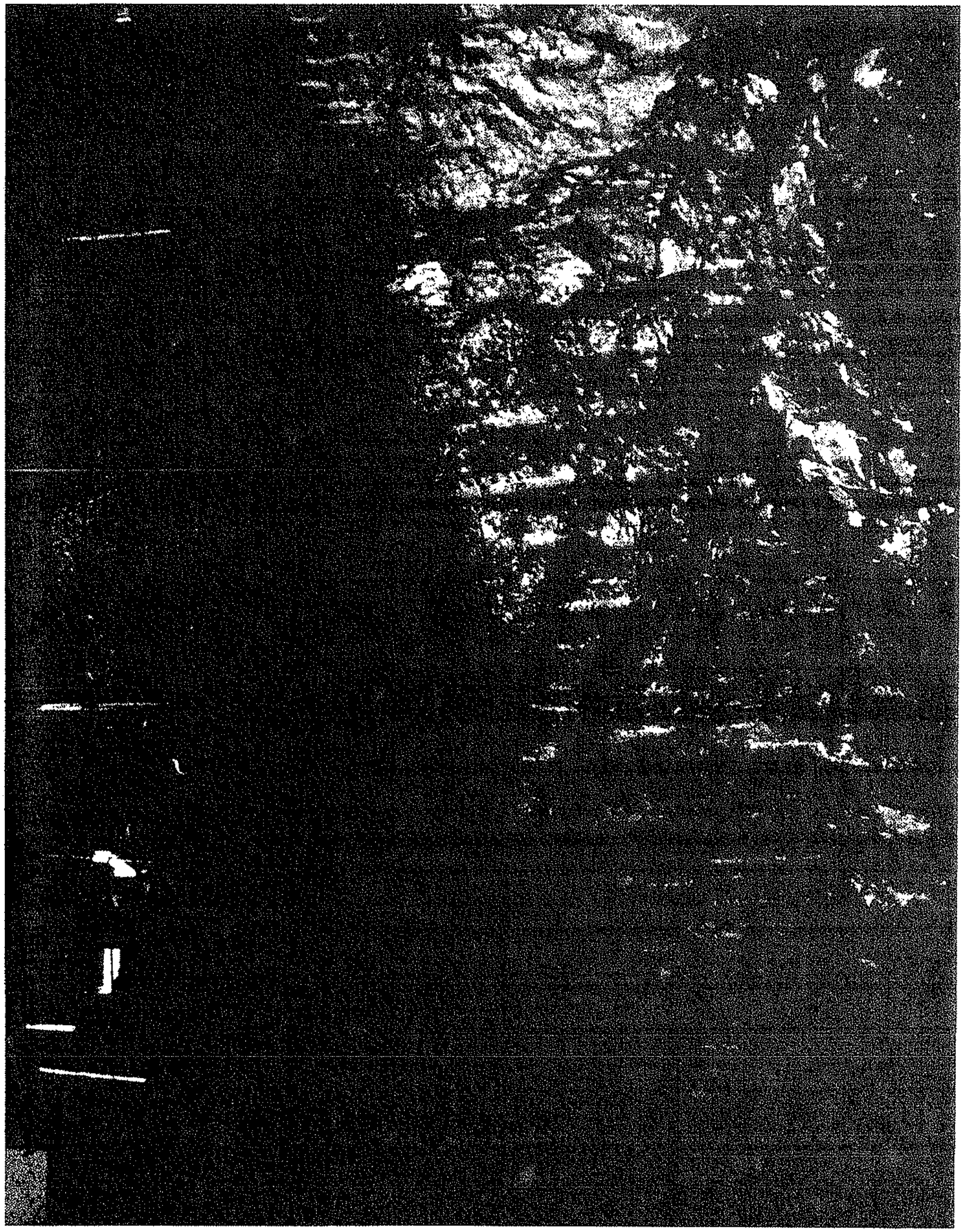
The Santa Monica fault has several scarps extending 6 miles on-shore from Santa Monica Bay, and is exposed at the mouth of Potrero Canyon north of the City of Santa Monica. It was also exposed in a foundation excavation and by our trenching at two locations:

- A foundation excavation and pumping test at Wilshire Boulevard and Bundy Drive defines a segment of the fault (Robert Bean, Glenn Brown and Alice Campbell, pers. comm., 1992).
- Our trenches at the southwest corner of the U. S. Veterans Administration Sawtelle property exhibited near-vertical to south-dipping normal shear zones with clay gouge trending roughly east-west.
- Trenches at University High School displayed two well-defined steep southerly-dipping normal faults, consisting of 2 to 12 inches of sheared clay, with apparent lateral displacements. No datable materials were found in any displaced units.

Proposed trenching on both the Santa Monica and Hollywood faults by Caltech (James Dolan and Kerry Sieh, pers. comm., 1992) may be completed by the time this paper is printed and may reveal new evidence on recency of faulting. Hauksson and Saldivar (1986) believe the 1930 M5.2 earthquake in Santa Monica Bay was on the Santa Monica fault. West of here, recent work by Rzonca and others (1991) and Drumm (in this chapter) indicates that the Malibu Coast fault moved in Holocene time.

OVERVIEW AND CONJECTURE ON THE SOUTHERN BOUNDARY OF THE TRANSVERSE RANGES PROVINCE

The Santa Monica fault zone is a portion of the much longer Anacapa-Malibu Coast-Santa Monica-Hollywood-Raymond-Sierra Madre-Cucamonga fault system that stretches more than 100 miles from offshore west of Ventura County to Cajon Pass (Fig. 4). This system of faults roughly defines the southern structural boundary between the Transverse Ranges (mainly left-lateral and thrust faults) and the Peninsular Ranges (mainly steep right-lateral faults) provinces of



southern California. At Cajon Pass, this boundary is right-laterally offset 15 miles along the San Jacinto fault, and resumes eastward as the Banning thrust fault. (See Fig. 5.) Although this fault system may have been a through-going active entity at some time in the past, Yerkes and Lee (1979a, b), Chapman and Chase (1979) and Weber and others (1980) suggest that since late Pleistocene time this is no longer so. Our work at Caltech in 1975-78 (Crook and others, 1987), led us to believe that the Sierra Madre fault zone and the Raymond fault behave as several discrete segments that act independently to local tectonic stresses and that they therefore should be treated as individual segments with regard to future seismic activity. This conclusion is also extended to the Anacapa-Malibu Coast-Santa Monica-Hollywood fault system. Figure 3 shows the interrupted nature of the faults, particularly the nearby Sierra Madre fault zone that is actually a connected series of thrust faults that curve northeastward to become steep left-slip faults. We believe each thrust segment moves independently to cause typically moderate-sized earthquakes, such as the M 6.5 San Fernando earthquake in 1971.

In our opinion, therefore, a scenario of a long reach of the fault system moving to cause an earthquake with a magnitude approaching 7.5 is unlikely. Bonilla and others (1984) indicate such a large event would rupture the ground surface for almost 50 miles; a long rupture length does not appear to fit the direct arcuate thrust fault traces, nor the local tectonics (e.g. Allen, 1975; Hauksson, 1990, and Hauksson this volume).

Until approximately 1987 the boundary between the Transverse Ranges and the Peninsular Ranges provinces was considered to be the obvious geomorphic southern limit of the Transverse Ranges. In other words, the southernmost steep parts of the Santa Monica, San Gabriel and San Bernardino mountain ranges. However, work by Davis (1987) suggested that the actual boundary might lie south of these areas as a series of north-dipping blind thrusts. This model appears to have been confirmed by the October 1987 Whittier Narrows earthquake. Geologic and seismic studies of this earthquake by Davis and others (1989) and Hauksson and Jones (1989), and of other subsequent earthquakes (Hauksson, 1990; Hauksson and Jones, 1991), have suggested that the boundary between the two provinces lies south of the Santa Monica-Hollywood-Raymond-Sierra Madre-Cucamonga fault system. The boundary exists as a zone of exposed and buried northeast-trending, left lateral strike-slip faults (San Jose, Indian Hill, Walnut Creek and Red Hill) east of the Los Angeles Basin and a series of northwest- to west-trending blind thrusts (Davis and others, 1989) in the central part of the Los Angeles basin.

At the far western end of the Los Angeles basin this boundary is less defined at present. Here the presently active bounding fault appears to be the Santa Monica fault, although on-shore Holocene movement has yet to be proven.

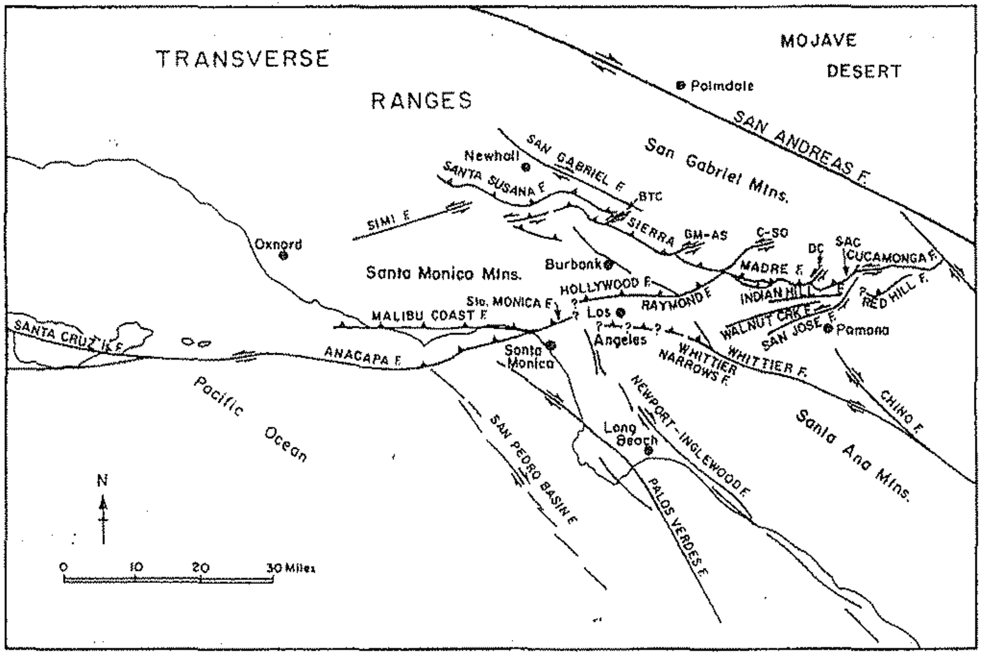


Figure 4. Regional fault map, showing uncertainty of south boundary of Transverse Ranges Province in this part of southern California. Queries indicate doubts as to connection between E-W faults. See text for discussion. The Sierra Madre thrust fault forms distinct segments as it swings NE into canyons and becomes steep left-lateral faults: BTC = Big Tujunga Canyon; GM-AS = Gould Mesa-Arroyo Seco; C-SC = Clamshell-Sawpit Canyon; DC = Dalton Canyon; SAC = San Antonio Canyon.

Work by the authors indicated late Pleistocene movement at two locations (University High School and U. S. Veterans Administration, Sawtelle). More recent field work by Dolan and Sieh (1991) suggests that Holocene movement has indeed occurred on this fault, which they hope to substantiate by their ongoing subsurface investigation.

Curiously, the subsurface evidence for faulting revealed by our 1982 work on the Santa Monica and the Hollywood faults all indicated nearly vertical to south-dipping faults with apparent normal (dip-slip) displacements. Such faulting could be expected within the hanging wall of a deeper blind thrust (Avouac and others, 1992) and might also explain a portion of what Wright (1991) has concluded to be monoclinal folding due to recent extension in this area (Fig. 6a-c).

HISTORICAL REVIEW

Onshore segments of the Santa Monica and Hollywood faults were first shown on the map prepared by Hoots (1931). His map and text indicate that the only surface trace observed by him on the Santa Monica fault is at the mouth of Potrero Canyon. Hill (1979) and Johnson (1932) reported that two traces are exposed here; one is vertical and the other dips to the north at approximately 45 degrees. The latter trace can be seen to displace terrace deposits thought to be late Pleistocene in age, possibly 125,000 years old (Hill, 1979).

Hill and others (1979), in a review of all studies of these zones up to that time, state that except for an exposure seen by John McGill in Rustic Canyon (quoted in Hill, 1979) no additional site-specific information was available regarding the surficial traces of these two faults. Analyses of oil well and exploratory well data by Lang and Dreesen (1975), Knapp and others (1962), Jacobson and Lindblom (1977), and Wright (1991) indicate that movement on the Santa Monica fault has been negligible since the Pliocene. However, Hill and others (1979), on the basis of their investigation conclude that:

1. The near-surface trace of the Santa Monica fault in the Beverly Hills-Hollywood area is defined by a zone of differential subsidence;
2. The fault has been active during at least part of the Pleistocene time;
3. Holocene movement cannot be precluded on the basis of current knowledge;
4. Subsurface fault traces within the Santa Monica-Raymond fault zone in the eastern part of the Beverly Hills-Hollywood area are actively undergoing tectonic strain accumulation and release.

This last conclusion was partly based on the results of a study of seismicity in this area by Buika and Teng (1978).

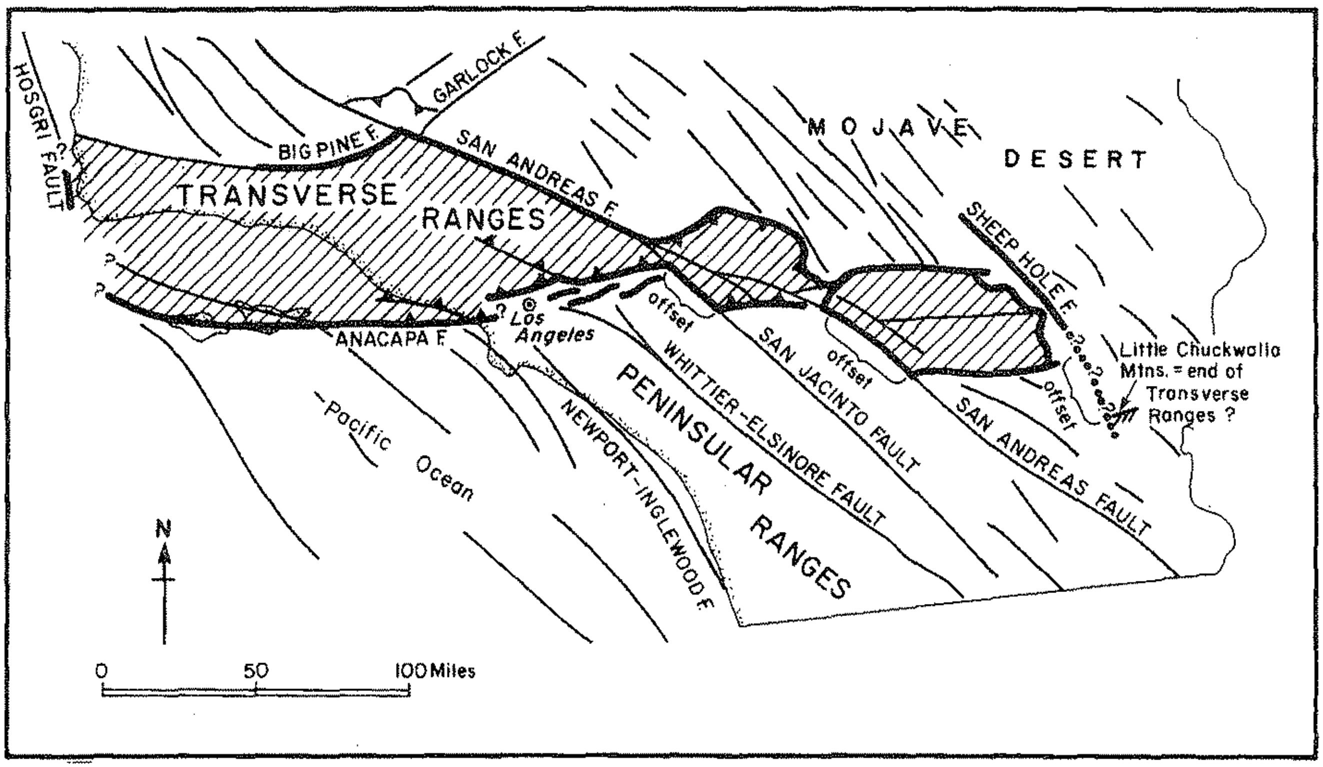


Figure 5. The Transverse Ranges province. See text for comment on apparent right-lateral offsets of southern boundary. Queries indicate unknown end of faults and unknown east and west ends of Transverse Ranges province.

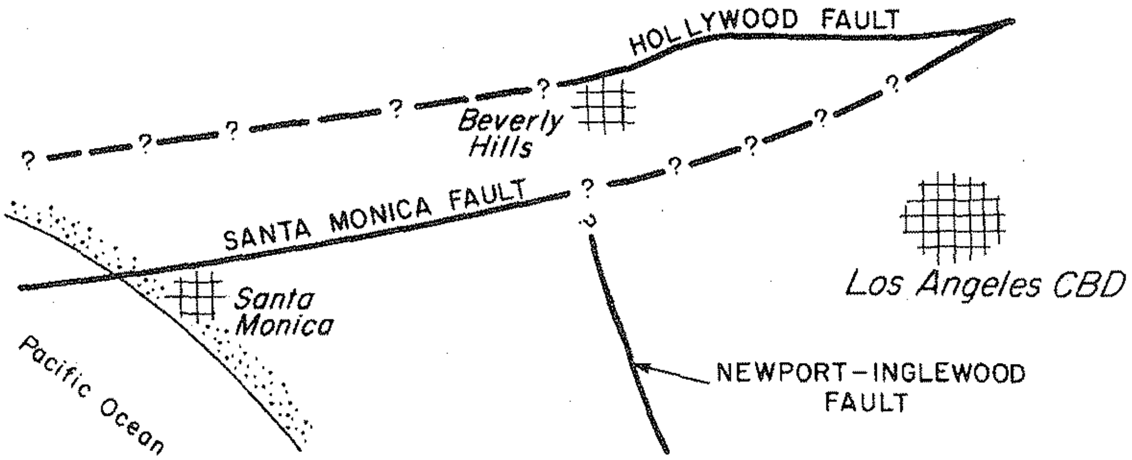


Figure 6a. Fault interpretation shown on many maps to 1980s. Does the Hollywood fault extend westward? does the Santa Monica fault extend eastward?

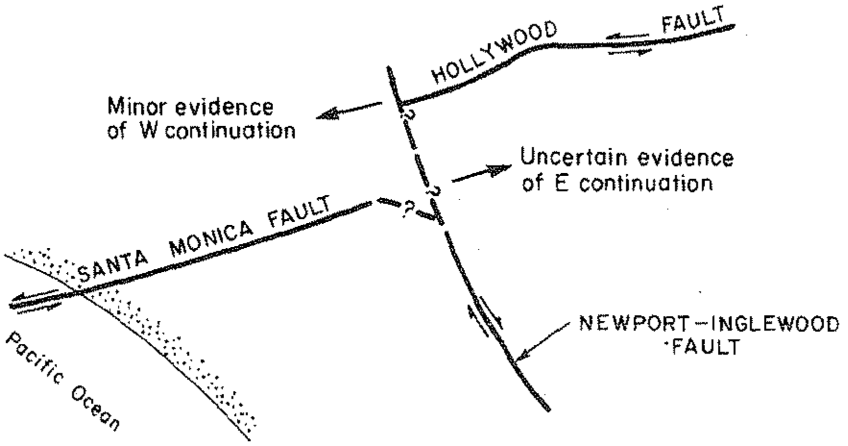


Figure 6b. Possibility of left-stepping separation of 1.5 miles by the right-lateral Newport-Inglewood fault (wrong sense of historic movement); or possibility of merging of Santa Monica and Newport-Inglewood faults as shown by Ziony and Jones (1989), but causing conflicting sense of historic movement on each fault.

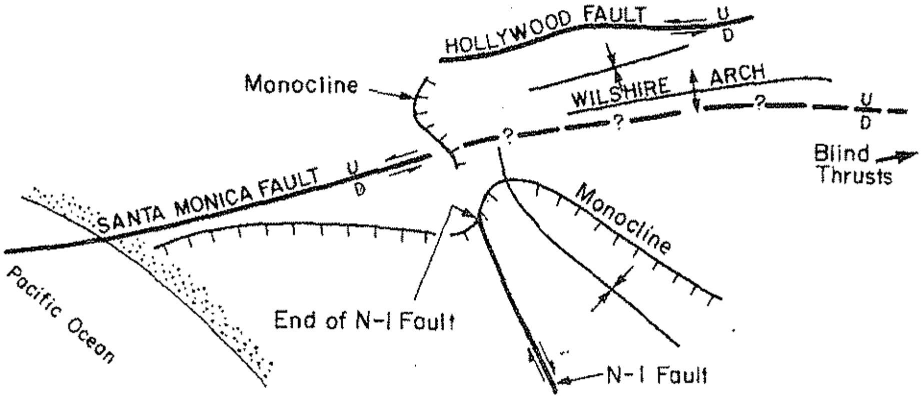


Figure 6c. Two new possibilities: (1) Faults ending in east- and south-dipping monoclines (Wright, 1992, Fig. 16c). (2) Our conjecture of as yet undiscovered buried eastward extension of the Santa Monica fault, possibly associated with the newly discovered Wilshire Arch of Robert S. Yeats (pers. comm., 1992; Hummon and others, 1992), extending eastward to connect to known E-W blind thrusts toward Whittier Narrows.

Subsequently, Weber and others (1980) report that the part of the Hollywood fault zone between Hollywood and the Los Angeles River is primarily expressed by geomorphic features—"scarp-like features in older and younger alluvial deposits and steeply inclined spurs at the south ends of spurs". No exposures of the fault are reported.

Foundation excavations and borings near the corner of Wilshire Boulevard and Bundy Drive in west Los Angeles yielded evidence of a ground water barrier in late Pleistocene deposits (Glenn Brown and Alice Campbell, pers. comm., 1982). They report that ground water was encountered at a depth of approximately 15 feet under the lot at the northwest corner of the intersection and at depths of up to 70 feet under the lot at the southwest corner. A pump test performed on the latter lot (Robert Bean, pers. comm., 1992) indicated a nearby ground water barrier about 350 feet south of Wilshire.

This location coincides with a geomorphic feature—possibly a scarp on a branch of the Santa Monica fault—as seen on 1927 Fairchild aerial photographs and old topographic maps. It also aligns with a projection of similar geomorphic features at University High School and the U. S. Veterans Administration property within a mile eastward. Current geomorphology studies by Dolan and Sieh (1991, and pers. comm., 1992) are discovering subtle new scarps in this area.

THE 1982 TRENCHING

Two sets of older vertical and a series of oblique aerial photographs of the project area were studied to assist in picking fault scarps and prospective trenching sites. The verticals were 1927 and 1928 Fairchild photographs; the obliques were Spence photographs with dates ranging from 1921 to 1931. (These rare photos are preserved at the Whittier College Geology Department.) We located possible fault scarps, then plotted these onto Thomas Guide maps, to help find vacant sites in a densely urbanized area.

Hollywood Fault Trenches

Wattles Park, Los Angeles, site S-3, Plate 1. Two trenches were excavated at this site. The first trench was 166 feet long, and exposed massive- to locally crudely-bedded, silty sand colluvium with scattered pebbles and cobbles. No evidence for faulting was encountered in this trench.

The second trench was excavated upslope of the first trench. This trench was started in granodiorite and extended downhill toward Trench No. 1. It was short, by about 6 feet, from overlapping trench No. 1 owing to the existence of a paved driveway. In the southernmost 20 feet of trench several thin gouge layers were exposed that dipped northward into the hill at 10 to 15 degrees. As these layers approached the depositional rock-colluvium contact, they were displaced downward to the south along several south-dipping shears that probably are small landslide planes. A mass of

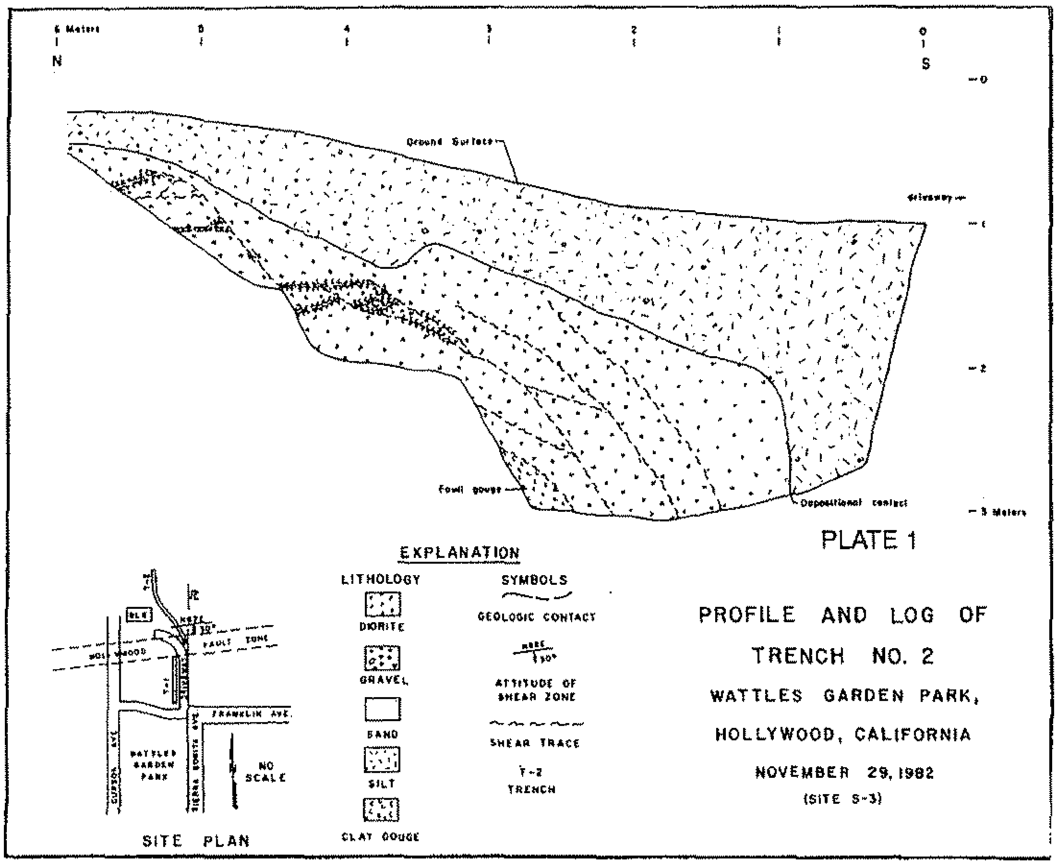


PLATE 1

PROFILE AND LOG OF
TRENCH NO. 2
WATTLES GARDEN PARK,
HOLLYWOOD, CALIFORNIA
NOVEMBER 29, 1982
(SITE S-3)

bluish-green clay gouge at least 2 feet thick was exposed at the bottom of the trench beneath rock displaced along one of the slide planes. It is probable that this gouge is part of the main zone of the Hollywood fault. No datable materials were exposed.

Greystone Park, Beverly Hills, site S-4, Figure 7. Portions of a road cut on Loma Vista Drive north of Doheny Drive were excavated by hand. Materials encountered were the Santa Monica slate and a sedimentary unit consisting of yellow-tan, massive arkosic sandstone with abundant pebble-size fragments of slate. The relationship between the two units was difficult to ascertain. Both units are extremely weathered and clay-rich and generally have a sheared appearance. The contact has the general appearance of being depositional; however, at two locations sheared planar inclusions of sandstone are within the sheared slate, dipping 72° and 75° north. The age of the sedimentary unit is not known and may be as old as Tertiary. This is based on the highly weathered and clayey state of the material, as well as the well-developed soil at its surface. We also found that on the park grounds there are several oil and water seeps that appear to align with the road cut exposure. It thus appears that the Hollywood fault passes through the Greystone Park property.

Santa Monica Fault Trenches

Two sites on the Santa Monica fault were investigated by trenching, these being the U. S. Veterans Administration property (site S-2) and the University High School property (site S-5).

U. S. Veterans Administration, Sawtelle, site S-2, (Plates 2 and 3). Trench No. 2 at this site was 141 feet long and 12 to 18 feet deep with two approximately 12-foot long gaps due to caving ground and a concrete substructure. Materials encountered in this trench were massive- to crudely-bedded fluvial and sheet-wash fan deposits varying from firm silty clay to loose, coarse, silty and sandy gravel. Contacts were generally gradational and only locally were sharp and well defined. The sharper contacts generally were between deposits with large grain-size difference.

The southern 100 feet of trench consisted primarily of the crudely-bedded fluvial silt, sand and gravel deposits overlying a south-sloping, locally stripped, older alluvial fan surface. No evidence of faulting was observed in this section of trench nor were there any features that might be attributable to liquefaction.

In the northern 30 feet of trench (Plate 2) the "older" fan surface is within 3 feet of the ground surface and most of the exposed deposits were less well-bedded and sorted and much more fine grained and cohesive than those to the south. These materials contained numerous features suggestive of faulting. Some of the features consist of planar zones of gray clay and clay-rich material that coincide with discontinuities in the crudely-bedded material. Two of the zones

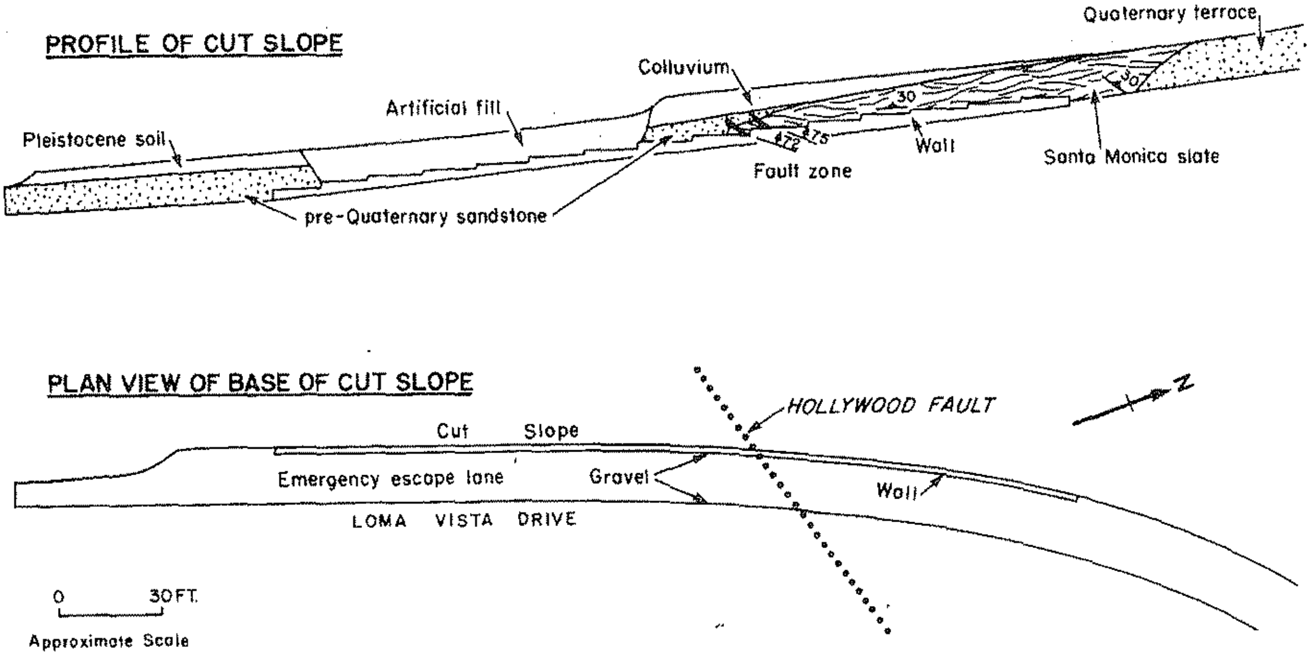


Figure 7. Sketch map of roadcut excavation on Loma Vista Drive (Trench Site S-4) adjacent to Greystone Park, Beverly Hills. The faults in the Santa Monica slate contain sheared pre-Quaternary sandstone.

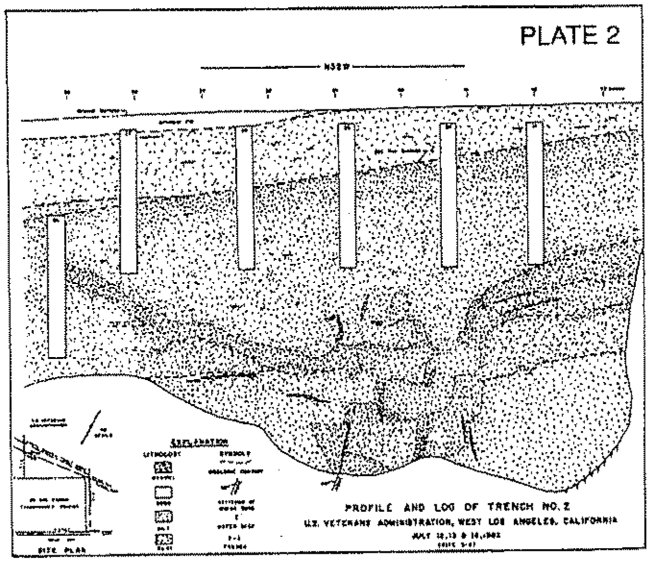


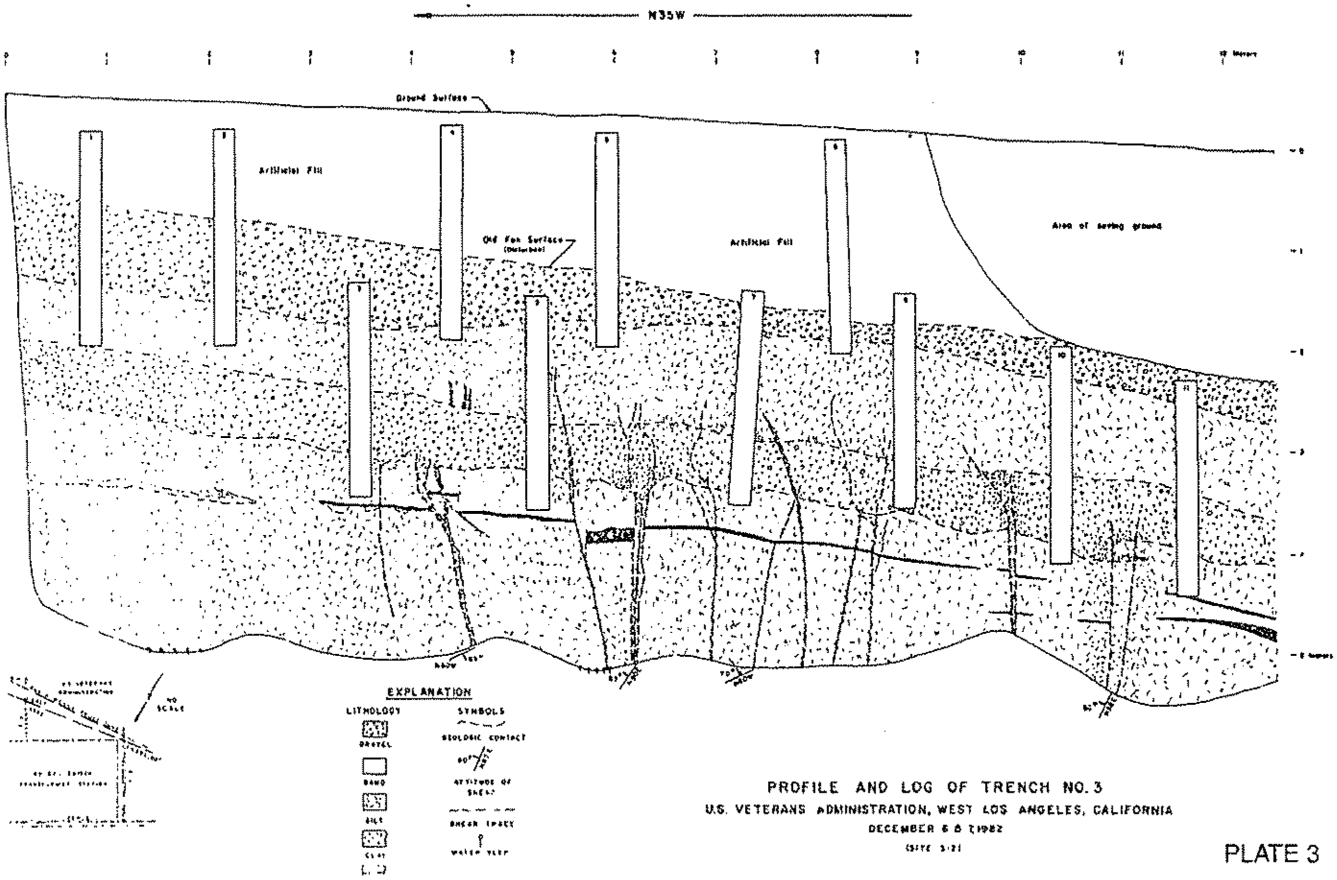
PLATE 2

near the bottom of the trench could be found on both trench walls and they defined a strike of N 80 E. Other features include the apparent stepped configuration of some crude bedding and slight warping.

It should be noted that the above described features could suggest normal movement, down to the south, on south-dipping planes as well as north-dipping reverse-slip features.

The above described features are in the "older" alluvial fan whose buried surface appears to become coincident with the ground surface a short distance north of the trench. This fan surface is underlain by an argillic B horizon approximately 2.5-feet thick. Evidence for faulting could not be found within 6 feet of this surface although the massive, heterogenous nature of the materials within this section might make such evidence difficult to recognize. The fan surface did not appear to be displaced but this could not be confirmed as the surface north of Shoring #27 looks to have been stripped prior to deposition of the overlying deposits. Additionally, the thickness of the argillic horizon did not appear to change above the faulted material.

Trench No. 3 (Plate 3) at this site was excavated approximately 145 feet west of Trench No. 2. The north end of the trench was excavated in the same "older" fan unit seen in Trench No. 2. These materials were crudely-bedded with gradational contacts and consisted of massive heterogeneous units of slightly clayey sand, silt, and silty, sandy gravel.



PROFILE AND LOG OF TRENCH NO. 3
U.S. VETERANS ADMINISTRATION, WEST LOS ANGELES, CALIFORNIA
DECEMBER 6 & 7,1982
(SITE 3-2)

PLATE 3

The lower silt unit contained what appeared to be a burned paleo-fan surface with a peculiar reddish color not attributable to pedogenic processes. The "older" fan surface in this area is overlain by 3 to 6 feet of artificial fill.

Numerous features were exposed in this trench that are attributed to faulting although displacements did not appear to be substantial and were questionable in many instances. All of these features consisted of planar zones of gray, silty, sandy clay in contrast to the brown to yellow-brown silt and gravel units containing them. The thicker zones appeared to have been sheared but the thinner zones appeared to differ from the surrounding material only by color and grain-size distribution. All of these features have steep dips that vary from 80° north through vertical to 80° south.

Only the zones beneath Shoring #4 and #6, and possibly the one north of Shoring #10, showed a relatively convincing component of vertical separation. As in Trench No. 2, these features appeared to stop short of the "older" fan surface, in this case by at least 2 feet, and maybe more, depending upon how much of the surface has been removed by erosion.

Although we are confident that the Santa Monica fault was exposed in both Trench No. 2 and No. 3, the geologic features on which we base this conclusion are less than ideal. There was certainly no clear evidence, for example, comparable to that seen in our 1976-78 trenches (Crook and others, 1987) on the Sierra Madre and Raymond faults. In fact, our strongest evidence is that the features attributed to faulting in both trenches lie on a N 80 to 85 E trend that coincides with the geomorphic expression of the scarp-like features through this area.

We propose that sharp, well-defined shears and offsets are lacking because the faulting recorded here occurred at a time when the deposits were far less consolidated than at present. Movement under these conditions would result in more of a mixing process along wide indistinct zones rather than shearing along narrow discreet planes. Similar features were noted in unconsolidated deposits exposed in trenches across some 1971 San Fernando earthquake breaks (Chapter 11 in Oakeshott, 1975; Proctor and others, 1972).

University High School, site S-5, Plate 4. A total of five trenches were excavated at this site and only Trench No. 1 exposed faulted material (Plate 4). This trench was 102 feet long, 9 to 12 feet deep and was excavated on the scarp-like feature crossing the school property.

Materials exposed in this trench varied considerably in grain-size distribution, and hence depositional environment, in the downslope direction. The upslope materials consisted of crudely-bedded to massive and heterogeneous sandy silt, silty clay and slightly clayey, silty, sandy gravel. These materials have the appearance of distal alluvial fan deposits.

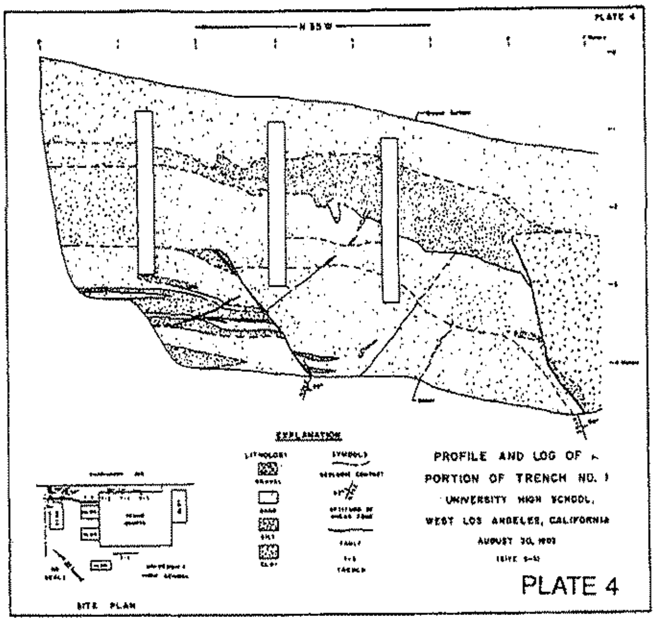


PLATE 4

These deposits are bound in the downslope direction by a fault that has juxtaposed against them a dark olive-gray to black, massive, heterogeneous, slightly sandy silty clay with scattered pebbles and cobbles. Depositional environment of this material is unknown but judging from the high clay content and color it may have been a sag pond.

Further downslope the dark clay unit grades into a fairly uniform brown, massive, clayey, sandy silt with scattered pebbles. This material has the appearance of colluvium that probably was derived from erosion of the fault scarp upslope. South of this trench this unit is overlain by relatively young, bedded fluvial deposits consisting of unconsolidated silt, sand and gravel.

Two well-defined south-dipping normal faults were exposed in the northernmost 22 feet of this trench, within and bounding the alluvial fan deposits (Plate 4). The northernmost fault is the most sharply defined and consists of a 1/4-inch thick clay layer that truncates several thin gravel and silt layers. It also appears to offset a small north-dipping fault and exhibits an apparent dip-slip component of 13 inches, down to the south. This fault appears to die out upward in a massive silty, sandy clay unit approximately 5 feet below the present ground surface.

The southernmost normal fault is less clearly defined and consists of an approximately 12-inch wide zone of sheared clay and gravel. The materials on either side of this zone are significantly different suggesting considerably more displacement than on the northernmost fault. The apparent vertical component of displacement is down to the south as suggested by the sense of drag exhibited by depositional contacts in the footwall. Significant lateral slip is suggested by the total lack of similarity of units on either side of the fault. This fault also appears to die out upward approximately 4 feet below the present ground surface and within the central portion of a massive gravel bed; this was seen on both walls of the trench.

Three sub-parallel north-dipping features were exposed in the trench between the two south-dipping faults. Two of these features consist of gray colored streaks with no evidence of shearing or displacement. The third feature consists of a 1/8-inch thick clay layer that contains two thin pods of sand. At its upper end this layer widened to 1/2- to 3/4-inch and extends approximately 2.5 inches into the base of the gravel deposit that is faulted by the southernmost normal fault. No displacement was evident along this feature. Another sub-parallel feature, north of the northernmost normal fault, exhibited a minor amount of reverse displacement in the form of a deformed silt bed.

A peculiar occurrence noted in a portion of the trench is that of abundant calcium carbonate in the form of caliche. These deposits were found only filling pores in the matrix of the uppermost gravel deposit and fractures in the upper portion of the clay unit on the south side of the southernmost normal fault. Caliche was found nowhere else in this trench nor in the other trenches at University High School.

Charcoal was collected from a silty sand layer at depths of 3.5 and 5 feet in Trench No. 2 (log not included herein). Dates were determined by Beta Analytic, Inc., Coral Gables, Florida. The samples yielded radiocarbon dates of 630 ±70 (Beta-6110) years B.P. and 380 ±130 (Beta-6111) years B.P. respectively and are in conflict.

1981-83 BORINGS FOR L.A. METRO RAIL

Until 1990, the Southern California Rapid Transit District was the public agency designated to design and build a subway system for Los Angeles. During the period 1979-1984, the District convened an eight-person Board of Geotechnical Consultants to prepare an exploration program and to advise on anticipated geologic conditions for subway construction. The geologists on the Board were Ronald Heuer, Richard Jahns, Eric Lindvall and Richard Proctor. Several of the recommended exploratory borings for a proposed subway route along Cahuenga Boulevard have bracketed traces of the Hollywood fault north of Hollywood Boulevard (see Fig. 2). Boring #28 at the south encountered only Quaternary fluvial deposits to a total depth of 202 feet and boring #28A, 1,000 feet north, encountered Tertiary rock at a depth of 63 feet (Converse and others, 1981). The Hollywood fault has to lie between these two borings. The Board recommended that additional borings be drilled to try to better define the fault location. In February 1983 boring #28B was drilled which encountered the fault as 10 feet of brecciated sandstone, alluvium and siltstone at a depth of 122 feet in a hole otherwise entirely in alluvium to a total depth of 205 feet. From the geologist's log, the breccia is described, from one 8-inch sample, as follows: "Mixed 1" to 2" masses, densely packed at skewed angles. 1. Sandstone fragments, angular, mottled light brown/dark yellowish-orange, fine to medium, cemented, massive. 2. Gravelly sand (1" gravel), light to mod. brown, well-graded, unconsolidated, very dense, with irregular dark reddish-brown stained masses. 3. Siltstone, grayish orange, at near-vertical angle, minor".

PHYSIOGRAPHY AND AGE OF FAULTING

It appears that the Hollywood fault between Coldwater Canyon on the west and at least to Western Avenue on the east, lies at the break in slope at the south edge of the Santa Monica Mountains. We were unable to ascertain the recency of faulting. It does appear, however, from the steepness of the alluvial fan surfaces in this reach and the lack of significant drainage entrenchment on these surfaces that late Quaternary movement has occurred on this fault.

West of Coldwater Canyon the fan surfaces are older, highly dissected and entrenched, suggesting that the Hollywood fault in this area has not been so recently active, or as Hoots (1931) suggested, the deformation has been by folding rather than faulting. This geomorphic boundary between areas of differing geomorphology also coincides with a northwest projection of the Newport-Inglewood fault zone (Dolan and Sieh, 1991).

The Santa Monica fault through west Los Angeles is fairly well known at depth from oil well data (especially Wright, 1991). The surface expression is best defined by a 2.5-mile long stretch of scarp-like features between Stanford Street and Washington Avenue on the west, and Manning Avenue and Santa Monica Boulevard on the east. These features have the appearance of being relatively old, as compared to the Raymond fault scarp in Arcadia, San Marino and South Pasadena (Crook and others, 1987). Nevertheless, these features were the primary reason for trenching at both University High School and the U. S. Veterans Administration property. We were successful in finding faults at these sites. None of the Holocene fluvial deposits exposed in these trenches exhibited any faults or features attributable to seismic shaking, such as infilled lurch cracks or liquefaction structures.

One surprising feature of the Santa Monica fault is that no evidence was found that would confirm that it is a north-dipping reverse fault. This may be due to either the fact that we did not expose the main fault in any of our trenches and that the features we saw are antithetic faults above a thrust fault (e.g., Avouac and others, 1992), or that the most recent movement has been predominantly strike-slip along high angle faults.

It might be argued that the scarp on the fan surface east of Potrero Canyon (Hoots, 1931; Hill, 1979) indicates Holocene movement on the Santa Monica fault. The age of the fan surface in that area, however, almost certainly is pre-Holocene.

Obviously a recurrence interval for the Santa Monica fault cannot be determined from our data. Our work also cannot prove Holocene movement on the on-shore portion of this fault, even though the geomorphic evidence suggests it.

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Active tectonics, paleoseismology, and seismic hazards of the Hollywood fault, northern Los Angeles basin, California

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Active tectonics, paleoseismology, and seismic hazards of the Hollywood fault, northern Los Angeles basin, California

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ABSTRACT

Data from geotechnical boreholes and trenches, in combination with geomorphologic mapping, indicate that the Hollywood fault is an oblique, reverse–left-lateral fault that has undergone at least one surface-rupturing earthquake during latest Pleistocene to middle or late Holocene time. Geomorphologic observations show that the fault extends for 14 km along the southern edge of the eastern Santa Monica Mountains, from the Los Angeles River westward through downtown Hollywood to northwestern Beverly Hills, where the locus of active deformation steps 1.2 km southward along the West Beverly Hills lineament to the Santa Monica fault. Rupture of the entire Hollywood fault, by itself, could produce a M_w ~6.6 earthquake, similar in size to the highly destructive, 1994 Northridge earthquake, but even closer to more densely urbanized areas. Assuming a 0.35 mm/yr minimum fault-slip rate consistent with available geologic data, we calculate an average maximum recurrence interval for such moderate events of ≤~4000 yr. Although occurrence of such moderate events is consistent with the elapsed time since the poorly constrained age of the most recent surface rupture, the data do not preclude a longer quiescent interval suggestive of larger earthquakes. If earthquakes much larger than M_w ~6.6 occurred in the past, we speculate that they may have been generated by the Hollywood fault together with other faults in the Transverse Ranges Southern Boundary fault system.

INTRODUCTION

During the past decade ideas about the seismic hazards facing urban Los Angeles have undergone dramatic revision and refinement. Earlier earthquake scenarios for the metropolitan region focused primarily on the effects of a great (M_w 7.7 to 7.9) earthquake generated by the San Andreas fault, which is located more than 50 km northeast of downtown Los Angeles (Fig. 1). Not until the mid-1980s (e.g., Wesnousky, 1986; Toppozada, 1988) did attention turn to the potential hazards posed by faults directly beneath the metropolitan area. The 1987 M_w 6.0 Whittier Narrows earthquake and the 1994 M_w 6.7 Northridge earthquake clearly demonstrated the seismic hazards associated with these urban faults. More recent seismic hazard assessments incorporate the possibility of large urban earthquakes, as well as the recurrence of a major earthquake on the San Andreas fault (e.g., Working Group on California Earthquake Probabilities, 1995). Because of their proximity to metropolitan Los Angeles, moderately large to large earthquakes (M_w 7.0 to 7.5) generated by the urban faults could cause at least as much, and possibly more damage, than a much larger earthquake occurring on the San Andreas fault (Working Group on California Earthquake Probabilities, 1995; Dolan et al., 1995; Heaton et al., 1995). At least two such large earthquakes have occurred during historic time in southern California on faults similar to those that underlie the metropolitan region: the December 21, 1812, M ~7.1 Santa Barbara Channel earthquakes (Toppozada, 1981) and the July 21, 1952, M_w 7.5 Kern County event (Hanks et al., 1975; Stein and Thatcher, 1981; Wallace, 1988; Ellsworth, 1990). Neither of these earthquakes resulted in widespread damage or major loss of life, because both regions were relatively sparsely populated at the time of the earthquakes.

Despite a heightened awareness of the potential for destructive earthquakes from faults beneath metropolitan Los Angeles, as well as numerous recent studies that have illuminated the active tectonics of the region (e.g., Hauksson, 1990; Wright, 1991; Shaw and Suppe, 1996), too little information exists about the earthquake histories and recent kinematics of these faults to construct realistic probabilistic hazard maps for the metropolitan region. Specifically, we have only sparse data concerning recurrence intervals, dates and sizes of past events, slip rates, and kinematics for many faults. Furthermore, we do not know the exact nature and surficial location of many of these faults. Knowledge of these fault parameters is essential for constructing realistic probabilistic seismic hazard models for southern California.

Over the past several years we have been studying the active tectonics and paleoseismology of the northern Los Angeles metropolitan region; the area extends from Pacific Palisades and Santa Monica on the coast, eastward through Beverly Hills, Hollywood, downtown Los Angeles, and east Los Angeles to Whittier Narrows (Fig. 1). In this paper we discuss our results from the Hollywood fault, which extends for 14 km through this densely urbanized region (Fig. 2). We first describe the results of our geomorphologic and paleoseismologic studies of the fault and then discuss the implications of these data for seismic hazard assessment in the metropolitan Los Angeles region. In addition to the implications of these results for seismic hazard analysis, data from this and similar studies of

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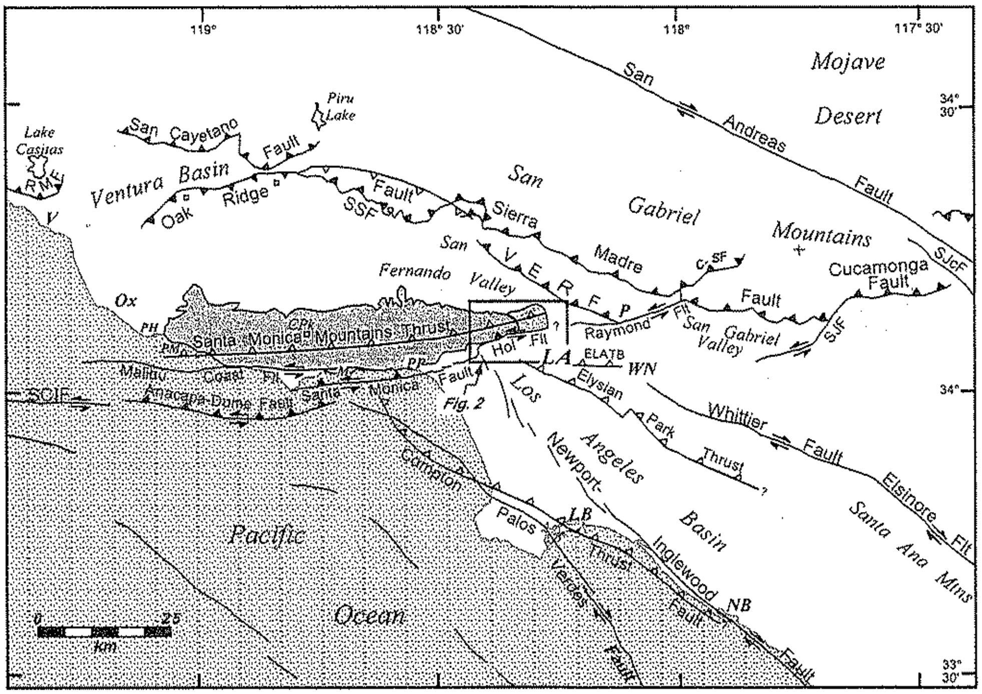

Figure 1. Regional neotectonic map for metropolitan southern California showing major active faults. Fault locations are from Ziony and Jones (1989), Vedder et al. (1986), and Dolan and Sieh (1992). Santa Rosa Island fault is off figure to west. Closed teeth denote reverse-fault surface traces; open teeth show upper edges of blind thrust-fault ramps. Strike-slip fault surface traces are identified by double arrows. Small open squares denote Global Positioning System (GPS) stations discussed in text (locations were provided by A. Donnellan, JPL Geodesy group, 1996, personal commun.). CPk—Castro Peak GPS station; ELATB—East Los Angeles thrust belt; Hol Flt—Hollywood fault; RMF—Red Mountain fault; SCIF—Santa Cruz Island fault; SJF—San Jose fault; SSF—Santa Susana fault; VERF—Verdugo–Eagle Rock fault; LA—Los Angeles; LB—Long Beach; M—Malibu; NB—Newport Beach; Ox—Oxnard; P—Pasadena; PH—Port Hueneme; PM—Point Mugu; PP—Pacific Palisades; SJcF—San Jacinto fault; V—Ventura; WN—Whittier Narrows. Dark shading shows Santa Monica Mountains.

numerous other active southern California faults will ultimately provide information about the long-term and long-distance interactions between these faults.

Studying a fault in such a densely urbanized setting presents many difficulties, perhaps the most challenging being logistical limitations on available trench sites. Because we could not choose the optimal trench site along the Hollywood fault, some aspects of the data set, in particular the slip rate and slip vector of the fault, could not be measured directly and are therefore not as well constrained as they might have been were the fault not in an urban setting. Nonetheless, the data presented below provide constraints on the location, kinematics, and earthquake history of the Hollywood fault, parameters that are critical for integrating this potentially hazardous fault into realistic probabilistic seismic hazard models. We conclude by using estimates of the slip rate and fault-plane area that are consistent with known geologic data to discuss plausible sizes and repeat times of future earthquakes on the Hollywood fault.

REGIONAL GEOLOGY

The Hollywood fault is part of a system of east-trending reverse, oblique-slip, and left-lateral strike-slip faults that extends for >200 km along the southern edge of the Transverse Ranges, an east-west belt of ranges that developed in response to north-south compression that began ca. 2.5 to 5 Ma (Fig. 1; e.g., Barbat, 1958; Davis et al., 1989; Wright, 1991; Shaw and Suppe, 1996; Schneider et al., 1996; Tsutsumi, 1996). We refer to these faults collectively as the Transverse Ranges Southern Boundary fault system. Within the fault system, left-lateral and oblique-reverse, left-lateral motion on a subsystem comprising the Raymond (Crook et al., 1987; Jones et al., 1990), Hollywood (Dolan et al., 1993; this study), Santa Monica (Dolan et al., 1992), Anacapa-Dume (Stierman and Ellsworth, 1976; Ellsworth, 1990), Malibu Coast (Drumm, 1992; Treiman, 1994), Santa Cruz Island (Patterson, 1978; Pinter and Sorlien, 1991; Pinter et al., 1995), and Santa Rosa Island faults (Colson et al., 1995) accommodates relative westward motion of the Transverse Ranges block. Paleomagnetic studies of upper Pliocene strata (1 to 3 Ma) reveal 20° of clockwise rotation of parts of the western Transverse Ranges block (Liddicoat, 1992), suggesting that left-lateral motion is accompanied by active clockwise rotation of the western Transverse Ranges.

The Hollywood fault extends east-northeast along the southern edge of the Santa Monica Mountains, the southernmost of the Transverse Ranges (Fig. 2). The range exhibits an asymmetric, south-vergent anticlinal structure, which has been interpreted as a fault-propagation fold above a gently north-dipping blind thrust fault (Fig. 3; Davis et al., 1989; Davis and Namson, 1994). The basic structure of the Hollywood area was revealed during extensive oil exploration, which began during the early 1900s and continued through the 1980s (see Wright, 1991, for a comprehensive review). These data show that the steeply north-dipping Hollywood fault juxtaposes Cretaceous quartz diorite and predominantly Miocene volcanic and sedimentary rocks of the Santa Monica Mountains against Quaternary and Tertiary sedimentary rocks to the south

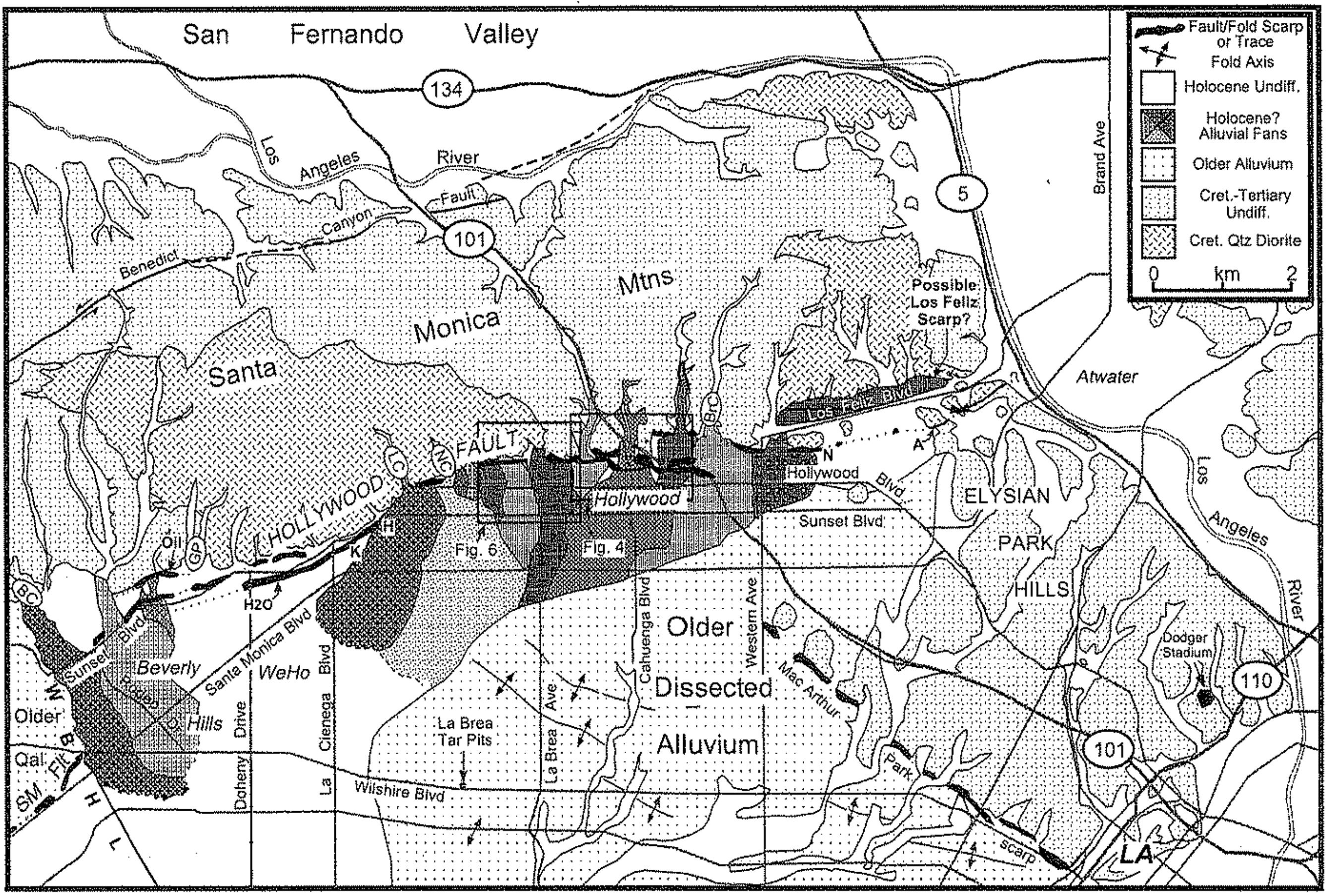

Figure 2. Map of the Hollywood fault zone, showing surficial geology and major tectonic and sedimentary landforms. Major fault and fold scarps are shown in black. Faults are dotted where inferred beneath recent alluvium. Bedrock geology is from Dibblee (1991a, 1991b). Lines with opposing double arrows are crests of youthful folds on the ground surface. The word *Hollywood* is centered on the main business district of downtown Hollywood, which extends approximately from La Brea Avenue eastward to Western Avenue and from Santa Monica Boulevard northward to the mountain front. A—bedrock fault in Elysian Park Hills (Lamar, 1970); H—eastern end of the Sunset Strip at intersection of Sunset Boulevard and Havenhurst Drive; H2O—shallow ground water along Hollywood fault (F. Denison, 1991, personal commun.); K—Kings Road–Sunset Boulevard intersection; N—intersection of Normandie and Franklin Avenues; Oil—linear oil and water seeps at Greystone Park (Crook and Proctor, 1992); SM Flt—Santa Monica fault; BC—Benedict Canyon; BrC—Brushy Canyon; GP—Greystone Park; LC—Laurel Canyon; NC—Nichols Canyon; WBHL—West Beverly Hills lineament; WeHo—West Hollywood.

(Figs. 2 and 3). The fault is marked by a narrow, steeply southward-sloping gravity gradient that is most pronounced in the downtown Hollywood area (Chapman and Chase, 1979).

The Hollywood fault defines the northern edge of the 300-m-deep Hollywood basin, which extends parallel to the fault for >10 km, from east of downtown Hollywood to northwestern Beverly Hills (Fig. 3; Hill et al., 1979; Wright, 1991; Hummon et al., 1994). The basin is generally interpreted as being asymmetric, deepening toward the Hollywood fault along its northern flank. The North Salt Lake fault, which is interpreted as a steeply north-dipping normal fault, extends westward along the southern margin of the basin, ~1.5 km south of, and parallel to, the Hollywood fault (Schneider et al., 1996; Tsutsumi, 1996). The North Salt Lake fault can be traced to within 500 m of the surface, but it has not been shown to displace late Quaternary strata (Fig. 3; Schneider et al., 1996; Tsutsumi, 1996), and it does not exhibit any surface geomorphic expression.

To the south of the Hollywood basin is an expanse of dissected, older (Pleistocene?) alluvium. Differential stream incision identified on serial topographic and stream profiles across this older alluvium reveals several very low-amplitude, northwest-trending anticlines that warp the alluvial surfaces (Fig. 2; Dolan and Sieh, 1992). The older alluvium overlies the northeast Los Angeles basin monocline, a south-dipping sequence of strata that is interpreted to have been tilted during reverse slip on the postulated Los Angeles fault, an ~60° north-dipping downward extension of the blind Las Cienegas reverse fault (Fig. 3; Schneider et al., 1996; Tsutsumi, 1996). Hummon et al. (1994) hypothesized the existence of the Wilshire arch in this same region, a gentle, east-trending anticline that they interpret to have formed during the past ~0.8 to 1 Ma above the postulated Wilshire fault, a gently north-dipping blind thrust fault (Fig. 3).

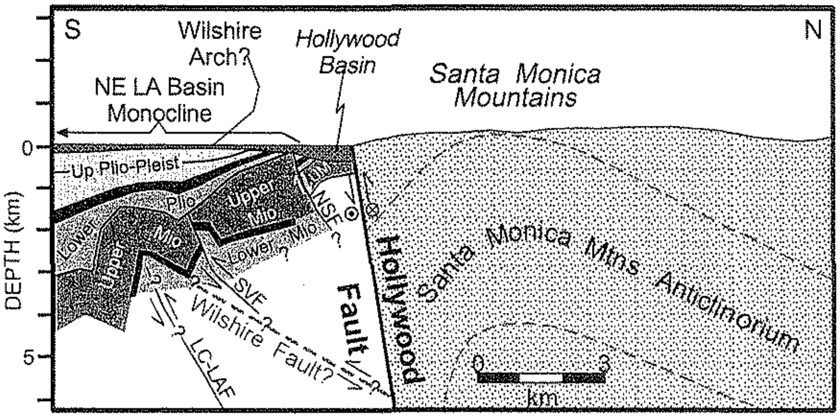

Figure 3. Generalized north-south cross section through downtown Hollywood area showing major tectonic features of the region, including the Hollywood fault, North Salt Lake fault (NSF), Hollywood basin, Santa Monica Mountains anticlinorium, northeast Los Angeles basin monocline (NE LA monocline in figure), Las Cienegas fault and its postulated downdip extension (Los Angeles fault; LC-LAF), San Vicente fault (SVF), and the postulated Wilshire fault and associated Wilshire arch. The latter is from Hummon et al. (1994). Geology south of Hollywood fault is generalized from Tsutsumi (1996) and Schneider et al. (1996). North Salt Lake fault is based on Schneider et al. (1996). Form lines (dashed gray lines) showing postulated late Cenozoic convergent structure in undifferentiated crystalline basement and Mesozoic-Tertiary sedimentary rocks of Santa Monica Mountains anticlinorium are from Davis and Namson (1994). Active and potentially active faults are shown by thick black lines. Up—Upper; LM—lower Miocene.

GEOMORPHOLOGIC EXPRESSION OF THE HOLLYWOOD FAULT

The sharply defined southern margin of the eastern Santa Monica Mountains (also known as the Hollywood Hills) represents one of the most pronounced topographic features of the Los Angeles region, and it has long been hypothesized to be the locus of a fault (e.g., Lawson, 1908; Hoots, 1931). Other than knowledge of its approximate location, however, little has been known specifically about the fault's location, geometry, and earthquake history.

Because of the limited use of geomorphology during mapping by earlier workers, the exact location of the Hollywood fault had been identified at only a few sites during the course of geotechnical investigations, notably early exploration for the Metropolitan Transit Authority subway currently under construction (e.g., Converse Consultants, Earth Sciences Associates, and Geo/Resource Consultants, 1981; Crook and Proctor, 1992). None of these studies exposed the fault directly. As part of a paleoseismological study conducted during the early 1980s, Crook et al. (1983; Crook and Proctor, 1992) excavated several sites along the mountain front. However, they did not expose any active strands of the fault. Prior to this study no paleoseismological evidence of fault activity had been documented for the Hollywood fault.

In spite of the dense urbanization of the area, most alluvial, fluvial, and fault-related landforms (e.g., fans, channels, fault scarps, and faceted mountain spurs) are surprisingly well preserved. The high degree of preservation of these geomorphic features is the result of urbanization of this part of the city primarily during the 1910s and 1920s, before the widespread use of mechanized grading equipment. Rather than leveling building plots as would be done now, the builders simply draped the city across the existing landscape with minimal cutting and filling. Our analysis of tectonic landforms along the fault trace was greatly facilitated by a series of 1:24 000 topographic maps constructed for all of Los Angeles County by the U.S. Geological Survey during the mid-1920s. We conducted our initial geomorphic analysis of the Hollywood area using these highly detailed maps, which have a 5 ft (1.5 m) contour interval on relatively gentle terrain, and a 25 ft (7.6 m) interval in mountainous areas. We later field checked all suspected tectonic landforms. The field analyses allowed us to distinguish many features related to grading during road construction. Our geomorphologic observations, in conjunction with the geotechnical data presented below, provide the basis for construction of the first detailed map of the most recently active surficial trace of the Hollywood fault zone (Fig. 2).

Linear scarps and faceted south-facing ridges confirm that recent activity on the Hollywood fault is concentrated along the southern edge of the Hollywood Hills in Hollywood and Beverly Hills. The continuity of the scarps is interrupted by numerous recently active alluvial fans along the mountain front. The absence of any significant fan incision or segmentation implies recent uplift of the Hollywood Hills at the mountain front. Along much of the fault, particularly west of downtown Hollywood, the numerous small fans coalesce downslope into a nearly uninterrupted alluvial apron, which merges southward with two gently sloping alluvial plains in southern Beverly Hills–West Hollywood and south-central Hollywood (Fig. 2).

Downtown Hollywood

In downtown Hollywood the fault exhibits several parallel, locally overlapping south-facing scarps that indicate a wide, complex zone of surficial faulting (Fig. 4). Data from previous geotechnical and ground-water studies, in combination with our geomorphologic results, confirm that the fault comprises at least three major splays through much of downtown Hollywood (Converse Consultants, Earth Sciences Associates, and Geo/Resource Consultants, 1981; Crook and Proctor, 1992; F. Denison, 1991, personal commun.). The most prominent scarp in the downtown area, which we refer to as the Franklin Avenue strand, extends for ~2 km along and just south of Franklin Avenue, from ~250 m east of La Brea Avenue to just east of Gower Street (Figs. 2 and 4). Two 1991 foundation boreholes excavated just south of Franklin Avenue on Las Palmas Street confirm that a fault exists beneath the prominent scarp (G′ in Fig. 4; R. Slade, 1992, personal commun. in Crook and Proctor, 1992). These boreholes reveal a pronounced ground-water barrier that correlates with the prominent south-facing scarp (G in Fig. 4). Ground water on the north side of the fault was encountered at 4.6 m, whereas south of the fault it occurred at 13.7 m. The dotted and dashed lines through G in Figure 4 show the probable trace of this fault strand. Farther east, the Franklin Avenue strand is defined by pronounced scarps just east and west of Cahuenga Boulevard and by a fault mapped in Miocene bedrock near Vine Street (Fig. 4; Dibblee, 1991a).

At least two other fault strands occur in Hollywood, one to the south (Yucca Street strand) and one to the north (northern strand) of the Franklin Avenue strand (Fig. 4). West of the Cahuenga alluvial fan, the Yucca Street strand exhibits a 5–6-m-high scarp. East of the fan the Yucca Street scarp merges with the Franklin Avenue scarp. The lack of topographic scarps across the 300 m width of the fan suggests that surficial displacements on the fault have been obscured during at least the past few thousand

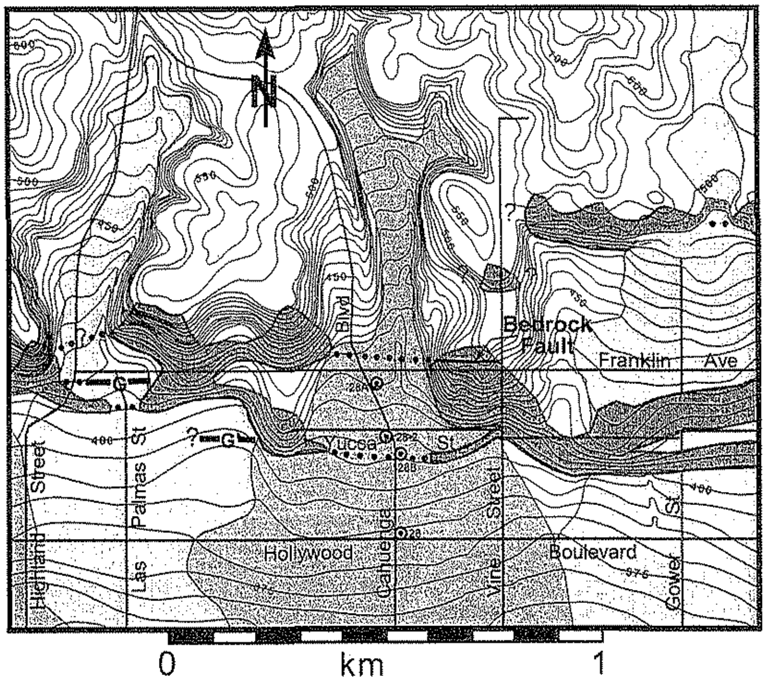

Figure 4. Detailed map of the Hollywood fault zone and related fault scarps, ground-water barriers, and alluvial fans in downtown Hollywood. Darkest shaded areas are inferred fault scarps. Lighter shading denotes recently active alluvial fans and drainages. Fault locations dotted where inferred, and dashed where based on ground-water barriers. Bull's-eyes denote boreholes (Converse Report, 1981; Crook and Proctor, 1992). Location is shown in Figure 2. Bedrock fault north of Franklin Avenue from Dibblee (1991a). Ground-water barriers along fault are denoted by G (R. Slade, cited *in* Crook and Proctor, 1992) and G′ (F. Denison, 1991, personal commun.). Topography redrafted from Burbank and Hollywood 1:24 000 6′ USGS quadrangles (1926). Contour interval is 1.5 m (5 ft) up to the 500 ft contour, above which the interval is 7.6 m (25 ft).

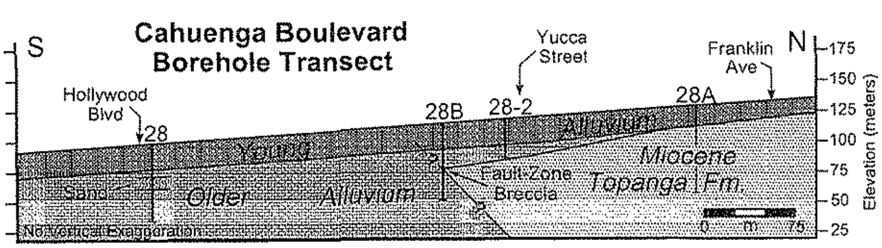

Figure 5. Cross section inferred from boreholes along Cahuenga Boulevard in downtown Hollywood (data from Converse Report, 1981; see Crook and Proctor, 1992, for alternative interpretation). Location is shown in Figure 4. Crook and Proctor (1992) show a fault displacement between 28-2 and 28A. We observe no evidence for this strand, and we do not show it in the figure. Fault dip is not constrained by data; we show an arbitrary 45°N dip. See text for discussion.

years by fluvial deposition and/or erosion. Westward of a point ~300 m west of Cahuenga Boulevard the Yucca Street strand does not exhibit a surficial scarp. However, ~375 m west of Cahuenga Boulevard the fault acts as a ground-water barrier; much shallower ground-water levels are observed in building excavations north of the fault (5 m depth) than to the south (>12 m depth) (G′ in Fig. 4; F. Denison, 1991, personal commun.).

The stratigraphy of four boreholes drilled during 1981 along Cahuenga Boulevard confirms that the Yucca Street scarps mark a fault (Converse Consultants, Earth Sciences Associates, and Geo/Resource Consultants, 1981). These data indicate a major north-side-up displacement of the Miocene Topanga Formation south of borehole 28A (Figs. 4 and 5). Direct evidence for the Yucca Street strand was encountered in borehole 28B, which penetrated 3.4 m of fault breccia, composed of phacoids of Miocene sandstone and siltstone, at 37 to 40 m depth. Crook and Proctor (1992) used these data to suggest two closely spaced, north-dipping faults in this area, but we see no compelling evidence for the existence of their more northerly strand, which would project to the surface just south of Yucca Street. Because of the wide spacing of the boreholes and the absence of trench data from this site, the dip of the fault is poorly constrained. In contrast to Crook and Proctor (1992), who showed the faults as shallowly dipping (23°) thrust faults, we show the fault as dipping moderately north, on the basis of the well-determined, steep northward dip of the fault observed in three excavations 1 km to the west (discussed in the following).

The northern strand is defined by discontinuous scarps at the topographic mountain front that extend eastward from Vine Street (Fig. 4). This scarp disappears eastward beneath the Brushy Canyon fan (Fig. 2). East of the fan the well-developed scarp extends eastward along the northern edge of Franklin Avenue for ~1 km (to north in Fig. 2; Normandie Avenue intersection). The possible terminations of the northern strand near Vine Street and the Franklin Avenue strand beneath the Brushy Canyon fan may indicate that the fault exhibits an ~350-m-wide left step between the two strands in downtown Hollywood.

Although the east-northeast–trending mountain front along Los Feliz Boulevard northeast of downtown Hollywood exhibits a linear, south-facing slope (Fig. 2), we are uncertain whether this represents a surficial fault trace. The gentle southward slope of the alluvial apron there (~5° to 8°S) does not resemble the more steeply sloping scarps that we observed elsewhere along the fault, and we speculate that this slope may represent alluvial strata that have been tilted southward above a near-surface thrust fault.

West of Downtown Hollywood

West of downtown Hollywood, between La Brea Avenue and Laurel Canyon, the fault traverses an area of recent alluvial sedimentation on small, young alluvial fans that emanate from numerous small-canyon sediment sources. The lack of pronounced scarps along this reach of the fault suggests that sedimentation has buried all evidence of recent fault activity (Figs. 2 and 6). Geotechnical data from this area provide evidence to support this interpretation. Near Nichols Canyon the fault changes strike westward from N85°E to N55°–N60°E (Fig. 2). This more northeasterly trend extends for ~1.6 km between Nichols Canyon and the intersection of Sunset Boulevard and Havenhurst Drive, the far eastern end of the famed Sunset Strip (H in Fig. 2). Along the western part of the Sunset Strip, west of La Cienega Boulevard, the fault may exhibit two main strands: a weakly defined northern strand that lies approximately at the mountain front, generally north of Sunset Boulevard, and a better defined southern strand in the alluvial apron ~50 to 150 m south of Sunset Boulevard (Fig. 2).

The scarp of the southern strand is particularly well-developed where it crosses Doheny Drive ~150 m south of Sunset Boulevard. The topographic expression of the southern strand appears to die out west of Doheny Drive, although differential stream incision of the alluvial apron ~850 m west of Doheny Drive suggests recent warping and possible faulting of the fan surface. Shallow ground water was encountered in a foundation excavation ~600 m east of Doheny Drive; the clayey granitic soil there is greenish gray, in marked contrast to the beige and brown of most alluvium in the area (H2O in Fig. 2; F. Denison, 1991, personal commun.). The presence of shallow ground water suggests that there may be a fault to the south, although the absence of excavations to the south precludes assessment of whether this represents the northern part of a true ground-water barrier caused by a fault.

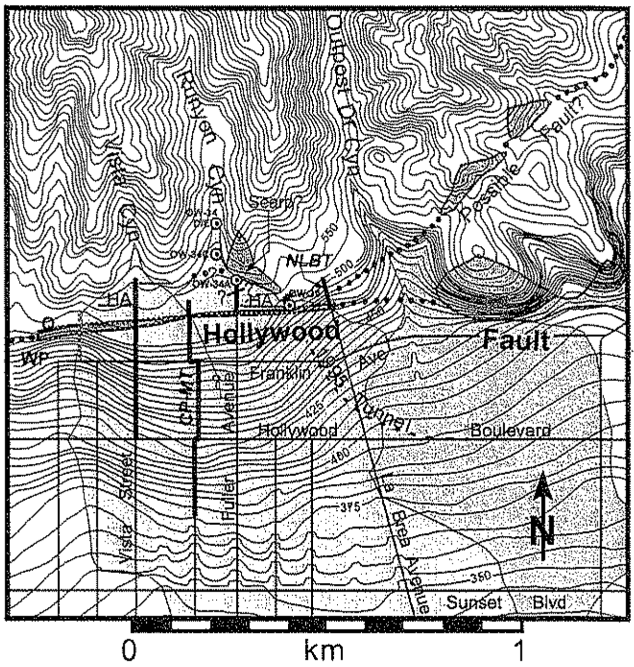

Figure 6. Geologic map of young features within our detailed study area west of downtown Hollywood. Runyon Canyon, Vista Street, and Outpost Drive fans are shown in shades of gray. Narrow, dark gray horizontal swath shows location of Hollywood fault inferred from subsurface data. Fault scarps inferred from topography are shown by medium gray shading. No scarps are discernible across the recently active parts of the fans. Thick black north-south lines show locations of trenches and borehole transects discussed in text. Secondary strand of Hollywood fault encountered in Fuller Avenue trench is shown by short black line immediately south of borehole OW-34A. Location of Metropolitan Transit Authority subway tunnel excavated as of July 1995 is shown as a dashed line. Triangular facets in northeast corner of figure show possible northeast-trending fault strand. CP-MT—Camino Palmero–Martel Avenue Transect; HA—Hillside Avenue; NLBT—North La Brea transect; WP—Wattles Park; Q shows location of near-surface (<1 m depth) quartz diorite from Crook and Proctor (1992). Topography redrafted from Burbank and Hollywood 1:24 000 6′ USGS quadrangles (~1926). Contour interval is 1.5 m (5 ft) up to the 500 ft contour, above which the interval is 7.6 m (25 ft).

The hills along the north edge of Sunset Boulevard consist of quartz diorite, whereas the steep slopes along the southern edge of the road are underlain by alluvium. A 1974 borehole ~200 m east of La Cienega Boulevard and ~50 m south of Sunset Boulevard penetrated >60 m of alluvium (G. Brown, 1993, personal commun.). This borehole and outcrops of quartz diorite ~10 m south of Sunset Boulevard confirm that the main strand of the Hollywood fault lies either directly beneath or just south of Sunset Boulevard (Fig. 2). The very steep slopes of the alluvial fan apron south of Sunset Boulevard (up to 17°) are too steep to be purely depositional, and probably reflect tectonic disruption, indicating recent north-side-up displacement along the fault. About 300 m east of La Cienega Boulevard shallow ground water was encountered just south of Sunset Boulevard (K in Fig. 2; King's Road intersection), but was not encountered in excavations 160 m to the south, suggesting that the fault forms a ground-water barrier in the steep slope along the southern edge of the boulevard (F. Denison, 1991, personal commun.). West of La Cienega Boulevard, the sharp break in slope at the southern edge of bedrock outcrops suggests the presence of a northern strand of the fault, which is probably located just north of, and subparallel to Sunset Boulvard. This strand is much less well defined geomorphically than the southern strand in this reach.

West of Doheny Drive a third, northernmost splay appears to split off from the main fault. This strand, which is defined by a linear zone of oil and gas seeps at the south end of Greystone Park (Oil in Fig. 2; Crook and Proctor, 1992) and discontinuous scarps, can be traced for only ~500 m. Excavations of this feature in Greystone Park encountered sheared Miocene and Mesozoic bedrock, but no evidence of recent faulting (Crook and Proctor, 1992).

The Hollywood fault zone can be traced as a nearly continuous geomorphic feature westward to the east edge of the Benedict Canyon drainage in northwestern Beverly Hills, near the corner of Sunset Boulevard and Rodeo Drive (Fig. 2). There the pronounced south-facing scarps terminate. However, the mountain front to the west of Benedict Canyon in northern Westwood and Brentwood is locally quite linear and may represent the trace of an older (or much less active) westward continuation of the Hollywood fault.

At Benedict Canyon the belt of most prominent surficial deformation steps southward ~1.2

km to the Santa Monica fault (Figs. 1 and 2). This left step in the fault system corresponds to a pronounced east-facing, north-northwest–trending topographic scarp that we refer to as the West Beverly Hills lineament (Dolan and Sieh, 1992). The lineament, which separates a region of highly dissected older alluvium to the west from the young Beverly Hills alluvial plain to the east, may represent an east-dipping normal fault associated with extension along the left step between the Hollywood and Santa Monica faults. Continuation of this feature to the south of the fault stepover, however, suggests the alternative possibility that, at least south of the stepover, the lineament is the surficial expression of a complex, oblique reverse–right-lateral, north-northwest–trending fault system, encompassing both the Newport-Inglewood right-lateral strike-slip fault system and a northern extension of the Compton blind thrust system (Dolan and Sieh, 1992). The West Beverly Hills lineament may be a fold scarp along the northern extension of the back limb of the Compton blind thrust anticline, which was identified farther to the south by Shaw and Suppe (1996). That is, the surface slope of the lineament scarp may be a dip slope along the east-dipping backlimb of a fold, the base of which is onlapped by young, flat-lying alluvium of the Beverly Hills plain (Dolan and Sieh, 1992). Another possibility is that the lineament is cut by a probable right-lateral strike-slip fault, which we have interpreted as the northernmost of a series of left-stepping, en echelon right-lateral fault segments that make up the northern Newport-Inglewood fault zone (Figs. 1 and 2; Dolan and Sieh, 1992).

East of Downtown Hollywood

East of downtown Hollywood, geomorphic data indicate that the Hollywood fault extends generally along the mountain front about to Western Avenue, where it diverges from the mountain front and continues eastward into the bedrock of the northern Elysian Park Hills (Fig. 2). Between downtown Hollywood and Western Avenue the fault exhibits a discontinuous, 8–25-m-high, south-facing scarp. The easternmost documented expression of the Hollywood fault occurs in the Elysian Park Hills northwest of downtown Los Angeles, where Lamar (1970) reported a bedrock fault that juxtaposes quartz diorite and upper Miocene (Mohnian) sandstone (A in Fig. 2). Although this bedrock fault does not displace late Quaternary strata, it is along trend with the young Hollywood fault scarp at Normandie Avenue, and thus may represent the bedrock expression of the active fault. Weber et al. (1980) reported scarps in the eastern flood plain of the Los Angeles River in the Atwater area and suggested that they represent the eastward continuation of the Hollywood fault. However, because these scarps are parallel to an east-trending reach of the main river channel just to the south, we suggest that it is likely that they are fluvial terrace risers, rather than fault scarps. We cannot trace the geomorphic expression of the Hollywood fault across the flood plain and into the hills northeast of the Los Angeles River. Gravity data, however, suggest that at least the bedrock expression of the fault extends eastward across the river toward the Raymond fault (Chapman and Chase, 1979).

DETAILED STUDY AREA WEST OF DOWNTOWN HOLLYWOOD

Geotechnical investigations for the subway tunnel through the Santa Monica Mountains and two storm-drain trenches excavated by Los Angeles County provide detailed data on the geometry, kinematics, and earthquake history of the Hollywood fault in a 700-m-wide area just west of downtown Hollywood (Figs. 2 and 6). The study area, bounded on the east by North La Brea Avenue and on the west by Wattles Park, encompasses two small alluvial fans emanating from canyons draining the Hollywood Hills—the Runyon Canyon fan, and a fan emanating from a canyon 215 m to the west (Fig. 6), which we refer to as Vista canyon; we refer to the associated fan as the Vista fan. Downslope, the Vista and Runyon Canyon fans merge into a larger, composite fan. Sediment input from Runyon Canyon appears to dominate this composite fan, as would be expected from the much larger catchment of Runyon Canyon (Fig. 6).

The youngest significant alluvial deposition on the Runyon Canyon and Vista fans appears to be recent, and no surficial scarps of the Hollywood fault are discernible crossing these deposits. The Hollywood Hills in this area are composed of mid-Cretaceous, coarse-grained quartz diorite (Hoots, 1931; Dibblee, 1991a; Wright, 1991), and most of the strata exposed in boreholes and excavations into the fans consist of sand and gravel derived from erosion of the plutonic rocks. Quartz diorite crops out at the northern end of Fuller Avenue and was encountered within 1 m of the surface in excavations at the northern ends of La Brea Avenue and Vista Street.

Continuously Cored Boreholes

We completed 30 continuously cored boreholes along two north-south transects (Fig. 6). The western transect was 525 m long and consisted of 25 boreholes that extended southward from the mountain front along Camino Palmero and Martel Avenue. The eastern transect consisted of 5 closely spaced boreholes along La Brea Avenue 375 m east of the Camino Palmero transect. The boreholes along the two transects ranged from 14 to 73 m in depth and all but one was continuously cored to produce 9 cm diameter cores. The cores were hand scraped to remove the drilling rind of disturbed material.

Most of the cores were recovered using a hollow-stem auger; the deeper parts of several deep holes (B-10, B-13, B-14, SM-1, SM-1A, and SM-1B) were drilled using a rotary core-mud system. The upper ~1.5 m (5 ft) of the holes were not cored due to the friable nature of the material, but the loose sand and minor gravel from these intervals was recovered during drilling. Core recovery was generally very good in all holes, and recovery in most intervals exceeded 90%. However, isolated intervals of nonrecovery as thick as 50 cm were common throughout many cores. A few rare intervals of nonrecovery were as much as 1.5 m thick. Hole B-15 was a 70-cm-diameter bucket-auger hole, which we examined directly by being lowered by winch into the hole.

Camino Palmero–Martel Avenue Transect. Boreholes along the Camino Palmero–Martel Avenue transect were drilled just west of the Runyon Canyon fan axis during the summer of 1992 (Fig. 6). The northernmost boreholes penetrated quartz diorite (Fig. 7). The upper surface of the quartz diorite, which dips southward 20°, more steeply than the 6° dip of the alluvial fan surface, is onlapped by young alluvial deposits.

The oldest alluvial deposits, herein referred to as unit C, consist of generally massive, beige to brown alluvial sand and minor gravel and clayey silt interlayered with several dark brown buried soils. In order to correlate these buried soils from core to core, we laid out all of the cores simultaneously in a parking lot. We correlated soils in adjacent holes on the basis of color, texture, the presence of buried A and argillic (Bt) horizons, and the thickness of these horizons relative to intervening intervals that did not exhibit any soil development. We were careful to keep track of the locations of unrecovered intervals and did not let these intervals influence our correlations. The correlations reveal that all of the buried soils dip gently southward, parallel to the recent fan surface (Fig. 7).

In order to determine an approximate accumulation rate on the Runyon Canyon fan, we conducted detailed analyses of the six soils exposed in core B-31. These analyses, which included particle-size analysis and estimates of the mean horizon index (MHI) and soil development index (SDI) for each soil, are described in the Appendix. Our results show that the surface soil (soil 1) and the shallowest buried soil (soil 2) exhibit relatively weak soil development, whereas the lower four soils (soils 3 through 6) exhibit mod-

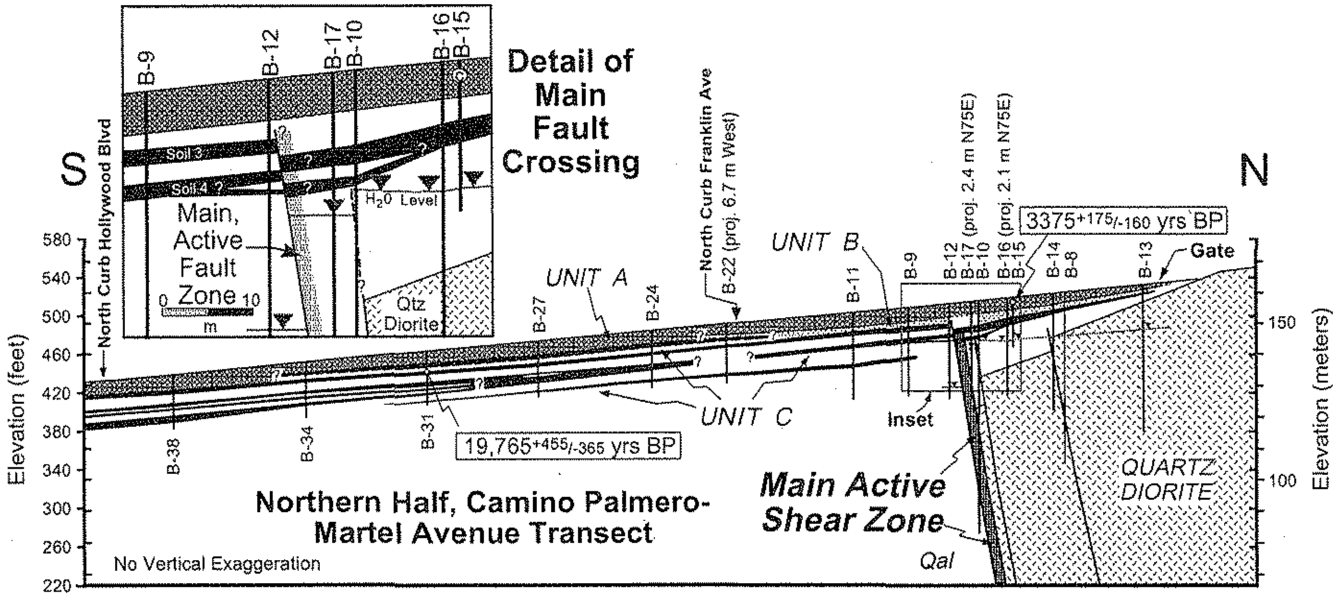

Figure 7. Cross section of the northern half of Camino Palmero–Martel Avenue borehole transect. Thick vertical lines denote continuously cored boreholes; thinner lines show sections of B-8 that were not cored. Subhorizontal black lines denote A and Bt horizons of buried soil horizons of unit C. White zones between these buried soils denote C horizons of buried soils and unaltered sedimentary strata that do not exhibit any soil development. Small triangles and gray lines denote ground-water level in boreholes during 1992. Open circles show locations of two accelerator mass spectrometry–dated detrital charcoal samples discussed in text. Locations of boreholes B-17 and B-16 are projected due east to the line of the cross section. Because of uncertainty of the fault strike, only water-level data from these two boreholes are shown in the figure; stratigraphic data from these holes are not shown in the figure. Modified from detailed borehole logs in Earth Technology Report (1993).

erate soil development. Collectively, the surface soil and the five buried soils are estimated to record ~150 000 (based on MHI) to 170 000 (based on SDI) years of soil development, providing a minimum age for the sediments at the base of B-31 at 16.6 m. These data yield an overall minimum late Pleistocene–Holocene average accumulation rate of ~0.1 mm/yr at B-31. This is a minimum estimate because: (1) there may have been minor erosion of several of the buried soils (Appendix); and (2) we assume that the duration of sediment accumulation between periods of nonsedimentation and soil development is very short, relative to the duration of periods of soil development. We consider this a reasonable assumption in this proximal alluvial fan setting, where most sediment was probably deposited very rapidly.

Accelerator mass spectrometer (AMS) radiocarbon analysis of a charcoal fragment recovered in B-31 at 6.55 m depth from the A horizon of buried soil 3 yielded an age of 19 765 $^{+455}/_{-365}$ yr B.P. (Table 1; Fig. 7; all radiocarbon samples were prepared by Beta Analytic, Inc. and were analyzed at the Lawrence Livermore Laboratory reactor). Because the charcoal fragment was recovered from the A horizon of the buried soil, we consider it likely that it was incorporated into the soil profile during development of soil 3. The charcoal may have had a preburial age. Thus, the ca. 20 000 yr date represents a maximum burial age for buried soil 3, and the combined age of the two overlying soils (1 and 2) must be ≤ca. 20 000 yr. The combined preferred MHI estimates for soils 1 and 2 total ca. 18 000 yr (Appendix), in very close agreement with the charcoal age. Because the combined preferred SDI ages overestimate the duration of soil 1 and 2 development at ca. 30 000 yr (Appendix), we have more confidence in the MHI method for estimating soil ages in this area. On the basis of the similar age estimates for soils 1 and 2, we estimate that the top of unit C is ca. 6000 to 10 000 yr old at B-31 (Appendix). Buried soil 2 is missing north of B-22 and may have been eroded (Fig. 7).

Unit C is overlain by two distinct alluvial units (Fig. 7). The lower, unit B, consists of moderately indurated, brown, massive, slightly clayey silty sand. Unit B is traceable from the north end of the transect southward for ~145 m. The deposit thickens downslope from 1.5 m in B-13 to more than 4.5 m in borehole B-10. The unit A-unit B contact could not be discerned in B-17. Between B-10 and B-12 unit B thins abruptly to ~2 m, in a lateral distance of only 10 m. Downslope from B-12 unit B thins gradually and is not present south of B-22 (Fig. 7).

In the area of B-12, B-10, B-17, B-15, and B-16, the uppermost alluvial deposit, unit A, consists of yellow-brown silty sand and minor gravel; it is distinguished from unit B by its more friable consistency and absence of clay. A charcoal fragment from the middle of unit A in borehole B-15 (2.1 m depth) yielded an AMS date of 3375 $^{+175}/_{-160}$ yr B.P. (Fig. 7; Table 1). The absence of soil development within unit A in the area of B-12, B-10, B-17, B-15, and B-16 is in marked contrast to the surface soil (soil 1) developed in the unit downfan at B-31 (Appendix). This suggests that the unit A surface soil 1 was eroded during relatively recently deposition of the friable, late Holocene alluvium encountered north of B-12. Furthermore, the absence of any soil development within unit A in the proximal part of the fan suggests relatively continuous deposition, without any long hiatuses characterized by soil development. Thus, the base of unit A at 4.9 m depth is probably no more than a few thousand years older than the detrital charcoal sample; deposition of the intervening 2.8 m of sediment requiring more than several thousand years would likely have produced detectable soil development. Compounding the uncertainty of the estimated age of the base of unit A is the possibility

TABLE 1. RADIOCARBON SAMPLES AND AGES

Sample number	Lab number	Lawrence Livermore National Lab # (2σ)	Calendric age (2σ)	^{14}C age (B.P. ± 1σ)	Age B.P. (A.D. 1950)
HF C-2	Beta-57674	CAMS-4148	1,230 ± 70 yr B.P.	A.D. 786 (A.D. 662–979)	1,165 + 125/–195 B.P.
HF C-3	Beta-57675	CAMS-4149	1,230 ± 70 yr B.P.	A.D. 786 (A.D. 662–979)	1,165 + 125/–195 B.P.
HF C-4	Beta-57676	CAMS-4150	300 ± 70 yr B.P.	A.D. 1641 (A.D. 1446–1954)	309 + 195/–315 B.P.
B-15 HF 7′	Beta-57677	CAMS-4151	3,170 ± 70 yr B.P.	1,424 B.C. (1264–1599 B.C.)	3,375 + 175/–160 B.P.
B-31 HF 21′	Beta-57681	CAMS-4152	16,760 ± 90 yr B.P.	17,814 B.C. (17448–18267 B.C.)	19,765 + 455/–365 B.P.

Note: Calendric ages calculated using CALIB 3.0 (Stuiver and Reimer, 1993).

that the charcoal sample had a significant age at burial. On the basis of the limited available evidence, however, our best estimate of the base of unit A is ca. 4000 to 8000 yr B.P. This age is supported by our analysis of the weak surface soil developed through the top of unit A in hole B-31, which suggests that soil 1 required $\sim6.5^{+14.8}/_{-4.5}$ k.y. to develop there (Appendix).

Evidence for Faulting. The cores contain abundant evidence of faulting, within both the quartz diorite and the alluvium. The southern, subsurface limit of the quartz diorite is a steeply north-dipping fault contact. One fundamental observation of this transect is that, in contrast to the wide zone of active faulting in downtown Hollywood, all evidence of recently active faulting is located in a narrow zone near the mountain front; no evidence of recent faulting or tectonic warping was observed in the southern 85% of the transect.

The buried soils of unit C are traceable continuously from the south end of the transect northward for >450 m, where their continuity is interrupted between B-12 and B-10, ~105 m south of the topographic mountain front. Between these boreholes the upper surface of the unit C buried soil (soil 3 at B-31; Appendix) appears to be displaced down to the north (Fig. 7).

The concentration of boreholes near this zone of displacement allowed us to construct a structure contour map on the top of buried soil 3 (Fig. 8). Because the boreholes were confined to a strike-parallel zone only 10 m wide, the contours of the structure contour map are not fully constrained. In contouring the data we assumed relatively uniform spacing of contours and no abrupt changes in slope, except at the zone of north-side-down displacement. We also assumed that the contours intersect the zone of displacement at the same angle on both sides. Total north-side-down separation of the top of the buried soil 3 is ~1 m between B-12 and B-10. We interpret this separation as the result of fault rupture, rather than fluvial incision of the Runyon Canyon fan, because buried soils 3 and 4 are vertically separated down-to-the-north the same amount between B-12 and B-10 (Fig. 7). Thus, the buried, north-facing scarp cannot be ascribed to incision of only the shallowest unit C buried soil (soil 3). This fault strand coincides with a ground-water barrier, which separates a shallow (17 m deep) water table north of the fault from a deeper (27.2 m) water table to the south (Fig. 7).

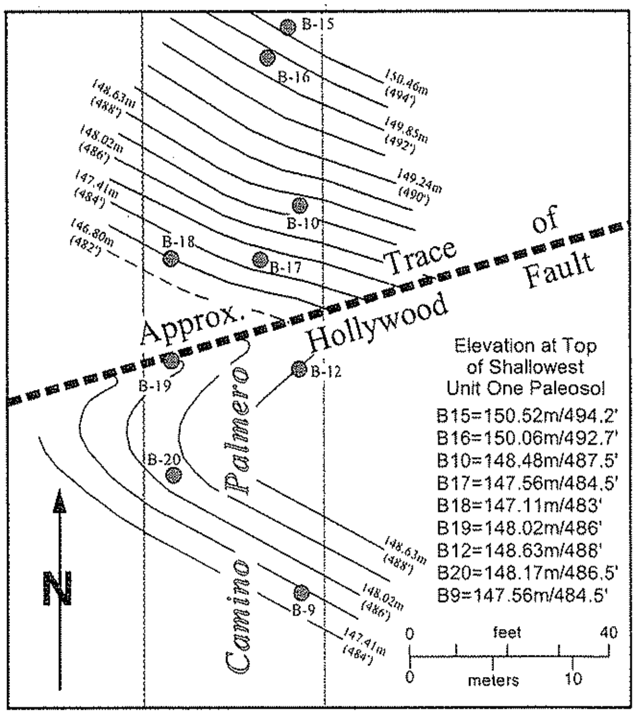

Figure 8. Structure-contour map of the top of the uppermost buried soil of unit C (soil 3) in the area of the most recently active fault strand at Camino Palmero. Contours are in feet (1 ft = 0.3 m). Numbered dots indicate the locations of boreholes. Vertical separation across fault is ~5 ft (1.5 m) and is mountain-side down.

Farther below the ground surface, the subsurface data indicate the presence of at least four distinct fault strands within a zone ~30 m wide (Fig. 7). However, only the single strand just described exhibits any evidence for post–late Pleistocene vertical displacement. The zone of near-surface displacement projects downward into a well-defined, very steeply north-dipping fault zone observed in B-10. The upper part of B-10 penetrated alluvial units A, B, and C in normal stratigraphic succession, as well as the underlying quartz diorite. At 40.8 m depth, however, the borehole again reentered alluvium. After penetrating 12.1 m of alluvium the borehole again encountered quartz diorite at 53.9 m. Below 60 m alluvium was again encountered to a total depth of 73 m. Both of the quartz diorite over alluvium contacts in B-10 are distinct faults (Fig. 7). The entire core, including both quartz diorite intervals, is intensely sheared from 28 to 59 m depth. Shear planes range in dip from 41° to 124° (opposing very steep dips occur in continuous core segments at many intervals). The predominant dip of the shear fabric is 70° to 85°, and 75% of the 200 dip measurements are ≥70°; the average dip is ~77° (Fig. 9). Because the core, which was not oriented with respect to map directions, is

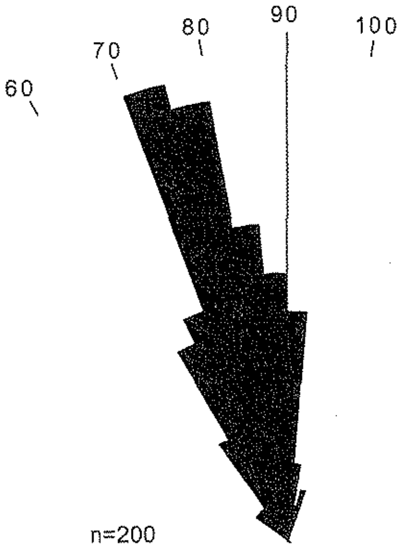

Figure 9. Rose diagram showing dips of shears in borehole B-10. Because the core was not oriented with respect to map directions, all measurements <90° have a bimodal distribution. However, we only show one of the two possible dips in order to emphasize opposing dips (>90°) observed in continuous core sections. The predominant dip of the shear fabric is ~70° to 85°.

typically broken up into 5–30-cm-long drill biscuits, many of the steep dips may actually be >90°; we plotted >90° dips only where they were observed in continuous core fragments with oppositely dipping shears. Thus, the true dip of the shear zone is probably steeper than the ~77° average dip shown in Figure 9.

The <1- to 14-mm-thick shear planes are defined both by white carbonate veins and clay gouge. One particularly well-exposed example in silty alluvium at 41 m depth contains a vertical shear highlighted by white carbonate veining that extends down the center of the 9 cm diameter core over ~90 cm. The steeply dipping sheared contacts of the quartz diorite intervals encountered in B-10 suggest that they are fault-bounded lenses. We therefore interpret the southern edge of the quartz diorite at Camino Palmero as a several-meter-wide fault zone that probably dips at the predominant 70° to 85° dip of the shear fabric observed in B-10. We show an average dip of 77°N in Figure 7. The buried soils south of the fault are parallel to the present fan surface, indicating that there is no dip-slip fault to the south of the steeply dipping strand between B-12 and B-10. We therefore interpret the steeply dipping fault as the main active strand of the Hollywood fault at Camino Palmero.

Fault gouge and the geometry of the quartz diorite reveal at least two other fault strands north of the main active strand between B-12 and B-10 (Fig. 7). Neither of these faults exhibits any vertical separation of either the youngest buried soils or the overlying Holocene alluvial units. If the upper surface of the quartz diorite unit is a planar feature with a nearly uniform dip, as it is in the Fuller Avenue trench to the east (discussed in the following), then it has apparently been displaced up-to-the-north between B-10 and B-16. This postulated fault strand projects upward to a ground-water barrier between B-10 and B-17, indicating the presence of a latest Pleistocene fault extending to within 13 m of the ground surface, the depth to ground water on the north side of the fault in B-10. This strand is ~10 m north of the main strand observed between B-10 and B-12, suggesting a recently active fault zone of at least this width. Because the northern strand exhibits no discernible vertical displacement, it either (1) has very minor displacement, sufficient to generate a fault plane capable of acting as a ground-water barrier but not to create discernible stratigraphic separation, or (2) has predominantly strike-slip motion.

The northernmost fault strand is revealed by 3 m of fault gouge in the quartz diorite penetrated by boreholes B-8 and B-14, as well as by an apparent abrupt shallowing of the upper surface of the quartz diorite between B-14 and B-16. The absence of a ground-water barrier above this strand suggests that it may not have ruptured up into the shallower parts of the overlying alluvium.

Age of Most Recent Faulting. The precise age of the most recent faulting event cannot be determined from available data. However, stratigraphic relationships observed in Camino Palmero boreholes allow us to bracket the age of most recent faulting. The ca. 20 000 yr age of the charcoal sample recovered from the faulted, buried soil 3 is a maximum age for the most recent surface displacement. At Camino Palmero the unit A-unit B contact, for which we estimate a mid-Holocene age of ca. 4000 to 8000 yr, is not discernible in borehole B-17, so it remains unknown whether this interface is displaced vertically. However, the contact projects as a continuous planar surface across the zone of displacement, suggesting that it has not been displaced vertically (Fig. 7). The most recent fault movement may therefore predate deposition of the base of unit A. Thus, the most recent Hollywood fault earthquake probably occurred between ca. 20 000 and ca. 4000 yr ago. However, the minimum date is somewhat problematic, because if recent motion along the Hollywood fault is predominantly left-lateral strike slip, then the lack of appreciable vertical separation of the unit A-unit B contact may have no relevance to dating the most recent fault movement. We consider this possibility unlikely, however, in light of the clear vertical displacements associated with earlier earthquakes on this strand.

North La Brea Avenue Transect. The continuously cored boreholes along this north-south transect were drilled at the north end of La Brea Avenue, along the fosse at the east edge of the Runyon Canyon fan, during November–December, 1992 (Fig. 6). No surficial fault scarps exist in the area. As at Camino Palmero, the La Brea boreholes penetrated alluvium that overlies Mesozoic quartz diorite, which in turn overlies more Pleistocene(?) alluvium (Fig. 10). These relationships indicate a component of reverse displacement on the north-dipping fault. Although the gross features of the fault zone are similar in the two transects, the North La Brea transect reveals a more complex near-surface fault geometry than at Camino Palmero.

All five La Brea boreholes encountered quartz diorite at various depths. In contrast to the Camino Palmero transect, the upper surface of the quartz diorite in the La Brea transect is not a planar feature (Fig. 10). The alluvium encountered above the quartz diorite consists predominantly of dark brown to reddish-brown, clayey sand, and rare gravel layers. The relatively high clay content and dark color of the alluvium contrasts markedly with the friable, yellowish-brown sediments encountered in the shallow subsurface at Camino Palmero. The characteristics of the alluvium are similar to the dark brown, shallowest unit C buried soil encountered at 9 m depth in B-10 at Camino Palmero (soil 3). The alluvium encountered below the quartz diorite consists of reddish-brown to brown clayey sand, sandy clay, and clay, and subordinate intervals of friable silty sand, sand, and gravel.

Evidence for Faulting. We interpret the contact between bedrock and the underlying alluvium to be the main fault trace. The fault plane steepens with depth from ~25° in the upper 10 m to ~60° at 43 m depth (Fig. 10). A fault-bounded lens of intensely sheared Puente Formation shale of middle to late Miocene age was encountered in boreholes SM-1 and SM-1B (Fig. 10; Earth Technology Report, 1993). The upper surface of this lens dips ~50° north. An internal shear fabric dips between 40° and 70°; intermediate dips are most common. Because this fault was observed only in the hanging wall of the main fault, we suspect that it may represent an older, inactive strand similar to those observed in the Fuller Avenue and Vista Street trenches (discussed below).

North of, and above, the main fault ground water was encountered at depths of 3 to 13 m, whereas it was not encountered within the depths drilled (61 m) below the lower fault plane. A

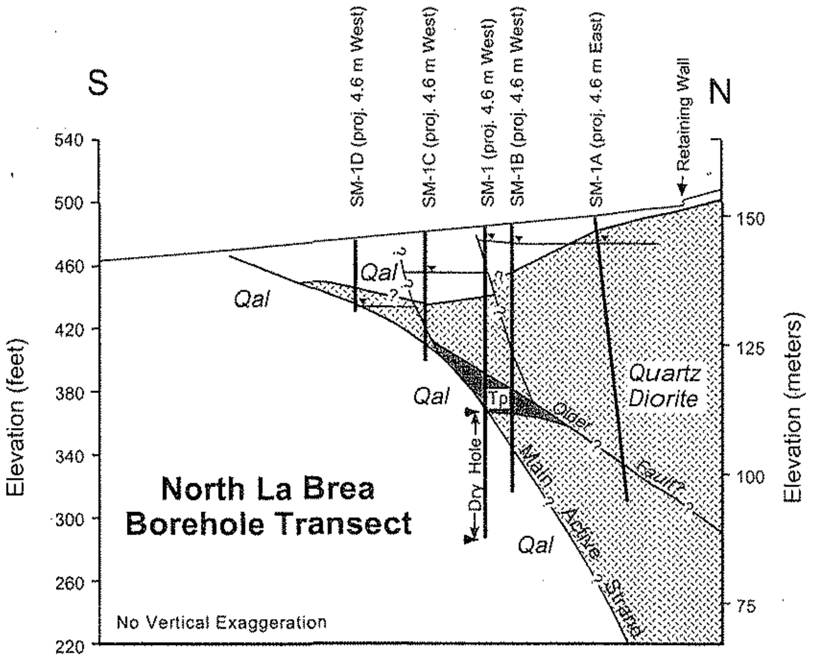

Figure 10. Cross section of North La Brea Avenue borehole transect shows that the Hollywood fault dips moderately steeply at depth but flattens near the surface. The main fault strand acts as a major ground-water barrier, separating a shallow water table to the north from a much deeper water table to the south. Thick vertical lines denote boreholes. Small triangles and gray lines denote ground-water levels in boreholes. Although ground water was encountered at shallow depth in SM-1, the hole was dry below the main fault plane. Modified from detailed borehole logs in Earth Technology Report (1993).

piezometer installed at the base of SM-1, screened entirely below the main fault in order to measure in situ conditions in the footwall of the fault, was found to be dry several days after installation. These observations indicate that the main fault forms an effective ground-water barrier. A thin wet zone encountered in SM-1D in the alluvium directly beneath the main fault may reflect ground-water flow along the fault or ground water cascading over the fault.

Two additional ground-water barriers in the hanging-wall block of the main fault suggest the presence of at least two additional fault strands. Ground water in SM-1D was encountered at an elevation of 132.5 m, 6.7 m ft deeper than in SM-1C (139.2 m elevation), indicating a barrier between the two boreholes. A second ground-water barrier is between SM-1C and SM-1; ground water in SM-1 was encountered at 144.4 m elevation, 5.2 m shallower than in SM-1C. Development of the topographic depression in the buried surface of the quartz diorite is probably related to displacement along these two fault strands. The ground-water data suggest that at shallow depths the northern fault lies between SM-1C and SM-1, whereas the southern strand lies between SM-1C and SM-1D. The anomalously steep, 50° dip of the upper surface of the quartz diorite projected between SM-1 and SM-1B suggests that it may record north-side-up fault displacement. A zone of abundant clay-lined shears in the quartz diorite at 25 m depth in SM-1B may be the downward continuation of the northern fault splay, suggesting a steep, northerly dip. Furthermore, a southward dip of the northern splay cannot explain downdropping of the quartz diorite between SM-1B and SM-1. The dip of the southern strand is not well constrained, although it is probably relatively steep. In Figure 10 we show both faults as steeply north-dipping, oblique-reverse faults. The probable northward dip of the northern strand makes alternative interpretations, such as a transtensional flower structure, or a hanging-wall graben related to thrust motion on the main fault, unlikely, because both require a southward-dipping northern strand.

1995 MetroRail Boreholes and Subway Tunnel

As part of a tunnel alignment investigation, MetroRail drilled six boreholes at four additional sites during winter–spring 1995. The following description is taken from R. Radwanski (1995, written commun.). Two closely spaced boreholes located along the north edge of Hillside Avenue between Fuller Avenue and La Brea Avenue, OW-34 and E-206 (located 3 m east of OW-34) penetrated only alluvium (predominantly silty sand and clayey sand) to a total depth of 58 m (OW-34; E-206 td 50 m; Fig. 6). The upper surface of the quartz diorite was not encountered, indicating that the boreholes were drilled into the footwall of the fault, which must therefore lie north of the boreholes. This inference is supported by the absence of ground water in the boreholes; no ground water was encountered during drilling, although one week after drilling ground water was measured at 52 m depth in OW-34.

Four other boreholes drilled at three sites extending north from the north end of Fuller Avenue penetrated only quartz diorite. The three boreholes at the southern two sites, OW-34 A (located several meters south of the gate at the north end of Fuller Avenue), OW-34B (located 3 m south of OW-34A), and OW-34C (located 90 m north of OW-34A in Runyon Canyon Park), encountered common clay gouge zones intercalated with intensely fractured and disaggregated quartz diorite. In contrast, the northernmost boreholes, OW-34D and E, which were drilled ~85 m north of OW-34C, encountered fractured, but more coherent bedrock with no clay gouge. These observations raise the possibility of a very broad Hollywood fault zone extending northward from just south of Hillside Avenue into the quartz diorite along the mountain front. Much of this faulting, however, could record late Neogene motion not directly related to the current tectonic regime (see Wright, 1991; Tsutsumi, 1996).

During May 1995 MetroRail excavated a subway tunnel northward to the Hollywood fault zone approximately halfway between La Brea and Fuller Avenues (Fig. 6). The main fault zone, which was marked by a 70-cm-wide shear zone juxtaposing alluvium with quartz diorite to the north, was encountered at 52 m depth ~50 m N24°W of the centerline of Hillside Avenue. The fault dips 60° to 70° N and was marked by discontinuous clay gouge.

Data from Storm Drain Trenches

During fall 1992 and spring 1993 we examined two storm-drain trenches excavated by the Los Angeles County Department of Public Works. Although the county was extremely accommodating of our research interests, our time in the trenches, particularly the Fuller Avenue trench, was very limited because of the rapid pace of construction of the storm-drain pipeline. The Fuller Avenue trench was excavated up the Runyon Canyon fan, just east of the fan axis, whereas the Vista Street trench was excavated up the axis of the Vista fan (Fig. 6). The trenches were 3 to 4.5 m deep and 2 m wide.

Fuller Avenue Trench. If the main strand of the Hollywood fault extends as a continuous feature between the subway tunnel and Camino Palmero, it probably crosses Fuller Avenue just south of the Hillside Boulevard intersection (Fig. 6). We were not able to view any part of the Fuller Avenue trench south of Hillside Boulevard. We did, however, map the 60 m of trench north of Hillside Avenue (Fig. 11). The trench exposed three of the four lithologic units encountered at Camino Palmero, the basal quartz diorite and alluvial units A and B (Fig. 11). As at Camino Palmero, the upper surface of the quartz diorite dips shallowly southward at ~15°, somewhat more steeply than the 6° dip of the fan surface.

The quartz diorite is overlain by massive, clayey sand of unit B. AMS dating of a charcoal fragment from within this deposit yielded an age of $309^{+195}/_{-315}$ yr B.P. (Fig. 11; Table 1). This age may not represent the true age of the deposit, because it underlies beds from which older charcoal was recovered (discussed in the following).

Unit B is overlain, along a very sharp, irregular, highly erosionally modified contact, by friable, well-bedded sand and pebble gravel of unit A. Two charcoal fragments from a 3–10-cm-thick clayey horizon near the base of a broad, 8-m-wide channel incised into unit B yielded identical AMS ages of $1165\ ^{+125}/_{-195}$ yr B.P. (Table 1). These AMS ages are in conflict with the younger AMS age of the charcoal sample recovered from underlying unit B. On the basis of the limited number of samples, we cannot determine whether the 1165 yr old samples were reworked from an older deposit, or whether the sample with the younger age was introduced into unit B after deposition. The unit A channel trends S50°E and projects upslope toward the mouth of Runyon Canyon. The AMS ages suggest that at Fuller Avenue, along the east shoulder of the fan, the base of unit A may be considerably younger than at Camino Palmero, if the deposits at the two sites are truly correlative (Fig. 6).

Evidence of Recent Faulting. The Fuller Avenue trench crossed what we interpret as a secondary zone of the Hollywood fault ~35 m south of the mountain front (short black line immediately south of OW-34A in Fig. 6). The secondary fault zone, which apparently is at least 40 m north of the main fault, juxtaposes the basal quartz diorite against unit B alluvium (Fig. 11). The main fault splay strikes N59°E, and dips 74°NW at the base of the trench, although several splays of the fault zone roll over into near-horizontal dips just south of the main zone (Fig. 11). North-side-up vertical separation of the contact is ~35 cm across the main fault strand, which is characterized by a 5–15-cm-thick gouge zone composed of sheared white carbonate. Other fault strands are defined by 1–12-mm-thick beige clay seams.

The south end of the quartz diorite exposure, ~1 m south of the main fault, appears to be a vertical fault that truncates the diorite outcrop, as well as the shallowly north-dipping fault strands that splay off the main northern strand, indicating at least two periods of faulting. Although this planar surface appeared to be a fault, because of our limited time in the trench at the fault crossing (<1 hour), we could not unequivocally exclude the possibility that it was a purely erosional feature. If this feature is a fault, the minimum north-side-up vertical separation across both strands is >90 cm. The upward termination of the inferred southern fault strand could not be determined. In the east wall of the trench another fault strand, located entirely within unit B alluvium, occurs several meters south of the northern strand. On the east wall the southern strand, which appears to trend ~N85°W across the trench, may connect with the near-vertical fault strand exposed on the west wall. In the east wall it steepens from a dip of ~40°N at 2.7 m to a near-vertical dip at 3.3 m depth. This strand could not be traced above a depth of 2.7 m. The northern fault strand extends at least 1 m upward into the alluvium, but we were unable to determine its upward termination because of the massive nature of unit B. Any possible displacement of the sharply defined unit A-unit B contact was obliterated in the west wall of the trench by an earlier excavation for a lateral feeder pipe, which was unfortunately located at exactly the site of any expected displacement (Fig. 11). Compounding the problem, in the east wall of the trench a similar lateral feeder pipe was excavated directly into the northern fault zone, completely obscuring its updip termination. Thus, the evidence necessary to unequivocally determine the updip termination of the fault was destroyed during construction of the storm drain.

The geometry of the channel, however, suggests that the unit A-unit B contact has probably not been displaced vertically. At issue is whether the south-facing scarp observed in the west wall of the trench is a purely erosional feature, or whether it is a fault-modified channel edge. Along the west wall of the trench the northern channel edge corresponds exactly to the expected position of the fault, if it in fact continues upward beyond its recognized extent and displaces the unit A-unit B contact. Because the channel cuts obliquely across the fault, the south-facing channel edge on the eastern wall of the trench is exposed more than 2.5 m south of the fault zone. Although it is cut out by the lateral side pipe at the fault, the unit A-unit B contact on the eastern wall projects across the side pipe as an apparently continuous, relatively planar feature, suggesting that the contact has not been displaced vertically. We could, however, have missed minor vertical separations of the contact up to ~20 to 30 cm. The steeper, higher northern edge of the channel might at first appear to suggest that it had been steepened during faulting. However, we suggest that this is simply due to the fact that the channel has cut obliquely across the ~6° dipping fan surface. This geometry requires a higher northern channel margin, and erosion of this higher bank resulted in the steepness of the northern channel margin.

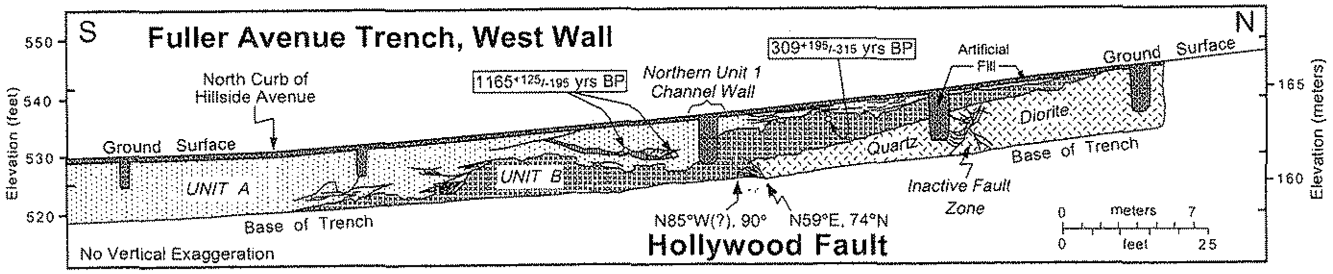

Figure 11. Map of the west wall of the Fuller Avenue trench. Irregular, thin black lines in unit 3 denote bedding. See Figure 6 for location.

Vista Street Trench. Although we logged the entire 425 m length of the Vista Street trench from Hollywood Boulevard to north of Hillside Avenue (Fig. 6), we observed no evidence of faulting. At Wattles Park, ~250 west of Vista Street, quartz diorite occurs within 25 cm of the surface just south of the mountain front (Q in Fig. 6; Crook and Proctor, 1992), indicating that the main fault lies south of that point. On the basis of this constraint and the data discussed above, the north-south Vista Street trench must have crossed the east-west trace of the fault, probably between Franklin and Hillside Avenues. Thus, the trench appears to have been too shallow to expose evidence of the most recent surface rupture. In Figure 12 we show only the 35-m-long section of the trench that includes the projected location of the Hollywood fault. Station numbers in the text below and in the figure refer to distance in feet north from the north edge of the sidewalk along the northern edge of Hollywood Boulevard (1 ft = 0.3 m). For example, the north edge of Franklin Avenue is at station 640, which is 640 ft (195 m) north of Hollywood Boulevard, and the south edge of Hillside Avenue is at station 1045, 1045 ft (318 m) north of Hollywood Boulevard.

As at Camino Palmero and Fuller Avenue to the east, the Vista Street trench exposed three alluvial units above the basal quartz diorite (Fig. 12). These alluvial units, however, cannot be correlated directly with any of the units in the eastern excavations. To avoid unintended correlations, we therefore refer to them as units 1 (youngest), 2, and 3 (oldest). Due to the absence of detrital charcoal in the trench, all age estimates are based upon soil analyses, which have much larger error estimates than features dated by radiocarbon methods (Appendix).

The quartz diorite is exposed only in the northern 45 m of the trench, north of Hillside Avenue. It exhibits a highly eroded, irregular upper surface that dips gently south at 2° to 12°, generally slightly more steeply than the 8° to 9° southward dip of the Vista fan surface. The quartz diorite extends to within 1 m of the surface north of station 1230. The upper surface of the quartz diorite plunges gently below the base of the trench at station 1115.

Unit 3 is a silty to pebbly sand that exhibits weak to moderate pedogenesis. The unit is exposed only discontinuously across the trench due to channelization and its depth below grade. Analysis of the uppermost part of the weakly developed argillic horizon of the buried soil that developed in unit A suggests $12.6^{+28.0}/_{-8.7}$ k.y. of soil development; this soil does not appear to have been eroded where we examined it (Appendix).

Unit 2 consists predominantly of silty sand, with local pebble gravel layers. The unit is characterized by a weakly developed soil that locally exhibits a Bw horizon defined by minor translocated clay (very few thin clay films in pores) below a distinct A horizon. These observations suggest between ~500 to 3000 yr of soil development (Appendix). In the section of the trench shown in Figure 12 the unit is exposed nearly continuously across the trench, interrupted only by local channels from about stations 910 to 915 and from about 930 to 950. Unit 2 is traceable to just south of Franklin Avenue (about station 580), where the upper contact becomes indistinct. The unit is cut out by a fluvial channel north of station 1080.

Unit 1 consists of friable, fine- to coarse-grained sand and minor pebble conglomerate. In the section of the trench shown in Figure 12, unit 1 is generally massive, and has local channels; north and south of this part of the trench the unit is locally well-bedded and has numerous channels. Unit 1 exhibits essentially no soil development, although a surficial A horizon could have been destroyed during grading of Vista Street (Appendix). The combined unit 1-unit 2 soil data indicate that the buried soil developed in unit 3 was buried no more than ~3000 yr ago, and could have been buried as recently as ~500 to 1000 yr ago (Appendix).

The only potential direct evidence of surficial faulting that we observed in the entire Vista Street trench was a vertical carbonate vein exposed in unit 3 at the base of the trench at station 918. The vein trends ~N70°E near the west wall of the trench and bends to a more northerly orientation within the trench floor; it is not exposed in the east trench wall. Despite the highly irregular geometry of the vein, the lack of abundant carbonate in the soil suggests that this may be a fracture fill of tectonic origin, rather than a pedogenic feature. If so, then the shallowest evidence for faulting in the Vista Street trench is in unit A, although this evidence is neither abundant nor clear cut.

At station 1170 in the Vista Street trench (not shown in Fig. 12), an inactive(?), steeply south-dipping (N75°E, 73°S) fault zone separates highly weathered, orange-brown decomposed quartz diorite to the south from firmer, orange-buff quartz diorite in pods within a clay matrix to the north. The fault does not cut the overlying friable, gravely sand of unit 1.

Age of Most Recent Surficial Faulting. The absence of faulting in the Vista trench across the presumed fault crossing (with the possible exception of the vein at station 918), suggests that the shallowest evidence of the most recent surface rupture has either been buried beneath the 3 to 4 m depth of the trench or has been obliterated by soil-forming processes in units 2 and 3. Unit 3 is exposed continuously from stations 860 to 942. Our experience observing similar, moderately well-developed, dark reddish-brown soils at Camino Palmero and Fuller Avenue suggests that faults and fractures should be readily apparent, because most of these features exhibit either a well-defined beige, 1–5-mm-thick oxidized halo, clay gouge, or carbonate shear veins. No such features were observed in unit 3, with the possible exception of the vein at station 918. Even if this vein is a fault, it projects upward into unfaulted unit 2 deposits. Although unit 2 is not exposed over a 7-m-long stretch between stations 930 and 950, we suggest that the unit has not been faulted. The only possible location where faulting of unit 2 might not be discernible is the

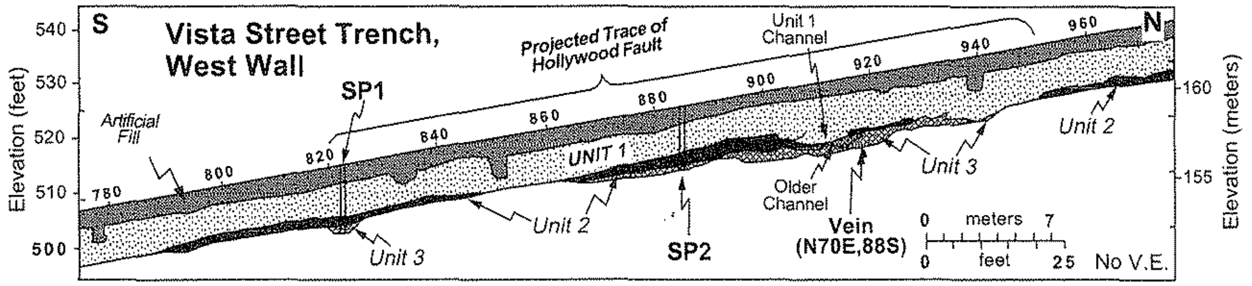

Figure 12. Map of the west wall of the portion of the Vista Street trench between Franklin and Hillside Avenues, which includes the presumed crossing of the main strand of the Hollywood fault zone. See Figure 6 for projected location of the Hollywood fault zone.

2.5-m-wide interval from stations 942 to 950, where neither units 2 or 3 are exposed. However, unit 2 projects across this unexposed interval with no apparent vertical displacement. Thus, the most recent surface rupture at Vista Street appears to have occurred before deposition of unit 2, and may even be older than deposition of unit 3. Alternatively, it is possible that 1000 to 2000 yr of soil development in soil 2 could have obliterated subtle traces of a surface rupture within unit 2. From this we infer that the weak unit 1 soil and at least most of the unit 2 buried soil have developed since the most recent surface rupture on the Hollywood fault, which therefore probably occurred at least ~500 to 3000 yr ago.

DISCUSSION: KINEMATICS OF THE HOLLYWOOD FAULT

Because of its location along the southern edge of the Santa Monica Mountains anticlinorium, and the pervasive evidence of contractional deformation in the Transverse Ranges, the Hollywood fault has generally been considered to be a north-dipping reverse fault (e.g., Barbat, 1958; Davis et al., 1989). Displacement of Cretaceous quartz diorite over Pleistocene alluvium at Camino Palmero and La Brea Avenue, and consistently south-facing scarps, confirm a long-term component of reverse motion along the fault. Recent uplift of the mountain front is also suggested by the deposition and lack of incision of the numerous small alluvial fans near the mountain front.

In addition to the north-side-up reverse component of motion, however, several lines of evidence suggest that the Hollywood fault also exhibits a significant, possibly predominant, component of left-lateral strike-slip motion.

(1) The buried, mountain-side-down separation between B-12 and B-10 at Camino Palmero (Fig. 7) is incompatible with pure reverse displacement on the fault and indicates either horizontal offset of irregular topography, or pure normal or oblique-normal displacement along the north-dipping fault. At Camino Palmero the fault displaces a shallowly south-southwest–dipping alluvial surface (Fig. 8). Because the apparent right-lateral offset of the contours is clearly at odds with the abundant data showing left-lateral strike-slip motion along the Transverse Ranges Southern Boundary fault system, including both the Raymond fault to the east (Jones et al., 1990) and the Santa Monica fault to the west (Dolan et al., 1992), recent fault displacement at Camino Palmero is almost certainly not right-lateral strike slip. The geometry of the faulted surface might at first suggest pure normal faulting, possibly along a secondary normal fault formed in the hanging wall of a north-dipping, near-surface thrust fault. However, the lack of tilting or warping of the buried soils south of the main active strand shows that no recently active contractional structures exist south of B-12. Coupled with evidence for a long-term, north-side-up component of reverse motion along the Hollywood fault, this observation indicates that the main strand at Camino Palmero cannot be explained by pure normal displacement, and that it is probably best explained as an oblique-normal, left-lateral strike-slip fault. The north-side-down sense of vertical separation at Camino Palmero is opposite to that observed in the North La Brea transect to the east. We speculate that this is related to a slightly more northeasterly strike of the fault at Camino Palmero, resulting in a local transtensional environment along a predominantly transpressional fault.

(2) Although the fault exhibits recent mountain-side-down separation at Camino Palmero, at all other sites (Figs. 5, 10, and 11), as well as deeper on the Camino Palmero strand, the fault exhibits recent mountain-side-up separation (Fig. 7). Such apparently contradictory senses of vertical separation are incompatible with pure reverse displacement, but are a common feature of many strike-slip faults (Yeats et al., 1997).

(3) The dip of the Hollywood fault has been directly measured at three localities. At Camino Palmero the main fault zone dips northward at ≥~75°N (Figs. 7 and 9). In the North La Brea transect the fault dips ~60°N at 50 m depth (Fig. 10). Because the fault steepens with depth in the North La Brea transect, the overall dip of the fault at >50 m depth may be steeper than 60°. In the MetroRail subway tunnel crossing the fault, dips are between 60° and 70°N at 50 m depth; the fault was only exposed at the tunnel crossing, and thus it is not known if it steepens with depth as it does in the North La Brea transect ~100 m to the east. On the basis of these data, we suggest that the overall dip of the Hollywood fault at depth is probably at least ~70° to the north. Such steep dips are generally not associated with pure reverse faults, whereas they are commonly associated with strike-slip and oblique-slip faults (Yeats et al., 1997).

In order to help quantify this assertion, we compared the dips and rakes from focal mechanisms for 26 Cordilleran earthquakes of $M_w \geq 5.3$ (Fig. 13; Appendix). These data reveal that faults dipping ≥~65° to 70° exhibit predominantly strike-slip motion. A similar comparison based on a global catalog of 170 earthquakes yielded the same basic result—faults that dip ≥70° exhibit strike-slip:dip-slip ratios >1 (Coppersmith, 1991; Wells and Coppersmith, 1991). On the basis of these observations, we suggest that the Hollywood fault probably accommodates more strike-slip than reverse motion.

(4) Inversion of earthquake focal mechanisms indicates that the maximum compressive stress in the Hollywood area is horizontal and trends N12°–N13°E (Hauksson, 1990). These data are compatible with the strike-slip component on the

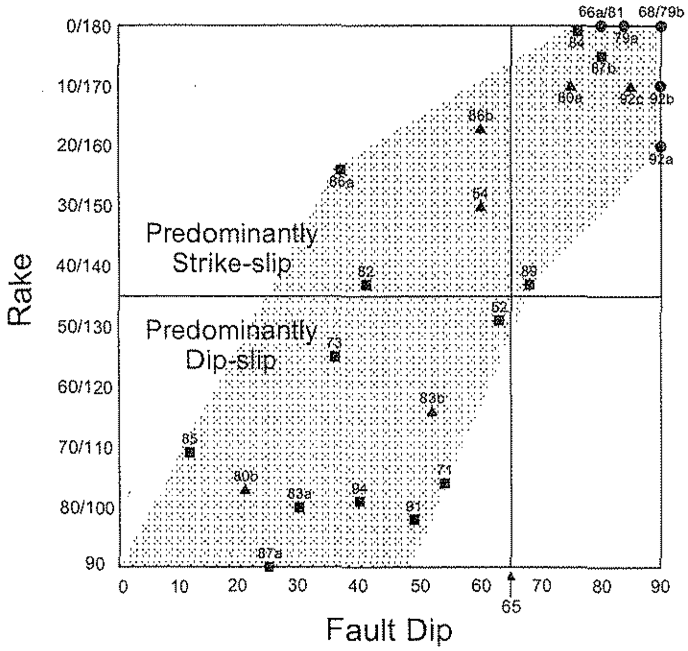

Figure 13. Plot of dip versus rake from focal mechanisms of 26 Cordilleran earthquakes $M_w \geq 5.3$. Squares show oblique-reverse–thrust events. Triangles denote oblique-normal earthquakes.

north-northeast–trending Hollywood fault being left lateral. Furthermore, the orientation of the stresses indicates that the more northeast-striking parts of the fault may accommodate a larger component of left-lateral motion than the more easterly trending sections of the fault, such as the reach through downtown Hollywood (Fig. 2). The depth of the Hollywood basin is based on data from only a few wells (Wright, 1991; Hummon et al., 1994; Tsutsumi, 1996), and it is therefore impossible to correlate the depth of this basin with changes in orientation of the Hollywood fault. However, on the basis of the evidence described above for a probable component of left-lateral slip on the Hollywood fault, we speculate that the Hollywood basin has formed at least partially in response to oblique, normal to left-lateral slip along more northeasterly trending stretches of the Hollywood fault, including the ~N60°E trending Nichols Canyon–Sunset Strip releasing bend, the ~N25°E trending Benedict Canyon releasing bend at the western end of the fault, and possibly the 350-m-wide left step between the Franklin and northern strands of the Hollywood fault just east of downtown Hollywood (Fig. 2). We further speculate that extension across the West Beverly Hills lineament at least partially explains the existence of the low-lying Beverly Hills alluvial plain east of the lineament; motion through the Benedict Canyon releasing bend has resulted in increased accommodation space to the east that is filled by alluvium derived from Benedict and Laurel Canyons (Fig. 2).

Our geomorphic analysis failed to provide any direct evidence of left-lateral strike slip along the Hollywood fault, either in the form of offset drainages or displaced fans. We attribute this to rapid aggradation of the alluvial fans, which have buried all potential evidence of strike-slip offsets (e.g., offset streams), and earthquake recurrence intervals that are long relative to the rate of geomorphic activity. For example, at Camino Palmero the displaced top of buried soil 3 at 7 m depth is the shallowest well-documented faulted feature. The apparently unfaulted unit A-unit B contact there lies at a depth of almost 5 m, suggesting that at least that much deposition has occurred since the most recent surface rupture that could have generated any discernible surficial strike-slip offsets. Similarly, evidence of the most recent surface rupture may have been buried beneath trench depth by more than 3 to 4 m of sediment at Vista Street. Furthermore, our data reveal late Holocene sediment accumulation on the fans at the fault crossing, rather than deep incision of channels that might be discernible even through the urban overprint.

We speculate that the lack of discernible large-scale offsets of the fans may be due to a conveyor-belt style of sediment input from the numerous, closely spaced canyon sediment sources. In this model, strike-slip motion along the fault would continually move the alluvial apron past the sediment sources, preventing the development of very large individual fans at any single canyon input and forming an alluvial apron upon which small fans develop. Such a process may explain the relatively small sizes of the fans observed along the central reach of the Hollywood fault. This hypothesis could be tested by excavating an east-west transect of sites in the footwall of the fault. The transects would be designed to document the three-dimensional transition from fans composed predominantly of sediment eroded from Tertiary sedimentary and volcanic strata exposed in the Hollywood Hills north of downtown Hollywood, to fans composed predominantly of eroded quartz diorite exposed to the west (Fig. 2). In summary, we contend that the lack of offset geomorphologic features does not necessarily preclude a significant component of left-lateral strike-slip motion along the Hollywood fault.

Potential Interactions Between the Hollywood Fault and Nearby Faults

Both the Hollywood and Santa Monica faults are interpreted to be north-dipping, oblique-reverse, left-lateral faults (Dolan and Sieh, 1992; Dolan et al., 1992; this study). Coupled with the similar orientations of the two faults, this leads us to interpret them as closely related strands within a single fault system that might rupture together during large earthquakes (Fig. 2). However, the three northeast-trending releasing bends along the Hollywood fault could act as earthquake segment boundaries, as has been shown along other faults (e.g., Sibson, 1985).

Recognition of a component of left-lateral strike slip on the Hollywood fault also raises the possibility that it may directly connect with the left-lateral Raymond fault to the east (Fig. 1). Such a connection has long been postulated on the basis of the similar strike of the two faults (e.g., Barbat, 1958; Lamar, 1961), and gravity data, which suggest overall continuity of basement trends across the Los Angeles River (Chapman and Chase, 1979). However, the area between the southwesternmost well-established location of the Raymond fault ~5 km east of the Los Angeles River (Weber et al., 1980) and the easternmost scarps of the Hollywood fault just west of the Los Angeles River is very complex topographically, and a thoroughgoing east-northeast–trending fault trace cannot be verified on the basis of geomorphic expression (Fig. 1). Rather, it appears that the Raymond fault splays westward into several east-trending, oblique-reverse(?) faults (Weber et al., 1980; Crook et al., 1987). Although left-lateral slip on the Raymond fault may ultimately be transferred to the Hollywood fault through some unknown mechanism, the Raymond fault may act at least partially as a left-lateral tear fault transferring motion from the Sierra Madre fault to the Verdugo–Eagle Rock fault system (Fig. 1). However, the presence of Pleistocene-Holocene(?) fault scarps of the western Raymond system west of Arroyo Seco, west of the presumed point of interaction with the Verdugo–Eagle Rock fault system, indicates that some slip on the Raymond fault system extends westward toward the Hollywood fault. Trenches excavated across one strand of the Raymond fault at the base of a drained, 5-m-deep reservoir west of Pasadena revealed numerous steeply north-dipping faults (64° to 85°)(Department of Water and Power Report, 1991). The steep dips and contradictory, but predominantly normal, vertical separations across these faults suggest that they are strike-slip faults, indicating that some left-lateral motion is transferred along the Raymond fault west of the Eagle Rock fault intersection.

Age of Most Recent Activity of the Hollywood Fault

In the absence of demonstrable evidence for Holocene displacements (Crook et al., 1983; Crook and Proctor, 1992), the Hollywood fault has not been zoned as active by the State of California. Our data indicate that the Hollywood fault has generated at least one surface rupture since latest Pleistocene time, suggesting that it is almost certainly capable of producing damaging earthquakes in the future. The ~500 to 3000 yr interval required to develop the unfaulted Vista Street soils (Fig. 12) represents the minimum interval since the most recent earthquake on the main strand. This estimate is supported by data from the Fuller Avenue trench (Fig. 11), which suggest, but do not prove, that no movement has occurred on the secondary strand of the fault exposed there in at least 1200 yr. An even older minimum age is suggested by the lack of discernible vertical displacement of the ~4000 to 8000 yr old unit A-unit B contact across the main fault zone at Camino Palmero. Although this latter age estimate is poorly constrained, recovery of an ~3500 yr old charcoal fragment from the middle of unit A, 2.8 m above the apparently unfaulted contact, suggests a long period of quiescence since the most recent Hollywood fault surface rupture.

The ca. 20 000 yr B.P. charcoal date from the faulted buried soil 3 at Camino Palmero (Fig. 7) represents a maximum age for the most recent surface displacement on the Hollywood fault. We do not know the exact depth of the upward termination of the most recent surface rupture at Camino Palmero. The shallowest displaced marker discernible in the cores is the unit B-unit C contact. In the Fuller Avenue trench, however, rupture clearly extended well above the contact, at least 1 m up into unit B (Fig. 11). Thus, if stratigraphic units are correlative between Fuller Avenue and Camino Palmero, the most recent surface rupture may significantly postdate the <~20 000 yr old unit B-C contact. In summary, our best estimate is that the most recent surface rupture on the Hollywood fault occurred during deposition of unit B between ca. 20 000 and 4000 yr ago. Available evidence does not allow us to exclude the possibility that more than one event has occurred during this time interval.

Constraints on the Slip Rate of the Hollywood Fault

The dense urbanization of the Hollywood area precludes excavation of a three-dimensional network of trenches designed to assess the rate and amount of lateral slip on the Hollywood fault; virtually the entire length of the fault is either paved or covered with buildings. Consequently, the overall slip rate and the relative proportions of lateral to vertical slip have not been directly measured. Nonetheless, we can use a combination of the borehole data, soil analyses, and regional geologic and geodetic information to place constraints on the slip rate and slip vector of the fault.

Despite the mountain-side-down separation of latest Pleistocene(?)–early Holocene(?) deposits at Camino Palmero, the displacement of quartz diorite over alluvium in both borehole transects suggests that the Hollywood fault exhibits a long-term component of reverse displacement. The weakly constrained ~0.1 mm/yr late Pleistocene–Holocene sediment-accumulation rate estimated from soil analyses at B-31, when extrapolated up-fan 170 m to just south of the fault crossing, yields an approximate age of ca. 660 000 to 750 000 yr for sediments at 73 m depth (correlative with the base of B-10) (Fig. 7; Appendix). The parallelism of the buried soils with the fan surface implies that the accumulation rate at the fault crossing is similar to that at B-31, and that this is therefore a reasonable extrapolation.

Because the quartz diorite was not observed in the footwall of the fault, the minimum amount of separation across the fault zone equals the vertical distance between the bottom of B-10 and the projection of the planar upper surface of the quartz diorite southward across all four known strands of the fault. Dividing this distance, ~50 m, by the sediment age yields a minimum relative uplift rate of ~0.07 mm/yr across the fault. For a local fault dip of 75°, this uplift rate yields a weakly constrained, minimum mid-Pleistocene to present dip-slip rate of ~0.075 mm/yr. We emphasize, however, that extrapolation of data on late Pleistocene–Holocene accumulation rates back several hundred thousand years introduces a potentially significant, but unquantifiable, degree of uncertainty in these age estimates, and in the accumulation rates and fault-slip rates that we derive from them.

We can also estimate an approximate maximum, long-term dip-slip rate on the basis of the thickness of Quaternary alluvium filling the Hollywood basin south of the fault. Dividing the presumed maximum 300 m depth to early Quaternary marine gravels at the base of the alluvial section by their estimated ca. 0.8 to 1.2 Ma age (Hummon et al., 1994; D. Ponti, 1995, written commun.) yields a maximum long-term uplift rate of ~0.3 to 0.4 mm/yr. An overall 70° dip for the Hollywood fault yields a similar dip-slip rate of ~0.3 to 0.4 mm/yr. This long-term rate is a maximum because: (1) the Hollywood basin probably developed at least partially, and possibly mainly, in response to motion through the Nichols Canyon–Sunset Strip and Benedict Canyon releasing bends; and (2) the bottom of basin may be shallower than 300 m over most of the length of the Hollywood fault. If any of Hollywood basin subsidence is due to strike-slip motion, and we suspect that much of it is, the true reverse dip-slip rate on the Hollywood fault must be slower than the ~0.3 to 0.4 mm/yr maximum rate. Given the maximum and minimum constraints determined above, in the following discussion we use 0.25 ± 0.15 mm/yr, the average of the minimum (~0.1 mm/yr) and maximum (~0.4 mm/yr) rate estimates, as a reasonable dip-slip rate for the Hollywood fault.

The estimated ~70° overall dip of the fault suggests that it may accommodate more strike-slip than reverse motion. In the following discussion, however, we assume a conservative strike-slip:dip-slip ratio of 1, which yields an overall oblique-slip rate of ~0.35 ± 0.2 mm/yr. This rate is probably a minimum because we suspect that the actual strike-slip rate may be higher, possibly considerably higher, than the dip-slip rate; in the far western part of the Transverse Ranges Southern Boundary fault system, the Santa Cruz Island and Santa Rosa Island faults exhibit left-lateral strike-slip rates of ~0.75 and ~1 mm/yr, respectively (Pinter et al., 1995; Colson et al., 1995).

A strike-slip rate along the Hollywood fault significantly >0.25 mm/yr is not precluded by recent geodetic data. Global Positioning System (GPS) geodetic data from four sites northwest of Hollywood (open squares in Fig. 1) show that the western Transverse Ranges, including the Santa Monica Mountains, are moving westward as a block relative to sites in the Los Angeles basin at 0 to 2 mm/yr (A. Donnellan, JPL Geodesy Group, 1996, personal commun.). These data suggest that a major strike-slip fault is between the Santa Monica Mountains and the Los Angeles basin.

The Hollywood fault is the most likely fault on which this left-lateral strike-slip motion could be accommodated. The only other near-surface fault that has been proposed in the Hollywood area is the North Salt Lake fault, which parallels the Hollywood fault ~1.5 km to the south (Fig. 3; Schneider et al., 1996; Tsutsumi, 1996). The North Salt Lake fault, however, exhibits no surface expression and may no longer be active. Available subsurface data do not clearly resolve whether the fault cuts late Quaternary strata (Tsutsumi, 1996). In contrast, the data discussed in this paper show that the Hollywood fault: (1) is well expressed at the surface; (2) has produced at least one earthquake since latest Pleistocene time; (3) is steeply dipping, which implies a strike-slip component of motion; (4) exhibits near-surface deformation at Camino Palmero indicative of strike-slip offset; and (5) has contradictory vertical separations on single strands consistent with predominantly strike-slip motion. On the basis of these observations, we suggest that most, if not all, of the left-lateral strike-slip motion between the Santa Monica Mountains and Los Angeles basin is accommodated along the Hollywood fault. Future GPS data will provide increasingly tighter constraints on the true slip rate of the Hollywood fault during the next decade.

Size and Frequency of Future Hollywood Fault Earthquakes

Although we have no direct information concerning the recurrence interval for Hollywood fault earthquakes, the probable long duration of the current quiescent period implies that the fault exhibits a recurrence interval measurable in terms of several thousands, rather than hundreds, of years. In the absence of direct recurrence data we can use estimates of the size of the Hollywood fault plane and minimum and maximum inferred slip rates to speculate about the size and frequency of future Hollywood fault earthquakes.

The Hollywood fault is 14 km in length. Assuming an average fault dip of 70° and a thickness of the seismogenic crust of ~17 km yields a total fault surface area of ~250 km^2. These data suggest that rupture of the entire Hollywood fault could produce a M_w ~6.6 earthquake with ~1.5 m of average slip across the rupture plane (Dolan et al., 1995). Assuming an oblique-slip rate for the Hollywood fault of 0.35 mm/yr, which we infer to be a probable minimum, yields a recurrence interval for a M_w 6.6 earthquake of ≤~4000 yr. As discussed above, this slip rate estimate is poorly constrained, and a faster rate would result in a correspondingly shorter expected recurrence interval. The Vista Street trench data indicate that it has been at least 500 yr, and possibly more than 3000 yr, since the most recent surface rupture on the fault. This minimum age is consistent with the average recurrence interval that we calculate for hypothetical, moderate earthquakes. However, the apparent lack of vertical displacement of the unit A-unit B contact at Camino Palmero suggests that the most recent earthquake occurred even earlier, probably before ~4000 yr ago, and possibly 20 000 yr ago. Although it is possible that a longer quiescent period could simply reflect an anomalously long interval between moderate earthquakes, it is equally possible that the current quiescent period indicates a recurrence interval that is longer than that expected for moderate earthquakes. Thus, the possibility of much less frequent, and therefore probably larger, earthquakes on the Hollywood fault cannot be excluded on the basis of available data. Resolution of this question awaits the results of planned excavations across the Hollywood fault. If such large earthquakes have occurred on the Hollywood fault, we speculate that they could have involved the Hollywood fault together with other transpressional faults in the Transverse Ranges Southern Boundary fault system (e.g., the adjacent Santa Monica and/or Raymond faults).

Implications for Seismic Hazard Assessment in Northern Los Angeles Basin

The Hollywood fault appears to be capable of generating an earthquake comparable to the 1994 M_w 6.7 Northridge event, which directly caused 31 deaths and resulted in more than 20 billion dollars in damage (Scientists of the USGS/ SCEC, 1994). The Northridge earthquake occurred beneath the San Fernando Valley, a predominantly residential region northwest of downtown Los Angeles (Fig. 1). In contrast, the Hollywood fault traverses a much more densely urbanized region. Of particular concern are the numerous older structures in this section of Los Angeles, including many unreinforced masonry buildings and older high-rise buildings. Many of these buildings sustained damage during the Northridge earthquake, despite the fact that they were located more than 25 km from the nearest part of the rupture plane.

The Northridge earthquake served as a reminder of the importance of source directivity as one of the primary controls on the location and magnitude of strong ground motions and consequent damage (Wald et al., 1996). For example, if a Hollywood fault earthquake initiated near the base of the seismogenic crust and propagated up the fault plane, as occurred at Northridge, much of the energy would be focused directly toward the most densely urbanized part of the Los Angeles metropolitan area. Another concern is that the Hollywood fault, in contrast to the blind thrust fault that produced the Northridge earthquake, ruptures through to the surface in large earthquakes. In addition to the obvious implications for damage to infrastructure associated with potential surface displacements, surface-rupturing earthquakes are likely to excite much stronger long-period surface waves than earthquakes that do not rupture to the surface (e.g., Liu and Heaton, 1984; Vidale and Helmberger, 1988). Such long-period surface waves could represent a significant hazard to the many high-rise buildings in the region (Heaton et al., 1995; Olsen and Archuleta, 1996).

CONCLUSIONS

From a seismic hazard perspective, perhaps our most important result is that the Hollywood fault is probably active and capable of producing damaging earthquakes beneath the densely urbanized northern Los Angeles basin. Prior to this study no paleoseismologic information was available for the fault, which is consequently not zoned as active by the State of California. The fault has ruptured to the surface at least once during the past 20 000 yr. Unfaulted deposits that cross the fault indicate that the most recent earthquake occurred at least ~500 to 3000 yr ago. However, stratigraphic relations in several excavations lead us to suspect that the most recent surface rupture probably occurred earlier, possibly during latest Pleistocene to early or mid-Holocene time, between ~4000 and 20 000 yr ago. Although the minimum age of the most recent surface rupture is consistent with the occurrence of moderate (M_w ~6.6) earthquakes along the Hollywood fault, the poorly constrained age of the most recent event is also consistent with the occurrence of less frequent, and therefore probably larger, earthquakes. We speculate that if such large ruptures have occurred, they may have involved simultaneous rupture of the Hollywood fault and adjacent faults of the Transverse Ranges Southern Boundary fault system.

Although it has generally been considered a reverse fault, recent mountain-side-down displacement documented at one site, coupled with the probable steep overall dip (~70°N) and north-northeast strike of the fault, suggest a significant, possibly predominant, component of left-lateral strike-slip motion along the Hollywood fault. In addition to the strike-slip component, the sparse available data suggest that the Hollywood fault exhibits a component of reverse displacement of ~0.25 mm/yr, indicating that overall motion is oblique reverse, left-lateral strike-slip.

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TABLE A1. SUMMARY OF MHI AND SDI RESULTS FROM SOILS IN THE VISTA STREET TRENCH AND BOREHOLE B-31

Soil	MHI	SDI	Predicted age (ka) (2σ)	
			MHI	SDI
Vista 2 (buried) (3.4 to ? m depth)	0.31	N.D.	12.6 +28.0/–8.7	N.D.
B–31 (surface/#1)	0.19	42.2	6.5 +14.8/–4.5	14.5 +45.6/–4.6
B–31 (soil #2)	0.29	47.8	11.3 +25.1/–7.8	15.8 +49.7/–5.0
B–31 (soil #3)	0.44	88.3	26.2 +57.0/–17.9	30.1 +93.9/–9.7
B–31 (soil #4)	0.48	108.3	32.8 +71.3/–22.5	41.4 +129.5/–13.2
B–31 (soil #5)	0.53	98.9	43.3 +94.8/–29.7	35.6 +111.3/–11.4
B–31 (soil #6)	0.46	90.4	29.3 +63.7/–20.0	31.1 +97.1/–10.0
Averages (B–31)			149.4 +326.7/–102.4	168.5 +527.1/–53.9

Notes: MHI—maximum horizon index, SDI—soil development index, N.D.—no data

TABLE A2. SOIL DESCRIPTIONS FROM THE VISTA STREET TRENCH AND BOREHOLE B-31

Pedon	Horizon	Depth (cm)	Color	Text	Structure	Consistency	Clay films	Bound.	Sand (%)	Silt (%)	Clay (%)	H.I.	SDI	Notes
Vista 1	Ab?	(94–144)		SL					76	16	8			
	C	(144–322) (195)		LS-SL					82.4	11.5	6.1			
	C	(144–322) (235)		LS					83.1	11	5.9			
	C	(144–322) (290)		SL					78.4	14.5	7.1			
	Bwb?	(322–330+)		SL					72	19	9			
Vista 2	C (undiff.)	0–270	10YR 3/4m, 5/5d	LS-SL	m-sg	so, so, po	n.o.	?	82	11.6	6.4	0.07		Scattered pebbles
	2Ab	270–312	10YR 3/4m, 4/5d	SL	m-1csbk	so-sh, so, ps	n.o.	g, w-s	71.6	19.3	9.1	0.15	6.5	
	2Ab2	312–340	10YR 3/4m, 4/5d	SL	m-1csbk	sh, so-ss, ps	n.o.	g, w	70.1	20.4	9.5	0.18	5.1	
	3Ab	340–371	10YR 3/4m, 3.5/4d	SL	1csbk	h, ss, p	vnpo	c, w	64.8	24.7	10.5	0.29	9.1	
	3Bt	371–400+	10YR 3.5/4m, 4.5/4d	SL	2csbk	vh, s, p	2npo, 1npf, vncl	n.o.	61.3	25.4	13.3	0.41	11.8	
B-31	Gone	0–1.52												
	Btj	1.52–1.83	10YR 5/4d, 4/4m	SL		sp, ss	1-2ncl		64.4	25	10.6	0.19	5.9	
	BC	1.83–2.74	10YR 5/4d, 4/4m	sgSL		so, po	vncl		73.6	17.9	8.5	0.12	10.9	Pebbly SL
	2BC	2.74–2.90	10YR 5/4d, 4/5m	SL		s, p	1copo		56.7	29.9	13.4	0.25	4	Minor clay staining
	3Cox	2.90–3.73	10YR 5/6d, 4.5/3m	SL		ss, sp	n.o.		72.6	18.9	8.4	0.11	9.1	
	4Btjb	3.73–4.27	10YR 5/4d, 4/3m	SL		s, p	1npf&po		64.3	26.8	8.9	0.29	15.7	
	4BC1b	4.27–5.03	10YR 5/4d, 4/3m	SL		ss, po	1npo, 1cocl		65.5	24.3	10.2	0.12	9.1	
	4BC2b	5.03–6.40	10YR 5/4d, 4/4m	SL		ss, po	1ncl		62.1	25.2	12.7	0.12	16.4	
	5Ab	6.40–6.55	9YR 5/4d, 3.5/4m	SL		s, p	n.o.		60.7	27.2	12.1	0.21	3.2	Many v.f. pores, ^{14}C date @ 17 ka
	5Bt1b	6.55–6.86	10YR 5/4d, 9YR 3/4m	L		s, p	3n&1mkpo, 3ncl		51.2	32.6	16.1	0.44	13.6	
	5Bl2b	6.86–7.32	10YR 5/4d, 4/4m	SL		s, p	2npo&cl		60.3	23.8	15.9	0.33	15.2	
	5BC1b	7.32–7.77	10YR 5/4d, 4/4m	SL		ss, ps	1npo		69.8	19.8	10.4	0.17	7.7	
	5BC2b	7.77–9.75	10YR 5/6d, 4/4m	SL		ss, ps	1npo		67.8	21.6	10.6	0.19	37.6	
	6Ab	9.75–9.91	10YR 4/6d, 3/4m	SL		ss, p	vnpo		57.8	28.4	13.7	0.23	3.7	
	6Btb	9.91–10.36	10YR 4/6d, 7.5YR 3/3m	L		s, p-vp	3npf, 3n&2mkpo		50	33.5	16.5	0.48	21.6	
	6BC	10.36–11.73	10YR 5/5d, 9YR 3/4m	SL		s, p	1-2npo, 2 ncl		55.6	26.7	17.6	0.34	46.6	
	7Btb	11.73–12.34	10YR 4.5/6d, 7.5YR 3/4m			s, p-vp	3npo&pf&cl, 1mkpo					0.53	32.3	
	7BCb	12.34–13.26	10YR 5.5/5d, 4/5m	SL		s, ps	1npo					0.24	22.1	
	8Btb	13.26–13.72	10YR 5/6d, 9YR 4/4m	SCL		s, p	2-3n&mkpo, 3ncl					0.46	21.2	
	9Bcb	13.72–14.78	10YR 4.5/6d, 4/4m	vgSL		ss, ps	2ncl, 1npo&br					0.26	27.6	
	10Bcb	14.78–15.24	10YR 5/5d, 4/5m	SL		ss, ps	vnpo					0.18	8.3	
	11BCb	15.24–15.70	10YR 4.5/6d, 4/4m	LS-SL		so, po	1ncl, vnpo					0.17	7.8	
	12BCb	15.70–16.46	7.5–10YR 5/6d, 3/4m	SL		ss, p	vnpo, pf					0.26	19.8	
	13Cb	16.46–16.61+	10YR 5/6d, 4/4m	LS-SL		so, po	n.o.					0.07	1.1	

TABLE A3. MAXIMUM HORIZONTAL INDEX (MHI) DATA FOR SOILS FROM VISTA STREET TRENCH AND BOREHOLE B-31

Profile	MHI	Sy′	Conf. int. (0.95)	Log age	Error in μ of Y		S(y–y′)	Conf. int. (0.95)	Error in Y pop.		Age (yr)	95% predicted age C.I.	
					Max.	Min.			Max.	Min.		Max.	Min.
Vista 2	0.31	0.0608	0.1273	4.10	4.23	3.97	0.2420	0.5065	4.61	3.60	12,653	40,616	3942
B31#1	0.19	0.0797	0.1667	3.81	3.98	3.64	0.2474	0.5178	4.33	3.29	6464	21,298	1962
B31#2	0.29	0.0635	0.1329	4.05	4.19	3.92	0.2427	0.5079	4.56	3.55	11,313	36,435	3513
B31#3	0.44	0.0512	0.1071	4.42	4.53	4.31	0.2397	0.5018	4.92	3.92	26,193	83,172	8249
B31#4	0.48	0.0516	0.1079	4.52	4.62	4.41	0.2398	0.5020	5.02	4.01	32,764	104,081	10,314
B31#5	0.53	0.0544	0.1138	4.64	4.75	4.52	0.2404	0.5033	5.14	4.13	43,344	138,100	13,604
B31#6	0.46	0.0512	0.1071	4.47	4.57	4.36	0.2397	0.5018	4.97	3.97	29,295	93,020	9226

TABLE A4. SOIL DEVELOPMENT INDEX (SDI) DATA FOR SOILS FROM VISTA STREET TRENCH AND BOREHOLE B-31

Profile	SDI	Sy′	Conf. int. (0.95)	Log age	Error in μ of Y		S(y–y′)	Conf. int. (0.95)	Error in Y pop.		Age (yr)	95% predicted age C.I.	
					Max.	Min.			Max.	Min.		Max.	Min.
Vista 2	—	—	—	—	—	—	—	—	—	—	—	—	—
B31#1	42.20	0.0611	0.1290	4.16	4.29	4.03	0.2361	0.4982	4.66	3.66	14,488	45,628	4,600
B31#2	47.80	0.0590	0.1245	4.20	4.32	4.08	0.2356	0.4971	4.70	3.70	15,835	49,741	5,041
B31#3	88.30	0.0525	0.1107	4.48	4.59	4.37	0.2341	0.4938	4.97	3.99	30,120	93,903	9,661
B31#4	108.30	0.0557	0.1175	4.62	4.73	4.50	0.2348	0.4954	5.11	4.12	41,377	129,461	13,225
B31#5	98.90	0.0536	0.1132	4.55	4.67	4.44	0.2343	0.4944	5.05	4.06	35,641	111,258	11,417
B31#6	90.40	0.0526	0.1110	4.49	4.60	4.38	0.2341	0.4939	4.99	4.00	31,141	97,101	9,987

TABLE A5. PARAMETERS FOR EARTHQUAKES USED IN CONSTRUCTING FIGURE 13

Date (day-month-year)	Location	Mw	Strike	Dip	Rake	References
07-21-52	Kern County	7.5	50	63	49	Hanks et al. (1975); Stein and Thatcher (1981); Hill et al. (1990)
12-16-54	Fairview Peak, Nevada	7.1	350	60	-150	Doser (1986)
09-12-66a	Truckee	5.9	44	80	0	Hill et al. (1990)
04-09-68	Borrego Mtn.	6.5	132	90	180	Hill et al. (1990)
02-09-71	San Fernando	6.7	290	54	76	Heaton (1982)
02-21-73	Point Mugu	5.3	80	36	55	Stierman and Ellsworth (1976); Hill et al. (1990)
08-06-79a	Coyote Lake	5.7	150	84	180	Hill et al. (1990)
10-15-79b	Imperial Valley	6.5	146*	90	180	*Ekstrom and England (1989); Kanamori and Regan (1982); Hill et al. (1990)
01-24-80a	Livermore	5.8	157	75	-170	Hill et al. (1990)
05-25-80b	Mammoth Lakes	6.2*	331	21	103	Ekstrom and England (1989); *Hill et al. (1990)
09-04-81	N. Santa Barbara Is.	5.9	45	80	0	Hill et al. (1990)
10-25-82	New Idria	5.5	154	41	137	Ekstrom and Dziewonski (1985); Stein and Ekstrom (1992)
05-02-83a	Coalinga	6.5	145	30	100	Kanamori (1983); Eberhart-Phillips (1990); Stein and Ekstrom (1992); *Anderson et al. (1995)
		6.3	140	30	88	Ekstrom and England (1989)
10-28-83b	Borah Peak, Idaho	6.9	151	52	64	Average of 6 values (with nonfixed rake angle) in Richins et al. (1985)
04-24-84	Morgan Hill	6.2	333	76	179	Ekstrom and England (1989); *Anderson et al. (1995); Wells and Coppersmith (1995)
08-04-85	Kettleman Hills	6.1	142	12	109	Ekstrom et al. (1992); Stein and Ekstrom (1992)
07-08-86a	N. Palm Springs	6.1**	114	37	156	Ekstrom and England (1989); *Wells and Coppersmith (1995); **Anderson et al.(1995)
			150	45(55)	180	First motion only; Jones et al. (1986)
07-21-86b	Chalfant Valley	6.3*	149	60	163	Ekstrom and England (1989); Hill et al. (1990)
10-01-87a	Whittier Narrows	6.0	90	25	90	Hauksson (1990); Hartzell and Iida (1990)
11-24-87b	Superstition Hills	6.7*	305/20	80	175	Bent et al. (1989); *Anderson et al. (1995)
			35?	80	0	Hill et al. (1990)
11-18-89	Loma Prieta	6.9	130	68	137	Average of 11 values in Wald et al. (1991)
06-28-91	Sierra Madre	5.6	243	49	82	Wald (1992)
04-23-92a	Joshua Tree	6.1*	160	90	160	Hauksson et al. (1993); *Hough and Dreger (1995)
06-28-92b	Landers	7.3	170	90	170	Hauksson et al. (1993); *average of 5 in Anderson et al. (1995)
06-28-92c	Big Bear	6.2	55	85	10	Hauksson et al. (1993)
01-17-94	Northridge	6.7	122	40	101	Wald, Heaton, Hudnut (BSSA in press); *average of 5 in Anderson (1995)

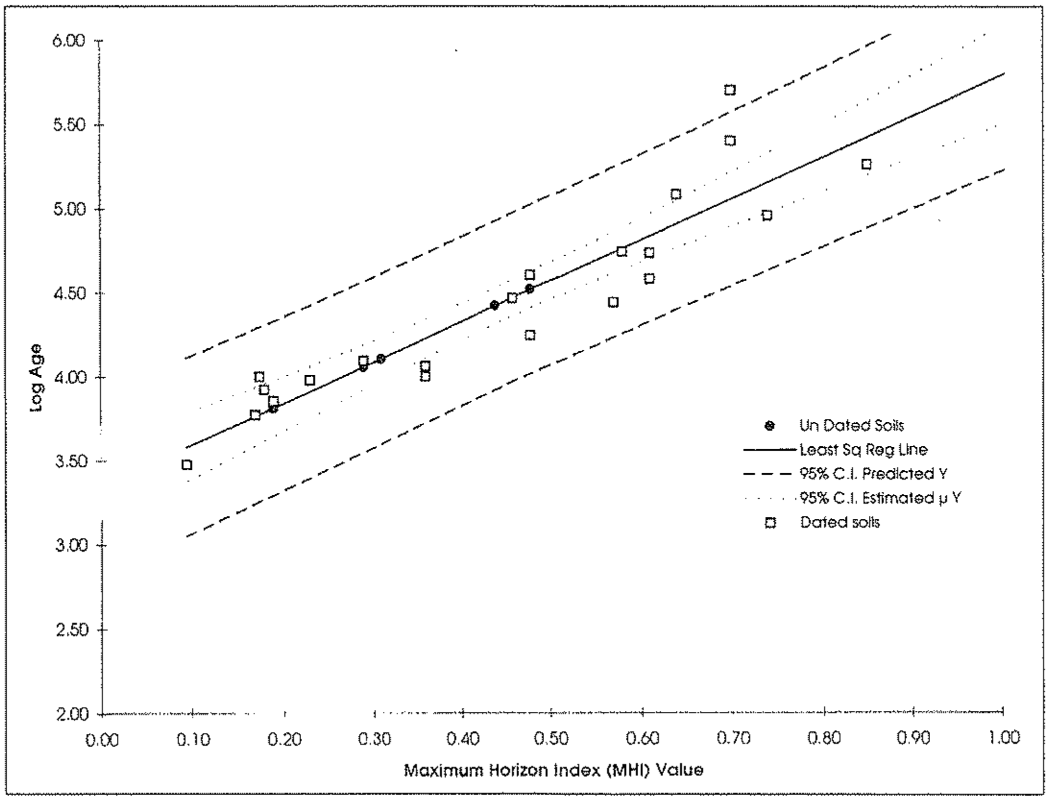

Figure A1. Regression of Maximum Horizon Index (MHI) values for undated soils in Vista Street trench and borehole B-31 against data from dated southern California soils.

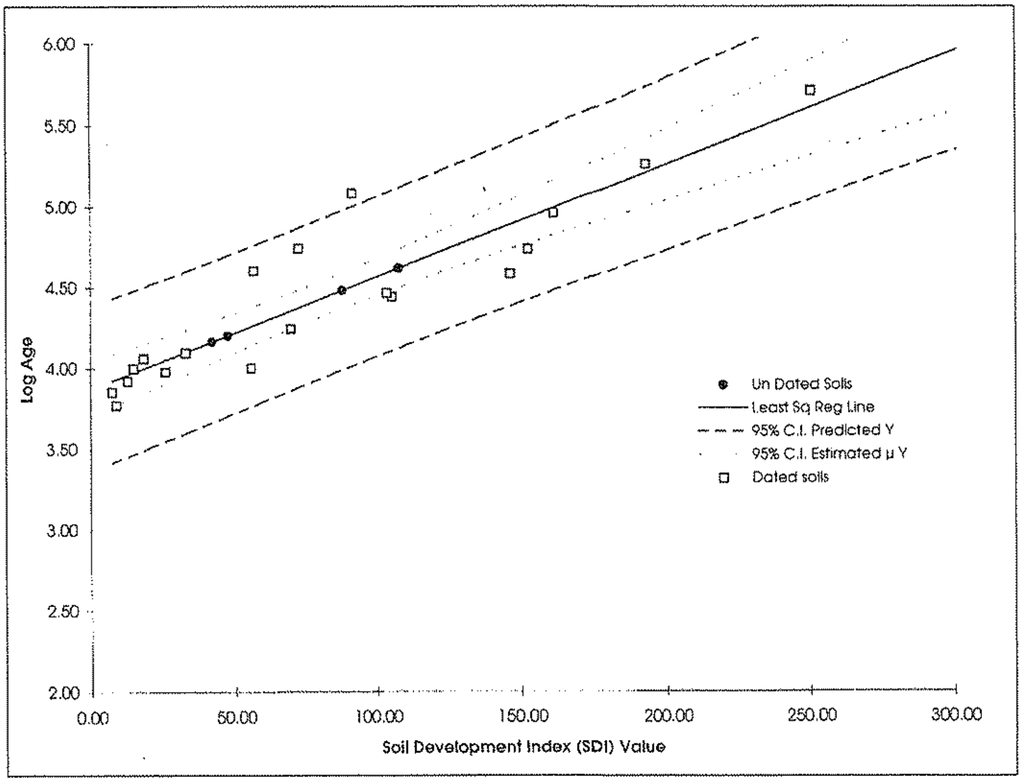

Figure A2. Regression of Soil Development Index (SDI) values for undated soils in Vista Street trench and borehole B-31 against data from southern California soils.

APPENDIX. SOIL DESCRIPTIONS FROM BOREHOLE B-31, CAMINO PALMERO BOREHOLE TRANSECT AND FOR VISTA STREET TRENCH

We described one complete and one partial soil profile from the Vista Street trench during the storm drain pipeline excavations (Fig. 12), as well as a sequence of six soils from the core of borehole B-31 at Camino Palmero (Fig. 7). All of these soils were described according to SCS Soil Survey Staff (1975; 1992) (Tables A1 and A2) and samples were collected for particle-size analysis.

Vista Street Profiles

The partial profile we described, Vista 1, was located at stations 822-824, whereas profile Vista 2 was located at station 885 (Fig. 12). Vista 2 appeared to expose a complete profile of the soil developed in depositional unit 2. At least three depositional pulses are present in the Vista 2 profile: the upper 2.7 m (unit 1) is characterized by unweathered, essentially raw alluvium. The alluvium between 2.7 and 3.4 m depth (unit 2) appears to have been exposed to the surface for a period of time and has an A horizon developed through it. Vista 2 appeared to expose a complete profile of the soil developed in depositional unit 2. The lower part of the buried A horizon in the Vista 2 exposure graded laterally into a weakly expressed Bwb horizon in the Vista 1 exposure 20 m to the south. Particle size distributions for both of these units are nearly identical, supporting their correlation. The top of a better developed buried soil (unit 3) is present at ~3.4 m depth at the Vista 2 site. There a buried A horizon overlies a weakly developed argillic (Bt) horizon developed in this lowest stratigraphic unit exposed in the trench.

We compared the Vista 2 and borehole B-31 soils to dated soils elsewhere in southern California as the basis for age estimates. For a buried soil, the age estimate represents only the time that the sediments and soil were exposed at the surface. Thus, because there is no age control on the length of the depositional phase, the cumulative ages represented by the combined ages of the surface and buried soils should be considered a minimum age for the sediments at the base of the trench and borehole.

Vista Trench 2

The surface soil and deposit exposed in the trench has essentially no soil development, suggesting a very young age. However, an A horizon may have been present that was disturbed or graded during construction of Vista Street. If not, then the surface alluvium is probably <100 yr in age in that well-formed A horizons are usually evident within 50 to 100 yr in southern California (Rockwell et al., 1985; Harden, 1982; McFadden and Weldon, 1987). Similarly, the shallowest buried soil (unit 2) is represented by only an A horizon (albeit a thick one) in the Vista 2 exposure and possibly by a cambic (Bw) horizon in the Vista 1 exposure (Fig. 12). The presence of a cambic horizon indicates more development and time than just the presence of an A horizon. Cambic horizons without evidence of translocated clay have formed in sandy alluvium in similar environments in southern California in 500 to 5000 yr (Rockwell et al., 1985; McFadden and Weldon, 1987), although many recent data have been collected from the Los Angeles basin area showing incipient illuviation (clay film development) in fewer than 3000 yr (T. Rockwell, unpub. data). On the basis of these observations, we suggest that the unit 2 is middle to late Holocene in age.

For the lowest buried soil (unit 3) with a weak argillic horizon, the maximum horizon index (MHI) values from the field descriptions were regressed against data from soil profiles in three different chronosequences developed under a xeric (Mediterranean) climate in California. There are minor differences in parent material and climate among these chronosequences (see Rockwell, et al., 1990, for a complete discussion), but they are similar enough for analysis of the Vista Street soil profiles. We also include data from dated soil profiles from within the Los Angeles basin region.

The three chronosequences used are from the Ventura basin (Rockwell, 1983; Rockwell et al, 1985), the central Valley of California (Harden, 1982), and the Cajon Pass area (McFadden and Weldon, 1987) (Figure A1). Only one criterion was used to estimate the age of the Vista Street trench soils: the maximum horizon index (MHI), as presented in Harden (1982), Ponti (1985), and Rockwell et al. (1994). Two other criteria, the profile mass accumulation of secondary clay, as determined by particle-size analysis, and the soil development index (SDI) of Harden (1982), are usually also used, but only the top of the argillic horizon was exposed, so there are too many assumptions that would have to be made to apply these techniques. The MHI parameter converts field description data of the best-developed horizon (usually the Bt) to numerical values that allow numerical comparison to the dated profiles. We assume that the exposed portion of the Bt horizon that we described is representative of this unit's soil. We understand that such an assumption, if incorrect, could lead to wide significant errors in the age estimate of the soil. We therefore do not use our age estimate of soil 3 for any paleoearthquake calculations.

The MHI data for the three chronosequences, along with the other Los Angeles basin profiles (not presented here; these will form the focus of a future paper), define a log-linear trend with a high r^2 value (0.85; Fig. A1). Regression of the Vista 2 MHI value (0.31) indicates an exposure age of 12.6 $^{+28.0}/_{-8.7}$ ka.

Borehole B-31

Borehole B-31 penetrated a sequence of six soils over a vertical thickness of 16.6 m. For these profiles, both MHI and SDI values were calculated and regressed against the same dated soils used for the Vista Street trench (Figs. A1 and A2; Tables A3 and A4). Similar to the MHI, the SDI converts the field description data into numerical values but uses the entire soil profile: they can also be compared to dated soils. The surface soil in B-31 was not described in the upper 5 ft (~1.5 m) due to lack of core recovery. Thus, caution should be used in interpreting the age estimates for the surface soil.

The MHI and SDI values for the six B-31 soils are summarized in Table A1. The minimum likely age for the deepest sediments exposed in the core, calculated by adding the best estimates for each of the surface and buried soils, is ca. 150 000 (MHI) to 170 000 (SDI). As noted above, the one charcoal fragment recovered from B-31 was recovered from the A horizon of soil 3, and was probably added to the soil profile during development of soil 3. Thus, the charcoal AMS age (19,765 $^{+455}/_{-365}$ yr B.P.) probably provides a maximum age for the cumulative development of soils 1 and 2. The similarity of this maximum age with the cumulative MHI age estimates for soils 1 and 2 (~18 000 yr) leads us to place more confidence in the MHI estimates of soil ages in B-31 than the SDI estimates.

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Description of Research

Summary Statement of Research Interests

My research focuses on the behavior of active and ancient faults and their associated folds, with the ultimate goal of understanding the mechanics of plate-boundary deformation. My students and I work mainly at the critically important time scale of one to a few dozen earthquakes, with the goal of understanding the detailed interactions amongst the various tectonic elements that comprise plate boundaries. These studies are inherently multi-disciplinary, and we operate at the interface between structural geology, seismology, tectonic geomorphology, geodynamics, and seismic hazard assessment, and take full advantage of emerging technologies such as LiDAR airborne laser swath mapping and cosmogenic radionuclide dating. My specific interests include: spatial and temporal patterns of earthquake occurrence, collective behavior of regional fault systems, transient strain accumulation and release, structural geology of active and ancient faults, seismic hazard assessment, controls on earthquake nucleation, propagation, and arrest, discreteness of deformation in the lithosphere. Some of the techniques we use: Tectonic geomorphology, paleoseismologic trenching, analysis of LiDAR airborne laser swath mapping digital topographic data, cosmogenic dating, structural analysis of exhumed ancient fault-zone rocks, high-resolution seismic reflection imagery, paleoseismologic trenching, and good old-fashioned field mapping. Recent research projects include numerous analyses of slip rates and paleo-earthquake ages and displacements on a number of major continental faults designed to elucidate the pace and constancy (or lack thereof) of relative plate motions at the earthquake time scale, documentation of exhumed faults in the pursuit of constraints on the dynamic behavior and structural evolution of major faults, analysis of the evolution and hazard associated with blind thrust faults, the study of potential long-distance and long-term fault interactions, and possible triggering mechanisms of earthquake clusters on both single faults and regional fault networks, with a focus on the relationship between upper crustal faulting and fault loading associated with the inter-seismic behavior of the lower crust.

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Faculty may update their profile by visiting https://mydornsife.usc.edu.

EXHIBIT C

KENNETH WILSON

Principal Engineering Geologist

EDUCATION

University of California at Riverside, B.S. Geological Sciences, 1967
University of California at Riverside, M.S. Geological Sciences, 1972

PROFESSIONAL REGISTRATIONS

Professional Geologist, California, #3175 [Issued 1-08-1974; Expires 2-28-2014]
Certified Engineering Geologist, California, #928 [Issued 1-08-1974; Expires 2-28-2014]

PROFESSIONAL SUMMARY

Kenneth Wilson is responsible for management, technical supervision and performance of engineering geology, geotechnical, environmental impact, and environmental geology projects, and is a Professional Geologist (#3175) and Certified Engineering Geologist (#928) in California. He performs and supervises environmental assessments for commercial, industrial and government projects covering the disciplines of hydrogeology, engineering geology, geology, hydrology, seismicity, tectonics, faulting, mineral resources, and waste management. Geotechnical studies include fault evaluations, ground failure assessments, slope stability, and foundation materials characterization, liquefaction potential, flooding hazards and site selection. The emphasis of his work is on defining geologic and geotechnical conditions, and hazards, which may affect the feasibility and design of any type of development project. Mr. Wilson has over 20 years of technical performance and project experience in critical facilities studies, radioactive/mixed/hazardous waste management, energy plant site licensing, impacts to surface and groundwater resources, waste disposal site development, dams and reservoirs, and numerous other engineered structures. Specialized experience is in engineering geology in support of geotechnical studies, site selection/evaluation, seismic safety, integration of multidisciplinary technical teams, project management, and EIRs, EAs, and EISs.

PROFESSIONAL EXPERIENCE

Wilson Geosciences, Engineering and Environmental Geology [1989-Present]

Principal Engineering Geologist: Responsible for all management, technical and marketing activities for engineering geology, environmental impact, and environmental geology projects. Performs and supervises environmental assessments for commercial, industrial and government projects covering the disciplines of hydrogeology, engineering geology, geology, hydrology, seismicity, tectonics, faulting, mineral resources, and waste management. Geotechnical studies include fault evaluations, ground failure assessments, slope stability, and foundation materials characterization, liquefaction potential, flooding hazards and site selection.

The Earth Technology Corporation [1974-1989]

Corporate Vice President: Mr. Wilson worked from late-1987 to mid-1989 for the Chairman/CEO and the President/COO performing the following tasks: assisting in evaluation of several potential acquisitions; management of pre-acquisition due diligence; evaluation of four new office geographic expansion options; managed preparation of corporate health and safety program and H/S technical procedures. In 1989 was principal-in-charge for start-up of environmental engineering and hydrogeology portion of Technical Assistance Contract with DOE/Nevada Operations, Environmental Safety and Health Branch; task areas included quality assurance, geohydrologic assessments, defense waste management, geohydrology, environmental restoration program, and environmental compliance.

Vice President; Director, Program Management: Mr. Wilson reported to the President of the Western Division (1985-1987) and was responsible for business development, project execution, and strategic planning for market areas related to radioactive (high, mixed, and low-level) waste management programs, energy and mineral resources, geophysics, and offshore technology. Emphasis was on geosciences, engineering, environmental, and program management disciplines for site selection, site evaluation/characterization, site remediation and specialized advanced technology considerations in hydrologic modeling, rock mechanics testing and geophysical exploration. Directed and supervised preparation of proposals for large government programs (e.g. California Low-Level Waste Site Development Contractor, Grand Junction Project Office Management Contract, Southern Region Geologic Project Manager, DOE Salt Project-Technical and Field Services Contract).

Vice President, Associate and Senior Manager: Mr. Wilson had numerous challenging technical and management responsibilities and assignments during the period 1974-1988, many of which are summarized in available REPRESENTATIVE PROJECT EXPERIENCE addenda. There was a wide range of projects for which he had a technical role, either performance, supervisory, or management in scope. A substantial portion of the time he was involved in the Missile-X (MX) ICBM, Siting and Characterization Studies in the Western and Midwestern United States: for United States Air Force, Ballistic Missile Office, and the Southern Region Geologic Project Manager (SRGPM) in Mississippi, Louisiana, Texas, Georgia, South Carolina, Virginia, Maryland for Office of Nuclear Waste Isolation (ONWI) and Office of Crystalline Repository Development (OCRD). These projects were national in scope and involved most geologic, geotechnical, geophysical, environmental, and hydrologic disciplines, with multi-year contract values in the $30 to 70 million dollar range.

Converse Consultants (formerly Converse, Davis and Associates) [1970-1974]

Staff and Project Geologist: Conducted and supervised investigations in southern, central, and northern California, southern Nevada, and eastern Washington. Groundwater and related studies included permeability, transmissibility, and storage coefficient studies at Searles Lake, California; earth dam projects at Yucaipa, Littlerock, and Anaheim, California; groundwater contamination (hydrocarbons) evaluation in the Glendale, California area; wastewater and water treatment facilities in Solvang, Lompoc, Victorville, Thousand Oaks, and Sylmar, California. Numerous earthquake and fault risk studies were performed for earth dams and reservoirs, high-and low-rise buildings, hospitals and schools, proposed nuclear power plant sites, water storage tanks, and large-diameter pipelines. Landslide and other slope failure studies were performed in rock and soil terrains. Offshore studies planned and conducted include coastal geophysical (seismic reflection, side scan sonar, fathometer), sampling and scuba investigations near Monterey and Dana Point, California.

Performed geologic, hydrologic, drilling, geophysical, faulting and earthquake evaluations (both field and office-based) for two potential and two existing nuclear power plant sites. Field evaluations included mapping, trenching, drilling, detailed logging, age-dating, technical analyses, and report preparation. Geologic environments ranged from arid deserts (California and Washington) to humid coastal (California).

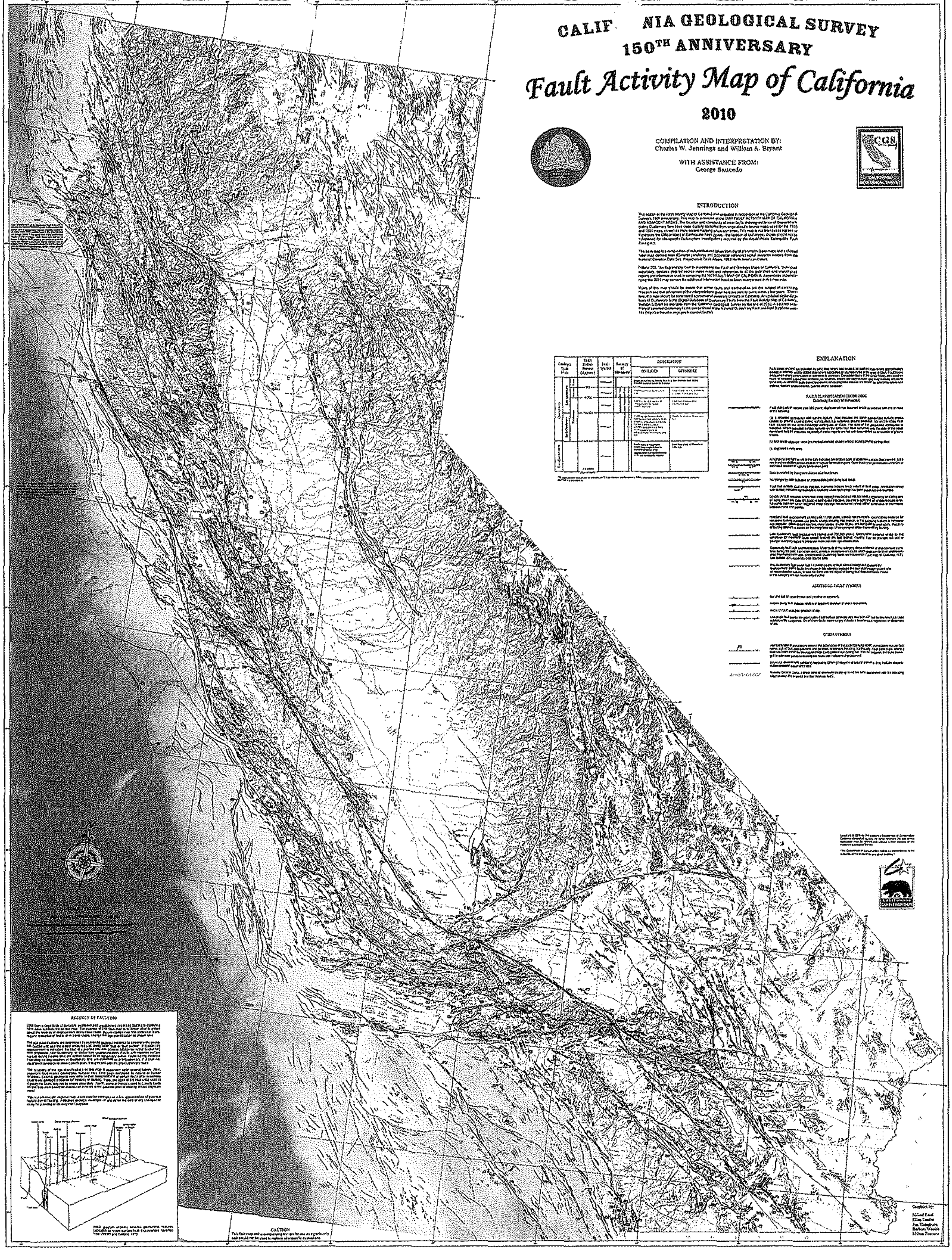
PROFESSIONAL ORGANIZATIONS

Member Association of Engineering Geologist, National Section
Member Association of Engineering Geologist, Southern California Section

COURSES, SEMINARS, AND WORKSHOPS

Seismic Interpretation for Geologists, by the Oil and Gas Consultants International, Inc., Intensive Short Course, Houston, Texas
Engineering Geophysics Short Course, Colorado School of Mines, Office of Continuing Education, Golden, Colorado
Technical Writing Seminar, Earth Technology Corporation, Long Beach, California
Fundamentals of Ground-Water Monitoring Well Design, Construction, and Development, Las Vegas, Nevada
Field Practices for Collecting Representative Ground-Water Samples, Las Vegas, Nevada
New Developments in Earthquake Ground Motion Estimation and Implications for Engineering Design Practice, Seminar organized by Applied Technology Council and funded by U.S. Geological Survey, Los Angeles, California
Seismic Hazards Analysis, Course sponsored by Association of Engineering Geologists, Los Angeles, California

EXHIBIT D



CALIF NIA GEOLOGICAL SURVEY
150TH ANNIVERSARY
Fault Activity Map of California
2010

COMPILATION AND INTERPRETATION BY:
Charles W. Jennings and William A. Bryant

WITH ASSISTANCE FROM:
George Saucedo

INTRODUCTION

[illegible]

EXPLANATION

[illegible]

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

[illegible]

ADDITIONAL FAULT SYMBOLS

[illegible]

OTHER SYMBOLS

[illegible]

Geologic Time Scale	Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION ON LAND	DESCRIPTION OFFSHORE
[illegible]				[illegible]	
[illegible]	200			[illegible]	[illegible]
[illegible]	11,700			[illegible]	[illegible]
[illegible]	700,000			[illegible]	[illegible]
[illegible]	1,600,000			[illegible]	[illegible]
[illegible]	[illegible]			[illegible]	[illegible]

[illegible]

RECENCY OF FAULTING

[illegible]

CAUTION

[illegible]

Graphics by:

[illegible]

An Explanatory Text to Accompany the Fault Activity Map of California

Scale 1:750,000

ARNOLD SCHWARZENEGGER, Governor
STATE OF CALIFORNIA

LESTER A. SNOW, Secretary
THE NATURAL RESOURCES AGENCY

BRIDGETT LUTHER, Director
DEPARTMENT OF CONSERVATION

JOHN G. PARRISH, Ph.D., State Geologist
CALIFORNIA GEOLOGICAL SURVEY

CALIFORNIA GEOLOGICAL SURVEY

JOHN G. PARRISH, Ph.D.
STATE GEOLOGIST

An Explanatory Text to Accompany the Fault Activity Map of California

Scale 1:750,000

Compilation and Interpretation by
CHARLES W. JENNINGS and WILLIAM A. BRYANT

Digital Preparation by
Milind Patel, Ellen Sander, Jim Thompson, Barbra Wanish, and Milton Fonseca

2010

Suggested citation:
Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.

An Explanatory Text to Accompany the Fault Activity Map of California

INTRODUCTION

The 2010 edition of the FAULT ACTIVTY MAP OF CALIFORNIA was prepared in recognition of the 150th Anniversary of the California Geological Survey (CGS). It replaces the *FAULT ACTIVITY MAP OF CALIFORNIA AND ADJACENT AREAS* (Jennings, 1994) and is more complete with the addition of recent data. The map shows the locations of known faults that can be portrayed at 1:750,000 scale and indicates the latest age when displacements took place, according to available data. The displacements may have been associated with earthquakes or may have been the result of gradual creep along the fault surface. Faults exhibiting creep or triggered creep are identified on the map with appropriate symbols. The faults are color-coded and designated into one of five categories: historic (red), Holocene (orange), late Quaternary (green), undivided Quaternary (purple), and pre-Quaternary (black).

Fault names are indicated on the map where space permits, including newly named faults. Some of the faults on the 1994 map were deleted or revised to reflect new, more detailed studies. The ages of faults on the 1994 map have been revised where improved dating methods were available. Lastly, occurrences of surface faulting caused by earthquakes since 1994 have been added.

In order to effectively catalog the information, the faults have generally retained the reference numbers originally assigned in 1994. These numbers are referenced in Appendix A and Appendix B accompanying this map and report. Each entry in these appendices includes: the name of the fault, its most recent age of activity, and the sources for fault location and recency. If the fault has been encompassed in an Official Earthquake Fault Zone, the 7.5 minute quadrangle maps prepared and issued by CGS are listed.

The 1994 version of the Fault Activity Map of California showed selected faults that exhibited Quaternary displacement in Oregon, Nevada, and Baja California. We decided to limit the data to within California's boundaries for the 2010 version of the Fault Activity Map. Consult the National Quaternary Fault and Fold Database for fault trace data for states adjacent to California (http://earthquake.usgs.gov/hazards/qfaults/). The aligned seismicity and locations of Quaternary volcanoes are not shown on the 2010 Fault Activity Map. However, the location of Quaternary volcanoes can be found on the 2010 version of the Geologic Map of California (Jennings and others, 2010).

Digital Compilation

A significant difference from the 1994 version of the Fault Activity Map of California is the method of fault compilation. Almost all of the Quaternary faults shown in the 2010 version of the Fault Activity Map have been digitally compiled from original-scale source maps (1:12,000 to 1:250,000) used for the 1975 and 1994 maps, as well as more recent mapping when available. This compilation method insures that locations of these faults are more accurate than those depicted on previous editions of the Fault Activity Map. Also, the line width for faults depicted on the 2010 Fault Activity Map has been reduced from 0.35 mm to 0.2 mm (260 m to 150 m width at a scale of 1:750,000). This was done in order to more accurately portray the location and complexity of faults showing evidence of displacement during Quaternary time. The Pre-Quaternary faults remain the same as in the 1994 version.

Base Materials

The base map for the new Fault Activity Map of California consists of a shaded relief image and a combination of cultural, political, transportation, geographic, and hydrologic features. The onshore shaded relief image was derived from 90-meter Digital Elevation Models (DEM) available from the National Elevation Data Set (http://ned.usgs.gov). The offshore bathymetric shaded relief image was derived from DEMs available from the California Department of Fish and Game (http://dfg.ca.gov/biogeodata/gis/mr_bathy.asp). The cultural, political, transportation, geographic and hydrologic features depicted in the base map were largely derived from data obtained from the Cal-Atlas Geospatial Clearinghouse (http://atlas.ca.gov).

Select geographic features throughout the state and in the offshore region were digitized from USGS 1:500,000-scale topographic maps and include a selection of peaks in the Sierra Nevada named after historic survey members. Projection of the base map layers is Teale Albers, 1983 North American Datum.

FAULTS

Introduction

The Fault Activity Map of California shows where faults have been recognized and mapped. Many of the faults are assigned numbers and are keyed to descriptions in Appendix A and Appendix B. In addition, Table 1 describes surface fault rupture associated with earthquakes that are known to have occurred in California. If a Quaternary fault has no number, it was taken from the initial *Fault Map of California* (Jennings, 1975). Refer to Bulletin 201 (Jennings, 1985) for the source on which the fault and its age were based.

As with the 1994 Fault Map of California, a conservative approach was followed for this new edition - we felt it is better to show those faults where evidence is questionable rather than to ignore them. Hence, some questionable faults may have been included as long as they are based on some reasonable data. Omission of such information may lead decision-makers for building critical structures to assume no fault hazard exists. The prudent course should be to include questionable data to suggest where future investigations are needed before any final design and construction takes place.

Although it is not possible to tell if a fault will be reactivated, we assume that if a fault has been active for millions of years and has been active in historic or recent geologic (Quaternary) time, it is very likely to become active again. This assumption is borne out by studies of historically active faults in California and elsewhere.

Fault Activity Definitions

The terms "active," "potentially active," "capable," and "inactive," have been interpreted differently by geologists, seismologists, and agencies, depending on the purpose on hand. To avoid confusion, this Fault Activity Map does not use these terms. Instead, faults are classified according to the age of latest displacement and, hence, are as factual as the geologic data upon which the fault is based. This procedure continues the practice used for the 1994 Fault Activity Map of California. Because a common understanding of terms is essential, the following excerpts from *BULLETIN 201, An Explanatory Text to Accompany the 1:750,000 Scale Fault and Geologic Maps of California* (Jennings, 1985) are restated here.

> "In defining the term "fault," geologists have no significant disagreement; the various definitions differ only in the elaboration. All agree in defining a fault as a tectonic fracture or break in the earth's crust along which displacement (horizontal, vertical, or diagonal movement) has taken place. In elaborating, some definitions further specify: (1) that the fracture or break may be either a discrete surface or a wide zone of fractures; (2) that the fault may be a result of repeated displacements which took place suddenly or very slowly as a result of creep slippage; and (3) that the cumulative displacement may be measurable from millimeters to kilometers.
>
> All definitions of "active faults" in common use imply future movement commonly constituting a geologic hazard. In recent years, specialized definitions vary according to the type of structure to be built in the vicinity of a fault and the degree of risk acceptable for a particular type of structure. The most conservative definition is that of the U.S. Nuclear Regulatory Commission (NRC). In defining fault activity for its special uses, the NRC sought to avoid the misunderstanding that might arise from its use of the term "active" by using the term "capable" in its place. A "capable fault" is defined as a fault that exhibits one or more of the following characteristics:
> (1) movement at or near the ground surface at least once within the past 35,000 years, or movement of a recurring nature within the past 500,000 years; (2) macro seismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault; (3) a structural relation to a fault deemed "capable" such that movement on one can be reasonably expected to be accompanied by movement on the other.
>
> In California, special definitions for active faults were devised to implement the Alquist-Priolo Earthquake Fault Zoning Act of 1972, which regulates development and construction in order to avoid the hazard of surface fault rupture. The State Mining and Geology Board established Policies and Criteria in accordance with the Act. They defined an "active fault" as one which has "had surface displacement within Holocene time (about the last 11,000 years). A "potentially active fault" was considered to be any fault that "showed evidence of surface displacement during Quaternary time (last 1.6 million years). Because of the large number of potentially active

Table 1. Known surface fault rupture associated with earthquakes in California.

Year	Fault (location)	Magnitude[1]	Surface Rupture Length (kilometers)	Maximum Displacement and Type of Slip[2] (centimeters)	References[3]
1812	San Andreas (Wrightwood)	7±	25+	No data	Jacoby and others, 1988
1838	San Andreas (San Francisco-Mission Santa Clara?)	7	60+	No data	Louderback, 1947 Toppozada and Borchardt, 1998 Bakun, 1999
1857	San Andreas (Parkfield-Fort Tejon to Wrightwood)	7.9	322±	RL 950	Wood, 1955 Bonilla, 1970 Agnew and Sieh, 1978 Sieh, 1978b
1861	Calaveras (Dublin)	5.3	13±	No data	Radbruch, 1968 (p. 52-53) Toppozada and others, 1981 (p. 148)
1868	Hayward (Oakland to Warm Springs)	6.8	48±	RL 90 V 30	Lawson and others, 1908 Bonilla, 1970 Toppozada and others, 1981 (p. 152)
1868	San Andreas (Dos Palmos)	No data	"long fissure"	No data	Townley and Allen, 1939 (p. 500
1872	Owens Valley[4] (Big Pine to Olancha)	7.8[4]	100+	RL 600 Some LL V 700	Hobbs, 1910 Knopf, 1918 Bonilla, 1970 Beanland and Clark, 1994
1875	Surface rupture previously reported at Clio[5]	6.0?	No data	No data	Bonilla, 1970 Toppozada and others, 1981 (p. 156)
1890	San Andreas (Chittenden)	6.3	8±	30? Lateral	Holden, 1898 (p. 150) Lawson and others, 1908 (p. 110) Toppozada and others, 1981 (p. 162)
1892	Unamed[6] (Allendale, Sacramento Valley)	6.4	1.6	No data	Toppozada and others, 1981 (p. 164)
1899	San Jacinto[7]	6.6	3.2?	No data	Daneš, 1907 Bonilla, 1970 Toppozada and others, 1981 (p. 169)
1901	San Andreas (Parkfield)	6+	"several miles"	V 30	Lawson and others, 1908 (p.40) Townley and Allen, 1939 Brown and others, 1967 (p. 10)
1906	San Andreas (Shelter Cove to San Juan Bautista)	7.8	432	RL 600 V 90	Lawson and others, 1908 Bonilla, 1970
1916	San Andreas[8] (Gorman area)	6±	No data	O data	Branner, 1917 Bonilla, 1959 (p. 134)
1922	San Andreas (Cholame area)	6.5	0.4?	No data	Townley and Allen, 1939 Richter, 1958 (p. 533)
1934	San Andreas (Parkfield area)	6.3	3	No data	Byerly and Wilson, 1935 (p. 233) Richter, 1958 (p. 534)
1940	Imperial (Calif.-Mex.)	6.9	64+	RL 580 V 120	Ulrich, 1941 Bonilla, 1970 Hileman and others, 1973
1947	Manix (Mojave Desert)	6.2	1.6	LL 7.6	Richter, 1958 Bonilla, 1970 Hileman and others, 1973
1950	Fort Sage (Honey Lake Valley)	5.6	8.9	V 20	Gianella, 1957 Bonilla, 1970
1951	Superstition Hills	5.6	3.2±	RL slight	Allen and others, 1965 Bonilla, 1970

Table 1 - continued

Year	Fault (location)	Magnitude[1]	Surface Rupture Length (kilometers)	Maximum Displacement and Type of Slip[2] (centimeters)	References[3]
1952	White Wolf (Arvin-Tehachapi)	7.4 and 6.4	57	LL 76 V 122	Buwalda and St. Amand, 1955 Bonilla, 1970 Hileman and others, 1973
1966	Imperial	3.6	9.7	RL 1.5	Brune and Allen, 1967b Bonilla, 1970
1966	San Andreas (Parkfield)	6.4	37	RL 17.8 [9] V 5 [9]	Brown and others, 1967 Bonilla, 1970
1966	Unnamed (Truckee)[10]	5.9	16.1	No data	Carter, 1966 Kachadoorian and others, 1967
1968	Unnamed (La Habra)[11]	?	0.32	LL 5 V 2.5±	Yerkes, 1972 (p. 31) Lamar, 1972
1968	Coyote Creek (Borrego Mountain)	6.6	31	RL 38+	Allen and others, 1968 Hileman and others, 1973 Clark, 1972a
1971	San Fernando	6.6	15.3	LL 100 V 100	U.S. Geological Survey, 1971 (p.55) Hileman and others, 1973 Allen and others, 1975 (p. 275)
1975	Galway Lake	5.2	6.8	RL 1.5	Hill and Beeby, 1977 Bryant and Hart, 2007
1975	Cleveland Hill (Oroville Dam area)	5.7	5.7	RL 4 V 5	Hart and Rapp, 1975
1975	Brawley	4.7	10.4	V20	Sharp, 1976 Bryant and Hart, 2007
1978	Stephens Pass (E. of Mt. Shasta)	4.6	2+	V 30	Bennett and others, 1979 Bryant and Hart, 2007
1979	Homestead Valley	5.2	3.25	RL 10 V 4	Hill and others, 1980
1979	Johnson Valley	5.2	1.45	RL 1 V 1	Hill and others, 1980
1979	Calaveras (Coyote Lake area)	5.8	39?	RL 0.5	Urhammer, 1980 Lee and others, 1979 Armstrong, 1979
1979	Imperial Brawley Rico (Imperial County)	6.6	30 13 1	RL 55 V 15 V10	U.S. Geological Survey, 1982
1980	Greenville (Livermore Valley area)	5.8	6.5	RL 3	Hart, 1981b
1980	Hilton Creek (Mammoth Lakes area)	6.0 - 6.5	20	V 30	Taylor and Bryant, 1980 Bryant and Hart, 2007
1981	"Lompoc Quarry"[12]	2.5	0.6	V 25	U.S. Geological Survey, 1984
1982	Little Lake	5.2	10	RL slight V slight	Roquremore and Zellmer, 1983 Bryant and Hart, 2007
1983	"Coalinga Nose"	6.7	0.005	V 5	Rymer and Ellsworth, 1990 Bryant and Hart, 2007
1983	Nunez (Coaling area)	5.2-5.9	3.3	V 60	Rymer and Ellsworth, 1990 Hart and McJunkin, 1983
1984	Calaveras (Morgan Hill area)[13]	6.1	1.2	RL 20?	Hart, 1984c
1986	Banning	6.1	9	RL 7	Sharp and others, 1986b
1986	White Mountains (Chalfant Valley area)	6.2	13	RL 11	Kahle and others, 1986 Lienkaemper and others, 1987

Table 1 - continued

Year	Fault (location)	Magnitude[1]	Surface Rupture Length (kilometers)	Maximum Displacement and Type of Slip[2] (centimeters)	References[3]
1987	Elmore Ranch	6.2	12	LL 12	Hanks and Allen, 1989 Kahle and others, 1988
1987	Superstition Hills	6.6	28	RL 80	Hanks and Allen, 1989 Kahle and others, 1988
1989	San Andreas (Loma Prieta area)	6.9	1[14]	RL 2.5	U.S. Geological Survey, 1989
1992	Parts of Johnson Valley, Homestead Valley, Emerson, Camp Rock, Eureka Peak, Burnt Mountain (Landers)	7.3	85	RL 460-600	Hart and others, 1993 Bryant, 1993b, 1994, 2004 Treiman, 1992
1994	Various ground deformations, but not on causative fault. Earthquake hypocenter on blind fault (Northridge)	6.7	-	-	Rymer and others, 2001
1995	Airport Lake Kern and Inyo counties)	5.4-5.8	2.5	1	Treiman, 1995
1999	Lavic Lake, Bullion, Mesquite Lake (Hector Mine area)	7.1	45	RL 525	Treiman and others, 2002
2004	San Andreas (Parkfield)	6.0	32	RL 15[15] V 3[15]	Rymer and others, 2006

[1] Earthquake magnitudes greater than 6 prior to 1985 are mostly from Toppozada and others, 1986. Magnitudes listed after 1985 are either surface wave magnitude (Ms) or moment magnitude (Mw). The scale is logarithmic so that M8 is 10 times that of M7 and 100 times that of M6. In energy terms a M8 earthquake radiates 30 times that of M7 and 900 times the energy of M6.

[2] RL=right lateral, LL=left lateral; V=vertical.

[3] Complete references listed in Appendix C.

[4] Four large earthquakes: M8 and 6.5, and a few days later M6.1 and 6.6 (Toppozada and others, 1986).

[5] The 1875 earthquake was thought to have occurred in Mohawk Valley as shown on the Fault Map of California, 1975. Turner (1897), 22 years after the event, thought he could locate ground ruptures for this event described by local residents near Clio. New data and isoseismal maps (Toppozada and others, 1981) indicate the earthquake was centered to the east, probably on the Honey Lake Fault.

[6] Two early newspaper accounts (Toppozada and others, 1981) describe a fissure about 1.6 Kilometers (1 Mile) long near Allendale, 8 kilometers (5 miles) west of Dixon (not plotted on Fault Activity Map of California for lack of data).

[7] Questionable fault rupture — may have been landslides (Allen and others, 1965; Sharp, 1972). Not plotted on Fault Activity Map of California.

[8] Questionable fault rupture — cracking may have been caused by shaking only.

[9] Includes tectonic creep that occurred within 50 days following main shock.

[10] Surface fault rupture not conclusive.

[11] Some uncertainty regarding earthquake associated with 1968 ground rupture near La Habra (Yerkes, 1972); probably related to oil and brine withdrawal.

[12] Lompoc quarry "fault" triggered by unloading of mined-out diatomite.

[13] Questionable faulting (may be landsliding).

[14] Surface rupture possibly triggered slip.

[15] Includes tectonic creep that accumulated for several months following main shock.

faults in California, the State Geologist adopted additional definitions and criteria in an effort to limit zoning to only those faults with a relatively "high" potential for surface rupture. Thus, the term "sufficiently active" was defined as a fault for which there was evidence of Holocene surface displacement. This term was used in conjunction with the term "well-defined," which relates to the ability to locate a Holocene fault as a surface or near-surface feature (Bryant and Hart, 2007).

Another special definition is used by the U.S. Bureau of Reclamation in the design of dams. According to this agency, any fault exhibiting relative displacement within the past 100,000 years is an active fault.

Table 2 is a summary of the fault definitions in common use and the factors on which they are based. Each of these definitions is concerned with future fault activity and this is based on the recent history of the fault. Depending on the type of structure being planned and the acceptable risk to be taken, the definition of an active fault may be based on the last 11,000 to 100,000 years or on repeated movements during the past 500,000 years.

Of recent concern is the possibility that faults, even geologically ancient ones (that is, pre-Quaternary), can be reactivated by the influences of man. For example, there are now several authenticated cases showing that the filling of a reservoir can induce fault activity and earthquakes of significant size. In this way, what may have been considered "inactive faults" can become "active faults."

The term "active fault" is best avoided altogether when seismic risk is not a consideration. For simply describing the characteristics of faults, such terms as "historic

Table 2. Comparison of various commonly used fault definitions.

	Design Structure	Fault Term	Time of Last Displacement on Fault	Other Criteria
NRC (U.S. Nuclear Regulatory Comm.), 1978	Nuclear power plants	Capable	1) at least once within past 35,000 yrs. or 2) two or more times within past 500,000 yrs.	1) Macroseismicity relatable to specific fault. 2) Structural relationship to a capable fault such that movement on one can cause movement on another.
California Geological Survey (Bryant and Hart, 2007)	Structures for human occupancy	Active	Within Holocene (11,000 yrs.).	
		Potentially Active	During Quaternary (last 1.6 million years)	
USBR (U.S. Bureau Reclamation), 1976	Dams	Active	Within past 100,000 yrs	
Grading Codes Board (Assoc. Eng. Geol.), 1973	Not specified	Active	Historic	a) Ground water barrier or anomaly within Holocene deposits. b) Related earthquake epicenters
		Potentially Active	No Historic evidence but strong evidence of geologically recent activity	
		High Potential	Holocene	
		Low Potential	Pleistocene (less than 1 Myrs)	
Louderback, 1950	Not specified	Active	Historic or Recent	Related earthquake epicenters.

> fault," "Holocene fault," "Quaternary fault, "pre-Quaternary fault," or "seismically active fault" are preferable. With these designations, a project geologist, after confirming the designation of a fault, can then go on and make an independent determination of its activity relative to the type of structure to be built and the acceptable risk."

Fault Age

The fault map depicts what is known about the recency of displacement along faults. However, future studies may find additional faults, require replotting of faults, or, in some cases, change the age classification shown here. The age classifications are based on geologic evidence to determine the youngest faulted unit and the oldest unfaulted unit along each fault or fault section. If Quaternary displacement is indicated, the fault is classified into one of three categories within Quaternary time (Holocene, late Quaternary, or Quaternary undifferentiated). Faults with reported surface rupture during historic time are further classified as historically active.

The reliability of the age classifications on this map is dependent upon several factors. First, and perhaps foremost, fault-related geomorphic features may have been destroyed by natural or human activities. Geomorphic features, such as scarps, troughs, offset drainage channels, triangular faceted spurs and sag ponds, are geologically temporary. They may be easily destroyed by erosion or covered by vegetation and their preservation is strongly affected by climate. Likewise, fault features may be modified or destroyed by works of humans, especially in urban areas. Second, geologists may have different interpretations of faults after examining incomplete geologic evidence for recency of faulting. Third, the ages of the rock units used to classify the faults may not be accurately known, or in some cases, Quaternary rocks may be absent. Fourth, some of the data used to classify faults on this map were based on studies not done directly to determine the recency of fault activity.

The color code on the Fault Activity Map of California reflects the *latest* age at which fault rupture has occurred and not the age the fault originated. Thus, a fault showing Holocene or Quaternary displacement may have originated several million years before and may have had several previous displacements.

The age of some faults listed in Appendix A, referenced by Clark and others (1984), is given in years. These are generally minimum and maximum ages of offset features. These features include a wide range of geologic, biologic and cultural features that allow fault displacements to be measured or estimated and dated. Among the dating methods used were: radiometric dating of volcanic rocks; soil profile development; soil or geomorphology correlations; historic records; dendrochronology (tree rings); amino acid and uranium series on mollusks; carbon 14 on charcoal and organic sediments; paleontology; and sea-level curves.

Blind Thrust Faults

Blind thrust faults typically are low angle structures in areas of active folding, such as the Transverse Ranges of southern California. The upper extent of the fault plane may terminate several kilometers below the ground surface and the surface expression is often delineated by young anticlines. These faults can be seismogenic (Stein and Yeats, 1989) and have produced strong earthquakes in California, such as the 1983 Mw 6.4 Coalinga and 1994 Mw 6.7 Northridge earthquakes. Although significant work has been done on identifying blind thrust faults and associated folds, especially in the southern California area (Plesch and others, 2007), we have decided to continue the practice of showing faults that displace the surface, as well as near surface concealed faults, on the 2010 Fault Activity Map of California. The National Seismic Hazard Maps incorporate blind thrust fault models in California, specifically in the southern Transverse Ranges/northern Peninsula Ranges boundary, Santa Barbara Channel, and along the western margin of the Great Valley (WGCEP, 2008). Consult this reference for information on location and characterization of blind thrust faults.

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APPENDIX A

CLASSIFIED FAULTS

(For complete references see Appendix C)
Note: The names following the abbreviation EFZ (Earthquake Fault Zone) are the quadrangles issued by the State showing the boundaries of officially zoned faults.

1
MAHOGANY MOUNTAIN FAULT ZONE
Holocene; Quaternary
 Bryant, W A, 1990a
 Hart and others, 1991
 EFZ: Dorris, Red Rock Lakes

2
IKES MOUNTAIN FAULT AND UNNAMED FAULTS OF BUTTE VALLEY
Late Quaternary; Quaternary
 Williams, H., 1949 (p. 54, Plate 1)
 Wood, P. R., 1960
 Bryant, WA, 1990a
 Hart and others, 1991

2A
MEISS LAKE FAULT
Late Quaternary; Holocene
 Bryant, W A, 1990a
 Hart and others, 1991

3
MOUNT HEBRON FAULT ZONE
Late Quaternary?
 Bryant, W.A., 1990a
 Wood, P.R., 1960

4
CEDAR MOUNTAIN FAULT ZONE
Late Quaternary; Holocene
 Bryant, W.A., 1990a
 Hart and others, 1991
 EFZ: Sams Neck, Dorris, Macdoel, Sheep Mtn., Bray, Sharp Mtn., Tennant, Garner Mtn.

5
GILLEM FAULT
Late Quaternary; Quaternary
 Donnelly-Nolan and Champion, 1987
 Donnelly-Nolan, J.M., 1989
 Bryant, W.A., 1990e
 Hart and others, 1991

6
BIG CRACK FAULT
Late Quaternary
 Donnelly-Nolan and Champion, 1987
 Donnelly-Nolan, J.M., 1989
 Bryant, W.A., 1990e
 Hart and others, 1991

7
SURPRISE VALLEY FAULT
Holocene; Late Quaternary
 Clark and others, 1984 (5,600-13,000 yrs.)
 Bryant, W.A., 1990b
 Hart and others, 1991
 Hedel, C.W., 1984
 EFZ: Fort Bidwell, Lake City, Cedarville, Warren Peak, Eagle Peak, Eagleville, Snake Lake

7A
GOOSE LAKE FAULT
Late Quaternary
 Bryant, W.A., 1990d
 Hart and others, 1991
 Lydon, P.A., 1969

7B
DAVIS CREEK FAULT
Late Quaternary
 CDWR, 1963
 Lydon, P.A., 1969
 Bryant, W.A., 1990d
 Hart and others, 1991

7C
FITZHUGH CREEK FAULT
Quaternary
CDWR, 1963
 Bryant, W.A., 1990d
 Hart and others, 1991

7D
JESS VALLEY FAULT
Quaternary
 CDWR, 1963
 Bryant, W.A., 1990d
 Hart and others, 1991

8
UNNAMED FAULT
Late Quaternary
 Donnelly-Nolan, J.M., 1989
 Muffler and others, 1989 (p. 200)

9
UNNAMED FAULTS
Holocene
 Donnelly-Nolan, J.M., 1989

10
UNNAMED FAULTS
Quaternary
 Bryant, W.A., 1990a
 Hart and others, 1991

11
EAST CEDAR MOUNTAIN FAULT ZONE (SOUTHERN PART)
Holocene
 Bryant, W.A., 1990a
 Donnelly-Nolan, J.M., 1989
 Hart and others, 1991
 EFZ: Bray, Sharp Mountain, Tennant

12
YELLOW BUTTE FAULT
Quaternary
 Mack, S., 1960
 Williams, H., 1949 (p. 53)

383
SQUAW PEAK FAULT
Pre-Quaternary
    Matti and others, 1985
    Meisling and Weldon, 1989 (age p. 117)

384
SAN GABRIEL FAULT (EASTERN PART)
Quaternary
    Bortugno, E.J., 1986
    Dibblee, T.W., Jr., 1998, 2002a, 2002b, 2002c, 2002d, 2002e
    Morton and others, 1991
    Morton and Matti, 2001a
    Morton and Miller, 2003
    Weber, F.H., Jr., 1982

385
CLAMSHELL-SAWPIT CANYON FAULT ZONE
Late Quaternary
    Bortugno, E.J., 1986
    Crook and others, 1987 (p. 49 and Plate 2.3)
    Dibblee, T.W., Jr., 1998, 2002d
    Morton, D.M., 1973 (p. 17-18)
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 57)

386
EAGLE ROCK FAULT
SAN RAFAEL FAULT
Late Quaternary?
    Lamar, D.L., 1970 (p. 39)
    Weber, F.H., Jr., 1980 (p. A-3, A-4)
    Yerkes and Campbell, 2005
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 56)

387
VERDUGO FAULT
Holocene; Late Quaternary
    Weber and others, 1980 (p. A-2, A-3, A-4)
    Yerkes and Campbell, 2005
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 56)

388
POSSIBLE FAULT IN NORTH HOLLYWOOD
Holocene?
    Weber, F.H., Jr., 1980 (p. B-99)
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 56)

389
MALIBU COAST FAULT
Late Quaternary; Holocene
    Campbell and others, 1996
    Clark and others, 1984 (185,000-200,000 yrs)
    Fall and others, 1987 (Holocene faulting at Malibu Point)
    Leighton and Associates, 1989
    Treiman, J.A., 1994a, 2007
    Yerkes and Campbell, 2005
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 56)

390
MALIBU COAST FAULT (OFFSHORE)
Late Quaternary
    Fisher and others, 2005
    Treiman, J.A., 1994a
    Vedder and others, 1986b

391
SANTA MONICA FAULT
Holocene; Late Quaternary
    Clark and others, 1984 (122,000-126,000 yrs)
    Dolan and others, 2000
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 57)

392
HOLLYWOOD FAULT
Holocene
    Clark and others, 1984 (4,000-6,000 yrs)
    Dolan and others, 1997
    Weber and others, 1980 (p. A-3 and Plate 1)
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 57)

393
FAULT WEST OF MONTEREY PARK
Late Quaternary?
    Ziony and Jones, 1989

394
RAYMOND FAULT
Holocene
    Crook and others, 1987 (p. 58)
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 57)
    Treiman, J.A., 1991b
    Hart and others, 1991
    EFZ: Los Angeles, El Monte, Mt. Wilson

395
DUARTE FAULT
Late Quaternary; possibly Holocene along northern strand near Azusa
    Bortugno, E.J., 1986
    Crook and others, 1987 (p. 50, 52)
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 57)

396
SAN JOSE FAULT
Late Quaternary
    Bortugno, E.J., 1986
    Morton and Miller, 2003
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 58)

397
INDIAN HILL FAULT
Late Quaternary
    Bortugno, E.J., 1986
    Morton and Miller, 2003
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 57)

398
RED HILL-ETIWANDA AVENUE FAULT
Late Quaternary except Holocene at eastern end
    Hart and others, 1978
    Bortugno, E.J., 1986
    Burnett and Hart, 1994
    Morton and Miller, 2003
    Ziony and Jones, 1989
    Ziony and Yerkes, 1985 (p. 58)
    EFZ: Cucamonga Peak

399
CUCAMONGA FAULT
Holocene
    Bortugno, E.J., 1986
    Burnett and Hart, 1994
    Morton and Matti, 1987 (p. 179)
    Morton and Miller, 2003
    Ziony and Jones, 1989
    EFZ: Devore, Cucamonga Peak, Mt. Baldy

APPENDIX C

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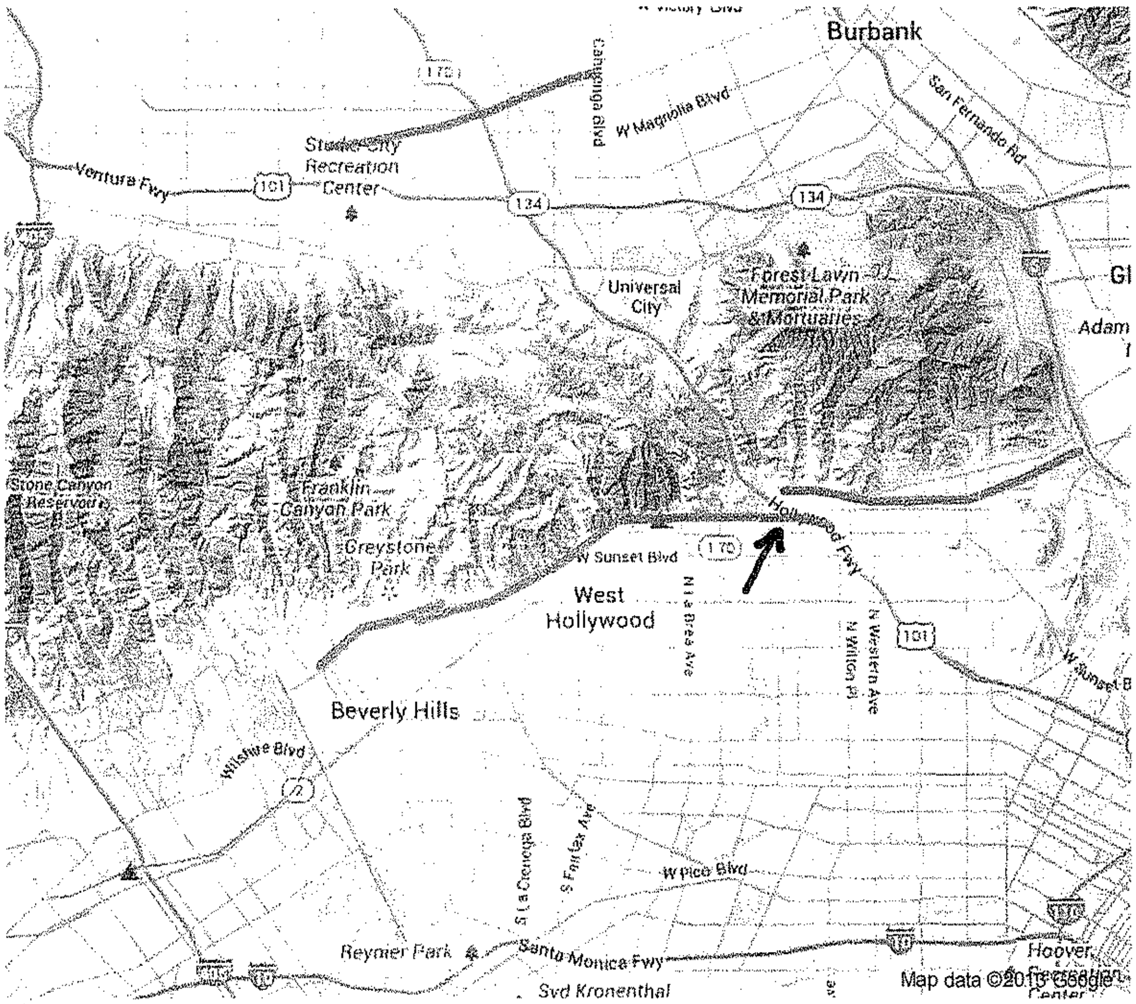
Geologic Hazards Science Center

EHP Quaternary Faults

Search for fault: Hollywood Select a state or region map: Alaska Submit

Submit Clear Selected Features



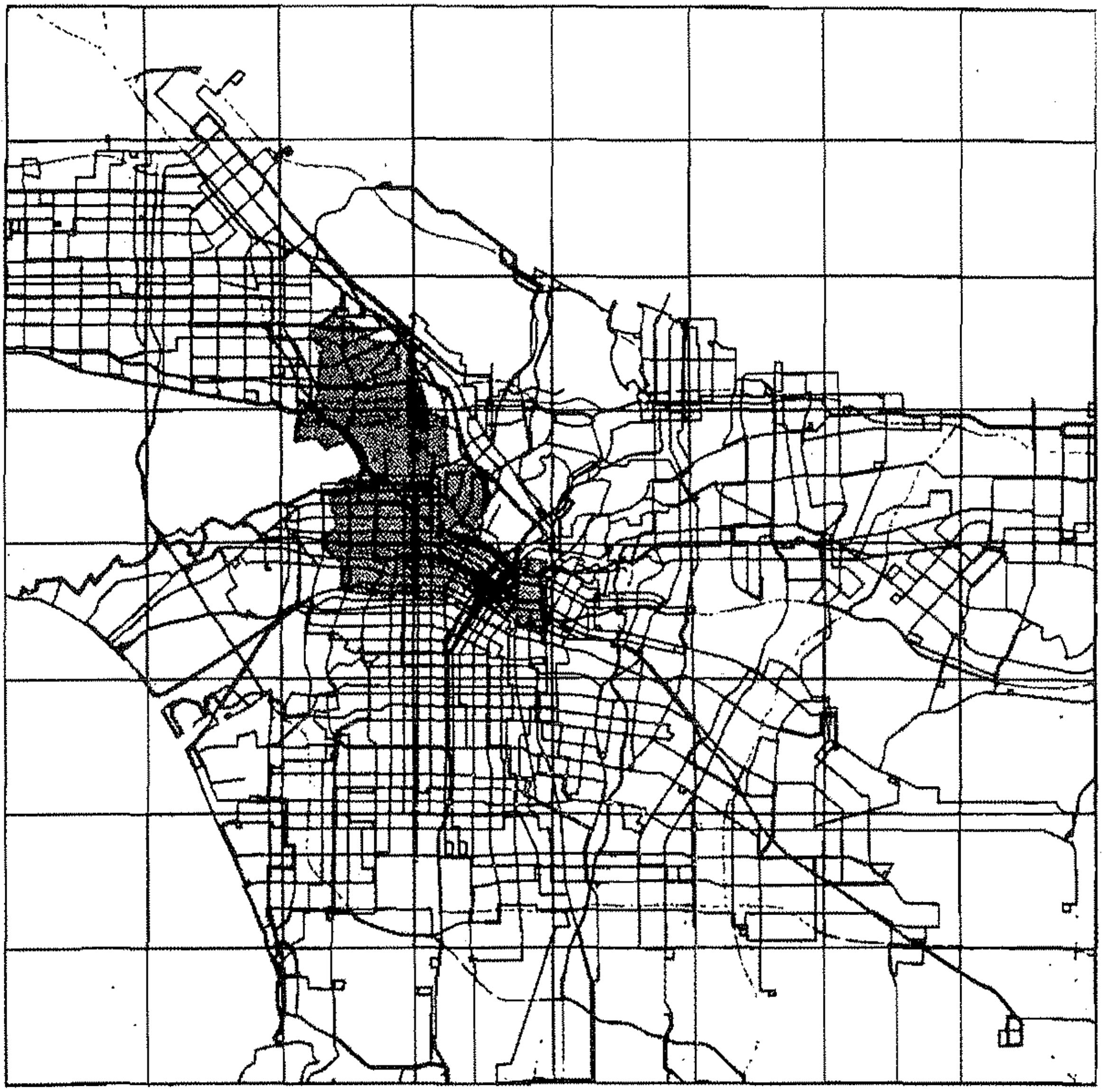
SHARE

References to non-U.S. Department of the Interior (DOI) products do not constitute an endorsement by the DOI. By viewing the Google Maps API on this w the user agrees to these Terms of Service set forth by Google.

U.S. Geological Survey Map of Hollywood Fault shows fault running through or immediately adjacent to Millennium site— not .4 miles away (South of Franklin along Yucca.)

FINAL

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT /
SUBSEQUENT ENVIRONMENTAL IMPACT REPORT



Los Angeles
Rail Rapid Transit Project
Metro Rail

U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

JULY, 1989

The locations of known faults are shown on Figure 3-10. Eleven faults, one syncline and one anticline have been identified in the study area. They are:

- Santa Monica Fault
- Sixth Street Fault
- San Vicente Fault
- Los Cienega Fault
- Third Street Fault
- MacArthur Park Fault
- Hollywood Fault
- Four unnamed faults
- Hollywood Syncline
- Los Angeles Anticline

Only two of the above faults are considered active or potentially active. "Active" faults are those that are believed to have moved within the last 10,000 years. "Potentially active" faults are believed to have moved between 10,000 and 2 million years ago. The Hollywood fault is considered active, and the Santa Monica fault is considered potentially active. Geologists estimate that the probability of a Richter magnitude seven earthquake associated with these faults in the next 100 years is five percent. Metro Rail has been designed to a limiting peak horizontal acceleration of 0.70g from a maximum credible earthquake of magnitude 7.0 on the Richter Scale related to the Santa Monica Fault.

The New LPA Mid-Wilshire Segment intersects the MacArthur Park Fault and another unnamed fault between Alvarado Street and Vermont Avenue. The North Segment (along Vermont) of the New LPA intersects the Los Angeles Anticline near Beverly Boulevard.

The Hollywood Boulevard segment of the New LPA intersects the Santa Monica Fault just west of Normandie Avenue. The Valley segment intersects the Hollywood Syncline and the Hollywood Fault.

Oil field locations also are shown on Figure 3-10. Eight known oil fields have been identified in the study area. They are:

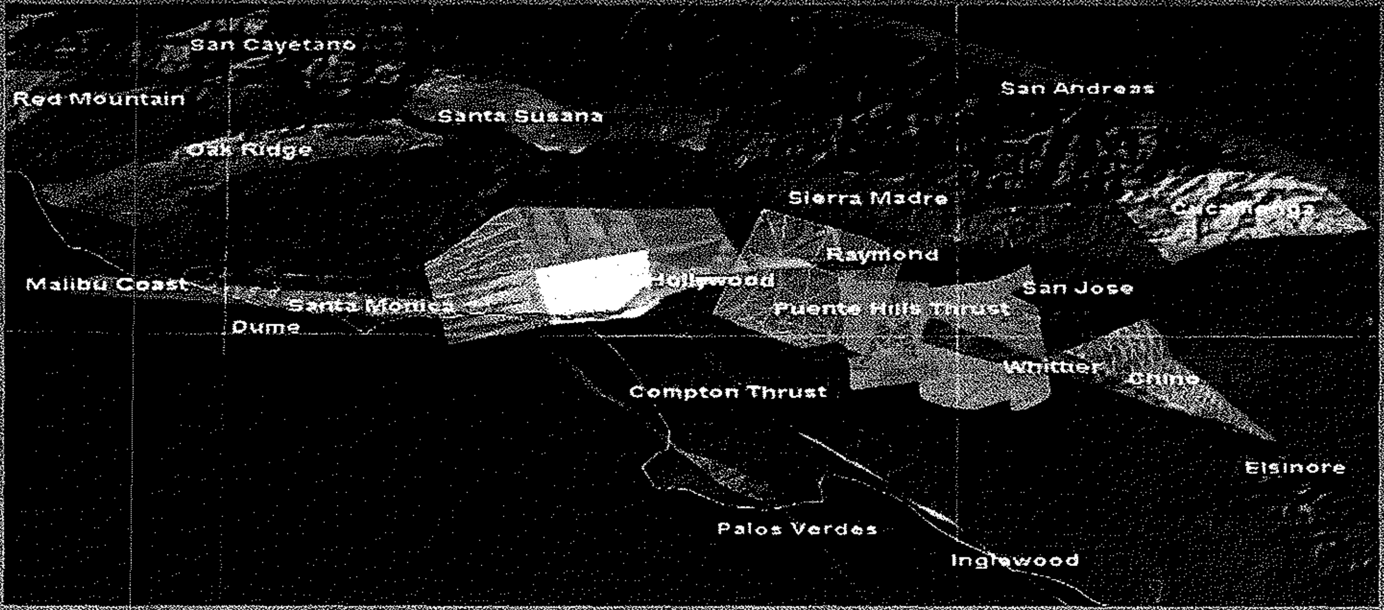
- Los Angeles City Oil Field
- Western Avenue Oil Field
- Las Cienegas Oil Field (encompassing the Murphy, Fourth Avenue, Good Shepherd, and Pacific Electric Areas)
- Beverly Hills Oil Field
- South Salt Lake Oil Field
- Salt Lake Oil Field
- San Vicente Oil Field
- Sherman Oil Field

The Mid-Wilshire Segment and the North (Vermont Avenue) Segment of the New LPA cross over or near the Los Angeles City Oil Field in the area of Wilshire Boulevard and up Vermont Avenue nearly to Beverly Boulevard. This field is estimated to be at a depth of 375 feet. This is the only oil field in the path of the New LPA.

Faults of Los Angeles

Bryce Walters, Kelsey Brunner, JaKayla Walker,
Hannah Potter, Elena Soto, Samuel Lauda

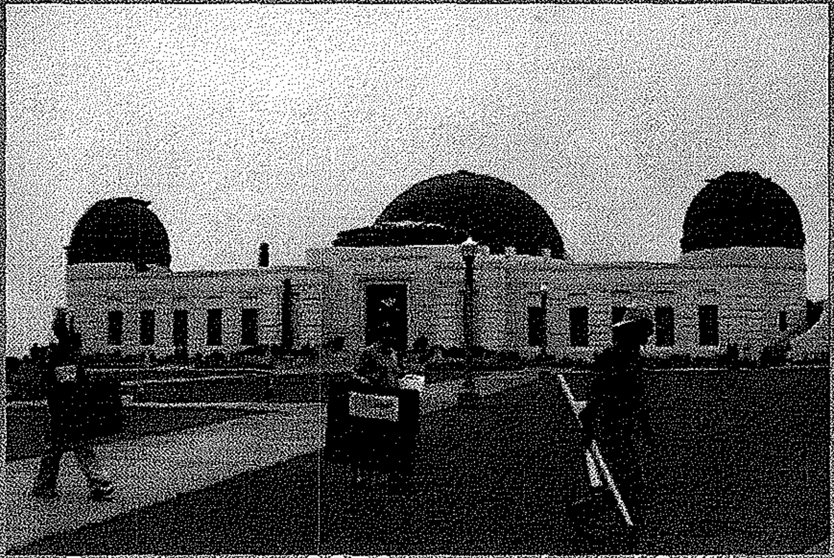
Introduction



A SCEC VDO illustration of the faults of Los Angeles.

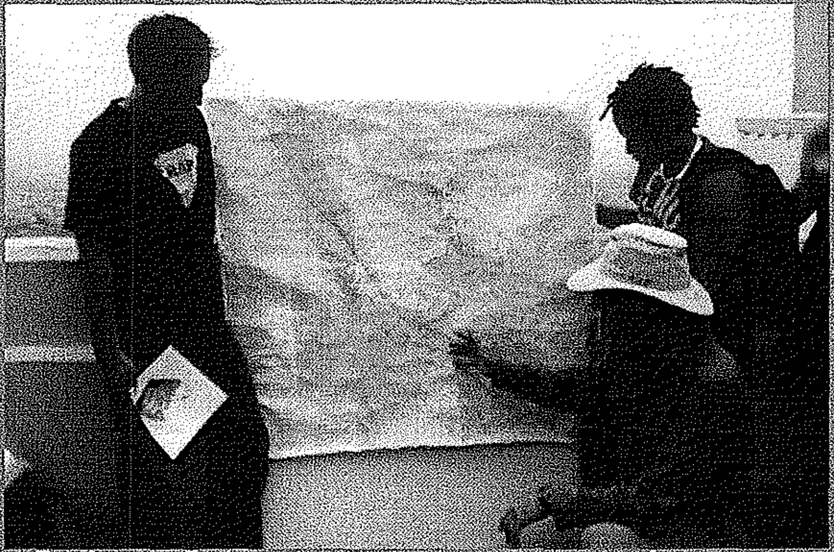
Google Earth map showing the stops of our field trip.

Griffith Observatory



Professor Dolan leads the SCEC interns infront of Griffith Observatory, followed by Michael Ihrig and Elena Soto.

View of LA skyline as seen from Griffith Observatory.



Professor Dolan shows the interns a map for Southern California, while interns Jakayla Walker and Brian Anderson hold the map.

The Hollywood Sign sits atop the Hollywood Hills that were created by the Santa Monica Fault.

Hollywood Blvd. & Vine St.

Capital Records building located by Hollywood Blvd. that often gets destroyed in earthquake movies.

View down Vine St. showing the scarp of the Hollywood Fault.

SCEC interns stand at the intersection of Hollywood and Vine as they listen to their guide, Professor James Dolan. (Photo: Kaitlin Welch)

City of Los Angeles
Department of City Planning • Environmental Analysis Section
City Hall • 200 N. Spring Street, Room 750 • Los Angeles, CA 90012

DRAFT ENVIRONMENTAL IMPACT REPORT

HOLLYWOOD COMMUNITY PLAN AREA

Volume 1 of 2

Sections I to IV.J.5

Millennium Hollywood Project

Case Number: ENV-2011-675-EIR
State Clearinghouse Number: 2011041094

Project Location: 1720, 1722, 1724, 1730, 1740, 1745, 1749, 1750, 1751, 1753, 1760, 1762, 1764, 1766, 1768, 1770 N. Vine Street; 6236, 6270, 6334 W. Yucca Street; 1733, 1741 N. Argyle Avenue; 1746, 1748, 1754, 1760, 1764 N. Ivar Avenue, Los Angeles, California, 90028
Council District: 13

Project Description: The proposed project includes the construction of approximately 1,052,667 net square feet of new developed floor area. The historic Capitol Records Building and the Gogerty Building are within the Project Site. These historic structures would be preserved and maintained and are operating as office and music recording facilities under long term lease. Including the existing approximately 114,303 square-foot Capitol Records Complex, the Project would include a maximum of approximately 1,166,970 net square feet of floor area resulting in a 6:1 Floor Area Ratio averaged across the Project Site. The Project would also demolish and/or remove the existing approximately 1,800 square foot rental car facility.

The Project would develop a mix of land uses, including some combination of residential dwelling units, luxury hotel rooms, office and associated uses, restaurant space, health and fitness club uses, and retail uses.

APPLICANT:	PREPARED BY:	ON BEHALF OF:
Millennium Hollywood LLC	CAJA Environmental Services	The City of Los Angeles Department of City Planning Environmental Analysis Section

OCTOBER 2012

Environmental Impact	Mitigation Measures	Most Impactful Development Scenario	Level of Significance After Mitigation
	remains.		
D. GEOLOGY AND SOILS			
The overall determination of significance is based on the Concept Plan's mix of land uses and densities. The Project Site is not located in an area delineated on the Alquist-Priolo Earthquake Fault Zoning Map. Likewise, the Project Site is not located within a fault rupture zone. The California Geological Survey (CGS) and the City of Los Angeles ZIMAS system (http://zimas.lacity.org/map.asp) show the closest fault to the Project Site with the potential for fault rupture as the Santa Monica/Hollywood Fault. It is located approximately 0.4 miles from the Project Site. In addition, data published by the CDMG (2002) indicates that the Puente Hills and the Elysian Hills blind thrust faults are present more than one mile beneath the Site. Therefore, surface rupture at the Project Site from these faults is considered to be unlikely and less than significant The risk for ground failure based on liquefaction at the Project Site is low. Groundwater levels at the Project Site are relatively deep and therefore less susceptible to liquefaction. Based on the City of Los Angeles Safety Element "Areas Susceptible to Liquefaction" map the Project Site is located within an area mapped as "Liquefiable Area". However, the California Geological	Potential impacts related to geotechnical hazards would be mitigated to an insignificant level through compliance with applicable codes, standards and ordinances, as well as by implementation of the recommendations contained in the Project's geotechnical engineering report. The recommendations in the preliminary geotechnical report include the following: **D-1** The design and construction of the Project shall conform to the Uniform Building Code seismic standards as approved by the Department of Building and Safety. **D-2** Prior to the issuance of building or grading permits, the Project Applicant shall submit a final geotechnical report prepared by a registered civil engineer or certified engineering geologist to the written satisfaction of the Department of Building and Safety. The final geotechnical report shall ensure adequate geotechnical support for the proposed structures given the existing geologic conditions on the Project Site. The final geotechnical report shall make final design-level recommendations regarding liquefaction, expansive soils, soil strength loss, estimation of settlement, lateral movement and reduction in foundation soil-bearing capacity, as well as carry forward the applicable recommendations contained in the preliminary geotechnical report The final geotechnical report shall	Concept Plan	Less than significant

seismically active region of California, within the zone of influence of several active and potentially active fault systems. The Project Site is subject to moderate to intense earthquake-induced ground shaking as a result of periodic movement along nearby faults.

Fault Rupture

The Project Site is not located within a designated Alquist-Priolo Earthquake Fault Zone. A portion of the East Site is adjacent to the boundary of a fault rupture study zone included in the Safety Element of the City of Los Angeles General Plan published in 1996 (Safety Element). The California Geologic Survey (CGS) and the City of Los Angeles ZIMAS system show the closest fault to the Project Site with the potential for fault rupture as the Santa Monica/Hollywood Fault. It is located approximately 0.4 miles from the Project Site. Also, data published in the CDMH (2002) indicates that the Puente Hills and Elysian Hills blind thrust faults are present more than one mile beneath the Project Site.

Ground Shaking

Ground shaking is generated during an earthquake as a result of movement along a fault. In general, ground shaking is greatest near the epicenter, increases with increasing magnitude, and decreases with increasing distance. However, ground shaking measured at a given site is influenced by a number of criteria, including depth of the epicenter, proximity to the projected or actual fault rupture, fault mechanism, duration of shaking, local geologic structure, source direction of the earthquake, underlying earth material, and topography.

Earthquake magnitude is a quantitative measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic or geologic observations. Earthquake intensity is a qualitative measure of the effects a given earthquake has on people, structures, or objects. Earthquake magnitude is measured on the Richter scale or as moment magnitude, and intensity is described by the Modified Mercalli intensity scale. A related form of measurement is peak ground acceleration, which is a measure of ground shaking during an earthquake. Peak ground acceleration values are reported in units of gravity (g).

Based on existing Project Site conditions, the following seismic design parameters apply to the Project Site:

- Maximum Considered Earthquake (MCE) S_S and S_1 of 1.785g and 0.600g, respectively.
- Site Class D.
- Site Coefficient F_A and F_V of 1.0 and 1.5.
- MCE spectral response acceleration parameters at short periods. S_{MS} and at one-second period. S_{M1} of 1.785g and 0.900g, respectively.

Development Agreement. The Concept Plan, Residential Scenario, and Commercial Scenario are studied in this Draft EIR as representative development scenarios to establish the maximum environmental impacts per each environmental category required to be studied under CEQA. The maximum environmental impacts identified in connection with the Concept Plan, the Commercial Scenario, or the Residential Scenario also form the basis of the Equivalency Program.

The maximum environmental impacts identified in each impact area across all three scenarios also form the basis of the Equivalency Program. These maximum impacts per environmental issue area are derived from the analysis of the Concept Plan, the Commercial Scenario, and the Residential Scenario. The most intense impacts from each scenario represent the greatest environmental impacts permitted for any development scenario for the Project. The Project may not exceed any of the maximum impacts identified for each issue area from the Concept Plan, the Residential Scenario, or the Commercial Scenario. The maximum impact per environmental issue area is shown in Table I-1, in the Executive Summary of this Draft EIR.

For geology and soils, this Draft EIR analyzes only the Concept Plan because any development on the Project Site (regardless of land uses, densities, or heights) will encounter the same geologic conditions within the footprint of the development envelope.

Impacts under Concept Plan

The Project would not expose people or structures to potential substantial adverse effect, including the risk of loss, injury or death involving earthquake fault rupture, seismic ground shaking, ground failure or landsides that could result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. *(CEQA Checklist Question a (i-iv) and L.A. CEQA Thresholds Issue 1)*

The Project Site is not located in an area delineated on the Alquist-Priolo Earthquake Fault Zoning Map. Likewise, as discussed above, the Project Site is not located within a fault rupture zone. The Safety Element of the City of Los Angeles General Plan, published in 1996, indicates that a portion of the East Site is adjacent to, but not within, the boundary of a fault rupture study zone. Figure 4 in the Geotechnical Report illustrates the proximity of the Project Site to the fault rupture study zone.

Also, the California Geological Survey (CGS) and the City of Los Angeles ZIMAS system (http://zimas.lacity.org/map.asp) show the closest fault to the Project Site with the potential for fault rupture as the Santa Monica/Hollywood Fault. It is located approximately 0.4 miles from the Project Site. In addition, data published by the CDMG (2002) indicates that the Puente Hills and the Elysian Hills blind thrust faults are present more than one mile beneath the Project Site. Based on the facts that the Project Site is not within a mapped fault rupture study zone, there are no identified surface faults with rupture potential on the Project Site, and the identified blind thrust faults are deep beneath the surface, the potential for surface rupture at the Project Site is considered unlikely and less than significant.

Similar to all properties in the region, the Project Site is susceptible to ground motion and shaking as a result of potential movement along faults in the region. These geologic hazards are common and ubiquitous throughout Southern California. The Project would be designed and constructed in

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

[illegible]

10 May 2012

Mr. Steven C. Hood
Millennium Hollywood, LLC
1680 North Vine Street, Suite 1000
Los Angeles, CA 90028

Re: Preliminary Geotechnical Engineering Study for EIR
Millennium Hollywood Development
Hollywood, Los Angeles, California
Langan Project No.: 700019501

Dear Steven:

Langan Engineering & Environmental Services is pleased to submit our Preliminary Geotechnical Engineering Study for the Millennium Hollywood Development. We have prepared this report to assist in preparation of the Draft Environmental Impact Report for this project.

We appreciate the opportunity to continue working with you on this project. We are available at your convenience to discuss any questions you may have regarding this report. Please contact us if you have any questions.

Sincerely,
Langan Engineering and Environmental Services, Inc.

Dan Royden Eberhart
No. 965

Dan R. Eberhart, PG, CEG
Associate
CEG # 965

Rudolph Pio Frizzi
No. GE2780

Rudolph P. Frizzi, PE, GE
Senior Principal
RCE #62433; GE #2780

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PRELIMINARY GEOTECHNICAL ENGINEERING STUDY

MILLENNIUM HOLLYWOOD DEVELOPMENT

HOLLYWOOD, CALIFORNIA

Prepared for:
Millennium Hollywood, LLC
1680 North Vine Street, Suite 1000
Los Angeles, CA 90028

Prepared by:
Langan Engineering and Environmental Services
18662 MacArthur Boulevard, Suite 456
Irvine, CA 92612

10 May 2012
Langan Project No. 700019501

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ENGINEERING & ENVIRONMENTAL SERVICES

expansive potential. These soils were encountered at depths between approximately 23 and 28 feet, and 78 and 83 feet below ground surface. The shallower potentially expansive soils will be removed within the footprint(s) of the below grade parking garages. The deeper soils are below the saturated zone and exist at a depth that will not adversely impact the performance of the building foundations.

SEISMIC CONSIDERATIONS

Mapped Faults

The Site is not located within an Alquist-Priolo Special Study Zone Area. However, a portion of the East Site is adjacent to the boundary of a fault rupture study zone included in the Safety Element of the City of Los Angeles General Plan published in 1996 (Safety Element). Figure 4 presents the Site location in relation to the Fault Rupture Study Zones map as included in the Safety Element

The California Geological Survey (CGS), which was formerly known as California Division of Mines and Geology (CDMG)) Active Near-Source Fault zones map; and the City of Los Angeles ZIMAS system (http://zimas.lacity.org/map.asp) show the closest fault to the Site with the potential for fault rupture as the Santa Monica/Hollywood Fault. It is located approximately 0.4 miles from the Site. Data published by the CDMG (2002) indicates the Puente Hills and the Elysian Hills blind thrust faults are present more than one mile beneath the Site. These faults are blind thrust faults. Therefore, surface rupture at the Site from these faults is considered to be unlikely. Figure 5 shows the Site in relation to the active faults in southern California. As discussed above, the Site is not located within a mapped fault rupture study zone.

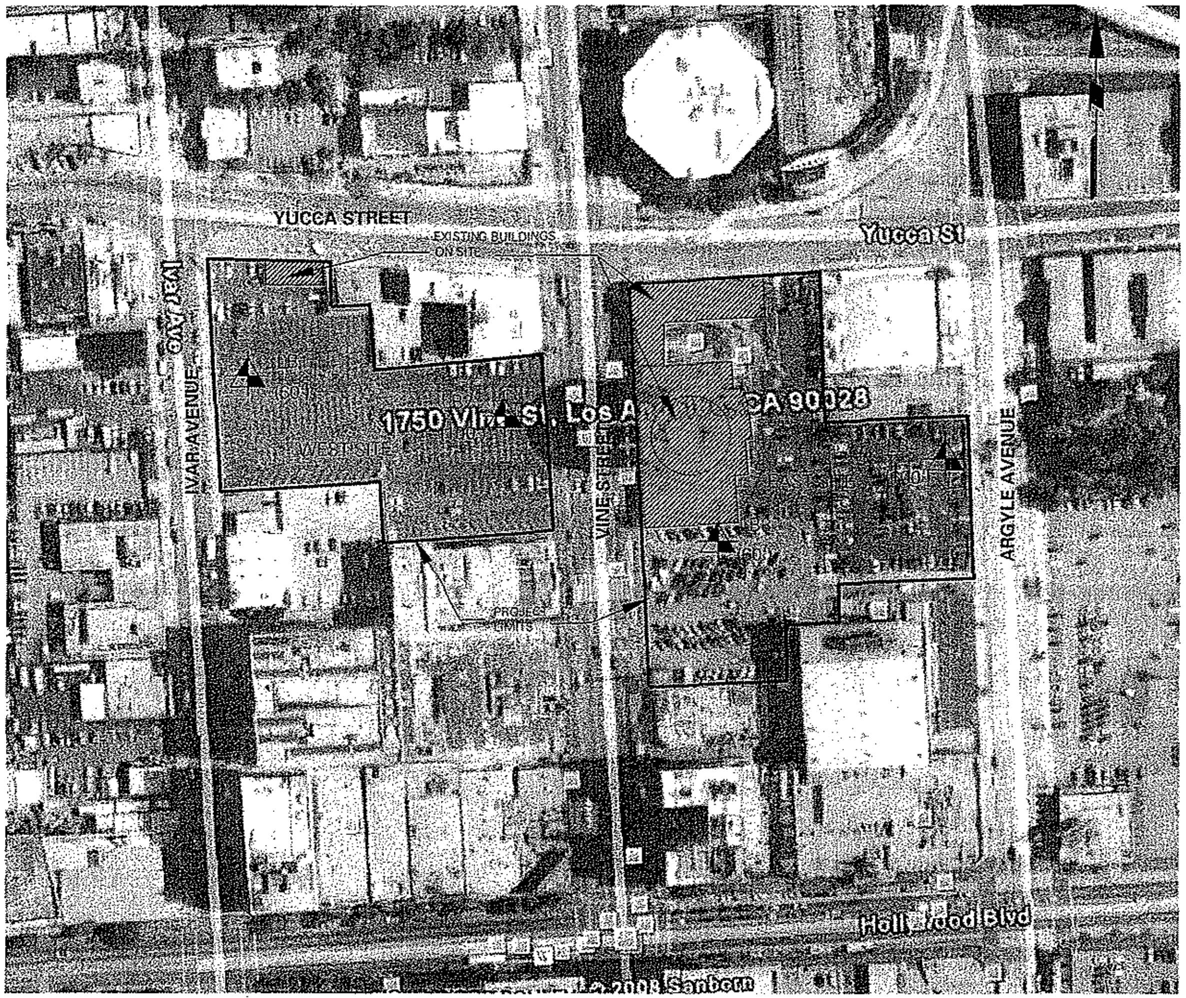
Landslides

The Site is not within a designated landslide area according to the landslide inventory and hillside area map in the City of Los Angeles Safety Element. (Safety Element 1996). Figure 6 shows the Site relative to the Safety Element "Landslide Inventory & Hillside Areas" map. The Site and the surrounding topography is relatively flat and mostly covered with impervious surfaces. Thus, the Site is not susceptible to landslides.

Seismic Design Parameters

This report was prepared based on the project description information contained in the Project's Draft Environmental Impact Report. For final design of the Project before construction, and in accordance with the applicable seismic provisions of the 2010 California Building Code (2010 CBC), we recommend the following seismic design parameters be used:

- Maximum Considered Earthquake (MCE) S_s and S_1 of 1.785g and 0.600g, respectively.
- Site Class D.
- Site Coefficients F_A and F_V of 1.0 and 1.5.



LEGEND:

- LB2 ▲ LANGAN BORING (2008)
- BORING DEPTH
- — APPROXIMATE PROJECT LIMITS
- ▨ EXISTING BUILDINGS ON SITE

NOTES:

1. BASE PLAN TAKEN FROM SATELLITE IMAGE PROVIDED BY GOOGLE EARTH.
2. BORINGS WERE DRILLED ON 26 JUNE, 15 AND 16 JULY 2008 UNDER FULL-TIME CONTROLLED INSPECTION OF LANGAN ENGINEERING
3. BORING LOCATIONS ARE APPROXIMATE, BASED ON FIELD MEASUREMENTS.
4. A BORING PROFILE IS SHOWN ON FIGURE 2.

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ENGINEERING & ENVIRONMENTAL SERVICES
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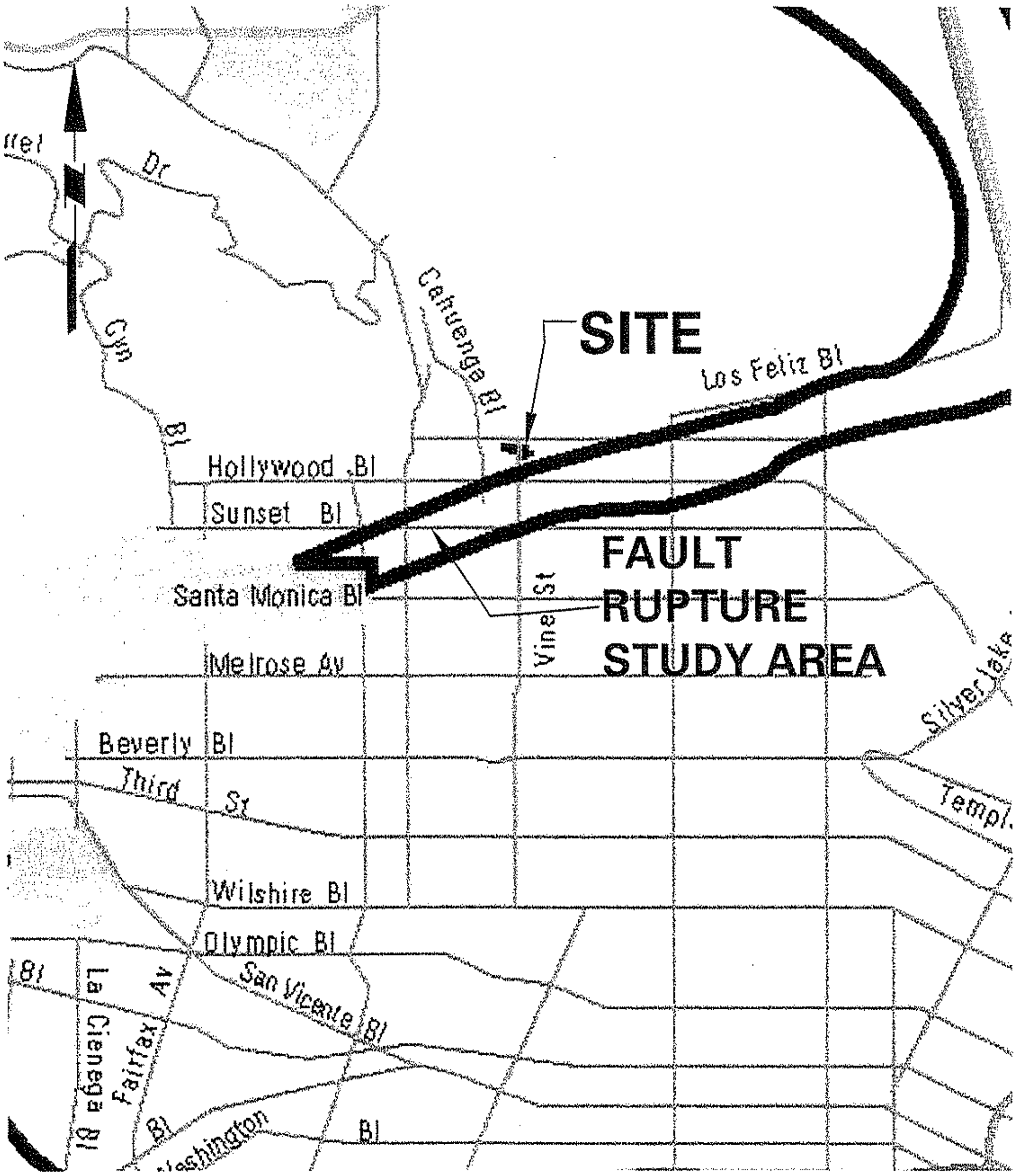
MILLENIUM HOLLYWOOD DEVELOPMENT

BORING LOCATION PLAN

HOLLYWOOD CALIFORNIA

Project No.	Date	Scale	Figure No.
700019501	5/10/12	1" = 100'	1



Notes:

1. Base figure reproduced from "Safety Element of the City of Los Angeles General Plan Exhibit A "Alquist-Priolo Special Study Zones & Fault Rupture Study Areas", 1996.

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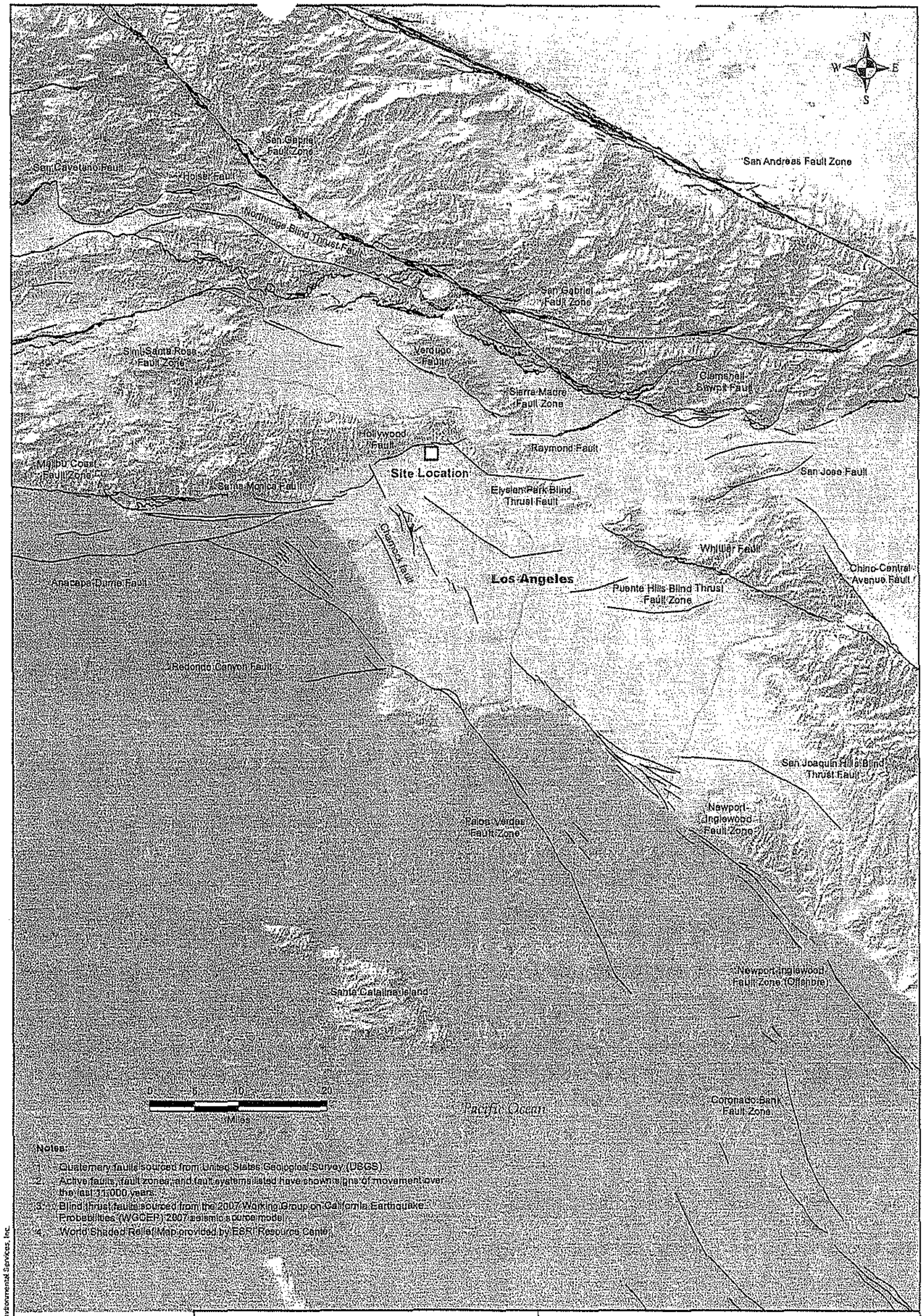
MILLENIUM HOLLYWOOD DEVELOPMENT

FAULT RUPTURE STUDY ZONE MAP

HOLLYWOOD CALIFORNIA

Project No.	Date	Scale	Figure No.
700019501	5/10/12	NTS	4



Notes:

1. Quaternary faults sourced from United States Geological Survey (USGS).
2. Active faults, fault zones, and fault systems listed have shown signs of movement over the last 11,000 years.
3. Blind thrust faults sourced from the 2007 Working Group on California Earthquake Probabilities (WGCEP) 2007 seismic source model.
4. World Shaded Relief Map provided by ESRI Resource Center.

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NEVADA CALIFORNIA ABU DHABI DUBAI ATHENS
NJ Certificate of Authorization No: 24GA27996400

QUATERNARY FAULT MAP

MILLENIUM HOLLYWOOD DEVELOPMENT

HOLLYWOOD CA

Project No.	Date	Scale	Drawn by	Figure
700019501	11/22/2011	1 " = 10 mi	TAC	5

From: "ggg@copper.net" <ggg@copper.net>
To: <Dan@robertsilversteinlaw.com>
Date: 6/12/2013 6:56 PM
Subject: Fwd: Re: hollywood fault
Attachments: Dolan et al. 1997.pdf

--- Begin forwarded message:

From: James Dolan <dolan@usc.edu>
To: ggg@copper.net,Fran Reichenbach <franreichenbach@sbcglobal.net>
Subject: Re: hollywood fault
Date: Mon, 03 Jun 2013 18:24:54 -0700

Dear Mr. Abrahams and Ms. Reichenbach,

Forgive the joint e-mail, but I am in a rush. You have both contacted me this afternoon requesting information about the Hollywood fault in downtown Hollywood. In response to your questions, please find attached our 1997 paper on the Hollywood fault. Figure 4 is a detailed map of the area of your concern. This peer-reviewed paper has been widely known and cited for the past 15 years, so everybody in the southern California geological/earthquake hazard community should certainly be aware of it.

I would also suggest that you peruse the California Geological Survey website to get a copy of their active fault map of the area.

Note that in the figure from our paper we are mapping fault scarps (shaded in gray), cliff-like features associated with fault movements. The prominent north-side-up scarp north of the Capitol Records building is the most prominent of these (easy to see if you stand and Hollywood and Vine and look North). But there is another, more southerly strand in this area that is shown on the map that is based on scarps to the east and west, separated by younger material coming out of the Cahuenga drainage, as well as by a groundwater barrier near Cahuenga and Yucca. The presence of at least two strands in this area is common along major faults like the Hollywood fault, which are not typically just a single strand, but rather zones of faulting that can encompass several different strands.

Looking at our mapping of these scarps from the perspective of almost 20 years later, I am not completely convinced that the southern strand shown in the figure has that pronounced change in orientation at Vine Street (shown swinging North right at Vine Street). This looks as if it could have at least partially been caused by deposition of young material and/or erosion associated with the small south-flowing drainage just east of Vine Street, as well as by construction of Vine Street itself.

In any event, the only way to sort out the exact locations and states of activity of faults in this area would be through extensive subsurface exploration (boreholes, trenching, seismic reflection, etc.), which I assume is being done for this project as a matter of course?

I hope this information is of use to you.

Sincerely,

James Dolan
Professor of Earth Sciences
University of Southern California
Los Angeles, CA
90089-0740

dolan@usc.edu

From: "ggg@copper.net" <ggg@copper.net>
To: <Dan@robertsilversteinlaw.com>
Date: 6/12/2013 6:56 PM
Subject: Fwd: Re: hollywood fault

--- Begin forwarded message:

From: James Dolan <dolan@usc.edu>
To: Fran Reichenbach <franreichenbach@sbcglobal.net>
Cc: "ggg@copper.net" <ggg@copper.net>
Subject: Re: hollywood fault
Date: Tue, 04 Jun 2013 08:09:38 -0700

Dear Fran and George,

I will try to give you a call later this morning. But the fact that the Hollywood fault is not yet zoned under the State's Alquist-Priolo Act doesn't mean that it isn't an active fault zone (it is). It just means the State hasn't gotten around to zoning it yet, even though I've been asking them to do so since 1992, when I first mapped the Hollywood-Santa Monica fault system. The California Geological Survey moves at a glacial pace with zoning faults. Moreover, the fact that it is not yet zoned in no way obviates the requirement that one not build structures designed for human occupancy directly atop active faults.

Given the scope of this project, I would assume that the developers must have done a detailed subsurface geological investigation to look for possible active faulting beneath their site. Do you know what they have (or have not) done in this regard? There must be a geological report that includes a detailed discussion of the potential for active faulting at their site. The Hollywood fault is one of the best known active faults in California, and that 1997 paper has been publicly available in a widely circulated mainstream peer-reviewed journal for many years. Plus, I've led dozens of field trips along the Hollywood fault over the years that have included many dozens (if not hundreds) of consulting geologists, as well as LA City and County geologists. So its not as if anyone could credibly plead ignorance of the existence and approximate location of the Hollywood fault in that area.

Bottom line: Based on our mapping back in the 1990s, supplemented by the consulting geologists reports we discuss in that paper, it looks as if there is at least one strand of the Hollywood fault extending approximately through the middle of that block, but to determine its exact location and state of activity would require extensive subsurface fault investigations (boreholes, trenching, seismic reflection, etc.). They MUST have done the detailed subsurface fault investigations necessary to determine the exact locations and states of activity of fault strands in that area. I can't believe that they wouldn't have done this as part of due diligence for developing the site. If they didn't, it would seem from my perspective that they should be required to to do so by the City and/or County and/or CGS geologist (whoever is charged with this issue for that area). To undertake a development of this scale (or indeed any development) in that area of known active faulting without doin
g detailed subsurface fault investigations just doesn't make any sense.

I am concerned enough about this issue to try to free up some time to come to a meeting, but I need you to understand, as I mentioned to George on the telephone, that I have no agenda in this matter vis-a-vis development. My only interest is in determining where active faults are (or aren't). In this case, however, I would need to be convinced by extensive subsurface investigations that the Hollywood fault does not extend through their building site.

Cheers,

James

From: "ggg@copper.net" <ggg@copper.net>
To: <Dan@robertsilversteinlaw.com>
Date: 6/12/2013 6:57 PM
Subject: Fwd: Re: hollywood fault

--- Begin forwarded message:

From: James Dolan <dolan@usc.edu>
To: ggg@copper.net
Cc: franreichenbach@sbcglobal.net
Subject: Re: hollywood fault
Date: Tue, 4 Jun 2013 12:08:43 -0700

Hi George,

Do you know the name of the geological consulting company that did the site investigation? Do you have a copy of their report? Can you get one? If so, can you send it to me? Please fill me in with what you know. I'm always in search of new data on faulting in the LA region, and this sounds as if it could be a rich source.

I don't see how there is any way that their proposed building is 0.4 miles from that southern strand of the Hollywood fault. Is that what they said? Maybe they mean distance to the northern strand? Even that isn't 0.4 miles away, if I understand where they are proposing to build. Do they mean E-W distance to previous study sites? If so, that doesn't really mean anything in terms of proximity to a fault that extends E-W. I'd be very much surprised if at least some part of their proposed building wasn't much closer to that southern strand in the block north of Hollywood and west of Vine. But I await getting a look at their report on the subsurface investigations before saying anything beyond that.

James

>James,
>
>I think that they have done some boring but I don't know what was
>found. They have not done the northwest corner of their property by
>Yucca and Ivar where the Enterprise Rent a Car business is. At the
>City Planning Commission hearing the developer commented that the
>fault is .4 miles away but that doesn't make sense. Your paper said
>the borings on Cahuenga indicated that there was a fault there which
>is only .2 miles and the Figure 4 map shows a bedrock fault just
>north of Franklin which is .1 mile away.
>
>I looked up a description on Alquist Priolo and it said the the
>normal 50 foot setback is increased to 500 feet in order to
>accommodate imprecise locations of faults and the possible existence
>of active branches.
>
>George

From: "ggg@copper.net" <ggg@copper.net>
To: <Dan@robertsilversteinlaw.com>
Date: 6/12/2013 6:57 PM
Subject: Fwd: Re: hollywood fault

--- Begin forwarded message:

From: James Dolan <dolan@usc.edu>
To: ggg@copper.net
Subject: Re: hollywood fault
Date: Tue, 4 Jun 2013 13:27:15 -0700

Hi George,

Thanks for sending the draft EIR. I've taken a quick look, and I'm honestly not quite sure what to say. I want to be circumspect, but trying to find an E-W fault with an E-W (i.e., fault-parallel) transect of four incompletely sampled (18" of core every 5' of depth) boreholes is simply ... well, stunning. So stunning that I would suspect that they weren't looking for a fault at this location, as this study could not possibly have been designed to look for potential E-W-trending strands of the Hollywood fault system. Puzzling, as my mapping shows the fault either through right next to their site, and the CGS website shows the northern strand of the Hollywood just north of Yucca at the very prominent scarp.

In any event, this subsurface analysis, if this is all that has been done, is completely inadequate in terms of a fault-investigation report. There's no way that they could ever hope to determine where faults are (or aren't) at their proposed building site from just these four boreholes.

Is that really all there is? At some point along the line, somebody associated with this development project MUST have done a more detailed subsurface analysis to check for faulting.

James

>James,
>
>here is the report:
>
>http://cityplanning.lacity.org/eir/Millennium%20Hollywood%20Project/DEIR/DEIR%20Appendices/Millennium%20Hollywood%20DEIR_Volume%201%20Appendices_COMPILED.pdf
>
>langan engineering and environmental services
>
>report starts on page 699
>
>George

Appendix IV.A

Aesthetic Impacts Report by Roschen Van Cleve Architects
(August 2012)

ROSCHEN VAN CLEVE ARCHITECTS

August 30, 2012

Aesthetic Impacts Report for the
Millennium Hollywood Project

I. Introduction

This technical report has been prepared for consideration in the Draft EIR for the Millennium Hollywood Project. This report intends to assess the existing visual environment, including the aesthetic context at the project site and within the surrounding urban environment. This report relates the Project to the "micro" and "macro" architectural and aesthetic character of the site, as well as, determines potential impacts of the Project on existing view corridors and area-wide visual context.

II. Project Description

The Project would involve the construction and operation of a transit-oriented development anchored by the historic Capitol Records Tower that would transform a series of under-utilized parcels into a pedestrian-focused development located on an approximately 4.47 acre site in the Hollywood area of the City of Los Angeles.

The Project is a mixed-use development, including residential dwelling units, luxury hotel rooms, office and associated uses, restaurant space, health and fitness club uses, and retail establishments. These uses are defined in a Development Agreement and Development Regulations that establish the Project's proposed arrangement and density of specific land uses, siting, and massing characteristics.

The Project includes a Concept Plan, which provides an assemblage of land uses and developed floor area that conforms to the terms of the Development Agreement. The Concept Plan includes approximately 492 residential dwelling units (approximately 700,000 square feet of residential floor area), up to 200 luxury hotel rooms (approximately 167,870 square feet of floor area), approximately 215,000 square feet of office space including the existing 114,303 square-foot Capitol Records Complex, approximately 34,000 square feet of quality food and beverage uses, approximately 35,100 square feet of fitness/sports club use, and approximately 15,000 square feet of retail use. The Concept Plan would result in a total developed floor area of approximately 1,166,970 square feet, which yields a floor area ratio (FAR) of 6:1.

In addition, and importantly from an architectural and aesthetic perspective, the Project includes a detailed set of Development Regulations that establishes heights zones and maximum floor plates for the towers to limit maximum building heights and control bulk. These regulations respond to the Project's development objectives that require context with the built environment and the preservation of certain view corridors. The Project would involve the development of four various height zones, which include the following: Height Zone A would permit development to a maximum of 220 feet above ground zone and would be located on the northwest portion of the West Site; Height Zone B would permit development to a maximum of 585 feet above ground zone and would be located on the eastern half of the West Site; Height Zone C would be located on the west side of the East Site fronting Vine Street (south of the Capitol Records Building) and would permit buildings to be a maximum of 585 feet above grade; and Height Zone D would be located on the east side of the East Site fronting Argyle Avenue and would permit buildings to a maximum height of 220 feet above grade. The Project also contains massing standards. Thus, the scale and massing of the Project will be regulated pursuant to the Development Regulations in a manner that the buildout of the Project will occur within a pre-determined massing envelope. The Development Regulations and architectural components of the Project ultimately control the aesthetic and architectural variations that could affect visual resources. Thus, these components were assessed to determine potential visual impacts associated with the Project.

III. Aesthetic Analysis and Contextual Concepts of Urban Form

A. Aesthetic Concepts Related to the Project Site and Surroundings

Starting with the architectural and visual character of the Project, the composition of the three individual towers (two new project structures plus the Capitol Records Tower) is designed to create a "unified whole" with the historic Capitol Records Tower as its compositional center. This aesthetic and architectural strategy will ensure a well-balanced integration of the Capitol Records Tower at both the micro and macro site scale. This compositional strategy adds urban and visually enhanced qualities to the site and its surroundings while maintaining architectural spacing in recognition of existing structures.

Conceptually, the "micro site" of the project is designed primarily to provide complementary and supportive spatial setting for the Capitol Records Tower. It also allows the Project to fully engage, extend, and redefine the pedestrian experience in this area of Hollywood because the Project visually and architecturally transforms a currently underutilized portion of the site. The micro site (which is the immediate surroundings of the Project) includes publicly accessible open spaces and engaging architectural features that that will add to the Hollywood experience. These plazas will enliven the visitor and community appreciation for the destination areas at, and around, the micro site such as the historic Capitol Records Tower, the historic Playhouse and the world famous corner of Hollywood and Vine.

Similarly, the "macro site" (consisting of the Project's relation to the wider aesthetic and architectural context surrounding the site) is conceived to align with and amplify the familiar gateway qualities of the historic Capitol Records Tower. This aesthetic and architectural strategy has the potential to complement the Hollywood skyline on the traditional Vine Street corridor. In addition, the Project's architectural and visual prominence will be consistent with and will further the unique architectural syntax of Hollywood by adding a new welcoming icon of design and unique place making that integrates Hollywood's past while building Hollywood's future. In this way, the Project will complement and support Hollywood's visual quality, recognized vistas and evolving aesthetic character.

B. Relation of Onsite Aesthetic Concepts to Potential Project Impacts

The micro site provides the historic Capitol Records Tower a supportive spatial setting by a spatial expansion surrounding the entire cylindrical form of the historic Capitol Records Tower to ensure the historic Capitol Records Tower will not be completely smothered by the project density, but will be enhanced and recognized. By crafting a compatible project backdrop that is sensitive to the architectural features and historic views; is complementary with the spacing and scale of the iconic tower; and that integrates supportive space surrounding the historic Capitol Records Tower with appropriate program uses, the micro site design protects the visual character of the site. This project-related urbanization includes a heightened pedestrian experience with intimate spatial engagements for all with the historic Capitol Records Tower that are not possible today on the existing parking lots. The existing visual character and quality of the site will therefore be protected and improved through compositional harmony and spatial orchestration of views of the familiar icon from the freeway, from Vine Street, from the sidewalks and, significantly, from on site.

In addition, the micro site fully engages, extends, and redefines the Hollywood pedestrian experience by bringing to Vine Street world-class plazas, mini parks, through-block passages, and destination public spaces that link and extend the experience of the Hollywood Walk of Fame with multiple historic icons, existing open spaces, and adjacent streets to replace the existing surface parking lots.
Also by locating distinguished and unique retail opportunities at street level on both sides of Vine Street, along through-block passages, along spaces surrounding the Capitol Records Tower, and on project edges facing the plazas and streets, the existing pedestrian urban intent, and visual quality of the site, will be protected and raised.

Finally, by designing street level environments that welcome visitors and locals in a series of intimate public spaces conceived in the Hollywood paradigm of intimate public outdoor rooms, such as the historic Chinese Theater and Egyptian Theater Forecourts, but specifically and dramatically unique to place making around the historic Capitol Records Tower, the Project will enhance this edge of Hollywood to the quality of other iconic Hollywood sites, which enhances the architectural features of the site and improves the visual character and quality of the site.

C. Analysis of Vistas, Viewpoint Obstruction and Aesthetic Contrast

In addition to the aesthetic concepts discussed above, the potential levels of aesthetic impacts associated with the Project can be described and discussed in three primary categories.

1. Scenic Vistas

The existing scenic vistas from the Hollywood Hills are a diverse expanse of urban Los Angeles which should be described as a basin wide perspective. These views include multiple urban centers such as downtown, Century City and the Wilshire corridor. The full texture and fabric of these views involves high rise, low rise and single family neighbors combining into an architecturally-diverse picture of the Los Angeles Basin. The texture and fabric of the Project is consistent with this basin view and will add urban figure and form in balance with the other urban centers represented in the scenic vista views of the Los Angeles Basin from viewpoints in the Hollywood Hills.

Other scenic vistas from different areas of the hills are consistent with the basin-wide perspective. Granted, the view of the historic Capitol Records Tower will change and vary with the hillside viewing locations and dependent on the height and massing of the implemented project development scenario.

In every case, however, the distance from the vista viewpoints in the Hollywood Hills to the Capitol Records Tower involves the key aesthetic feature in the textural view of the vista rather than as a specific object to be identified and distinguished. Hence, the Project's potential impact on vistas is not considered materially adverse given the diversified urban context of the basin and varied architectural features and structures that comprise the viewshed.

2. Potential Obstructions of Valued Views

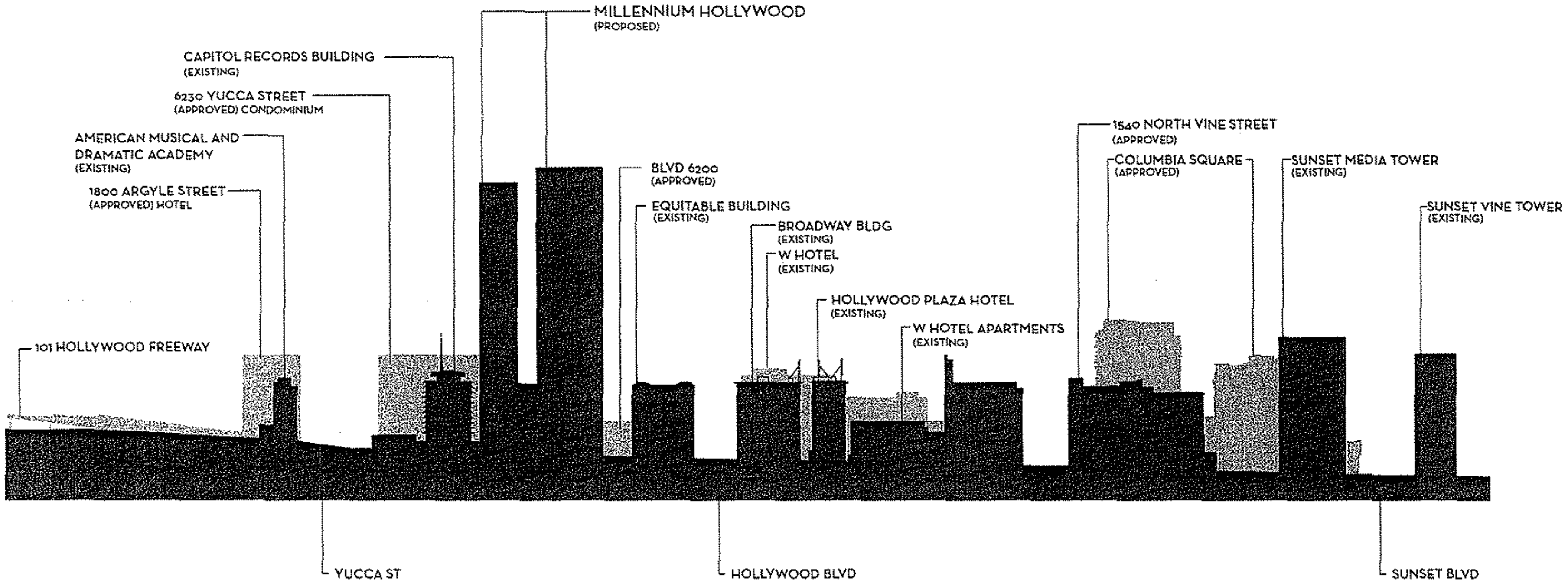
A key view from a focal point at grade level is the view of the Project from the corner of Hollywood and Vine. At the Project's lower design height of 220 feet, and even the 400-foot height, the obstruction of this familiar view could be significant. The view blockage is significant under these development scenarios because the cylindrical shape of the Capitol Records Tower would not be easily recognized. As Project structure height increases, however, the additional setback becomes adequate to visually describe the form and identify the iconic structure creating a spatial setting around the historic tower that preserves the valued views. From the vista views noted above, the architectural components and character of the site's valued visual resources are less distinguishable as the urbanized fabric and developed character of the site and the area consume stand-alone structures into an urbanized macro perspective. The resulting obstruction, and potential related project impacts, from this perspective are not considered significant given architectural and visual context.

3. Visual Contrast with Urbanized Setting and Existing Features

The site and its surroundings are fully urbanized and represent urban form, fabric and architecture. From many of the surrounding residential streets and commercial boulevards, there will be views of the project. These views will be distinguished by the heights of the project, but will be consistent with the areas existing aesthetic image, urban texture and city form. This is primarily because diverse character in urban form and design is a hallmark of Los Angeles and our many different Los Angeles neighborhoods and associated aesthetic contrast. The pattern of height juxtapositions is common in the project area, and in the City generally, and becomes the very nature of Los Angeles' character rather than a thematic urban fabric or a limited architectural language. Thus, the density, height and massing of the Project may be different than the existing uses on the site and in the area, yet the urbanized nature of the site and architectural features of Project are not in material contrast with the urban fabric of the area.

IV. Conclusions

In summary, the Project would not have a substantial adverse effect on scenic resources or substantially degrade the quality of the existing environment. The existing aesthetic environment, from both a micro and macro perspective, around the Project Site is fully urbanized. In fact, the focused pedestrian urbanization and skyline orchestration would substantially evolve the aesthetic nature of the project site from both a micro and macro perspective. The immediate focal viewpoints from limited street-level perspectives could be obstructed under certain development scenarios. Overall, however, the Project's additional urban uses, architectural components, and aesthetic character on an in-fill site will not only improve, but "turnaround" a long neglected site into an urban Hollywood gateway at the top of Vine Street. Accordingly, on balance with the existing visual environment, viewed from afar and near, the project's aesthetic impacts are mostly considered less than significant.



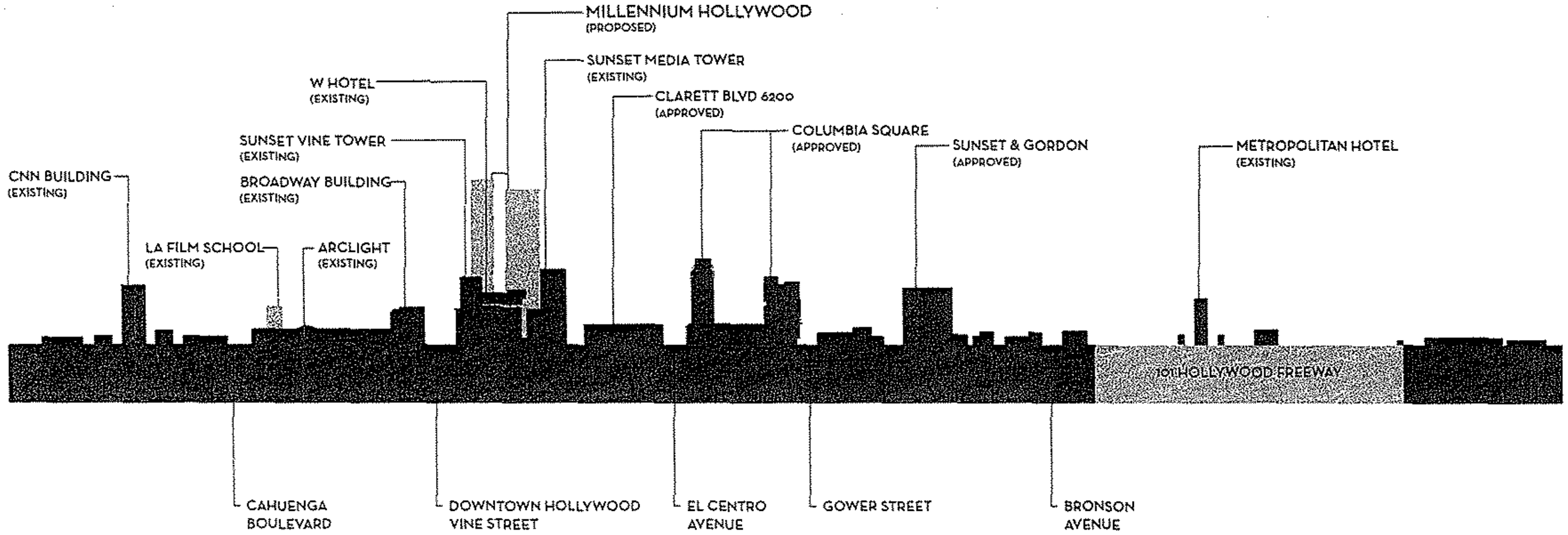
CONTEXT SECTION LOOKING EAST. "DOWNTOWN HOLLYWOOD" BEYOND VINE ST

MP MILLENIUM PARTNERS | ARGENT | HANDEL ARCHITECTS LLP | ROSCHEN VAN CLEVE ARCHITECTS

MILLENNIUM HOLLYWOOD PROJECT

URBAN SILHOUETTE 1: CONTEXT SECTION
LOOKING EAST

9.18.2012



CONTEXT SECTION LOOKING NORTH, "SUNSET STUDIO DISTRICT" AND HOLLYWOOD HILLS

MP MILLENIUM PARTNERS | ARGENT | HANDEL ARCHITECTS LLP | ROSCHEN VAN CLEVE ARCHITECTS

MILLENNIUM HOLLYWOOD PROJECT
URBAN SILHOUETTE 2: CONTEXT SECTION
LOOKING NORTH
9.18.2012

HOLLYWOOD HILLS AND "DOWNTOWN HOLLYWOOD"

MP MILLENIUM PARTNERS ARGENT | HANDEL ARCHITECTS LLP ROSCHEN VAN CLEVE ARCHITECTS | MILLENNIUM HOLLYWOOD PROJECT

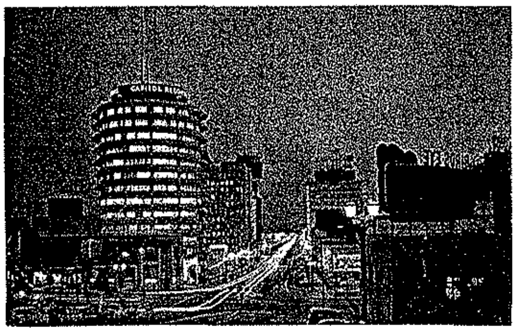
URBAN SILHOUETTE 3: CONTEXT SECTION
LOOKING EAST

9.18.2012

Appendix IV.C

Millennium Hollywood Project Historic Resources Technical Report

Historic Resources Group
(July 2012)



Millennium Hollywood Project
Historic Resources Technical Report
July 2012

HISTORIC RESOURCES GROUP

In addition to the project design features and Development Regulations discussed above, the following mitigation measures would further reduce potential impacts on historic resources associated with the Project:

1. The Project will include a plan to ensure the protection and preservation of any portions of the Hollywood Walk of Fame that are threatened with damage during construction. This plan shall conform to the *Hollywood Walk of Fame Terrazzo Pavement, Installation and Repair Guidelines* as adopted by the City in March of 2011.
2. The Project will include a shoring plan to ensure the protection of adjacent historic resources during construction from damage due to underground excavation, general construction procedures and mitigate the possibility of settlement due to the removal of adjacent soil. Particular attention will be paid to maintaining Capitol Records underground recording studios and their special acoustic properties.
3. The Capitol Records Building will be rehabilitated and preserved in accordance with the Secretary of the Interior's Standards for Rehabilitation.
4. The Gogerty Building will be rehabilitated and preserved in accordance with the Secretary of the Interior's Standards for Rehabilitation. Prior to construction, the environs of the Project Site (Project Site and surrounding area) will be documented with up to twenty-five images in accordance with Historic American Building Survey (HABS) standards.
5. The Project design team will consult with a preservation architect or other qualified professional regarding compatible design and siting of new construction.
6. The Project will include an interpretive program for the proposed open space which informs the public about the history and extant historic resources located on site and in the vicinity.

FROM THE DESK OF JON PERICA
10338 ETIWANDA AVE, NORTHRIDGE, CA 91326

May 17th, 2013

Honorable LA City Council

JUSTIFICATION TO DENY PROJECT – CPC 2008-3440(VZC)(CUB)(CU)(ZV)(HD) ENV 2011-675-EIR

My name is Jon Perica and I worked in the Los Angeles Planning Department for 35 years, including working as a Zoning Administrator for 20 years issuing legal decisions on over 2,500 cases. My decisions were based on the required legal findings and a fair and impartial evaluation of each case irrespective of the applicant and political popularity of the case. None of my cases were ever overturned by a Superior Court action. Over these many years of ruling on development projects I have learned what makes a "good" project. Unfortunately, the Millennium Hollywood Project is not a good project and cannot legally be supported with appropriate findings.

I have reviewed the applicant's requests and City Planning Commission determination for the above cited mixed use project in Hollywood at 1750 Vine Street and I strongly believe that the City Council should deny the applicant's request for the following reasons.

1. Failure to follow Zone Code: City Charter Requirements and Procedures.

The governing hierarchy for land use decisions in the City of Los Angeles starts with the City Planning and Zone Code (Section 526 City Charter). The Zone Code defines the by-right uses by specific zone, "Conditional Uses" (Sec 12.24 of the Code) permitted in a case-by-case situation by specific zone and a Variance process (Section 12.27 of the Code) for relief on a case-by-case basis if, due to some unique aspect of the land, an applicant cannot comply with the strict requirements of the Zoning Code.

At the next level of planning review, the City can impose case-by-case Conditions of approval as temporary requirements designated by this symbol (Q) or permanent conditions designated by a [Q] symbol. These conditions become officially part of the actual zoning for the particular parcel of land. Q conditions are defined in Section 12.32 G (2), which says they identify how, "...property not be utilized for all uses ordinarily permitted in a particular zone..." so the Q restricts by-right uses in a zone. Lastly, the City can impose conditions that are permanent but which do not change the official zoning and these are simply listed as conditions of approval of a particular discretionary land use application. Most City conditions on development cases are this last process which takes the form of "contract zoning." Through this process, the project is conditioned on the developer executing a Master Covenant and Agreement which memorializes all of the Q conditions intended to restrict the project to particular land uses or mitigate certain environmental impacts of the project.

If any applicant requests changes to any City project conditions, other than a simple clarification of intent or very minor adjustment of a conditions due to unintended difficulties, such modifications must be done in as a formal request with public notice and hearing based on numerous municipal code provisions.

The Millennium Hollywood application before the City Council contains a proposed Q Condition that opens a giant loophole to allow Planning Department staff to override the Los Angeles Municipal Code, adopted conditions imposed on the project as a condition of approval, and a right to declare what the "intent" of any of entitlements mean, apparently regardless of their wording.

The Planning Commission's April 27, 2013 approval of the Hollywood Millennium project application includes Condition #2 (Site Development" on page Q-1). The particular condition, as worded, allows Millennium Hollywood to file a request for, and City Planning officials to grant code changes and adopted condition changes without any public notice or hearing: "Minor deviations may be allowed in order to comply with provisions of the Municipal Code, the subject conditions, and the intent of the subject permit authorization". While this sentence sounds simple, in reality is very troubling and would set a bad precedent for the City to follow in the future.

In its essence, Condition #2 gives Millennium Hollywood an opportunity to evade full compliance with any of the hundreds of City conditions or existing City Code provisions that restrict and describe how the project will be constructed and operate.

The first specific problem is due process to adjoining property owners and interested parties. Will there be a written request by the applicant and public notice and hearing with appeal rights? Currently, changes to existing project conditions are made by written action by the Planning Department (with a hearing, or without a public hearing when the Department makes a written finding that the particular request is not "controversial" and would not "adversely" impact adjacent properties). A Planning Department decision to change an existing condition is sent to adjacent residents and is appealable so due process is provided in many City processes.

By way of example, Section 12.28 B.2 of the Zone Code sets a clear process for "modifications" by defining a measurable amount of permitted change (up to 20% for yard and area intrusion and 10% for area reductions) if the modification is filed with another request. Section 12.28 B.2 requires a public hearing unless the Planning Department determines that the requested change will not cause a public controversy and have a less than significant impact on adjacent properties. Thus, any Millennium Hollywood future "minor" deviation beyond a slight reduction in yard and lot area (10-10%) requests would not be consistent with Section 12.28.B.2.

Condition #2 for the Hollywood Millennium Project appears to bypass the City's minor project change procedures, like that specified in Section 12.28.B.2, without stating so. I know of no provision that authorizes a Q Condition to override numerous City due process provisions that protect adjoining property owners and provide a right of review.

The second specific problem is that subjective and arbitrary changes to conditions can be made by the Planning Department staff behind closed doors. There are too many unanswered questions about the scope of the power conferred on the Planning Staff. What is the definition of a "minor deviation"? What is a "minor" deviation on a 30-unit apartment is not the same as a "minor" deviation on a one million square foot project with possible towers 585 feet tall. Since Condition #2 is an unrestricted power to modify everything about the Project, presumably a City Planning official would be empowered to make a minor modification of the tower heights. A single "minor" deviation on a super large project such as this could have significant impacts. A "minor" 20 percent height increase (117 feet) would take the towers to over 700 feet in height.

Are there any measurable standards to define "minor"? If there are no quantifiable standards, one Planning Department staff's determination of "minor" could vary widely from others undermining the goals of consistency in land use laws of the City. As a result, there would be a complete inconsistency in the application of this extraordinary power. By what Zone Code authority can the City allow this Condition #2 which creates an undefined new process for changing adopted conditions of approval and overriding the Municipal Code?

The existing Zone Code grants no specific authority to change conditions based on the simple wording of Condition #2. By what Zone Code authority can Millennium Hollwood make these requests? Who in the Planning Department will make a final decision on requested "minor deviations"? Why is there no appellate process consistent with other City planning processes?

Q conditions are intended to restrict some of the by-right uses permitted for the project based upon the zoning for the site. Future changes to Q conditions could in fact allow an increase in what the zone use would permit (i.e. auto detailing/auto repair/tune-up) adjacent to a residential zone without further Zone Code required discretionary approval under a process where residential space and commercial spaces were changed under the general argument of equivalency of trip generation.

The possible City Planning Department staff modification of Q conditions in such an undefined process would be an "unbridled" self-grant of power inconsistent with the Zone Code. The Planning Commission is folding this "presumed" authority into the standard Q condition process for case approvals found in Zone Code Section 12.32 -- which only gives the Planning Commission authority to approve some or all of a request and impose conditions. The Planning Commission has current authority over existing project conditions but not over future changes to already approved conditions that Millennium Hollywood did not appeal before the City Council took the final approval action. Based upon my years of experience, I know of no Municipal Code provision that authorizes the Planning Commission to impose Condition #2 – because it is not really a condition. Rather it is an awesome new power of the City Planning Department staff to rewrite any City law or adopted condition.

In theory, by using the Land Use Equivalency Program also approved in Condition #2 (see Lack of Authority Finding #2 below), the Planning Department could make changes not allowed by the Zone Code without requiring a Zone Variance to be filed. In the hierarchy of planning authority described above, case conditions are below the Zone Code and cannot supersede the Zone Code without following all existing standards and requirements. There has **never** been such a condition written to allow future Q Condition changes without a public process on any Planning Department approval I have seen, and this unfettered power would set a terrible precedent for future projects.

Only with a defined standard for the amount of change allowed and a transparent process for public notification and public hearing should any future change to any condition be allowed. The Planning Commission has exceeded its authority in approving Condition #2 because there is **no** Zone Code authority to approve future Q condition changes without written standards, updated environmental review, and a written decision, all followed by a public process of appeal.

Finally, Condition #2, which allows undefined future changes and modifications, could also be carried out without any required further environmental and public review in violation of CEQA and the City's own environmental review procedures.

Conclusion – The City's two existing planning processes for minor deviations are extremely limited and defined: 1) One for limited changes of conditions/intent or a letter explaining language or 2) A minor yard and lot area reductions. Condition #2 of the Millennium Hollywood Project authorizing unfettered discretion for City Planning Department staff to re-write Zone Code without a variance process, and to re-write City Council adopted project conditions has no authority in the Zone Code provisions allowing imposition of Q conditions. The stated purpose and intent of Q conditions is to impose additional restrictions of a particular project to protect the public interest, not add unrestrained power to re-write the laws of this City and specific project conditions in a room at City Hall. For this reason, Condition #2 is wildly at variance with the history of Zone Code administration in this City and appears to be without any precedent.

2. Lack of Zone Code Authority for Land Use Equivalency Program – Future Changes to Past Approvals without New Approvals.

The City Planning Department has offered a Land Use Equivalency program which enables a developer to propose future changes in uses on large projects that take a long time to be constructed, however such programs have been limited only to Development Agreements. There had been a Development Agreement for the Millennium Hollywood Project, but I am informed it was withdrawn due to a conflict of interest of the Planning Commission President who has worked on the Millennium Hollywood Project.

It now appears that the Millennium Land Use Equivalency Program has been shifted by the City Planning Commission into Q Condition #1: "Permitted Use. The use of the subject property shall be limited to those uses permitted in the Land Use Equivalency Program, attached as Exhibit D or as permitted in the C2 Zone as defined in Section 12.16 A of the L.A.M.C."

While a Development Agreement under the State Planning Law allows use of the property to be a subject of such agreements, there is no explicit authority for Land Use Equivalency Programs that would permit an applicant to swap out land uses to be constructed over a long period of time without further discretionary decision or environmental review.

The Millennium Hollywood Project goes even further, however. The City Planning Commission, when it was barred from considering a proposed Land Use Equivalency Program as part of a Development Agreement, now has dropped the Land Use Equivalency Program into a Q condition. I know of no authority for a Q condition to grant a Land Use Equivalency Program. And this makes sense because, as indicated above, the Zone Code provides that Q conditions are used to further restrict land uses otherwise allowed by Code – not grant provisions that would be more permissive such as a Land Use Equivalency Program.

Since enactment of state law that permits Development Agreements, the City has entered into Development Agreements to provide some certainty that projects taking a long time to build will not be subject to changes in zoning laws before the project is constructed. That is the principal purpose of a Development Agreement. The idea is that very large projects can take 3 -5 years or more from original planning to final occupancy. There may be a greater demand in a mixed use project for housing in the future than currently, when the applicant secured approval for more office use. Whenever an applicant sought flexibility for this type of risk, it was required to set forth two or three specific project options so that the project could still be feasibly analyzed under environmental laws yet provide a measure of flexibility for future development. Thus, in the future, the applicant could change the land uses within the strict options defined at the outset. The Land Use Equivalency Program authority to change originally approved uses for different uses would occur without any further discretionary review so long as it was within the strict limits of the original discretionary approval. This was the theory behind the Planning Department Land Use Equivalency Program.

The Land Use Equivalency Concept does **not** exist in the City Zone Code as a formal process. The willingness of the City Planning Department to consider flexibility seems to have evolved after a developer came to the Planning Department several decades ago with a large project and asked for future flexibility. After the City Planning Department allowed this option as part of a Development Agreement with strict options, it became known in the Los Angeles community of land use attorneys, land use consultants, large developers and City Council members. Few members of the public, neighborhood councils, or homeowner organizations are aware of this flexibility program because the Planning Department does not advertise this program and the Department has no written rules as to how it operates.

While the City has approved several Land Use Equivalency applications over several decades, to the best of my knowledge, none of them have had any further environmental review to determine if the change in uses that were allowed caused more adverse impacts that the originally approved uses. Without any public notification of a requested land use change, there is no appeal opportunity if the Planning Department made changes that in fact were more permissive in their impact than the original grant conditions (i.e. conversion of a "restaurant" into a "nightclub").

As an example, the Howard Hughes Project next to the 405 freeway just north of LAX received a Land Use Equivalency approval in the early 1990's but there was no accurate standard provided in its entitlements for how "equivalency" of impacts would be measured using traffic generation. There was also no indication of what level of staff review be necessary for changes under the plan. Would review be done by less experienced line staff or by a senior staff member better able to evaluate the complexity of all the issues involved is a very large project of over one million square feet? There were no answers to these questions and the process remains secret without public transparency and participation. Thus, the Howard Hughes Project stands as an example of how the Land Use Equivalency Program has been unreliable in protecting communities without subsequent reviews for each change in the selected land uses of a project.

Conclusion - The Millennium Hollywood Land Use Equivalency Program imposed as a Q condition exceeds the authority of the City Planning Commission. A Q condition is used to restrict uses, height, and other project matters beyond that provided in the Zone Code by right. In my years of experience, I have never seen a Land Use Equivalency Program allowed in anything but a Development Agreement, and then, only if the project options were clearly defined and studied as part of the initial project approval.

The use of a Q condition to authorize a Land Use Equivalency Program also would set a terrible precedent for future land use decisions on major development projects. The Millennium Hollywood Land Use Equivalency Program, which grants almost completely undefined options, violates the City Zone Code standards for making open public decisions. No significant planning application like the Millennium Hollywood Project should be immune from normal City laws and procedures.

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