Estrada, Andres

From: Mesa CPUC
Sent: Tuesday, June 28, 2016 8:57 AM
To: Estrada, Andres
Subject: FW: Mesa 500kV Substation Project EIR Comments and supporting materiel
Attachments: ground motion MESA copy of previously sent.txt; Peer review.doc; SHMA CODE CITES MESA.doc; Whittier Fault extension notes.doc; current codes.doc; LiquefactionHazardAssessment.pdf; FINAL - OPR Amicus Curiae Brief (2).pdf; sydnor-july2005.pdf; Air Quality Bibliography 2010 MPMkt.pdf; ARS10.php.png; Biology Comments.doc; Climate Change, Air Quality, Greenhouse Gasses comments.doc; gnatcatcher quotes.doc; ground motion II.doc; ground motion.doc; Hydrology.doc; MESA GMED notes.doc; Mesa overview copy previously sent.txt; Mesa Project Comments Geotechnical.doc; montebello thrust bibliography.doc; Near Field Mesa copy.txt; Physics based SHA reference.doc; References for BACKTHRUST.doc; San Andreas Day and Olsen.doc; seismology.txt; Transportation and Traffic comments.doc; Uplift- Upper Elysian Park Thrust.doc; Vertical Ground Motion Mesa.txt; Whittier-EMB connection.txt

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From: Margot Eiser
Sent: Monday, June 27, 2016 1:00:13 PM (UTC-08:00) Pacific Time (US & Canada)
To: Mesa CPUC
Subject: Mesa 500kV Substation Project EIR Comments and supporting materiel

Citizens for Open and Public Participation
non profit public benefits association
Margot Eiser Chair

Lisa Orsaba, CPUC Project Manager

California Public Utilities Commission
RE: Mesa 500kV Substation Project
c/o Ecology and Environment, Inc.
505 Sansome Street, Suite 300
San Francisco, CA 94111

comments on DEIR

http://www.cpuc.ca.gov/Environment/info/ene/mesa/mesaDraftEIR.html

attachments - links are to be considered as if submitted in full- save trees
Previously submitted items are to be considered as re-submitted

Geology and Soils

http://www.cpuc.ca.gov/Environment/info/ene/mesa/attachment/DraftEIR/13GeologySoilsMinerals.pdf

SEISMIC HAZARD MAPPING ACT- no report attached and no peer review
see SHMA Code Cites required for structures for human habitation

Geotechnical - there is no Report, EIR section does not comply with LACOUNTY GMED MANUAL requirements for an EIR much less SHMA must be recirculated

Regulatory Setting Building Codes are Minimum and not currently designed for resilience however this is coming, They are also not for essential service structures which require site specific investigations and design see current codes attached

see Peer Review attached
see FEMA
Introduction to 2014 NEHRP Recommended Seismic Provisions
https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/BSSC2/150617_BSSC_Webinar_Intro_to.pdf
see regulatory flowchart page 5

http://www.fema.gov/media-library-data/1440422982611-3b5aa529affd883a41fbdc89c5ddb7d3/fema_p-1050-1.pdf

fema_p-1050-1.pdf

https://www.fema.gov/media-library-data/1436903055388-0eaf09be942e02c790440ec0322c7476/fema_p-1050-2.pdf
Commentary is not cumulative- consult prior commentaries

See Structural Performance issues relative to extreme events
http://www.structuremag.org/wp-content/uploads/2016/02/C-StrucPerform-Ghosh-Mar161.pdf
performance issues relative to extreme events

"The next edition of ASCE 7
Minimum Design Loads for Buildings and Other Structures, ASCE 7-16 (ASCE, 2016), is expected to be published in September 2016, in time for adoption into the 2018 international Building Code(IBC) (ICC, 2018)."
see also https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/bssc/asce-003_asce_7-10_commentar.pdf

See Whittier Fault Extension notes attached

The proposed Gold line NW of the 60 freeway adjacent to the project must be considered and considered for cumulative.
The Gold line proposes raising transmission lines in the vicinity of Paramount and 60 freeway- this must be considered in the EIR- we suggest doing it before Techachapi lines are powered or new communication lines installed
We suggest a Gold line station and park and ride on the NW side of the 60 freeway in the area of the Montery Park Marketplace with shuttle service for SCE employees, This must be considered Obvious Greenhouse Gases, climate change win

Traffic for park and ride must be considered and cumulative impacts although we consider projects impact to be minimal.

CalTrans ARS program can be used for a Scoping level snapshot see ARS attached

dap3.dot.ca.gov/ARS_Online/

Citizens for Open and Public Participation
Margot Eiser
Chair

Biology

figure 4.2-1
Non native vegetation must be removed and replaced with Area specific California Natives especially exotic invasive species
Example looking at map 4.3.1 the finger N-E of San Gabriel blvd has yellow and ??? on top
It is infested with Russian Thistle- tumbleweeds which were not present prior to Tehachapi project.
They are a serious fire hazard directly under lines 7 and 8 at the Mesa Y
There are also poisonous invasive Castor Beans
Both of these seedbeds take a consistent program of 7-10 years for eradication
Compare with the great FT gnatcatcher habitat on the SW side of San Gabriel and along Montebello blvd.
On the map it is labeled as ruderial however before Techachapi it had large stands of Southern Sycamore which must be replaced
Map shows Darlington Ave it's Darlington Street

Example 2 There is exotic invasive tree of heaven -alanthus in the Segment 11 ROW W of San Gabriel Blvd and segment 7-8 S-W of San Gabriel blvd (S-W of the Y)which must be removed
Example 3 Eucalyptus is highly flamable and must be removed from near power lines, along Montebello's Plaza drive for example.
Example 4 Pampas grass along Montebello blvd
The maps must show locations of exotic and invasive species and a removal and mitigation must be provided.

“According to USFWS, there is very little habitat left for
the gnatcatcher between these areas (Medak pers. Comm. 2015)”
provide a copy in the appendix

We suggest that the Project at the MESA Y work with Chevron to the SE on habitat to connect SCE Habitat mentioned above with the Whittier Narrows (vicinity of telecommunications line shown on map NE of San Gabriel Blvd
Providing Wildlife Mitigation Corridor

4.3.14 and elsewhere It's San Gabriel Blvd not San Gabriel Avenue

Mitigation must be provided for any disturbance for FT/FE Species/ Critical Habitat
Cactus Wren?

Tehachapi ROW between Montebello Blvd and 60 freeway must be restored to native habitat Or it could be used for Park and Ride for the Gold line and habitat mitigation elsewhere (Chevron property?)
It is unclear if Mitigations required for Tehachapi can be used for MESA
'

Air Quality, Climate Change, Greenhouse gasses, global warming

Nice Job

We expect all AQMD suggested Mitigation measures be adopted
We expect all CAL-EPA ARB Mitigation measures to be adopted

There are many helpful resources that set forth potential mitigation for greenhouse gas emissions (the type of pollution that causes climate change).
These include the 2008 Technical Advisory, pdf. issued by the Governor's Office of Planning and Research (OPR) and the 2008 white paper, CEQA and Climate Change, issued by the California Association of Pollution Control Officers (CAPCOA).
The update of the CEQA Guidelines in March 2010 also provides additional guidance

a couple of recent opinions for guidance

2012
http://oag.ca.gov/sites/all/files/agweb/pdfs/environment/sandag_ruling.pdf?
Plaintiffs represented By COPP Attorney Cory Briggs
read the slip opinion here
https://oag.ca.gov/sites/all/files/agweb/pdfs/environment/ct-app-slip-op-cleveland-nat-forest-foundation-v-sandag-d063288-11-24-2014.pdf?
Read the Attorney General's Answer Brief on the Merits, pdf.
https://oag.ca.gov/sites/all/files/agweb/pdfs/environment/people-answer-brief-merit.pdf?

2013
https://oag.ca.gov/sites/all/files/agweb/pdfs/environment/ct-app-slip-op-cleveland-nat-forest-foundation-v-sandag-d063288-11-24-2014.pdf?
Attn Johnson submitted comments on behalf of Save the Montebello Hills Sierra Club task force in the neighboring MHSP project.

See Exhibit A we expect similar mitigation for the MESA project
Best available Technology for diesel on and off road- earth-movers, construction equipment
The Heavy duty truck GHG mitigation and the On-Road Heavy Duty Diesel Vehicle regulation migrations are inadequate

APM-AIR-02: Tier 3 Engines. Is inadequate see 4.2.4 and rationalize
Cal EPA-ARB Tier 4 equipment for this project with no waiting till 2023
Electric charging stations
idling mitigation
use the latest methodology/ court rulings in determining GHG compliance

In enforcing CEQA, Attorney General Harris focuses on the need to address those impacts that affect our most vulnerable residents – children, the elderly, and people who already are bearing an unfair share of pollution (see Environmental Justice) Montbello and unincorporated South San Gabriel are heavily Hispanic, Monterey Park Chineese

Newhall Ranch Case

Gasses

Justice Kathryn Mickle Werdegar, writing for the court, said the environmental impact report failed to provide sufficient evidence that the project would not affect greenhouse gas emissions.

Without more evidence, “decision makers and the public are left with only an unsubstantiated assertion that the impacts — here, the cumulative impact of the project on global warming — will not be significant,” Werdegar wrote.

Just because a project is designed to meet high building efficiency and conservation standards “does not establish that its greenhouse gas emissions from transportation activities lack significant impacts,” she wrote.

4.14 Traffic and Transportation

Since the Preparation of the DEIR the METRO GOLD LINE Phase 2 has relocated the light rail to the Project side of the 60 freeway requiring analysis for the EIR.

There is a proposal for a station on the North West (project) side of the 60 freeway which would impact the project.

We suggest that SCE and PUC and Monterey Park support such a station and Park and Ride

WE do not see that the Gold Line traffic study was utilized but wish to point out that it did not consider the Monterey Park Market Place or MHSP and the Monterey Park Market Place does not consider the Gold line or the Montebello Hills Specific Plan.

The Montebello Hills Specific Plan does not consider the Gold Line or the Monterey Park Market Place (or the Mesa Project).

In other words all fail on cumulative effects

The Montebello Hills Specific Plan (MHSP) is especially flawed in that it was done during non peak season and school traffic was not included, it was also way out of date by the time the FEIR was approved.

It should not be utilized for anything especially freeway off ramps where they currently back up onto the mainline freeway during pm rush hour- which is not shown in the MHSP EIR
appendix p 13 item 14

We do not think SCE Mesa will have an affect on traffic volumes and apologize for the quality of reports which are available to you (Rosemead's Wal Mart was even worse)

“For the major roadways, growth rates were applied to the through volumes.
These growth rates are consistent with the Traffic Study for the Montebello Hills Specific Plan, Montebello, California

The MHSP is completely bogus, there is currently grid lock where the report shows wondefullness.

Hydrology and Water Quality

We would like to see bioswales and recycling of stormwater runoff

Flood-zone- 100 year flood is inadequate
Please utilize the USGS “Arkstorm” report as a basis of flooding, especially in Whittier Narrows

4.5 Geology and Soils

There does not appear to be an Appendix prepared by qualified professionals including a Seismologist, Engineering Geologist and Geotechnical (Soils) engineer, and Civil Engineer specializing in Soil Foundation interaction.
There is no support for, or references for the EIR the Geology and Soils Section is only of Scoping level and must be recirculated.

There does not appear to be any Seismic Hazard Mapping Act (SHMA) Report
There does not appear to be any independent Peer review which is required prior to approval of the project. Permitting agency (Monterey Park) must require
See current codes- attached

We do not see a hazard of fault rupture at the MESA site but do at the Techachapi lines crossings of the Whittier Fault (7,8,11) and Raymond Hill, Sierra Madre, San Gabriel faults (7, 11)

There may be minor faults in the project area, movement of lechate from the adjacent superfund site must be investigated and considered

4.5.9 Table 4.5.3 must be revised and updated - it is totally useless there is no clue where this erroneous data came from, the internet?
The Elsinore Fault Zone, East Montebello Fault and Whittier Fault are all the same fault.
As shown in the “Whittier Fault Extension notes” attached
Maximum Moment Magnitude of 6.8 would only be for the Whittier fault segment stricto senso utilizing Santa Ana River to San Gabriel River for calculations. Current regulations, especially for critical infrastructure, require consideration of multiple segment breaks – Whittier-Elsinore from Baja to Raymond Hill including East-Montebello and Alhambra Wash segments.
During planning for the Beverly Blvd Bridge over the Rio Hondo LA COUNTY DPW GMED division even then had calculated 7.5 for Whittier-Elsinore- they then had a consulting report from URS corp which verified their findings. This report is available from LA COUNTY GMED. Since then CalTrans in their investigation for the 710 freeway have found the Whittier fault in the Vicinity of Huntington Drive in San Marino/ South Pasadena- they calculate 7.85 The data must be updated,
That's the good news Complications follow

San Andreas Fault- Mojave section is irrelevant except for Vincent- the real hazard for MESA in the San Gabriel Valley and MESA Substation is the Southern San Andreas.
Probabilistically it is the most frequent.
Probabilistically and Deterministically it is the most hazardous at longer wavelengths and durations.
Project must consider the Love and Raleigh Waves traversing the chain of basins along the San Gabriel Mountains and turning south down the San Gabriel River Channel toward the project.
You must consider the effect of these waves on segments 7 and 8.
For starters see the Terrashake report ca 2005 et seq San Diego State University
Geology department professors Kim Bac Olsen and Steve Day
And the Shakeout Report USGS Lucy Jones et all

see complications following

Omissions must be corrected “Active and Potentially active:
The E-W Montebello Fault (not East Montebello or Montebello Thrust) is considered potentially active

by So Cal Gas- see the PUC decommissioning report, is not mentioned (we do not consider it to be a fault rupture hazard but may channel energy toward the project)

The Puente Hills Thrust is Active and directly under the project. The project MUST consider multi segment Thrust breaks in the 7.5 range
see complications following

The Upper Elysian Park Thrust of Oskin 2000 (now UC Davis) fault tips are near the project and thrust plane slopes toward the project- it must be considered
see complications following
The Lower Elysian Park Thrust must be considered.

Lines 7 and 11 cross the San Gabriel, Sierra Madre and Raymond Faults as well as Whittier-Elsinore
Sierra Madre was the source of the 1971 San Fernando earthquake and could generate ground motion similar to the similar Owens Valley fault/ earthquake-
Raymond may be connected to Santa Monica Fault on the west and faults on the east- the magnitude for critical infrastructure may be greater than shown
discussion is needed on the affect on these lines. Communications

4.5-10
USGS-Calculations are inadequate especially for Critical Infrastructure, site-specific investigation and calculations by a seismologist are required which must be included in this EIR and SHMA report.
The Citations used are way out of date in addition to being incomplete. USGS and CGS do not consider pulse, directivity, basin depth or Community Velocity Model data, near field effects- these must be calculated by a professional working in the field of seismology.

Figure 4.5.3 does not show Whittier-Elsinore crossing the Whittier Narrows as is shown on recent CGS Maps- See Tan 2000 and CGS Fault Evaluation Report FER 222 and City of Rosemead General Plan
It does not show the EW Montebello Fault from its intersection with Whittier-Elsinore near the 19 on the map to the vicinity S of Mesa substation
The map dos not show water or recycled water, storm drains, serwers- must be shown somewhere

4.5.13 CGS has not mapped all liquefaction areas- that is something that must be done in this EIR And SHMA report

Subsidence Mesa is located over an old river channel and alluvium filled structural bowl and must be site-specific investigated for subsidence and VS-30

fig 4.5.5 shows wells however we do not see analysis of core samples or down hole logging- this must be analyzed.

4.5.2.1 Regulatory Setting
1997 UBC-- U gotta be kidding -see current codes attached
4.5.2.2
Earthquake Hazards Reduction act
we have attached links to the latest

Seismic Hazards Mapping Act in Southern California has been Strengthened by the LACODPW

GMED manual. And Grading Guidelines

CBD The LA County amendments to the CBC must be followed

4.5.2.3
Los Angeles County Municipal Code (sic)- we have attached references for you- look again

See LA County General Guidelines and other references referenced in the attachment

The City of Rosemead General plan specifically extends A-P zones and zones for critical infrastructure-- it affects segment 11 look again

City of Rosemead's excellent General Plan and Beverly Blvd and Garvey Bridges were done BEFORE the major hazard of the Southern San Andreas was found ca 2005 Terrashake and 2008 Shakeout reports

4.5.3.1
a) ii and iii must be reanalyzed are recirculated
b) must be addressed, topsoil must be banked and reused

   c) the basin under the project must be analyzed- specifically is it subject to amplification during strong shaking (the bowl of jello effect, the perfect storm effect) which impacts both the severity and duration of strong seismic ground shaking see complications following

4.5.3.3
Geo 1,2,3, and 6 are all premature and not supported by the investigation and report
Impact GEO-5 must consider the banking and reuse of valuable topsoil

Mitigation Measure MM GEO-1 must be accomplished as part of the DEIR and the DEIR recirculated. Decision makers do not have enough information to make a decision on this project from the Scoping level analysis presented as a DEIR

Obviously documentation must also be provided to the permitting agencies
The public must be included.

Complications
As shown in the 1993 Bullard and Lettis paper previously provided- the MESA project sits in the Potrero Grande Paleo Channel, and evidently in a small basin
The Paleo Channel (old river Chanel) begins near the intersection of Potrero Grande and San Gabriel blvds, near the Whittier-Elsinore Rosemead Alquist Priolo zone and the source of the 1987 Whittier earthquake.
From this wide area it is shown to narrow like a funnel pointed toward the MESA project and the Gold Line extension down to the 60 freeway Garfield area.

The funnel effect as in the similar one in the Whittier Narrows focus seismic waves toward the project creating what we call “roaring rapids amplification.

From the Whittier-Elsinore fault NEAR FAULT amplification must be considered as well as directivity, pulse, fling, etc.

From the Upper Elysian Park Thrust near fault and directivity- comparison must be made with Northridge where the fault break sloped away and downward to MESA where the fault plane slopes upward and toward the project. The fault tips of the UEP must be located and if in the project area must be mitigated. (We hope not as we no way to construct the project over fault tips)

The Puente Hills Thurst may also break towards the project from any direction.
Puente Hills thrust must be analyzed both as a single segment and as a multiple segment break
We suggest that the project utilize the SCEC Simulation by Robert Graves now with USGS Pasadena
A site specific spectrum analysis must be provided for each fault.
For near fault and distance calculations the Puente Hills Thrust is at 0.0 distance using the CGS methodology of measuring distance from the 10 km depth line, anything less than 10 km deep is 0.0, horizontal measurement from that line, in this case to the North. Do not measure/ calculate to the fault tips in Bellflower or depth to the fault plane vertically.

There may be a Montebello Thrust sloping up to the North from down sloping to the north Puente Hills Thrust. This is one explanation for the uplift and structure of the Montebello (Merced) and Monterey Park (Repetto) Hills (which are cut by the paleo channel in the project area) It is shown in many papers by John Shaw

The Southern San Andreas is amplified by the Paleo Channel funnel effect at longer wavelengths than the others and for longer durations. A site specific spectrum analysis must be provided

Basin analysis must consider those faults where seismic energy comes from outside the basin and the Puente Hills Thrust which could come both from inside and outside the basin.

IT must be shown if the basin can be excited- the bowl of jello effect.
Basin wall reflection must be analyzed for the "perfect storm" effect of waves trapped in the basin and having a reflection/ interference effect.

The effect of the Potrero Grande Sycline must be shown.

Horizontal and Vertical accelerations, velocities and ground motions must be calcualted.

The critical periods of all structures and substation components) must be shown and compared with the seismic spectrums.
The resilience of each structure (and substation components) must be provided and the maximum time to return to service.

The structural engineer and Civil/ Geotechnical engineers need this data for structural and soil-foundation interface and design. We expect that mat foundations will be required

Any water system used for fire fighting and any tanks associated must be analyzed and designed as critical infrastructure.

Ground motions, standing and dynamic ground waves must be calculated and extrapolated to transmission tower tops to determine if adequate drop is available.
IE tower 1 swings west, tower 2 sways east at the same time
Especially in the basin and Whittier Narrows for segments 7 and 8 and up the river channel to the San

Gabriels. The river channel is 5000 feet deep alluvium in the critical area along the 605 freeway, considerable basin depth amplification, reflection and funnel effect past the segment 8 crossing.

WE suggest that the project utilize the SCEC Cybershake program as a first cut at the problem and consult with USGS Pasadena Robert Graves who may have later data and a more detailed data set than the published simulation. (SCEC Community Velocity Model)

Basin Depth Amplification must be considered, we suggest that the basin under the site be modeled by a qualified professional.

WE have attached a printout from CalTrans ARS tool which is suitable for a Scoping level quick look
As with the CGS/USGS websites CalTrans does not consider Vertical or Maximum Rotated shaking (which is required by current code) It also does not yet utilizes the latest Velocity Models not only for the Site selected but from the PATH earthquake source to the Site.
Notice the use of 5%50 years 2008 instead of latest data and 2%50 of current code and perhaps 1%50years for Critical Infracture
It also does not consider the Path effects on the biggest hazard- the Southern San Andreas
It does not show multi segment events
It does give a list of the faults which must be considered with the addition of multi segment breaks on Whittier-Elsinore, Puente Hills thrust and the Southern San Andreas
Note that it shows both Upper and Lower Elysian Park.
Proposed structures must be analyzed for their periods against the Periods shown in a similar site specific analysis by a registered professional.
Durations must also be considered which implies seismograms or synthetic seismograms

WE have attached a copy of Dr Syndor's CGS monograph for Special Service Structures- he does not like the term Critical Infracture, it needs to be brought current to latest regs but then so does everything

One of the problems I see with the EIR is that there are no periods, structural responses, associated with any proposed structures or tunnels, or non structual components like generators or tanks.
As long structures tunnels (and Tanks) may have long period structural responses which are not found in ordinary buildings, and as such require specific analysis.
Approximate structural period relationships MUST BE PROVIDED

The 2014 NEHRP Recommended Seismic Provisions for New Buildings and Other Structures (NEHRP Provision) even in final draft form must be considered as current standards of professional practice

The primary intent of the NEHRP Recommended Seismic Provisions for New Buildings and **Other Structures**
is to prevent, for typical buildings and structures, serious injury and life loss caused by damage from earthquake ground shaking.
Most earthquake injuries and deaths are caused by structural collapse; therefore, **the major thrust of the Provisions is to prevent collapse for very rare, intense ground motion, termed the maximum considered earthquake (MCE) ground motion.**[2]
The intent remains the same as in the 2009 Provisions;
however, the prevention of collapse is redefined in terms of **risk-targeted maximum considered earthquake (MCE_R) ground motions**.
This change is explained fully in the commentary to the Part 1 modification to ASCE/SEI 7-05 Section 11.2.

http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/bssc/appendixg_0810.pdf
the 2014 NEHRP Provisions will adopt by reference the seismic requirements of ASCE/SEI 7-10 (ASCE, 2010)

As initiated in the 2009 edition, the 2014 NEHRP Provisions are presented in three parts:
Part 1 will include consensus-approved modifications to ASCE/SEI 7-10.
Part 2 will provide commentary, also consistent with ASCE/SEI 7-10 and
Part 3 will provide resource papers coveringmaterial intended to
stimulate discussion from the engineering community on new seismic design concepts

INCORPORATION OF FEMA P695 AND P795
FEMA P695 – Quantification of Building Seismic Performance Factors (ATC, 2009) is a methodology
to quantify the seismic performance factors for code-defined structural systems and to verify the adequacy of proposed new systems.

FEMA P795 – Component Equivalency Method(ATC, 2011) is a component-based methodology for verifying equivalency of components, connections and
sub-assemblies proposed for substitution into an established structural system.
Since their publication, P695 and P795 have been generally accepted as the most appropriate approach to assigning seismic design coefficients to new systems and for qualifying new components

ATC 63-2 - Development of Seismic Performance and Methodology Calibration,
Ronald Hamburger - Project Technical Director

3. EVALUATION AND QUANTIFICATION OF SEISMIC PERFORMANCE OBJECTIVES
This issue team is examining the seismic performance that is inherent in our current provisions and
considering modifications to design procedures to improve our ability to achieve desired performance across all risk categories.
Among the issues being considered are: how does seismic risk in general compare with other natural hazards; how do collapse risk and other performance levels vary among:
structural systems,
risk categories and
seismic design categories;
and how does seismic risk vary with seismic hazard.

Of interest for Risk Category IV (critical) buildings (structures) is the intensity at which building (structure) function is lost.
Occupancy Category III or IV structures intended to provide enhanced safety and functionality are required to have more
strength than Occupancy Category I or II structures in an effort to reduce damage to the structural system
RISK CATEGORRIES and OCCUPANCY CLASSES MUST BE DEVELOPED AND STATED
Nonstructural system performance is enhanced by strengthening the anchorage and bracing requirements, and
i**mportant equipment must be shown to be functional after being shaken.**

Structures of higher importance due to hazardous contents or critical occupancy are assigned to higher Occupancy Categories

he damage level in these buildings is intended to be reduced by
decreasing nonlinear demand using an **importance factor, I**, to reduce the **response modification coefficient, R**
The resulting increased strength will reduce structural damage, or **increase reliability of acceptable performance**, for a given level of shaking.

In strong shaking associated with the design level of two-thirds the
maximum considered earthquake or higher,
the values of I have not been well tested for their effect on either functionality for
critical buildings or increased reliability of life safety protection for high occupancy buildings

The importance factor I also increases the design anchorage and bracing load for nonstructural systems, which should increase the reliability of their staying in place and, thus, remaining undamaged.

Establishment of seismic design coefficients for collapse, functional design and economic design MUST BE PROVIDED; and ground motion maps for very rare, rare and frequent events.
GIVEN the presence of 5 major faults, near field and basin depth amplification maps MUST BE CREATED by simulations.

PERFORMANCE GOALS MUST BE STATED
General Requirements: How performance goals will be either implicitly demonstrated through predictable stable response under MCER ground motion or explicitly through fulfillment of performance goals related to collapse probability and possibly other performance levels, (such as loss of function or return to service) as a function of Risk Category

Ground Motion Selection and Scaling:
Definition of the target spectrum (or spectra) using either the ASCE/SEI 7-10 Chapter 11 mapped or **site specific ground motion values** or **through one or more site specific scenario spectra covering MCER ground motion at appropriate (significant) periods of vibration of the building (structure).**
Which is why the period of vibration of the propsoed structues must be determined as stated

Consideration is given to specifying earthquake events that capture frequency content at appropriate magnitude and distance**,** **including requirements to address multiple earthquakes having distinct characteristics.**
Source, path (such as the Community Velocity Model) and site effects (including near fault and basin depth) must also be considered and included
simple AR's or GMPEs are insufficeint

Use of a maximum direction spectrum must be considered along with the period range for scaling.
Use of simulated records, (scnerios) (similar to current provisions) where appropriate records are not available.

Orientation (fault-normal and fault-parallel) of ground motions for sites within 5 km of controlling faults MUST BE addressed, as is the lack of specificity of orientation at other sites.
Consideration must be given for input ground motion at subterranean levels and for soil-foundation-structure interaction.

Modeling, Analysis and Acceptance Criteria:
System modeling considerations include the use of two-dimensional and three-dimensional modeling (including where to allow 2-D models), application of vertical ground motions MUST BE REQUIRED
how to ad dress non-participating elements and gravity loads, as well as diaphragm modeling, requirements fo r force controlled elements and guidance on soil-structure interaction.

Analysis and acceptance criteria considerations include use of average vs. maximum criteria, treatment of outlier ground motions resulting analytically in collapse or loss of use or unacceptable time to return of service

LIQUEFACTION AND OTHER SITE CONSIDERATIONS
LIQUEFACTION MUST BE RE-EVALUATED CONSIDERING MEDIUM and LONG PERIOD -LONG DURATION EVENTS

The Provisions require that buildings (and other structures) be assessed for potential consequences of liquefaction and soil strength loss, including but not limited to, estimation of total and differential settlement, lateral soil movement, lateral loads on foundations, reduction of foundation soil bearing capacity, reduction of axial and lateral soil reaction on piles and floatation of buried structures.

These effects are to be analyzed on the basis of:
peak ground accelerations, earthquake magnitudes and source characteristics associated with MCE_G peak ground accelerations, where MCE_G represents the Maximum Considered Earthquake geometric mean ground motion.

Evaluating liquefaction for MCE ground motions is intended to minimize risk of collapse (or loss of use) for the rare MCE ground motion, rather than at the design level,
which assumes a certain level of reserve structural capacity.

Consider more closely the geotechnical effects of the expected ground failure and its implications related to damage and performance.

LIQUEFACTION MUST BE RE-EVALUATED CONSIDERING MEDIUM and LONG PERIOD -LONG DURATION events such as shown for the Southern San Andreas Fault and implied for the San Jacinto Fault.
We read that SHMA and the Liquefaction implementation guide and LACODPW standards require both short period strong short events be evaluated AND long duration long period events be evaluated. Address S_S values greater than 3g and vertical values.

T_L (long period) maps must be provided for the project areas

The Provisions utilize site amplification coefficients F_a and F_v
that scale the mapped spectral values S_S and S_1
to obtain acceleration response parameters for sites with classification other than Site Class B.
These coefficients were originally developed in the 1990's based primarily on the 1989 Loma Prieta Earthquake and are being re-evaluated based on recorded data from more recent earthquakes and nonlinearity of site response.
This work is based on studies underway at the Pacific Earthquake Engineering Research Center
LATEST PEER work must be utilized

SOIL-STRUCTURE INTERFACE
Foundation design requirements (tunnel design requirements) that address horizontal and vertical load effects (considering inelastic demands based on response modifications factors), nominal strengths, resistance factors and acceptance criteria

Controlling behavior and load-deformation modeling of the system consisting of the structure, its anchorage to the foundation, the foundation itself, and the soil MUST BE ACCOMPLISHED

Significant design-related adjustments MUST BE MADE,
including use of risk-targeted ground motions, use of maximum direction ground motions, and use of near-source 84th percentile ground motion

VERTICAL GROUND MOTIONS FOR SEISMIC DESIGN
Chapter C23.1 DESIGN VERTICAL RESPONSE SPECTRUM
General.
ASCE/SEI 7-05 and the earlier editions of the Provisions use the term 0.2 S_{DS}D
to reflect the effects of vertical ground motion.
Where a more explicit consideration of vertical ground motion effects is advised—**as for certain tanks, materials storage facilities,** and electric power generation facilities—**BACKUP GENERATORS**
the requirements of this chapter may be applied. Professional practices interpret may as must

Historically, the amplitude of vertical ground motion has been inferred to be two-thirds (2/3) the amplitude of the horizontal ground motion.

However, studies of horizontal and vertical ground motions over the past 25 years have shown that such a **simple approach is not valid in many situations** (e.g., Bozorgnia and Campbell, 2004,
and
references therein) for the following main reasons:
(a) vertical ground motion has a larger proportion of short-period (high-frequency) spectral content than horizontal ground motion and this difference increases with decreasing soil stiffness and

(b) vertical ground motion attenuates at a higher rate than horizontal ground motion and t**his difference increases with decreasing distance from the earthquake**

lead to the following observations regarding the vertical/horizontal (V/H) spectral ratio (Bozorgnia and Campbell, 2004):

1.The V/H spectral ratio is relatively sensitive to:
spectral period,
distance from the earthquake,
local site conditions, and
earthquake magnitude (but only for relatively soft sites) and
relatively insensitive to earthquake mechanism and sediment depth;

2.The V/H spectral ratio has a distinct peak at short periods that generally exceeds 2/3 in the near-source region of an earthquake;
and

3.The V/H spectral ratio is generally less than 2/3 at mid-to-long periods.
Therefore, depending on the period, the distance to the fault,
and the local site conditions of interest,
use of the traditional 2/3V/H spectral ratio can result in either an underestimation or
an overestimation of the expected vertical ground motions.

The procedure for defining the design vertical response spectrum in the
Provisions is based on the studies of horizontal and
vertical ground motions conducted by Campbell and Bozorgnia (2003) and Bozorgnia and Campbell (2004).
These procedures are also generally compatible with the general observations of Abrahamson and Silva (1997) and Silva (1997) and
the proposed design procedures of Elnashai (1997).

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Evaluation of Hybrid Broadband Ground Motion Simulations for Response History Analysis and Design

http://web.stanford.edu/~bakerjw/Publications/Burks_et_al_%282014%29_HBB_for_RHA,_EQS.pdf

Lynne S. Burks,a)M.EERI,Reid B. Zimmerman ,b)M.EERI and Jack W. Baker,a)M.EERI **a= STANFORD**

"Chapter 16 of ASCE 7" (2010) governs the selection of ground motions for analysis of new buildings and requires recordings that meet specified criteria.

**If a sufficient number of recordings cannot be found,
it allows the use of "appropriate simulated ground motions"but does not provide further guidance**

Significant updates

to this chapter are currently under consideration,
but the basic process of ground motion
selection will remain similar
(Haselton et al., 2014) contact J.P Stewart UCLA http://www.cee.ucla.edu/faculty/stewart/publications
Ground motion records are selected to match a target spectrum
that is based on the maximum considered earthquake
(MCE_R) determinedfrom seismic hazard analysis NOTE THE R

p3
The seismic design of structures is based on a target spectrum using
seismic hazard analysis and then select ground motions with elastic response spectra that match the target

. These procedures require ground motion records as input rather than just a target spectrum

Hybrid broadband simulations are typically considered "state of the art" for structural analysis applications because they use a combination of deterministic and stochastic techniques to simulate ground motiontime histories across a wide frequency range and in three componentsof motion.
Contact Robert Graves USGS Pasadena

Some key relevant differences between Chapter 16 of ASCE 7-10 and the proposed procedure
are the use of the maximum considered earthquake (MCE_R) Seismic Design Coefficients (R-factor)
rather than design basis earthquake (DBE) spectrum for analysis,
the use of an $Sa_{RotD100}$(discussed in the next section)
rather than a geometric mean target spectrum, and
an increase to 11 required ground motions for response history analysis (Haselton et al., 2014)

7
After filtering by magnitude, distance,
V
S30
, and pulse cha
ra
cteristics,
the remaining
candidate
ground motion re
cordings were
scaled
uniformly
to
best
match
the target spectrum
between
0.2
s and
3.36
s
.
A
maximum scale factor of 4 was imposed
and n
o more than 3
recordings from
any single event were allowed
.
Ground motions were selected by
first
computing t

he sum of square error between the log of the target spectrum and the log of each scaled recorded spectrum over the period range of interest, and then choosing the 11 ground motions with the smallest error, subject to the above restrictions. Table 1 lists the 11 selected recordings, Figure 4a shows their $Sa_{RotD100}$ spectra, and Figure 5 shows some sample velocity time histories.

Table 1. The 11 selected ground motion recordings.

NGA #	Earthquake	Station	Magnitude	Distance (km)	V_{S30} (m/s)	Scale Factor	Pulse Period (s)
179	Imperial Valley-06	El Centro Array #4	6.5	7.1	209	1.9	4.6

183
Imperial Valley
-
06
El Centro Array #8
6.5
3.9
206
1.9
5.4
184
Imperial Valley
-
06
El
Centro Differential Array
6.5
5.1
202
1.7
5.9
723
Superstition Hills
-
02
Parachute Test Site
6.5
1.0
349
1.7
2.3
802
Loma Prieta
Saratoga
—
Aloha
Ave.
6.9
8.5
371
2.2
4.5
983
Northridge
-
01
Jensen Filter Plant Generator
6.7
5.4
526
0.9
3.5
1013
Northridge
-
01
LA Dam
6.7
5.9
629
1.9
1.7
1063
Northridge
-
01
Rinaldi Receiving Station
6.7
6.5
282
1.0
1.2
1202
Chi
-
Chi, Taiwan
CHY035
7.6
12.7
474
2.6
1.4
1493

Chi
-
Chi Taiwan
TCU053
7.6
6.0
455
3.6
12.9
1528
Chi
-
Chi Taiwan
TCU101
7.6
2.1
273
2.9
10.0

GROUND MOTION SIMULATIONS SOUTHERN CALIFORNIA EARTHQUAKE CENTER (SCEC) BROADBAND PLATFORM

The Southern California Earthquake Center's (SCEC) Broadband Platform is a software system that makes hybrid broadband simulation codes available to outside users (SCEC, 2012). A number of scientific researchers have contributed modules to the Broadband Platform for rupture generation, low frequency seismogram synthesis, high frequency seismogram synthesis, and nonlinear site effects. SEE GRAVES

under-prediction of ground motions by empirical GMPEs AKA Attenuation Relationships

Which Spectral Acceleration Are You Using? Jack W. Baker,a...M.EERI STANFORD ,andC. Allin Cornell,a...M.EERI

http://web.stanford.edu/~bakerjw/publications.html#In_press

http://web.stanford.edu/~bakerjw/Publications/Baker_Cornell_%282006%29_Which_Sa,_EQ_Spectra.pdf

Intro

Analysis of the seismic risk to a structure requires assessment of both the
rate of occurrence of future earthquake ground motions hazard and
the effect of these ground motions on the structure response.
These two pieces are often linked using an intensity measure such as spectral acceleration.
However, earth scientists typically use the geometric mean of the spectral accelerations of the
two horizontal components of ground motion as the intensity measure for hazard analysis,
while structural engineers often use spectral acceleration of a
single horizontal component as the intensity measure for response analysis.
This inconsistency in definitions is typically not recognized when the two assessments are combined,
resulting in unconservative conclusions about the seismic risk to the structure.

Conclusion

Although intensity measure–based analysis procedures have proven to be useful
methods for linking the analyses of earth scientists and structural engineers,
care is needed to make sure that the link does not introduce errors into the analysis.
Two definitions of "spectral acceleration" are commonly used by analysts,
and the distinction between the definitions is not always made clear.
Because of this, a systematic error has been introduced into the results from many risk analyses,
typically resulting in unconservative conclusions.
For an example site and structure located in Los Angeles, the error resulted in **a 12% underestimation** of the spectral acceleration value exceeded with a 2% probability in 50 years,

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Kim B. Olsen and Ralph J. Archuleta *Bulletin of the Seismological Society of America, June 1996, v. 86, p. 575-596* (not Whittir)

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We document several blind-thrust faults under the Los Angeles basin that, if active and seismogenic, are capable of generating large earthquakes (*M* = 6.3 to 7.3). Pliocene to Quaternary growth folds imaged in seismic reflection profiles record the existence, size, and slip rates of these blind faults. The growth structures have shapes characteristic of fault-bend folds above blind thrusts, as demonstrated by balanced kinematic models, geologic cross sections, and axial-surface maps. We interpret the Compton-Los Alamitos trend as a growth fold above the Compton ramp, which extends along strike from west Los Angeles to at least the Santa Ana River. The Compton thrust is part of a larger fault system, including a decollement and ramps beneath the Elysian Park and Palos Verdes trends. The Cienegas and Coyote Hills growth folds overlie additional blind thrusts in the Elysian Park trend that are not closely linked to the Compton ramp. Analysis of folded Pliocene to Quaternary strata yields slip rates of 1.4 ± 0.4 mm/yr on the Compton thrust and 1.7 ± 0.4 mm/yr on a ramp beneath the Elysian Park trend. Assuming that slip is released in large earthquakes, we estimate magnitudes of 6.3 to 6.8 for earthquakes on individual ramp segments based on geometric segment sizes derived from axial surface maps. Multiple-segment ruptures could yield larger earthquakes (M = 6.9 to 7.3). Relations among magnitude, coseismic displacement, and slip rate yield an average recurrence interval of 380 years for single-segment earthquakes and a range of 400 to 1300 years for multiple-segment events. If these newly documented blind thrust faults are active, they will contribute substantially to the seismic hazards in Los Angeles because of their locations directly beneath the metropolitan area.

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Simulations of Ground Motion in the Los Angeles Basin Based upon the Spectral-Element Method

1. Dimitri Komatitsch,
2. Qinya Liu,
3. Jeroen Tromp,
4. Peter Süss*,
5. Christiane Stidham and
6. John H. Shaw

Bulletin of the Seismological Society of America, Vol. 94, No. 1, pp. 187–206, February 2004
http://authors.library.caltech.edu/47818/1/187.full.pdf
http://www.bssaonline.org/content/94/1/187.short

> Simulations are performed using a new sedimentary basin model that is constrained by hundreds of petroleum-industry well logs and more than 20,000 km of seismic reflection profiles. The numerical simulations account for 3D variations of seismic-wave speeds and density, topography and bathymetry, and attenuation.
>
> Accurate prediction of hazardous ground shaking generated by large earthquakes requires the ability to numerically simulate seismic-wave propagation in realistic geological models. In this article we demonstrate that, using adetailed model of the Los Angeles, California, basin (Fig. 1)and an accurate numerical technique, ground motion can be accurately modeled down to a period of 2 sec inside the basin model and 6 sec in the regional model

Peak ground displacement, velocity, and acceleration maps illustrate that significant amplification occurs in the basin
There is evidence that large amplification (factors of 3, 4, or more) can occur between basin sites and hard-rock sites. It has also been shown that site effects caused by topography or local geological features, such as poorly consolidated sediments, can result in very significant amplification of the wave field

very large accelerations (up to 1.8g) at Tarzana Hill during the 1994 Northridge earthquake (e.g., Bouchon and Barker, 1996; Catchings and Lee, 1996; Rial, 1996; Spudich et al., 1996; Komatitsch and Vilotte, 1998).

Localization effects can also cause important damage, as illustrated in Santa Monica during the 1994 Northridge earthquake (e.g., Gao et al., 1996; Alex and Olsen, 1998; Davis et al.,2000).

Such effects are intrinsically 3D and therefore further illustrate the need for detailed basin models and accurate and flexible numerical techniques.

Peak ground displacement, velocity, and acceleration maps clearly illustrate that large amplification occurs within the basin

This (SEM) approach can be used to calculate synthetic peak ground displacement, velocity, and acceleration maps, such as those in Figures 11 and 14, to assess seismic hazards associated with such large events

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Influence of Focal Mechanism on Peak Accelerations of Strong Motions of the Whittier Narrows, California, Earthquake and an Aftershock

JOHN E. VIDALE
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Directional Site Resonances Observed from the 1 October 1987 Whittier Narrows, California, Earthquake and the 4 October Aftershock

John E. Vidale, Ornella Bonamassa, and Heidi Houston

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Simulations of Ground Motion in the Los Angeles Basin Based upon the Spectral-Element Method *Bulletin of the Seismological Society of America, February 2004, v. 94, p. 187-206*

Empirical Corrections for Basin Effects in Stochastic Ground-Motion Prediction, Based on the Los Angeles Basin Analysis *Bulletin of the Seismological Society of America, August 2003, v. 93, p. 1679-1690*

Site Response in Southern California for Probabilistic Seismic Hazard Analysis *Bulletin of the Seismological Society of America, December 2000, v. 90, p. S149-S169*

Site Amplification in the Los Angeles Basin from Three-Dimensional Modeling of Ground Motion *Bulletin of the Seismological Society of America, December 2000, v. 90, p. S77-S94*

Empirical Corrections for Basin Effects in Stochastic Ground-Motion Prediction, Based on the Los Angeles Basin Analysis (Whittier Narrows)

1. Claire E. Hruby and
2. *Igor A. Beresnev*

   BSSA v. 93 no. 4 p. 1679-1690 2003

   Ground-motion duration is defined as the time for 95% of the acceleration spectral energy to pass after the *S*-wave arrival. The results are directly applicable to engineering simulation of strong ground motions in a sedimentary-basin environment.

Francesco Gentile, Franco Pettenati, and Livio Sirovich

Validation of the Automatic Nonlinear Source Inversion of the U.S. Geological Survey Intensities of the Whittier Narrows 1987 Earthquake
Bulletin of the Seismological Society of America, October 2004, v. 94, p. 1737-1747, doi:10.1785/012003157 fgentile@ogs.trieste.it Lsirovich@ogs.trieste.it

Griffith and cooke
http://economiceducation.us/dotAsset/1947466.pdf
W.A Griffith *The Department of Geological and Environmental* Sciences, Stanford University, Stanford, California 94305; wagrif@ pangea.stanford.edu.

heoretical slip
maps such as Figure 4 can be used to choose suitable loca-
tions for paleoseismic investigation. Furthermore, the results
of this study indicate that strike-slip motion may be signifi-
cant on
PHT
faults and should be considered in predictive
earthquake hazard algorithms. Hazard analysis limited to re-
verse slip on these faults may underestimate earthquake risk.
Moreover, the sensitivity of strike slip on both the
PHT
and
Whittier faults to contraction direction highlights the need
for further investigation of the overall contraction direction
in the Los Angeles basin.

http://structure.harvard.edu/cfma

Importance of source effects on strong-motion seismograms-- (Whittier Narrows)
Hartzell USGS and Lida
Earthquake Engineering, tenth world converence Balkema, Rotterdam 1992 isbn 90 54 5410 060 5
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Probabilistic seismic hazard assessment in the wake of world disasters:

Honing the debate and testing the models !

Ross S. Stein (U.S. Geological Survey, Menlo Park, CA)
and Mark W. Stirling (GNS Science, Lower Hutt, New Zealand 3 October 2014
http://profile.usgs.gov/myscience/upload_folder/ci2014Oct0619203542966Revised%20EOS%20brief%20report.pdf stein@usgs.gov;

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Continuity of slip rates over various time scales on the Puente Hills **...**

Bergen, **Kristian J**.; Shaw, John H.; Leon, Lorraine A.; Dolan, James F.; Pratt, Thomas L.; Ponti, Daniel J.; Barrera, Wendy; Rhodes, Edward J.; Murari, Madhav K.; ...
adsabs.harvard.edu/abs/2014EGUGA..1613126B kbergen@fas.harvard.edu

Malburg, Ken Wilson 5/1/02

Marlberg Generating Site Vernon CA -geologic-hazards-california-energy-commission-

the Landsat-based figure in the Science article and the figure in the Dolan et al. (2001) summary (please see Figure 4-3)

is the best representation for the subsurface location of the three segments of the Puente Hills blind thrust.

Studies (SCEC, 2000) have hypothesized that the Puente Hills blind thrust is an important part of a master fault

system connecting to the San Andreas Fault zone in the deep subsurface.

The Puente Hills blind thrust as shown by Shaw and Shearer (1999) strikes at roughly

north 58 degrees west -where its leading edge projects to the surface just southwest of

the [Marlberg] site at a depth of about 2.5 to 3 kilometers.

In the Santa Fe Springs area, Shaw and Shearer (their Figure 1, a nearly north-south seismic section along the San Gabriel

River) show a “growth triangle” bounded by secondary faults that propagate

upward/south at an approximately 65-degree angle from the leading edge of the thrust

plane.

Shaw and Shearer (1999) show the fault to within about 800 feet of the surface in

this area, although there is no indication that these features pose a fault rupture hazard.

Dolan et al (2001) performed additional detailed high-resolution seismic profiling at two

sites (please see Figure 4-2) east of the proposed generating station site that

demonstrates folding above the PHT, which extends into the shallow sediments (<200

m) as discrete kink bands, consistent with the late Quaternary activity.

The shallow fold scarps were not associated with observable surface deformation during the 1987

Whittier Narrows (M6.0) earthquake. Using these data, the return interval for

earthquakes on the Puente Hills blind thrust are estimated by Dolan et al (2001) as

follows:

so it was

added for this study using the format described in the EQFAULT User’s Manual.

Expected Depth of the Los Angeles Basin at the Site

The Southern California Earthquake Center (SCEC) research provides a consistent

method to determine the depth of the sedimentary basin [defined as the depth to the 2.5-

kilometer per second (km/sec) shear-wave velocity isosurface] based on Magistrale, et

al. (2000). Based on the site coordinates the minimum depth, the computed depth, and

the maximum depth are:

Hill, Robert L., et al, Earthquake Hazards Associated With Faults in the Greater Los Angeles Metropolitan Area, Los Angeles County, California, Including Faults in the Santa Monica-Raymond, Verdugo-Eagle Rock, and Benedict Canyon Fault Zones, Open File Report 79-16 LA, Geological Survey (CGS), December, 1979.

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The spectral amplification factors presented in this work can be used in general probabilistic seismic hazard assessment.

A GEOTECHNICAL SEISMIC SITE RESPONSE EVALUATION PROCEDURE
Adrian RODRIGUEZ-MAREK[1], Jonathan D BRAY [2]And Norman A ABRAHAMSON 12WCEE 2000
Dr. Walter Silva of Pacific Engineering and Analysis for his assistance in providing the ground motion database used in this study; Dr. Paul Somerville for providing event-specific attenuation relationships for the Northridge and Loma Prieta Earthquakes; Dr. François E. Heuze, Dr. Mladen Vucetic, Dr. Sandy Figuers, and Dr. David Rogers for providing essential geotechnical data for ground motion sites; D

Characterization of forward-directivity ground motions in the near-fault region
JD Bray, A Rodriguez-Marek - Soil Dynamics and Earthquake Engineering, 2004

Ground motions close to a ruptured fault resulting from forward-directivity are significantly different than other ground motions. These pulse-type motions can place severe demands on structures in the near-fault region. To aid in the characterization of these special type of ground motions, a simplified parameterization is proposed based on a representative amplitude, pulse period, and number of significant pulses in the velocity–time history. Empirical relationships were developed for estimating the peak ground velocity (PGV) and **...**

Magnitude scaling of the near fault rupture directivity pulse

PG Somerville - Physics of the earth and planetary interiors, 2003 - Elsevier
Current ground motion models all assume monotonically increasing spectral amplitude at all periods with increasing magnitude. However, near fault recordings from recent earthquakes confirm that the near fault fault-normal forward rupture directivity velocity pulse is a narrow **...**
http://manishathesis.googlecode.com/svn-history/r90/trunk/Papers/somerville.pdf
Proceedings of the International Workshop on the Quantitative Prediction of Strong-Motion and the Physics of Earthquake Sources, 23–25 October 2000, Tsukuba, Japan.Tel.: +1-626-449-7650; fax: +1-626-449-3536. *E-mail address:* paul somerville@urscorp.com (P.G. Somerville

The conditions required for forward directivity are also met in dip slip faulting. The alignment of both the rupture direction and the slip direction updip on the fault plane produces rupture directivity effects at sites located around the surface exposure of the fault (or its updip projection if it does not break the surface).
dip
slip faulting produces directivity effects on the ground surface that are most concentrated in a limited region updip from the hypocenter.

Norm Abrahamson, Archuleta

Characterization of forward-directivity ground motions in the near-fault region

http://manishathesis.googlecode.com/svn-history/r111/trunk/Papers/MarekBray.pdf

Quantitative classification of near-fault ground motions using wavelet analysis

http://www.stanford.edu/~bakerjw/Publications/Baker%20(2007)%20Pulse%20ID,%20BSSA.pdf

http://www.stanford.edu/~bakerjw/Publications/Shahi_Baker_(2011)_Pulse_PSHA,_BSSA.pdf

The prediction and use of peak ground velocity

http://ssi.civil.ntua.gr/downloads/journals/2009-ASCE_Effects%20of%20Near-Fault%20Ground%20Shaking%20on%20Sliding%20Systems.pdf

Julian J. Bommer, John E. Alarcon*, THE PREDICTION AND USE OF PEAK GROUND VELOCITY, Journal of Earthquake Engineering, 2006, 10, 1, 1* CrossRef

Progress and trend on near-field problems in civil engineering

Design spectra including effect of rupture directivity in near-fault region

A Rodriguez-Marek - Earthquake Engineering and Engineering …, 2006 - Springer

http://link.springer.com/article/10.1007/s11803-006-0636-8

Selection of near-fault pulse motions for use in design

Connor P. Hayden, Jonathan D. Bray, Norman A. Abrahamson, Selection of Near-Fault Pulse Motions, Journal of Geotechnical and Geoenvironmental Engineering, 2014, 140, 7, 04014030
CrossRef

Selection of Near-Fault Pulse Motions Volume 140, Issue 7 (July 2014)

Hayden, Bray and Abrahamson

http://dx.doi.org/10.1061/(ASCE)GT.1943-5606.0001129

The relative contribution of pulse-type motions to the overall seismic hazard should be considered when selecting records in a suite of design ground motions for a site in the near-fault region.

Arias Intensity

Design ground motions near active faults Jonathan D Bray, Adrian Rodriguez-Marek, Joanne L Gillie

Baker J.W. and Cornell C.A. (2008). "Uncertainty Propagation in Probabilistic Seismic Loss Estimation," Structural Safety, 30 (3), 236-252.

- Baker, J. W., Coray, J., DeStefano, P., Duenas-Osorio, L., King, S., and Manuel, L. (2013). “Risk communication for critical civil infrastructure systems.” American Society of Civil Engineers Structures Congress, Pittsburgh, PA. 11p.

Baker J.W. and Cornell C.A. (2008). "Uncertainty Propagation in Probabilistic Seismic Loss Estimation," Structural Safety, 30 (3), 236-252.

- Baker, J. W., Coray, J., DeStefano, P., Duenas-Osorio, L., King, S., and Manuel, L. (2013). “Risk communication for critical civil infrastructure systems.” American Society of Civil Engineers Structures Congress, Pittsburgh, PA. 11p.

Empirical Corrections for Basin Effects in Stochastic Ground-Motion Prediction, Based on the Los Angeles Basin Analysis

Bulletin of the Seismological Society of America, August 2003, v. 93, p. 1679-1690, doi:10.1785/0120020121

1. Claire E. Hruby chruby@iastate.edu 2003
2. Igor A. Beresnev

Julian C. Lozos, David D. Oglesby, James N. Brune, and Kim B. Olsen
Rupture Propagation and Ground Motion of Strike- Slip Stepovers with Intermediate Fault Segments
Bulletin of the Seismological Society of America, First published on December 16, 2014, doi:10.1785/0120140114

These results have important implications for assessing the probability of a rupture propagating through small- and large- scale discontinuities in faults, as well as for evaluating ground- motion intensities near fault stepovers.

e and deepes fault plane reflections

Now open and go to fig 5
Puente Hills Blind-Thrust System, Los Angeles, California
Shaw, Plesch, dolan, Pratt and Fiore Bulletin of the Seismological Society of America, Vol. 92, No. 8, pp. 2946–2960, December 2002
http://activetectonics.asu.edu/bidart/bibliography/bssa/bssa_92_8/shaw_plesch_dolan_pratt_fiore_2002.pd
figure 5
 lables this backthrust as the "Montebello thrust" (I have also seen "Montebello Hills Thrust"

Challange is that the local developers and chamber of commerce and real estate/ interests claim that it does not exist.

Adjoint analysis of the source and path sensitivities of basin-guided waves

Steven M. Day,
1
Daniel Roten
2
and Kim B. Olsen
1Geophys. J. Int.
(2012)
189,
1103–11
http://www-rohan.sdsu.edu/~steveday/PUBLISHED/Day_et_al_Adjoint_2012.pdf

SUMMARY
Simulations of earthquake rupture on the southern San Andreas Fault (SAF) reveal large am-
plifications in the San Gabriel and Los Angeles Basins (SGB and LAB) apparently associated
with long-range path effect

Path kernels show that LAB excitation
is mediated by surface waves deflected by the velocity contrast along the southern margin of
the transverse ranges,
having most of their energy in basement rock until they impinge on the
eastern edge of SGB,
through which they are then funnelled into LAB. a waveguide effect

engineering estimates of physical damage to structures (e.g. Krishnanet al.2006a,b; Muto & Krishnan 2011)

large ensembles of such simulations are being explored as asupplement to empirical ground motion estimation,
with potential applications in PSHA (Graves et al.2010).

Likewise, simulations have particular relevance when regional geology is strongly heterogeneous,
and especially when deep and/or laterally extensive sedimentary basins are present
 (e.g.Frankel&Vidale1992;Olsenetal.1995;Gravesetal.1998;Pitarkaet al.1998; Olsen 2000; Komatitschet al.2004; Dayet al.2008a).

Moreover, recent studies have in some cases predicted unex-
pectedly large, localized amplifications when both of the forego-
ing factors are present, that is, when very large ruptures interact
over large spatial scales with extensive, low-velocity sedimentary
structures. For example, calculations by Olsen
et al.
(2006) for a
M
7.7 rupture scenario on the southern SAF suggest that surface
wave energy can be redirected into the urban Los Angeles Basin
by sedimentary structures present along the southern margin of the
transverse ranges (e.g. Magistrale
et al.
2000; Suss & Shaw 2003)

In the absence of recorded ground motion for large SAF events,
numerical ground motion simulations (e.g. Olsen
et al.
1995, 2006,
2008, 2009; Graves
et al.
1998, 2008; Krishnan
et al.
2006a,b; Cui
et al.

2010; Ely
et al.
2010)

Olsen et al. (2006,2008) show anomalously high long-period (4–5 s) ground motion in parts of the San Gabriel and Los Angeles Basins (SGB and LAB; Fig. 1) Subsequent simulations for similar SAF scenarios have confirmed those predictions (Graves et al. 2008; Olsen et al .2009; Ely et al. 2010).

Several observations are relevant here. (i) Predicted peak ground velocity (PGV) levels for this high-amplitude zone, more than 50 km from the SAF, are in some cases comparable to those immediately adjacent to the fault and can exceed median empirical predictions by 2, and locally up to 3, standard deviations of the natural logarithm (those figures are for the scenario of Olsen
et al.
2008; other source models lead to even more extreme predictions, e.g. Olsen
et al.
2006; Graves
et al.
2008). (ii) Moreover, those levels of exceedance are calculated after the empirical predictions (Campbell & Bozorgnia 2008) have already been corrected upward for the mean basin amplification effect derived from a large suite of simulations for other fault-rupture scenarios in southern California (Day
et al.
2008a). Thus, the high levels are not easily understood as a purely local amplification effect, but rather appear to require an explanation that considers the entire seismic wave path specific to the southern SAF events.

(iv) The
high amplitudes are clearly related to rupture–propagation-induced directivity, because the effect is far larger for NW-directed than for SE-directed SAF rupture. However the relationship is not the conventional one, because, as Fig. 1 makes clear, the region of high amplitudes is well to the west of the expected forward directivity cone for SAF ruptures

The explanation proposed by Olsen
et al.
(2006) is that the high
amplitude zone results from a waveguide-like effect, in which the NW-directed forward directivity pulse from a SAF rupture is diverted westward by the sequence of contiguous sedimentary basins lying along the southern edge of the transverse ranges (fig. 2 of Olsen
et al.
2006). In this conceptual picture, the high amplitudes result from the addition of these channelled waves to basin waves derived locally through other wave interactions at the SGB/LAB edges