City of Long Beach
Working Together to Serve

Memorandum

Date: November 13, 2017

From: Patrick H. West, City Manager

To: Mayor and Members of the City Council

Subject: **Community Hospital Documents**

In preparation for tomorrow's study session on Community Hospital, attached are a number of documents provided by Community Hospital. Tomorrow City staff and Community Hospital will jointly give a presentation on Community Hospital. This presentation will cover the following topics: the history of the facility; the lease; the seismic report commissioned by Community Hospital; the Office of Statewide Health Planning and Development (OSHPD) review of the seismic report; Community Hospital's recent Community Needs Assessment; data from the Fire Department; and potential next steps.

Attached are the following documents:

- Attachment A: Notification Letter to the City
- Attachment B: Copy of the most recent Hospital License
- Attachment C: Geologic Assessment Report (performed by Albus-Keefe & Associates)
- Attachment D: Community Hospital's Third-Party Review of the Seismic Report (performed by Group Delta)
- Attachment E: Community Hospital's Correspondence with the Office of Statewide Health Planning and Development (OSHPD) and the Seismic Determination
- Attachment F: Community Hospital Acute Care Needs Assessment (performed by Vizient)

Please contact Tom Modica, Assistant City Manager, at (562) 570-5091 if you have additional questions.

CC: CHARLES PARKIN, CITY ATTORNEY
LAURA L. DOUD, CITY AUDITOR
TOM MODICA, ASSISTANT CITY MANAGER
KEVIN JACKSON, DEPUTY CITY MANAGER
REBECCA GARNER, ASSISTANT TO THE CITY MANAGER
CHIEF DUREE, FIRE CHIEF
AMY BODEK, DIRECTOR OF DEVELOPMENT SERVICES
JOHN KEISLER, DIRECTOR OF ECONOMIC DEVELOPMENT
MONIQUE DE LA GARZA, CITY CLERK

Attachment A

MemorialCare
Long Beach Medical Center
Community Medical Center Long Beach
Miller Children's & Women's Hospital Long Beach

John Bishop
Chief Executive Officer
Jbishop@memorialcare.org

T 562-933-1111
F 562-933-1107

2801 Atlantic Avenue
Long Beach, California 90806

November 13, 2017

via e-mail

Tom Modica
Assistant City Manager
333 West Ocean Boulevard
Long Beach, California 90802

Dear Tom:

As you requested, this letter memorializes the information I provided at the October 30, 2017 meeting attended by representatives of Long Beach Memorial Medical Center (LBMMC) as well as you and other City of Long Beach staff. During that meeting, I informed you that Community Medical Center Long Beach (CMCLB) could not meet the State seismic safety standards for acute care facilities and that LBMMC, CMCLB's owner and operator, would be unable to operate CMCLB as an acute care hospital after June 30, 2019.

As you know, California law imposes strict seismic safety standards on all acute care hospitals operating in the State. Meeting these standards is challenging for most California hospitals, but is especially so for CMCLB because its buildings sit on a fault line, one LBMMC recently learned was larger than was previously known and was also found to be active.. Nevertheless, LBMMC consulted with seismic experts, structural engineers and architects as well as the California Office of Statewide Health Planning and Development (OSHPD) to determine whether there was a feasible way for CMCLB to meet these seismic safety standards. Unfortunately, LBMMC ultimately determined – and OSHPD has confirmed -- that CMCLB cannot meet the seismic compliance standards effective June 30, 2019.

As we also discussed at our October 30 meeting, concurrent with the seismic studies, LBMMC engaged a nationally known, respected third-party organization to conduct a community health services needs assessment to identify the current and future medical services of the Long Beach community. We have already provided you with a copy of this needs assessment.

All of us are disappointed by the conclusions reached by the seismic safety experts and OSHPD regarding CMCLB's inability to comply with State seismic safety standards for acute care hospitals. While it is unfortunate that LBMMC cannot continue to operate CMCLB as an acute care hospital, we are committed to working collaboratively with City as the landlord on an effective transition to what best meets the needs of the community.

Sincerely,

John Bishop
Chief Executive Officer
Long Beach Medical Center
Miller Children's & Women's Hospital Long Beach
Community Medical Center Long Beach

Attachment B

License: 930000090
Effective: 05/12/2017
Expires: 04/28/2018
Licensed Capacity: 158

State of California
Department of Public Health

In accordance with applicable provisions of the Health and Safety Code of California and its rules and regulations, the Department of Public Health hereby issues

this **License** *to*

Long Beach Memorial Medical Center

to operate and maintain the following **General Acute Care Hospital**

Community Hospital Long Beach
1720 Termino Ave
Long Beach, CA 90804-2104

Bed Classifications/Services
130 General Acute Care
20 Intensive Care
10 Coronary Care
100 Unspecified General Acute Care
28 Acute Psychiatric (D/P)

Other Approved Services
Basic Emergency Medical
Cardiac Catheterization Laboratory Services
Mobile Unit - MRI
Nuclear Medicine
Occupational Therapy
Outpatient Services - Partial Hospitalization at 4111 Wilton Street, Long Beach
Outpatient Services - Psychiatric Clinic at 1760 Termino Avenue, Suite G-18, Long Beach
Outpatient Services - Radiology
Physical Therapy
Respiratory Care Services
Social Services

This **LICENSE** is not transferable and is granted solely upon the following conditions, limitations and comments:
Mobile MRI Unit SPCM - 21352

Karen L. Smith, MD, MPH
Director and State Public Health Officer

Eric Stone, Program Manager

Refer Complaints regarding these facilities to: The California Department of Public Health, Licensing and Certification, L.A. County Acute & Ancillary Unit, 3400 Aerojet Avenue, Suite 323, El Monte, CA 91731, (626)312-1104

POST IN A PROMINENT PLACE

Attachment C

ALBUS-KEEFE & ASSOCIATES, INC
GEOTECHNICAL CONSULTANTS

January 3, 2017
J.N. 1707.02

Mr. Mark Shuck
Executive Director Facility Operation/ Development
Community Hospital Long Beach
2801 Atlantic Avenue
Long Beach, CA 90806

Subject: Updated Geologic Assessment of Surface Fault Rupture Potential, Community Hospital of Long Beach, 1720 Termino Avenue, Long Beach, California.

Dear Mr. Shuck,

Albus-Keefe & Associates Inc. is pleased to present to you our updated geologic assessment of surface fault rupture potential report for the Community Hospital of Long Beach campus, located at 1720 Termino Avenue, in the City of Long Beach, California. Our services were conducted to comply with a seismic risk assessment required for the site by the Office of Statewide Health Planning and Development (OSHPD) and California Code of Regulations (CCR), Title 24 requirements.

Our geologic assessment of surface fault rupture potential for the site was initiated in 2008 and included supplemental phases of subsurface exploration and geologic evaluation through early 2016. An initial report was prepared by this firm in August 2012 and a later supplemental report was prepared by this firm in early 2016. This report presents a comprehensive summary of findings from each phase of our study with updated conclusions related specifically to surface fault rupture potential within the subject site.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call.

Respectfully submitted,

Albus-Keefe & Associates, Inc.

Patrick M. Keefe
Patrick M. Keefe
Principal Engineering Geologist
C.E.G. 2022

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF WORK

The purpose of our work was to address the seismic risk associated with surface fault rupture potential within the Community Hospital of Long Beach (CHLB) campus in order to assist CHLB with determining if Structural Performance Category re-classification of existing hospital buildings would be possible. In accordance with the Office of Statewide Health Planning and Development (OSHPD) and the California Code of Regulations (CCR), Title 24, California Building Code (CBC), Part 1, Chapter 6, Section 1.4.5.1.2, SPC 1 hospital buildings are not eligible for reclassification if surface fault rupture and surface displacement has been identified within the existing building sites.

The CHLB campus, also referred to herein as the subject site, is located almost entirely within the boundaries of an Earthquake Fault Zone (EFZ) associated with the Reservoir Hill fault, as indicated on Figure 1. An EFZ is essentially a regulatory zone that encompasses all potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults and such other faults or segments determined to be "sufficiently active" and "well defined" by the State Geologists under the State of California, Alquist-Priolo Earthquake Fault Zoning Act. To address the seismic risk associated with surface fault rupture potential within the site we conducted a detailed investigation in general conformance with the State of California, Alquist-Priolo Earthquake Fault Zoning Act (Hart & Bryant, 2007) and the California Geological Survey Guidelines for Evaluating the Hazard of Surface Fault Rupture, (Note 49, Revised Dated May, 2002).

The following is a brief summary of the scope of services performed by this firm to complete our assessment of surface fault rupture potential within the subject site:

- Research and review geologic and seismic information available through the city of Long Beach and California Geological Survey
- Research and review available archived development plans and geotechnical information available at the CHLB engineering department
- Research and review of geologic and seismic information available from our in-house library collection
- Review of historic aerial photographs and topographic maps of the site and vicinity
- Preparation of a topographic base map of the property
- Compilation of geologic information acquired through our research
- Excavation and logging of exploratory borings
- Excavation and logging of exploratory trenches
- Consultation and peer review with Ms. Tania Gonzalez of Earth Consultants International

- Consultation and peer review with Mr. Jeremy Lancaster of the California Geological Survey
- Radiocarbon Age dating of selected samples
- Compilation of geologic information acquired through our subsurface exploration
- Geologic evaluation of data
- Preparation of this report.

1.2 PHYSICAL SETTING

1.2.1 Site Location

The Community Hospital of Long Beach campus is located at 1720 Termino Avenue in the city of Long Beach, California. The site is located southeast of the intersection of Termino Avenue and Pacific Coast Highway and is bordered by Pacific Coast Highway to the north, Outer Traffic Circle to the northeast, Wilton Avenue to the south, and Termino Avenue to the East. The site and its relationship to the surrounding area are shown on the Site Location Map, Figure 2.

1.2.2 Topography

The Community Hospital of Long Beach campus is generally situated on the southeasterly extension of Reservoir Hill. Reservoir Hill is a topographic high landform that rises about 100 feet above the surrounding lowlands and is bounded by steep slopes to the northeast and southwest. The peak of Reservoir Hill was modified sometime in the earlier 1900's to create a flat-top containment area for installation of large above-ground reservoir tanks used for storage of petroleum products. This prominent cluster of containment tanks at the top of the hill lead to the current landmark name known as Reservoir Hill.

Much of the original topography of the CHLB campus was also substantially modified over the years. Topographic modifications were primarily made through excavation and fill placement in association with periodic episodes of site development since the inception of the hospital facilities in 1924. Presently, much of the hospital facilities are situated on terraced building pads that generally step to lower elevations towards the east-northeast. Variable height perimeter cut slopes and fill slopes descend along the northern, eastern and southern boundaries of the site to the surrounding lower elevations. The most substantial slope descends roughly 50 feet along the east and southeast margins of the site. Based on our review of historic topographic maps for the site and vicinity, this southern slope area is believed to be comprised primarily of artificial fill materials. Current surface elevations within the site vary from roughly 97 feet (MSL) at the west-central margin of the site, to 25 feet (MSL) at the far southeastern margin of the site.

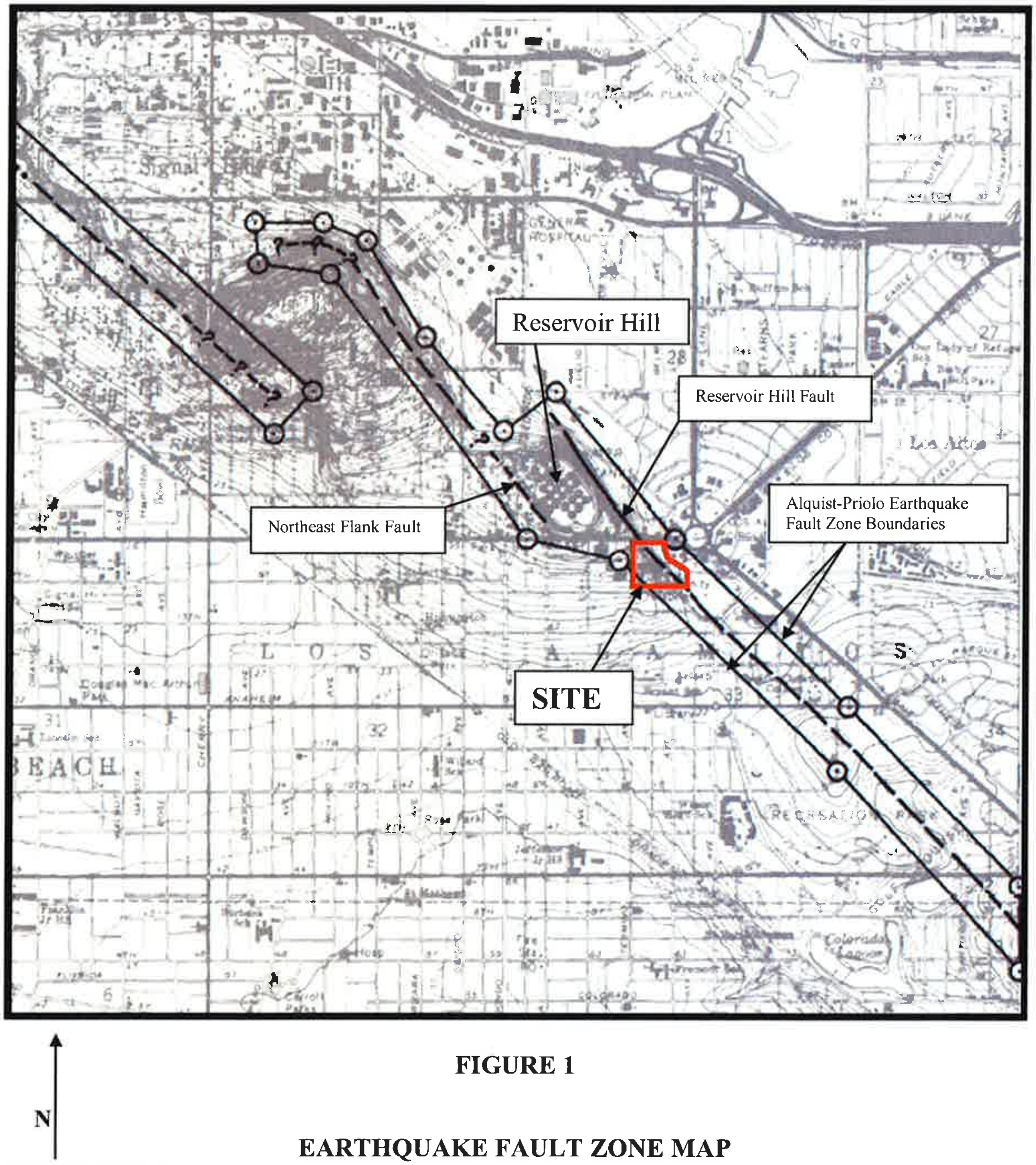
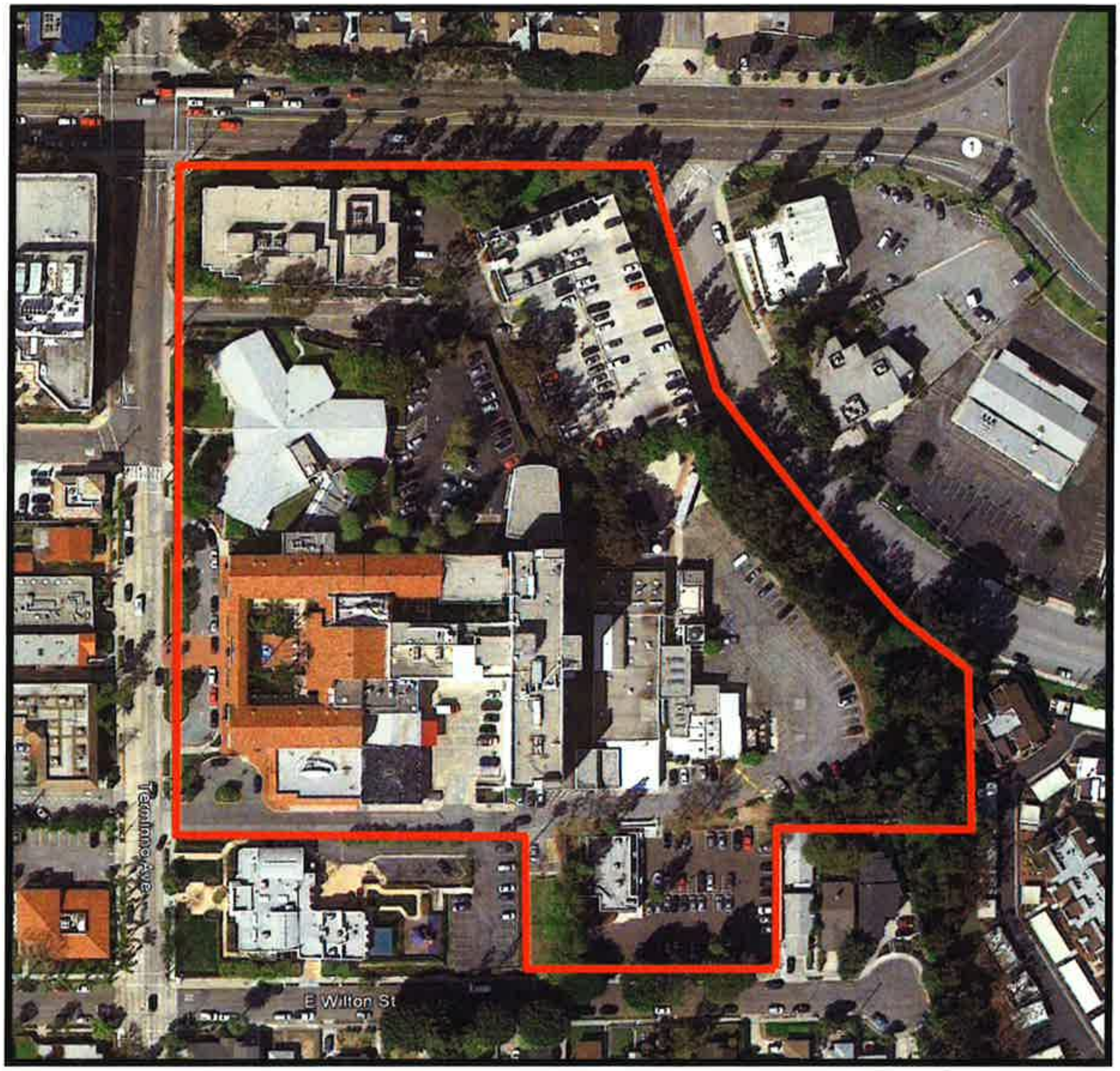


FIGURE 1

EARTHQUAKE FAULT ZONE MAP

Community Hospital of Long Beach
1720 Termino Avenue
City of Long Beach, California

From: CGS, State of California, Earthquake Fault Zone Map, Long Beach Quadrangle, Effective July 1, 1986



(From: Google Earth Pro)

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NOT TO SCALE

FIGURE 2

SITE LOCATION MAP

Community Hospital of Long Beach
1720 Termino Avenue
Long Beach, California

1.2.3 Existing Site Improvements

The Community Hospital of Long Beach was initially founded in 1924 and has expanded substantially over the years. The site is currently occupied by single and multi-story hospital/medical buildings and appurtenant structures up to six stories in height. Some of the buildings include subterranean elements. A four-level parking structure, paved driveways, pedestrian corridors, parking areas, various hardscape and landscape improvements and underground utility lines are also associated with the current site improvements.

2.0 BACKGROUND RESEARCH

2.1 SITE DEVELOPMENT PLANS

We reviewed available archived development plans available at the Community Hospital of Long Beach engineering department. These development plans assisted in establishing our understanding of the as-graded conditions of the site as well as the location of various improvements that could impact our subsurface investigation work.

2.2 PUBLICATIONS, MAPS, & AERIAL PHOTOGRAPHS

We reviewed a number of geologic publications and maps prepared from a regional geologic perspective, as well as specific to the subject site. These publications and maps assisted in establishing our initial understanding of the regional geologic setting of the study area as well as the structural and seismic characteristics of the Reservoir Hill fault. Of particular importance was Fault Evaluation Report; FER-173 (Bryant, 1985b) which presents a detailed summary of data collected from numerous fault study investigations performed by various consulting firms in the vicinity of the site. The report also summarizes the author's independent review and assessment of other pertinent geologic data relevant to faulting in the area of the subject site. The conclusions presented within this publication established the basis for the location of the Reservoir Hill fault shown on the current Earthquake Fault Zone Map for the Long Beach quadrangle. A complete listing of reports, publications and maps reviewed for this study are provided in the References section of this report.

We also reviewed historical U.S.G.S. topographic maps and stereographic aerial photographs of the site and surrounding areas to evaluate geomorphic evidence of faulting within and near the site. A detailed listing of the topographic maps and aerial photographs reviewed for this study is presented in the References section of this report. The contours from the U.S.G.S. topographic map from 1925 were also transferred onto our Geologic Map, Plate 2, to assess predevelopment topography with respects to current topography.

2.3 PREVIOUS STUDIES

We reviewed numerous geologic investigation reports prepared by various private consultants for the site and nearby properties that addressed faulting associated with the Reservoir Hill fault. These investigation reports were generally made available through the California Geological

Survey archive database. The purpose of our review was to obtain pertinent geologic and seismic data to assess the location, structural characteristics and seismic potentials of the Reservoir Hills fault within the site and local vicinity. Approximate locations of selected subsurface explorations by others and/or relevant fault projections from adjacent properties are indicated on our Compiled Plot Plan, Plate 1 and on the Geologic Map, Plate 2. Relevant field data utilized from these sources to supplement this investigation are included in the Appendices of this report.

The following presents a summary of findings of the pertinent onsite and some of the offsite consultant reports that we reviewed. It should be noted that it is not our intent to summarize all the reports we reviewed. A complete listing of private consultant reports reviewed for this study is provided in the References section of this report.

Onsite Reports

The earliest known geologic investigation that specifically addressed the presence of active faulting within the site was conducted by Fugro, Inc. (1974a & 1974b). Their investigation, however, relied primarily on interpretations of subsurface data collected from widely-spaced large diameter exploratory borings within the site, as well as some offsite trenching to the northwest (across Pacific Coast Highway). The Fugro report concluded that there was no evidence of near surface faulting beneath the site and refuted the mapped trace of the Reservoir Hill fault as reported by others. Fugro's rationale to dismiss faulting beneath the site was based largely on the presence of a correlatable fossiliferous layer that they encountered in several widely-spaced borings at various depths beneath the site. The fossiliferous bed was assumed to be the basal unit of the Palos Verdes Sand and was interpreted to be folded and not faulted. Fugro had also identified several geologic anomalies within their exploratory trenches positioned northwest of the site where the projection of the Reservoir Hill fault was inferred by others. Fugro attributed these geologic anomalies as high-angle erosional features and tectonic shearing between differing geologic units and not faulting. Our review of the Fugro data suggest the folded fossiliferous bed could be interpreted as a fault scarp that correlates with the mapped trace of the Reservoir Hill fault within the site. The shears identified within the offsite exploratory trenches also appear to be fault contacts that coincide exceptionally well with the mapped trace of the Reservoir Hill fault. Copies of the Fugro (1974) trench logs, geologic map and cross-sections are presented in Appendix B and the location of their fault trench is shown on the Compiled Plot Plan, Plate 1.

LeRoy Crandall and Associates (1991) later performed an investigation for construction of the Wilton Street MRI building and performed an investigation for the construction of the Heart Room building under their new name Law/Crandall, Inc., (1991). Both of these investigations reported no evidence of near surface faulting beneath the site. However, these studies were not intended to assess the entire hospital campus, but only a relatively narrow corridor that encompassed the new building additions at that time. Both of these studies relied on the same single fault trench excavated within a portion of the Wilton Street MRI building parking lot. The exploratory trench was excavated to a maximum depth of about 12 feet beneath the ground surface but provided limited exposure of bedrock materials due to the presence of overlying fill materials. A log of the fault trench is presented in Appendix C and the location of this fault trench is shown on the Compiled Plot Plan, Plate 1 and on the Geologic Map, Plate 2. Though the graphic presentation of the trench log lacked great detail, a 2-inch to 6-inch wide soil filled fracture, striking N35W, was identified within the bedrock materials near the northeast terminus of the trench. No detailed explanation of the soil filled fracture was presented in either of the consultant's report; however, both reports concluded that the soil infilled fracture was not fault related since no evidence of vertical offset was identified.

Offsite Reports

Rodine Companies, Inc. (1984, 1985a, and 1985b) prepared reports for the property located at the northwest corner of Termino and Pacifica Coast Highway. Their studies, which involved fault trenching, clearly identified the main trace of the Reservoir Hill fault as well as a relatively wide zone of less significant faults in close proximity to the Reservoir Hill fault. However, the Rodine reports concluded that the faults encountered during their investigation should be considered Pre-Holocene in age since the faults appear to terminate upward or die out and did not rupture overlying bedrock units near the ground surface. Roy J. Slemon (1984c) provided independent review in support of their findings. Other assessments by independent reviewers who evaluated the Rodine fault trenches at that time have opined that the Rodine interpretations may have misidentified key geologic indicators that would suggest contradictory conclusions relative to Holocene fault activity associated with the Reservoir Hill fault (Clarke, 1985). The main fault trace identified in their study is presented on the Compiled Plot Plan, Plate 1 and on the Geologic Map, Plate 2.

LeRoy Crandall and Associates (1984a) completed a geologic study for a proposed residential development located southeast of the site. Their investigation, which involved the excavation of fault trenches across the site, found evidence of a significant fault offsetting lower Pleistocene San Pedro Formation against upper Pleistocene Lakewood. A significant splay as much as 40 feet to 45 feet northeast of the main break of the Reservoir Hill fault was also identified and found to dip back toward the main break. Fault splays were also found on southwest side of the main fault trace for at least 30 feet before running out of trench exposure. With respects to fault activity, the study concluded that suitable pre-Holocene strata were not present above the fault exposures as a result of previous grading activities within the limits of their study. This lack of suitable pre-Holocene-age soil cover over the identified fault traces left the consultant with no correlative age dating techniques available to assess fault activity. As a result, a fault setback zone was established for the southeasterly adjacent property. The main fault trace identified in their report is presented on the Compiled Plot Plan, Plate 1 and on the Geologic Map, Plate 2.

Bagahi Engineering (1998) prepared a fault rupture assessment report for the property located at 3801 East Pacific Coast Highway, immediately west of the Rodine study. Much of the work by Bagahi included summaries of previous studies conducted by various consultants for the site and adjoining properties. The Bagahi report did not include independent exploratory trench excavations as part of their study due to very thick fill conditions within the site. However, Bagahi subcontracted with Spectrum-Gash to conduct a geophysical resistivity survey within the limits of the study area and appended the findings within their report. The purpose of the geophysical survey was to assess the presence of faulting beneath the site utilizing non-destructive investigative methods. The geophysical study by Spectrum-Gash identified significant conductivity anomalies along three separate resistivity profiles that correlate remarkably well with the surface trace of the Reservoir Hill fault mapped by Rodine. Additionally, subtle conductivity anomalies interpreted by Spectrum-Gash as a possible significant fault splay were also identified along the southwest side of the main trace of the Reservoir Hill fault. A copy of the Spectrum-Gash report is included in Appendix D. Projected surface trace alignments of the faulting identified through the Spectrum-Gash geophysical study are shown on the Compiled Plot Plan, Plate 1. Bagahi ultimately concluded that due to uncertainty regarding age of the materials overlying the Reservoir Hill fault at the site, a 50-foot setback from the main trace of the Reservoir Hill fault was considered "prudent" for construction of future structures.

3.0 REGIONAL GEOLOGY

3.1 GEOLOGIC SETTING

The subject site is located along the southeastern extension of Reservoir Hill. Reservoir Hill is one of several low-lying northwesterly trending hills within the western margin of the Los Angeles Basin. These low-lying hills are believed to be bounded by fault scarps that exhibit youthful geomorphic surface expression of the northern segment of the Newport-Inglewood structural fault zone (NIFZ). Subsidence and deposition within the Los Angeles Basin is believed to have initiated during mid to late Miocene time. As the basin subsided, it was filled with sediments that eroded from the surrounding highlands through late Pleistocene. The inception of right-lateral displacement along the NIFZ is believed to have occurred some two to five million years ago (Wright, 1991), but the structural features along the NIFZ did not show topographic expression before late Pleistocene time (Yerkes et al., 1965). During late Pleistocene, the region was continually deformed and gradually uplifted along the NIFZ to produce the geomorphic expression of what is now known as Reservoir Hill.

Reservoir Hill and the surrounding vicinity are generally underlain by thousands of feet sediments that rest unconformably above metamorphic basement rock. The bedrock units with the near surface of Reservoir Hill have been assigned to the upper Pleistocene age Lakewood Formation and the lower Pleistocene age San Pedro Formation. The older San Pedro Formation is generally marine in origin, whereas the younger Lakewood Formation is mainly continental in origin, deposited in a near-shore environment. The Lakewood Formation and the underlying San Pedro Formation are sometimes very difficult to discern from one another due to similarities in lithology and possible reworking of the San Pedro Formation during deposition of the Lakewood Formation. However, the contact between the bedrock units has been recognized by a slight to moderate angular unconformity. Marine shells are also typically encountered at the Lakewood/San Pedro boundary.

Holocene age sediments exposed at the natural ground surface of Reservoir Hill are generally comprised of residual soil and colluvium. Artificial fill materials are also widely present in association with past oil field operations and land development improvements.

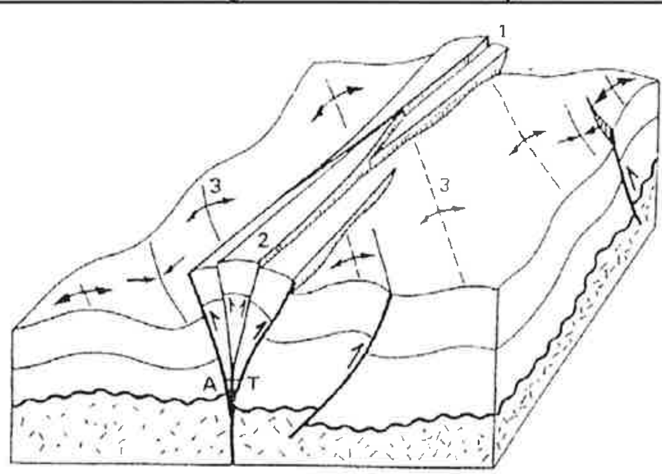
3.2 STRUCTURAL GEOLOGY AND FAULTING

Reservoir Hill forms one of several northwest-trending anticlines that lie astride the NIFZ. The NIFZ is a major zone of deformation resulting from faulting and folding of thick sequences of sedimentary rock units. This zone of folds and faults is characterized by a classic example of near-surface, right-lateral, left-stepping, en-echelon fault patterns (Barrows, 1974; Bryant, 1988). The en-echelon folds and faults are expressions of wrench tectonics that have been responsible for the numerous oil production levels at depth (Harding, 1984). Reservoir Hill forms a complex anticlinal structure bounded by the Northeast Flank fault on the west and the Reservoir Hill fault to the east (Bryant, 1988). These surface faults are believed to be interconnected at depth to form one near vertical "master fault" (Figure 3). In essence, this postulated vertical master fault, or fault zone, flowers upward to form the near surface fault structures. The resulting compressive stresses formed between the step-over fault segments and flowering structures are believed to be at least partially responsible for the substantial fracturing and uplifting of Reservoir Hill.

Both the Northeast Flank fault and the Reservoir Hill fault have been placed within a California Earthquake Fault Zone (Hart and Bryant, 2007). The subject property falls within the Reservoir Hill fault segment of the Newport-Inglewood Earthquake Fault Zone (Figure 1).

FIGURE 3

Convergent Wrench Fault Style



1. THROUGHGOING, NEARLY STRAIGHT, MASTER FAULT ZONE WITH DOMINANT REVERSE SEPARATIONS; OFFSETS BASEMENT.
2. IN-LINE, NARROW, ELONGATE FAULT SLICES THAT BOUND AN ANTIFORM; SEPARATION SENSE, DIP DIRECTION, AND/OR UPTHROWN SIDE MAY CHANGE.
3. FLANKING, OBLIQUE, EN ECHELON FOLDS AND THRUSTS (NOT ALWAYS PRESENT).

From: Harding, T.P, 1990

3.3 SEISMICITY

The NIFZ includes a series of numerous sub-parallel, northwest-trending faults that extend from offshore Newport Beach through the western portion of the Los Angeles Basin to about the Santa Monica Mountains. The NIFZ is seismically active as documented by the California Geologic Survey, the United States Geological Survey, the Southern California Earthquake Center and several other geologic and seismic professional organizations. The most notable recorded seismic event was the March 1933 Long Beach earthquake (M 6.3), which occurred along the southern segment of the NIFZ, offshore of Newport Beach (Bryant, 1988). The 1933 Long Beach earthquake caused significant structural damage and ground disturbance due to shaking including liquefaction, seismic settlement, and lateral spreading (Barrows, 1974); however, none of the reported ground disturbances were definitively attributed to surface rupture. Other historical earthquakes associated with the NIFZ include the June 1920 (M 4.9), Inglewood earthquake, the October 1933 (M 5.4) earthquake east of Reservoir Hill, and the 1944 (M 4.5 and M 4.4) earthquakes near Dominquez Hill (Bryant, 1988). More recent earthquakes associated with the NIFZ include the April 1989 earthquake (M 4.7) below the city of Newport Beach and the May 2009 earthquake (M 4.7) approximately 1 mile south of Inglewood (www.scsn.org, Southern California Seismic Network).

Recurrence intervals for surface rupturing events along the NIFZ have been estimated between 1,200 to 3,000 years (Freeman, et. al., 1992 and Grant, et. al., 1997). Grant and others (1997) recognized at least three and possibly as many as five surface rupturing earthquakes in the past 11,700 years on an active strand of the NIFZ identified in Huntington Beach. The two oldest Holocene events apparently occurred within 1,200 years of each other, but at least 3,000 years passed between early- and middle-Holocene events, suggesting temporal clustering. Temporal clustering has also been suggested in other studies involving faults along the NIFZ (Grant and Rockwell, 2002).

Slip rate estimates along the NIFZ have been difficult to interpret because it is uncertain as to when the right lateral movement initiated along the fault zone. Freeman, et. al. (1992), have indicated that the NIFZ has a long term slip rate of approximately 0.5 mm/yr. Fischer and Mills (1991) estimated a higher slip of between 1.3 and 3.5 mm/yr for the offshore segment of the NIFZ between San Mateo Point and Newport Beach.

The vertical to horizontal ratio of displacement along segments of the NIFZ is highly variable, but is believed to be about 1:20 (Freeman, et. al., 1992). The onshore section of the fault is considered capable of generating a moment magnitude earthquake (M) of approximately 7.2.

3.4 RESERVOIR HILL FAULT

The surface trace of the Reservoir Hill fault, as shown on the current Earthquake Fault Zone Map for the Long Beach quadrangle (Figure 1), was adopted by the State of California primarily based on a review of various private consultants fault study reports, review of published geologic data, review of available petroleum exploration data and assessments of geomorphic expression and tonal variations interpreted through review of historical aerial photography (Bryant, 1985b).

The general structural characteristics of the Reservoir Hill fault have been described in literature as both a strike slip fault (Bryant, 1985) and a high-angle, northeasterly dipping, normal fault with the southwest side up in relation to the northeast side of the fault (Department of Water Resources, 1961). That fault has also been interpreted to be the northwest extension of the Seal Beach fault (southwest of the site) where it has been interpreted as a groundwater barrier in the Alamitos Gap (Department of Water Resources, 1961). With respect to Holocene fault activity, Bryant (1985b) concluded that site specific investigations have not been conclusive and that in some studies there was considerable controversy regarding the identification of geologic units. However, Bryant does indicate that evidence suggestive of Holocene displacement was reported along the southeastern continuation of the Reservoir Hill fault in his Fault Evaluation Report, FER-172.

Our review of numerous private consultant fault study reports clearly suggests that the Reservoir Hill fault is a "zone" of complex faulting. Based on our review of the referenced private consultant reports, the main break associated with the Reservoir Hill fault has typically been described as a 2-inch to 3-inch wide, northwest trending near vertical fault with the southwest side of the fault up in relation to the northeast side. Associated with the main fault break, is an extensive zone of smaller faults and/or splays that are present on both the southwest block as well as the northwest block. As described from a study southeast of the subject site (Leroy Crandall and Associates, 1984a), a significant splay as much as 40 feet to 45 feet northeast of the main break of the Reservoir Hill fault was identified and found to dip back toward the main break. Findings from the same study also reported similar features on southwest side of the main fault trace for at least 30 feet before running out of trench exposure. Northwest of the subject site and closer to the crest of Reservoir Hill, a zone of smaller fractures at least tens of feet wide was reported to be associated with the main trace of the Reservoir Hill fault (Rodine, 1985a and b). The findings presented in the Spectrum-Gash (1998) geophysical resistivity survey also identified a possible significant fault splay along the southwest side of the main trace of the Reservoir Hill fault.

4.0 SITE INVESTIGATION

4.1 INVESTIGATIVE APPROACH

The primary objective of our site study was to determine whether "active" faulting (ruptured the ground surface within last 11,000 yrs. b.p.), as defined by the state of California, Alquist-Priolo Earthquake Fault Zoning Act, is present beneath the site. The numerous buildings, above- and below-ground improvements and presence of relatively thick artificial fill materials above portions of the natural topography within the hospital campus created significant challenges in accessing and exploring the subsurface conditions of the site, particularly where the main trace of the fault was believed to project through the site. Since continuous trenching within the boundaries of the Earthquake Fault Zone was determined to be impractical to virtually impossible, we resolved that both closely-spaced exploratory borings and overlapping trenches would be a practical approach to explore the subsurface conditions within readily accessible portions of the site.

4.2 BASE MAP PREPARATION

As part of our investigation, Robert J. Lung & Associates (RJL) was subcontracted to provide professional mapping services and prepare an accurate base map of the study area. A scaled topographic map of the study area was prepared utilizing photogrammetric methods to depict the current surface improvements and actual ground surface elevations. This map was utilized to compile geologic data from relevant reference sources, as well as the findings of our subsurface exploration for this study.

4.3 SUBSURFACE EXPLORATION

Our subsurface exploration conducted for this study was essentially performed in three phases which initiated in August 2008 and was completed in August 2015. Each subsequent phase was built on the findings of our earlier phase of work. The following presents a summary of each phase of our subsurface exploration work:

Phase I: Our initial phase of our subsurface exploration work was conducted in August 2008 and involved drilling and down-hole logging of seven (7) closely-spaced, large diameter, exploratory borings within a portion of the Administration Building parking lot (B-1 through B-7). The decision to drill this location rather than excavate an exploratory trench was predicated by the presence of relatively thick artificial fill materials and limited access above the suspected main trace of the Reservoir Hill fault. The borings were closely spaced in order to evaluate the continuity of the underlying stratigraphy and search for evidence of faulting beneath this portion of the site. The borings were drilled to depths ranging from approximately 50 to 61 feet below ground surface utilizing a 30-inch diameter bucket-auger drill rig. The borings were down-hole logged by our engineering geologist. Visual and tactile identifications made of the materials encountered and their descriptions are presented on the Boring Logs in Appendix A. The approximate locations of our exploratory borings are shown on the enclosed Compiled Plot Plan, Plate 1, as well as on the enclosed Geologic Map, Plate 2. Geologic interpretations from the data collected from each boring is graphically presented in our Geologic Cross-Section A-A', Plate 3.

Phase II: This phase of our subsurface exploration work was conducted in November 2008 and involved the excavation and logging of two overlapping exploratory fault trenches (FT-1 & FT-2) within the Wilton Street MRI facility parking lot. This area was generally underlain by relatively shallow to moderate accumulations of fill materials and access was less restrictive than on the main hospital campus. The purpose of this phase of our study was to assess the extent and nature of faulting on the upthrown block (southwest side) of the Reservoir Hill fault where most of the hospital buildings would be impacted. Our efforts focused on exposing pre-Holocene age geologic units (preferably with preserved soil profile development) in order to evaluate the relative age of any cross-cutting faults encountered. Where suitably younger stratigraphy was found, the relative age of any fault found could also be evaluated relative to the known age of the dateable sediments encountered. If pre-Holocene age units were observed to be continuous and unbroken/offset, then the possibility of active faulting could be excluded in these areas.

The exploratory fault trenches (FT-1 & FT-2) were excavated roughly perpendicular to the Earthquake Fault Zone using a large track-mounted excavator and a rubber-tire loader. FT-1 was excavated to depth varying from 7 feet to 10 feet in the southwest portion of the parking lot and was extended 95 feet in a northeasterly direction. Fault trench FT-2 slightly overlapped the northeast end of FT-1 and extended approximately 142 feet further northeast. Due to the presence of thicker artificial fill material, FT-2 was excavated to depths that varied from approximately 11 feet to 28 feet below the existing ground surface. The approximate locations of fault trenches FT-1 and FT-2 are indicated on the enclosed Compiled Plot Plan, Plate 1, as well as on the enclosed Geologic Map, Plate 2.

Engineering geologists from this firm performed detailed logging of the exploratory fault trenches. The walls of the fault trenches were prepared for logging by removing all caked and smeared materials with hand tools to expose a fresh surface. Logging emphasis was placed on noting stratigraphic continuity. A string and nail baseline was leveled and geologic features (lithologic contacts and planar features) were measured by hand-held ruler from the baseline. Munsell color notation was used to describe color variations of earth materials. Trench walls were mapped at a scale of 1-inch equals 5 feet. Once logged and photographed, the fault trenches and significant fault breaks were surveyed utilizing GPS recording methods. Graphic logs of the fault trenches are presented on Plates 4 and 5.

During our geologic assessment of the fault trenches, Ms. Tania Gonzalez, Senior Geologist with Earth Consultants International, Inc. (ECI), was invited to the site to assist with relative age dating correlations of the soil and bedrock encountered within Fault Trench FT-2, as well as to provide independent opinions relative to faulting. Ms. Gonzalez also collected carbon and shell samples identified within prehistoric midden deposits encountered in the trench for radiocarbon age dating-dating correlations. A detailed summary of Ms. Gonzalez's findings and conclusions are presented in the accompanying report by ECI included herein within Appendix E.

Mr. Jeremy Lancaster of the California Geological Survey was also invited to the site as a courtesy to review the geologic conditions exposed within the fault trenches. The purpose of his visits was to make independent observations of the exploratory trench exposures and to review our findings and interpretations prior to backfilling the trenches.

Upon completion of our work, the fault trenches were backfilled with trench spoil and compacted to at least 90% relative compaction to match the existing parking lot pavement subgrade. A representative of this firm provided field observation and density testing services during backfill operations. Once the desired subgrade conditions were achieved, the asphalt pavement was replaced by a subcontractor contracted by CHLB.

Phase III: This phase of work was conducted during June 2015 through August 2015 and involved supplemental exploratory drilling within the accessible northwestern portion of the hospital campus. The purpose of this work was to further assess the extent and nature of faulting on the upthrown block (southwest side) of the Reservoir Hill fault and to determine whether fault features identified through earlier phases of our study could be extended laterally along strike to the northwest.

Initially, five (5) small diameter exploratory borings were excavated within the driveway area, north of the Heart Building (B-9 through B-11). The borings were drilled to depths ranging from approximately 22 feet to 27 feet below ground surface utilizing a limited access, 8-inch diameter, hollow-stem auger drill rig. Nearly continuous sampling was performed to aid in our logging of the borings. The primary purpose of this phase of subsurface exploration was to assess fill thicknesses, stratigraphic conditions of underlying bedrock and evidence of faulting to determine feasibility of supplemental trenching and/or to assist with placement of larger diameter borings.

Following our evaluation of the data from the small diameter exploratory borings it was determined that exploratory trenching would not be feasible in this area of the site. As such, seven (7) large diameter exploratory borings were drilled within the driveway and landscape area, located north and west of the Heart Building (B-12 through B-18). The borings were drilled to depths ranging from approximately 15 to 40 feet below ground surface utilizing a limited access, 24-inch diameter, bucket auger drill rig. The large diameter borings were down-hole logged to visually assess intact bedrock, stratigraphic conditions, structural contacts and the presence of faulting.

Visual and tactile identifications made of the materials encountered in our borings and their descriptions are presented on the Boring Logs in Appendix A. The approximate locations of the exploratory borings excavated during this phase of our study are shown on the enclosed Compiled Plot Plan, Plate 1 as well as on the enclosed Geologic Map, Plate 2.

5.0 FINDINGS

5.1 GEOLOGIC UNITS

Bedrock encountered beneath the site during our investigation consists of sediments that have been assigned to the upper Pleistocene-age Lakewood Formation and sediments assigned to the lower to middle Pleistocene-age San Pedro Formation. Surficial units encountered consist of artificial fill materials and residual soil/midden deposits. Descriptions of the geologic units encountered within the site are provided in the following sections and are presented in detail on the Boring Logs in Appendix A and in our Fault Trench Logs, Plates 4 and 5. The distribution of the bedrock units beneath the site are shown on the Geologic Map, Plate 2. Geologic cross-sections depicting our subsurface interpretation of the geologic units within the site are presented on Plate 3.

5.1.1 Artificial Fill (Af)

Artificial fill materials associated with land development modifications of the hospital campus over the years were encountered in nearly all of our exploratory excavations within the site. The fill materials are generally comprised of fine-grained silty sands and sand that are various shades of gray and brown. The fill materials are dry to moist and medium dense to dense. Beneath the Administration Building parking lot, the fills also contained varying amounts of large concrete, red brick, asphalt, wood and glass bottle debris. The thickness of fills encountered varied from less than one foot to as much as 24.5 feet in the Administration Building parking lot.

5.1.2 Residual Soil / Midden Deposit (No Symbol)

Residual soil materials were encountered locally within the site beneath the existing fill materials. These materials represent a modern solum that formed as a result of in-place near surface weathering of the underlying bedrock units. Where encountered, these materials are generally comprised of various shades of gray and brown silty sands that are damp to moist, loose to medium dense, porous, and contain scattered roots and abundant krotovinas.

In Fault Trench FT-2, midden materials associated with early Native American settlements are interspersed within the residual soil materials. The mixing of these two materials appears largely associated with burrowing animal activity. The resulting 'midden deposit", as described in our trench log, generally consists of dark gray-brown, fine grained silty sands that are damp, medium dense, and are inter-mixed with sea shells and residual carbon material/fragments. Some stone tools were also encountered within the midden debris. Krotovinas are also widespread. The thickness of the midden deposit encountered in FT-2 generally varied from 1 foot to 3 feet.

A possible "midden deposit" was also locally encountered in our exploratory borings B-4 and B-5 as evident by similar appearing soil matrix that contains some shell fragments.

5.1.3 Lakewood Formation (Qlw)

The Lakewood Formation is present on the northeast side of the main trace of the Reservoir Hill fault where it is in fault contact with the San Pedro Formation. Based on our exploratory boring excavations B-4 and B-5, the Lakewood Formation consists primarily of fine grained sandstone that is light brown in color, massive and slightly friable. The basal portion of the Lakewood Formation is denoted by a carbonate cemented zone, which was identified in Boring B-4 starting at a depth of 44 feet and in Boring B-5 at a depth of 50 feet. The carbonate cemented zone likely formed on a shell hash which is typically present at the base of the Lakewood Formation and is often utilized to discern the sediments of the Lakewood Formation from the similar lithology of the underlying San Pedro Formation. As depicted on our Geologic Cross-Section A-A', the base of the Lakewood Formation forms an irregular erosional contact with the underlying San Pedro Formation. The basal contact appears to be relatively horizontal but steepens abruptly in close proximity of the Reservoir Hill fault.

5.1.4 San Pedro Formation (Qsp)

The San Pedro Formation underlies the entire site. The San Pedro Formation consists chiefly of various shades of gray, brown and yellow brown colored silty sandstone and sandstone that are generally fine-to coarse-grained, massive to well stratified, locally cross-bedded, dry to moist, and moderately hard. Local concretions, gravel beds and beds with crudely aligned siltstone rip-up clasts are also locally present within of the San Pedro Formation. Within our exploratory borings B-1, B-2, B-3, B-6 and B-7, where the argillic soil horizon is absent, the upper portion of the San Pedro Formation is highly weathered and is largely disturbed as a result of animal burrowing activity and root intrusion.

5.2 BEDDING STRUCTURE

Bedding structure was generally difficult to discern in the San Pedro Formation due to numerous cross-bedding features and channel infills. Where continuous units were encountered, bedding was relatively flat to gently inclined and mimics the overlying natural topography. However, the bedding structure in the San Pedro Formation clearly steepens and eventually becomes truncated adjacent the main trace of the Reservoir Hills fault, as demonstrated in our Geologic Cross-Section A-A', Plate 3.

Bedding structure was also difficult to discern in the Lakewood Formation. Where observed, it also appears to be near horizontal to very gently inclined and mimics the direction of the overlying natural topography.

5.3 GROUNDWATER

With the exception to some slight seepage encountered in Boring B-1 at depths of 27 feet and 32 feet below the ground surface, groundwater was not encountered below the surface of the site during our investigation to the maximum depths explored (61 ft.). This depth is equivalent to an elevation of about 22 feet above mean sea level. Previous exploratory borings by Fugro (1974a) encountered groundwater below the subject site at elevations varying from about mean sea level to 18 feet below mean sea level.

5.4 SOIL PROFILE DEVELOPMENT

An argillic Bt soil horizon formed through time where the Lakewood and San Pedro Formations were exposed near the original ground surface. Typically, soil profiles pass through qualitative stages of development over long periods of time. Soil profile development is dependent on such factors as climate, parent material, slope gradient, and organic content (Shlemon, 1985). In general, the process of soil diagenesis includes key changes in color (often described by Munsell notation), increased clay content and structural (ped) development. The Bt soil horizons observed within the site were recognized by their yellowish brown and brown colors (Munsell notation 7.5YR 4/6 to 5/6), relatively high clay content and clay films on surfaces of distinct blocky ped structure.

The argillic Bt soil horizon is in almost every case underlain by dark, overlapping, clay-rich lamellae or lams. These lams decrease in thickness and abundance with depth from the base of the argillic Bt horizon into the underlying B/C soil horizon, which has formed on both the Lakewood and San Pedro Formations. Bt lams are believed to have formed by multiple epochs of downward migrating groundwater that percolated beneath the ground surface prior to the development of the less permeable argillic Bt soil horizon. These lams appear to have formed on finer-grained interbeds that created groundwater traps, evidenced by vertical oxidized seams and fractures. The groundwater has etched out and highlighted these finer-grained strata to produce the distinct Bt lams.

The abundance of the Bt lams is extremely fortuitous since their darker color contrasts with the parent soils and their overlapping continuity form exceptionally well-defined markers that delineate even the slightest offset.

5.5 AGE CORRELATIONS OF GEOLOGIC UNITS

Age approximations of the geologic units found on site are understandably critical to any fault evaluation. The stratigraphic position of geologic units dated by others, soil profile development, and radiocarbon dating methods were used as relative age dating techniques during this investigation. Marine shells at the Lakewood/San Pedro boundary were dated by Ponti and Lajoie (1992) using amino acid stereochemistry. Results of their studies indicate the basal Lakewood Formation is approximately 220,000 years old. They also assigned an age of 650,000 to 800,000 years to the upper section of San Pedro Formation.

The age of the argillic Bt horizon that formed at the original natural ground surface within the bedrock units can be approximated based on degree of soil profile development. This cumulic soil profile is moderately- to strongly-developed to a thickness of at least three feet, and contains abundant secondary clay films with a moderate to strong angular blocky structure. Other researchers have found that similar moderately- to strongly-developed argillic Bt horizons require at a minimum 35,000 to 40,000 years (oxygen isotope stage 3) to develop within similar climatic environments (Shlemon, 1985).

The residual soil materials encountered locally beneath the site are interpreted as a modern solum considered Holocene in age. This Holocene age correlation was largely concluded based on a lack of distinctive pedogenic soil development.

Radiocarbon dating methods were performed by Beta Analytical, Inc., headquartered in Miami, Florida during this investigation to compute relative age correlations of organic material found within the midden materials intermixed within the residual soil identified in Fault Trench FT-2. Results of the radiocarbon dating methods indicate shells near the bottom of the midden deposit range from about 2,400 years before present (b.p.) to about 3,400 years b.p. The relative age of a charcoal fragment identified within a fault zone of the midden was reported to be on the order of about 300 years b.p.

5.6 FAULTS FOUND WITHIN THE SITE

The findings of our investigation confirmed the presence of the main trace of the Reservoir Hill fault within the northeastern margin of the hospital campus. Additionally, numerous northwest trending faults were also encountered within the up-thrown, southwest block. Similar findings were reported by Rodine (1984), Bagahi (1998) and Spectrum-Gash (1998) and Leroy Crandall & Associates (1984a) for nearby properties. These faults are interpreted to be flower structures and/or splays off the main trace of the Reservoir Hill fault and extend as much as 165 feet to 200 feet southwest of the main trace of the Reservoir Hill fault. Many of these faults project beneath buildings at the hospital campus. The width of the zone of splays northwest of the main break was not specifically assessed as part of this study. However, Leroy Crandall & Associates (1984a) identified splays at least 40 feet to 45 feet or more on the northeast side of the main trace of the Reservoir Hill fault on an adjacent property located southeast of the subject site.

The following presents a detailed summary of our findings and conclusions relevant to faulting during each phase of our subsurface exploration:

Phase I Findings:

Phase I of our investigation involved the excavation of multiple large diameter exploratory borings within the Administration Building parking lot across the trace of the Reservoir Hill fault. As illustrated in Geologic Cross-Section A-A' (Plate 3), there is an abrupt break in the bedrock stratigraphy between exploratory boring B-4 and B-6 with bedrock of the San Pedro Formation to the west juxtaposed against bedrock of the Lakewood Formation to the east. Although the actual vertical and horizontal offset could not be determined through our study, there is at least 20 feet of apparent vertical offset noted at the fault contact between the Lakewood Formation and the San Pedro Formation, as illustrated in Geologic Cross-Section A-A' (Plate 3). Based on relative offset characteristic, this abrupt change in lithology within a horizontal distance of roughly 8 feet is reasonably explained by the presence of the Reservoir Hill fault rather than an erosional contact. This is further supported by the local folding (steepening) of the bedding structure in the San Pedro Formation as it approaches the interpreted fault location. The findings summarized herein clearly refute the conclusions presented by Fugro (1974a & b).

In addition to identifying the main fault trace, numerous northwest trending, high angle faults were encountered in borings B-1, B-2, B-3, B-6 and B-7 on the southwest side of the of the main trace of the Reservoir Hill fault. Many these faults are lightly oxide stained, exhibit minor offsets (generally less than 12-inches), flower upward, and generally become obscured in the near surface due weathering and bioturbation. A possible fault was also identified in B-4 based on a narrow zone of disrupted Bt lams on the northeast side of the main trace of the Reservoir Hill fault.

Although, we did not actually expose the main trace of the Reservoir Hill fault, we did identify unique geologic characteristics from the borings on each side of the fault that were used to assess activity of faulting. A summary of these characteristics is presented as follows:

- The argillic Bt-horizon present in the Lakewood Formation on the northeast side of the fault was not present in the San Pedro Formation on the southwest side of the fault. The absence of the argillic Bt-horizon within the San Pedro Formation suggests the ground surface southwest of the fault had been uplifted and subsequent erosion had removed the relic soil structure. Taking into consideration that the argillic Bt horizon would require at a minimum 35,000 to 40,000 years to develop, one can conclude that ground rupture along this fault occurred sometime within the last 35,000 to 40,000 years.

- The possible midden deposit observed in borings B-4 and B-5 on the northeast side of the fault does not appear to be present in B-6 on the southwest side of the fault. The absence of the midden deposit could suggest the ground surface southwest of the fault had been uplifted and subsequent erosion had removed the midden deposit. If the midden deposit observed in borings B-4 and B-5 was placed contemporaneously with the midden deposit identified within fault trench FT-2, it is reasonable to assume that ground rupture along this fault occurred in Holocene time.

Or

- If the residual soil observed in B-6 and the midden deposit observed in borings B-4 and B-5 are actually the same unit, the boring data suggest that there may be roughly 1.5 feet to 2 feet of relative vertical offset with the base of the residual soil/midden deposit on the southwest side up relative to the northeast side of the fault. This would also indicate that ground rupture along this fault occurred in Holocene time. However, it should be noted that the borings provided limited exposures laterally and the inferred relative offset noted above could also be attributed to disturbances by burrowing animals and/or differences in the rate of soil development due to differential bedrock conditions below.

Phase II Findings:

Phase II of our investigation included excavation and logging of two overlapping exploratory fault trenches within the Wilton Street MRI facility parking lot. Geologic interpretation of subsurface data observed within fault trench FT-2 identified numerous northwest trending fault splays and/or flower structures associated with the Reservoir Hill fault. These faults were encountered at various locations between stations 0+0 to approximately 0+90 in exploratory trench FT-2 and extend roughly 165 feet from the projected main trace of the Reservoir Hill fault. Most of the faults encountered in FT-2 exhibited relatively minor apparent offset that disrupted and/or warped Bt lams on the order of 1-inch or less, were lightly oxide stained, flowered upward, and in the near surface were filled with soil and/or became obscured due to rodent burrowing.

Two distinct zones of faulting identified between Stations ± 0+25 and ± 0+32 and between Stations ± 0+60 and 0+70 within FT-2 were more significant. The zone of faulting between Stations ± 0+25 and ± 0+32 dips at moderate to steep angles to the northeast and clearly exhibits about 2.5 feet to 3 feet of apparent vertical offset on a thin sandy siltstone bed near the base of the trench. In the near surface, this zone of faulting diminishes rapidly and becomes indistinct at the upper Bt soil horizon of the near surface San Pedro Formation.

The fault zone identified between Stations ± 0+60 and 0+70 within FT-2 dips at moderate to steep angles to the northeast and defines an abrupt stratigraphic break between dissimilar bedrock materials in the San Pedro Formation. Near the bottom of the trench, as much as 5.5

feet of apparent vertical normal offset was measured. Some dragging of siltstone rip-up clasts were also noted adjacent the fault contact. In the near surface, the fault appears to offset the argillic Bt soil horizon of the upper San Pedro Formation and exhibits apparent vertical offset on the order of approximately 1.5 feet. Some questionable offset krotovinas are also present between individual fault splays.

On the opposite side of the trench, the same fault zone clearly offsets the Holocene midden deposit with up to approximately 1.5 feet of apparent vertical offset, as shown in Photo 1. Midden materials positioned above the bedrock unit have in-filled the upper portions of the fault zone, as well as other nearby ground cracks. The midden in-fills of the fault zones and ground cracks would suggest that the last faulting episode occurred subsequent to the placement of the midden deposits. In-filled fractures associated with faulting in this section of the trench ranged in width from less than 1-inch to as much as 2-inches and showed no evidence of distinct carbonate mineralization typically associated with more ancient fault features. Coincidentally, similar soil in-filled fractures were reported by LeRoy Crandall during their 1991 investigation for construction of the Wilton Street MRI building. This same fault splay also appears to correlate well with the suspected significant fault splay identified by Spectrum-Gash (1998) to the northwest, as shown on the enclosed Compiled Plot Plan, Plate 1. Additionally, a significant soil infilled zone was also identified by Fugro (1974a) within their exploratory trench T-1 at roughly station 20.

PHOTO 1
Southeasterly View of Fault Trench FT-2 (opposite side ± 0+60 and 0+70)
Showing Offset Midden Deposit

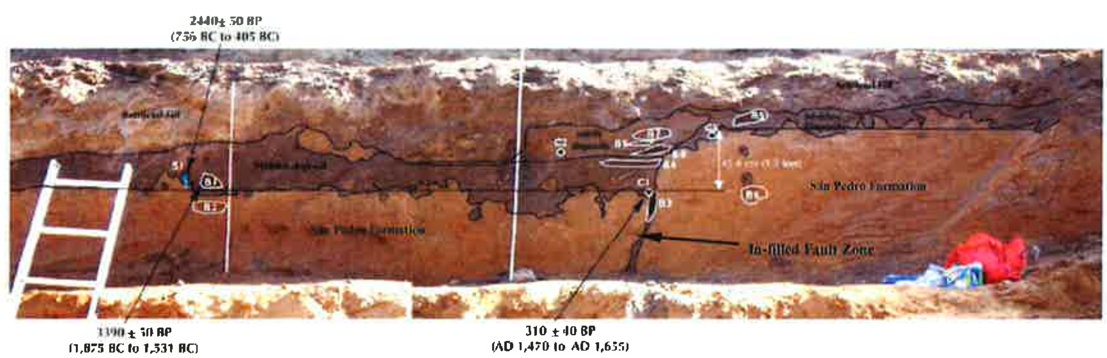


Photo from: Earth Consultants International, 2009

No discernable evidence of faulting was identified southwest of station ± 0+90 in FT-2, nor within the entire length of FT-1. Detailed graphic depictions of the fault trenches are presented on the enclosed Exploratory Trench Logs, Plates 4 and 5.

Additional documentation to support the findings and conclusions relevant to Holocene ground rupture within exploratory fault trench FT-2 are presented in the accompanying report prepared by Earth Consultants, Inc. presented in Appendix E.

Phase III Findings

Our final phase of subsurface exploration included additional exploratory drilling within the accessible northwestern portion of the hospital campus. The findings of this phase of our investigation confirmed the northwest extension of associated fault splays along the Reservoir Hill fault zone.

Numerous northwest trending minor faults were identified mainly within our large diameter exploratory borings B-13 through B-17. At least one small fracture presumed to be a minor fault splay was encountered in our small diameter exploratory boring B-10. The majority of the fault splays identified were high angle, relatively thin features (1/8- to-1/4-inch wide oxide stained zone) exhibiting less than 6-inches of apparent normal offsets. The apparent offset noted on some of the fault splays decreases as the faults extended upward in the borings.

A relatively thin fault splay (approximately 1/8-inch wide) dipping 45 degrees to the northeast was encountered within exploratory boring B-16 at a depth of 11 feet. The fault splay exhibits up to 8-inches of apparent normal offset. The same fault splay was encountered in exploratory boring B-17, at a depth of 6 feet. However, in exploratory boring B-17 the fault splay only exhibits up to 2.5-inches of apparent vertical offset and dips approximately 42 degrees to the northeast. The fault's structural orientation and relative location suggest that this fault may represent the northwestern extension of the fault splay found to offset Holocene midden deposits within our exploratory fault trench FT-2, between Stations ± 0+60 and 0+70. Discrepancies in magnitude of apparent offset between points of exploration could reasonably be attributed to horizontal/strike slip components of fault movement.

No evidence of faulting was encountered in our western-most large diameter exploratory boring B-18. The lack of identifiable faulting to the west of exploratory boring B-17 would suggest the zone of fault splays may terminate somewhere between exploratory boring B-17 and B-18. Based on our interpreted location of the main trace of the Reservoir Hill fault, the zone of associated fault splays on the southwest side of the main trace of the Reservoir Hill fault is as much as approximately 200 feet wide in the area of our supplemental exploration.

6.0 CONCLUSIONS

6.1 SURFACE FAULT RUPTURE POTENTIAL

As summarized herein, the NIFZ is a seismically active fault zone. Studies by others have indicated that some sections of the NIFZ exhibit Holocene age ground rupturing events (Bryant, 1985a & Grant, et. al., 1997).

The Reservoir Hill fault and many of the associated splays identified through this investigation were found to at least offset and/or break the Bt soil horizons and Bt lams associated with the

Lakewood and San Pedro Formations. Based on age correlations of the soil development summarized herein, we can conclude that several ground rupturing events occurred within the fault zone identified through this investigation sometime after development of the argillic Bt soil horizon (minimum relative age estimated to be 35,000 years to 40,000 years before present).

Furthermore, there is permissive evidence that the main trace of the Reservoir Hill fault may have offset the base of a residual soil/midden deposit indicating Holocene activity. More substantial evidence of Holocene fault activity was also found at the fault splay identified in FT-2 (between Stations 0+60 and 0+70), where the midden deposit was clearly offset. Based on the age dating estimates from the midden material collected in fault trench FT-2, we can conclude that at least one earthquake has ruptured the ground surface subsequent to placement of the midden deposit, about 2,400 years b.p. Knowing the relative age of the charcoal fragment found specifically within the fault zone offers an upper boundary of about 300 years b.p. for the last surface rupturing earthquake within the site.

Based on our observations and interpretations summarized herein and assuming that the main trace of the Reservoir Hill fault and associated significant fault splay identified in FT-2 both ruptured the ground surface during the same event, it our opinion that the main trace and associated significant fault splay should be considered "active" under current guidelines of the Alquist-Priolo Earthquake Fault Zoning Act. Since many of the less significant fault splays identified through our investigation exhibited youthful-like characteristics such as flower structures in the near surface and the absence of carbonate mineralization, we are also of the opinion that the entire zone of faulting recognized during this investigation should be considered an "active zone" of faulting. The "active zone" of faulting is depicted on the enclosed Compiled Plot Plan, Plate 1 and the enclosed Geologic Map, Plate 2.

It should be noted that the limits of faulting on the northeast block of the Reservoir Hill fault was not fully assessed as part of this investigation.

6.2 FUTURE PLANNING

Many of the existing buildings within the Community Hospital of Long Beach are situated within an "active zone" of faulting as depicted on the enclosed Compiled Plot Plan, Plate 1 and the enclosed Geologic Map, Plate 2. In accordance with the Office of Statewide Health Planning and Development and the California Code of Regulations, Title 24, Part 1, Chapter 6, Section 1.4.5.1.2, SPC 1 hospital buildings are not eligible for reclassification since the potential for surface fault rupture and surface displacement has been identified within building sites at the Community Hospital of Long Beach.

7.0 LIMITATIONS

This report has been prepared for the exclusive use of the **Community Hospital of Long Beach** and their authorized project consultants. This report is intended to assist the Community Hospital of Long Beach with compliance requirements associated with the California Code of Regulations (CCR), Title 24, California Building Code (CBC) and the Office of Statewide Health Planning and Development (OSHPD). The findings and conclusions presented herein are based on the geologic conditions observed during this investigation, available referenced documents listed herein, and professional judgment. It is important to acknowledge that the understanding of some geologic principles, tectonic relationships, and earthquake risk assessments is continually evolving as more technical data is collected and/or developed for the professional industry. As such, the findings of future studies and/or conclusions from scientific data not yet available to our profession may warrant further review. If future scientific data or Code requirements invalidate this report's conclusions, additional professional services may be warranted to assess the effects of any changes that may influence the conclusions presented herein.

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guarantee or warranty.

This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

Respectfully submitted,

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Plan

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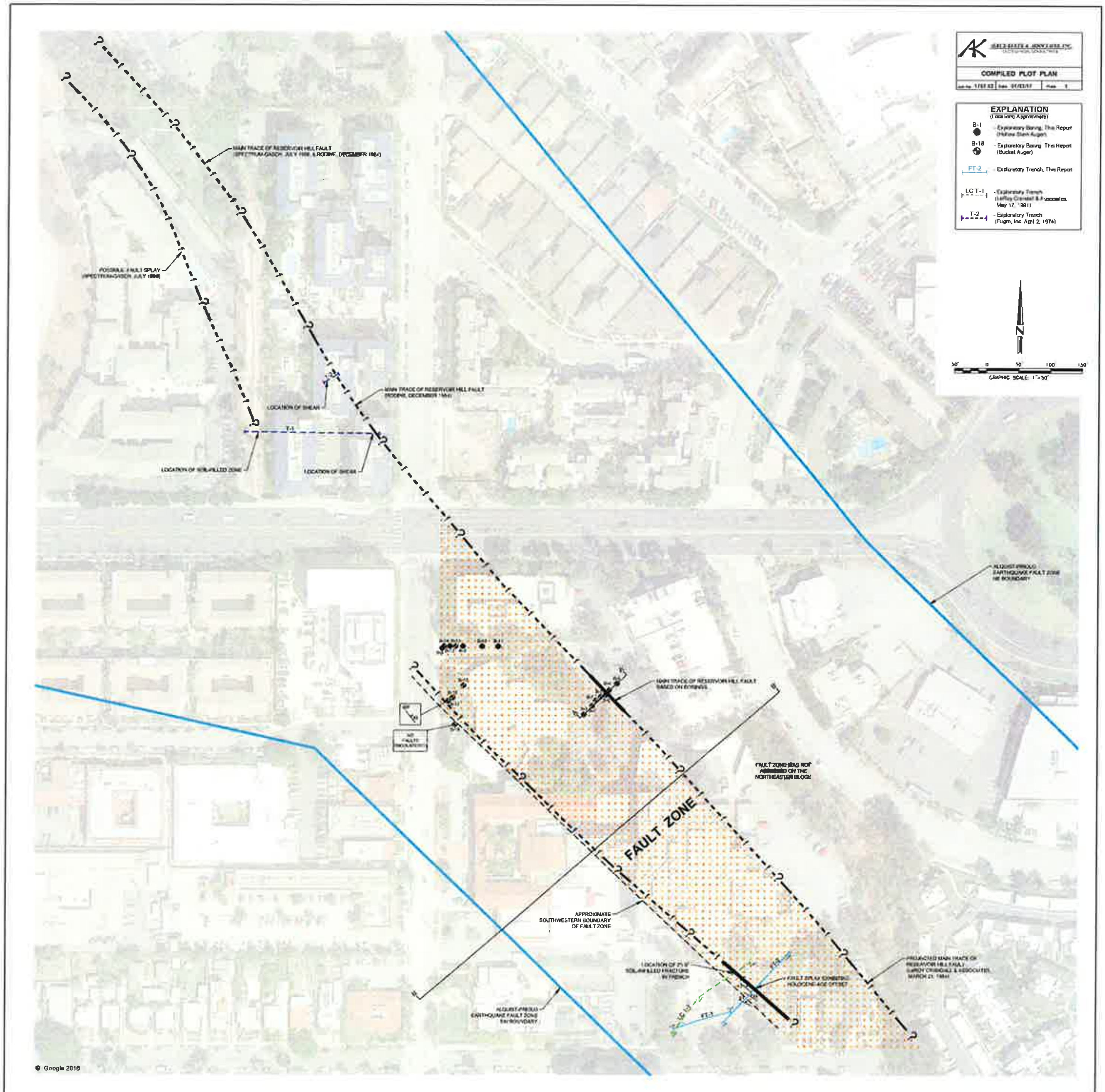
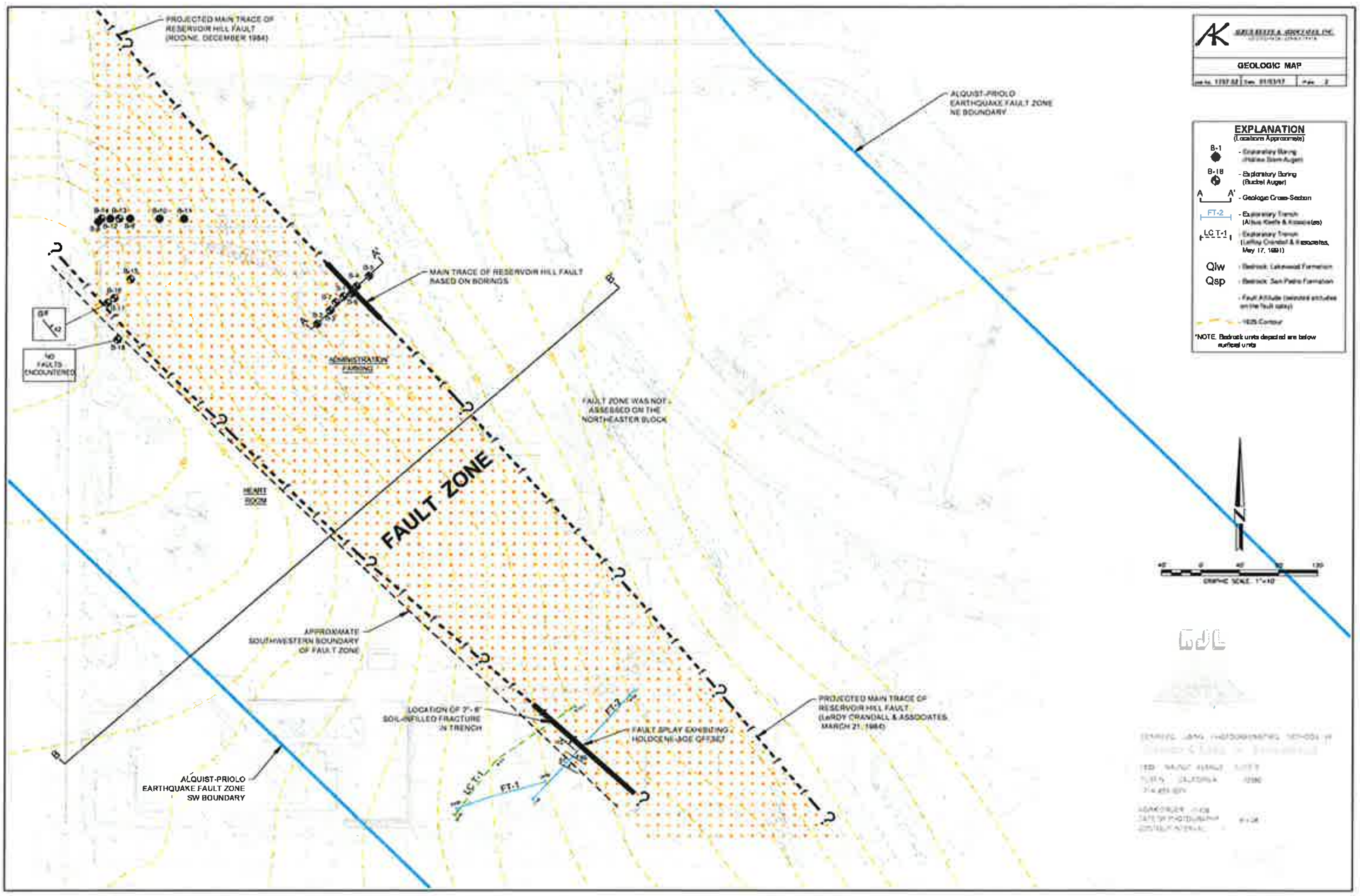
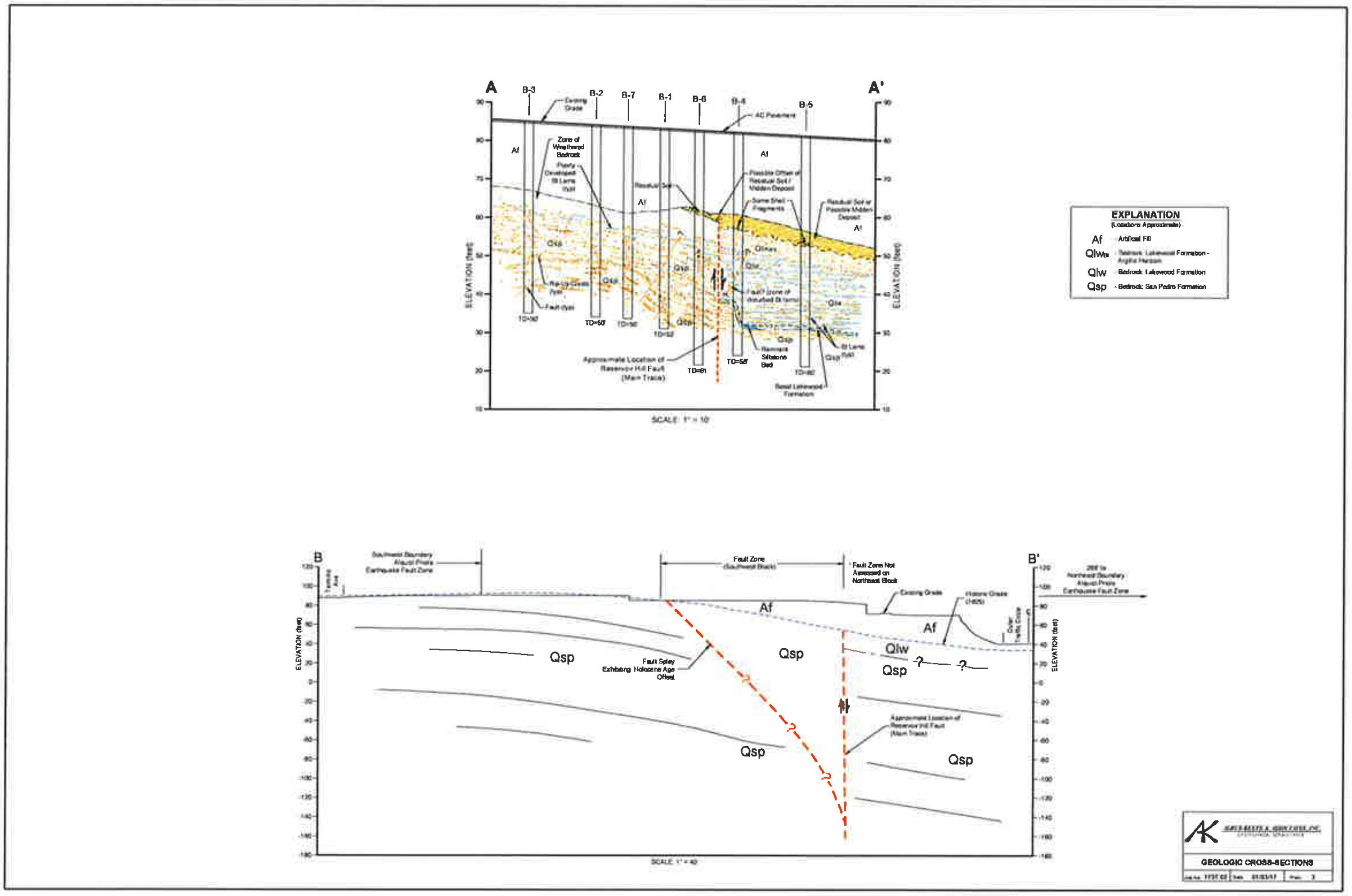
Agency	Date Flown	Flight No.	Photo No.	Scale
Fairchild	1928	C-300	M-174-176	unknown
Continental	11-19-53	14K	95&96	1"=1666'
Continental	4-3-60	311-5	5 & 6	1"=1000'
Continental	1-31-70	61-7	177 &178	1"=4000'
Continental	5-12-79	FC-LA	127 & 128	1"=2800'
Continental	1-27-86	F	352 & 353	1"=2800'
Continental	7-7-88	AF	19206	1"=2200'
Continental	1-29-92	C85-7	29 & 30	1"=2000'
Continental	6-9-93	C93-13	165 & 166	1"=2000'
Continental	1-29-95	C103-35	126 & 127	1"=2000'
Continental	10-15-97	C117-35	240 & 241	1"=2000'



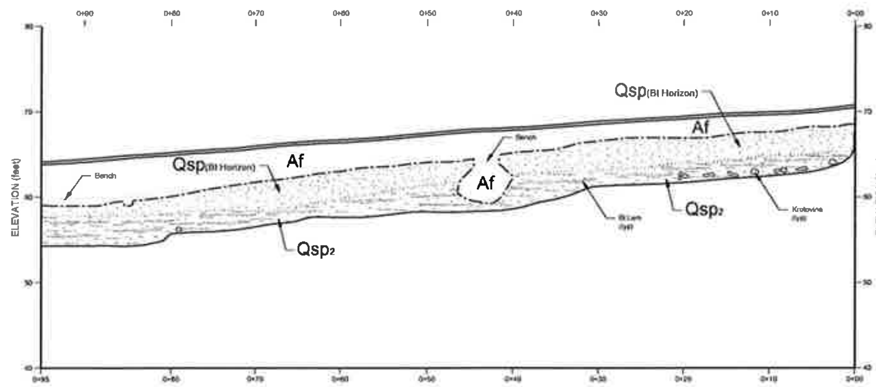
COMPILED PLOT PLAN
EXPLANATION
(Locations Approximate)
B-18
- Exploratory Boring, This Report
(Bucket Auger)
FT-2
- Exploratory Trench, This Report
LC T-1
May 17, 1981)
T-2
- Exploratory Trench
(Fugro, Inc April 2, 1974)
N
50' 0 50' 100 150
GRAPHIC SCALE: 1" = 50'
MAIN TRACE OF RESERVOIR HILL FAULT
LOCATION OF SHEAR
T-1
LOCATION OF SHEAR
FAULT ZONE
APPROXIMATE
SOUTHWESTERN BOUNDARY
OF FAULT ZONE
© Google 2016


GEOLOGIC MAP
EXPLANATION
(Locations Approximate)
B-1
B-18
- Exploratory Boring
(Bucket Auger)
A A'
- Geologic Cross-Section
FT-2
LC T-1
May 17, 1991)
Qlw
Qsp
*NOTE: Bedrock units depicted are below surficial units
PROJECTED MAIN TRACE OF
RESERVOIR HILL FAULT
(RODINE, DECEMBER 1984)
MAIN TRACE OF RESERVOIR HILL FAULT
BASED ON BORINGS
NO
FAULTS
ENCOUNTERED
ADMINISTRATION
PARKING
FAULT ZONE WAS NOT
ASSESSED ON THE
NORTHEASTER BLOCK
ALQUIST-PRIOLO
EARTHQUAKE FAULT ZONE
NE BOUNDARY
HEART
ROOM
FAULT ZONE
APPROXIMATE
SOUTHWESTERN BOUNDARY
OF FAULT ZONE
LOCATION OF 7"- 8"
SOIL-INFILLED FRACTURE
IN TRENCH
FAULT SPLAY EXHIBITING
HOLOCENE-AGE OFFSET
PROJECTED MAIN TRACE OF
RESERVOIR HILL FAULT
(LeROY CRANDALL & ASSOCIATES,
MARCH 21, 1984)
ALQUIST-PRIOLO
EARTHQUAKE FAULT ZONE
SW BOUNDARY
FT-1
FT-2
LC T-1
GRAPHIC SCALE 1"=40'


A
A'
B-3
B-2
B-7
B-1
B-6
B-8
B-5
Existing Grade
AC Pavement
Af
Zone of Weathered Bedrock
Residual Soil
Possible Offset of Residual Soil / Midden Deposit
Some Shell Fragments
Residual Soil or Possible Midden Deposit
Qsp
Qlw
Remnant Siltstone Bed
Approximate Location of Reservoir Hill Fault (Main Trace)
Basal Lakewood Formation
ELEVATION (feet)
SCALE: 1" = 10'
EXPLANATION
(Locations Approximate)
Af - Artificial Fill
Qlwa - Bedrock: Lakewood Formation - Argillic Horizon
Qlw - Bedrock: Lakewood Formation
Qsp - Bedrock: San Pedro Formation
B
B'
Southwest Boundary Alquist-Priolo Earthquake Fault Zone
Fault Zone (Southwest Block)
Fault Zone Not Assessed on Northeast Block
Existing Grade
Historic Grade
Fault Splay Exhibiting Holocene Age Offset
Approximate Location of Reservoir Hill Fault (Main Trace)
SCALE: 1" = 40'
GEOLOGIC CROSS-SECTIONS

FT-1

N73E



SCALE: 1" = 5'

EXPLANATION

Af: **Artificial Fill:** Silty Sand and Sand, fine-grained sand, light grayish brown, brown and dark grayish brown, medium dense, dry to damp, some scattered gravel, brick and asphalt fragments.

Qsp: **San Pedro Formation**

Qsp(Bt Horizon): "Argillic Horizon" Silty Sandstone, slightly clayey, fine-grained sand, strong brown (7.5YR 4/6 to 5/6), damp, very dense, massive, locally porous, moderate blocky ped development with clay films on ped surfaces.

Qsp2: Sandstone and Silty Sandstone, fine- to coarse-grained sand, light gray (10YR 7/1), dry to damp, slightly friable to locally very friable, internally massive to locally well stratified and cross-bedded, some thin gravel and silty interbeds, some thin clay-rich Bt lams. The Bt lams are up to 1" thick, strong brown in color (7.5YR 5/8), and decrease in abundance and thickness with depth.

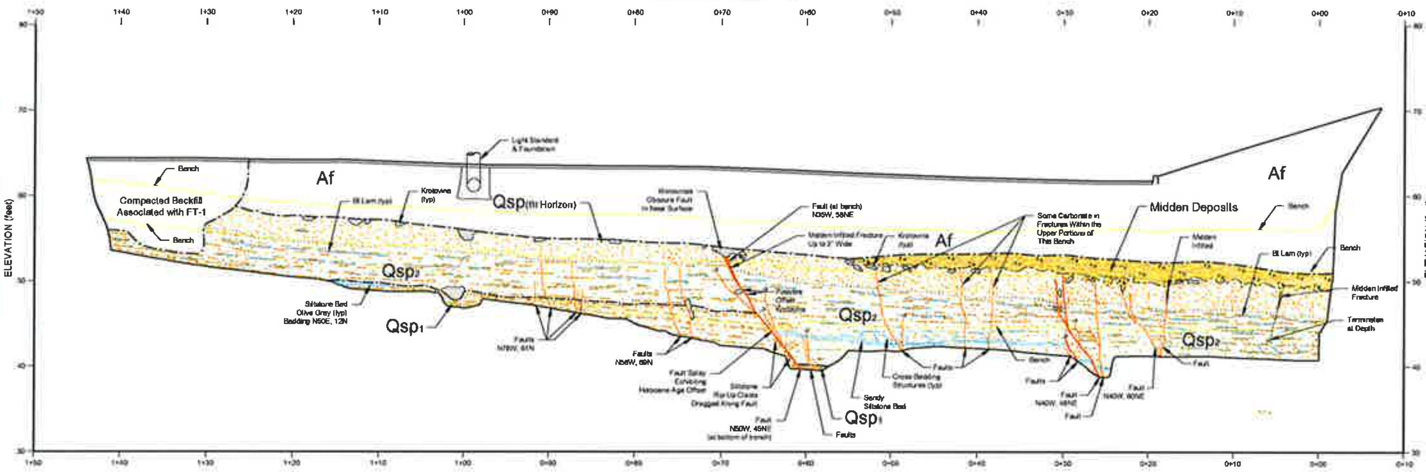
ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

FAULT TRENCH FT-1

Job No.: 1707.02	Date: 01/03/17	Plate: 4

FT-2

N45E



SCALE: 1" = 5'

EXPLANATION

Af: **Artificial Fill:** Silty Sand and Sand, fine-grained sand, light grayish brown, brown and dark grayish brown, medium dense, dry to damp, some scattered gravel, brick and asphalt fragments.

(No Symbol): **Midden Deposits:** Silty Sand, fine-grained sand, dark grayish-brown (10YR 7/1), damp, medium dense, scattered shells, rare charcoal fragments, intensely bioturbated with abundant krotovina

Qsp: **San Pedro Formation**

Qsp(Bt Horizon): "Argillic Horizon" Silty Sandstone, slightly clayey, fine-grained sand, strong brown (7.5YR 4/6 to 5/6), damp, very dense, massive, locally porous, moderate blocky ped development with clay films on ped surfaces.

Qsp_2: Sandstone and Silty Sandstone, fine- to coarse-grained sand, light gray (10YR 7/1), dry to damp, slightly friable to locally very friable, internally massive to locally well stratified and cross-bedded, some thin gravel and silty interbeds, some thin clay rich Bt lams. The Bt lams are up to 1" thick, strong brown in color (7.5YR 5/6), and decrease in abundance and thickness with depth

Qsp1: Sandstone and some Silty Sandstone, fine-grained sand, yellow (10YR 7/8), damp, friable, massive to faintly well stratified, some crudely aligned rip-up clasts, some very thin Bt lams

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

FAULT TRENCH FT-2

Job No. 1707.02	Date: 01/03/17	Plate: 5

APPENDIX A

EXPLORATORY BORING LOGS

Prepared by Albus-Keefe & Associates, Inc. (this study)

BORING LOG

Project:	Community Hospital of Long Beach		Boring No.: LEGEND
Location:	1720 Termino Ave., Long Beach, CA		Elevation:
J.N.:	1707.01	Client: Comm. Hospital of Long Beach	Date:
Drill Method:	(drill rig type)	Driving Weight: (hammer wt. and drop)	Logged by:

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		EXPLANATION							
		Heavy solid lines separate geologic units.							
		Thin solid Lines separate material types within geologic unit.							
		Dashed lines indicate unknown depth of material type change.							
		Heavy double line indicates bottom of boring.							
5		**Solid black rectangle** in Core column represents California Split-Spoon sampler (2.5in. ID, 3in. OD).							
		Gray shaded rectangle in Core column represents SPT sampler.							
10		**Rectangle with vertical lines in** Core column represents Shelby tube sampler							
		Light gray Rectangle in Bulk column represents large bag sample.							
15		<u>Other Laboratory Tests:</u> MAX = Maximum Dry Density/Optimum Moisture Content SO4 = Soluble Sulfate Content CON = Consolidation/Collapse DSR = Direct Shear, Remolded DS = Direct Shear, Undisturbed SA = Sieve Analysis (1" through #200 sieve) -200 = Percent Passing #200 Sieve EI = Expansion Index AL = Atterberg Limits R = R-value MR = Minimum Resistivity pH = pH value							

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-1**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.:	**1707.01** / **Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/7/08 - Logged 8/8/08**
Drill Method:	**Bucket Auger** / **Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		0 - 3": Asphaltic Concrete							
	Af	ARTIFICIAL FILL (Af): Silty Sand, fine grained, yellow brown and gray brown, moist, medium dense, with varying amounts of concrete, red brick, asphalt, wood and glass bottle debris.							
5									
10		@ 11.0', very difficult drilling due to large chunks of concrete debris.							
		@ 14.5', some organic plant debris.							
15		@ 16', some possible sump debris (bentonite like materials).							
		@ 21', contact at base of fill: N-S, 15W.							
20	Qsp	**BEDROCK: San Pedro Formation "Weathered" (Qsp):** Silty Sandstone, yellow brown, fine grained, damp to moist, moderately hard, highly bioturbated with abundant krotovinas and roots, and some very thin, irregular, poorly developed Bt lams. Generally becomes less weathered with depth.							
	Qsp	**BEDROCK: San Pedro Formation (Qsp):** Silty Sandstone and Sandstone, yellow brown, fine grained, slightly micaceous, damp to moist, slightly friable, massive to locally well stratified and cross-bedded, some interbeds and lenses of gravelly sandstone with occasional siltstone rip-up clasts, and some very irregular, 1/8" up to 2"-thick, dark yellow brown Bt lams that decrease in thickness and frequency with depth. Bt lams appear to completely diminish at approx. 29'.							

BORING LOG

Project:	**Community Hospital of Long Beach**		**Boring No.: B-1**
Location:	**1720 Termino Ave., Long Beach, CA**		**Elevation:**
J.N.:	**1707.01**	**Client: Comm. Hospital of Long Beach**	**Date: Drilled 8/7/08 - Logged 8/8/08**
Drill Method:	**Bucket Auger**	**Driving Weight: 140-lb Autohammer**	**Logged by: MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
25	**Qsp**	@ 25', attitude on Bt lam: N65W, 6NE.							
		@ 26', becomes moist to very moist, some large tree roots.							
		@ 26.5', attitude on Bt lam: N55E, 19NE.							
		@ 27', Bt lams are becoming much thinner (1/8"-1/4" thick) and less distinct, some slight seepage emanating along some tree roots.							
30		@ 28.5', bedding attitude on crudely aligned medium gray siltstone rip-up clasts:N45W, 5NE.							
		@ 31', bedding attitude on some very thin sandy siltstone beds, continuous around boring. : N45W, 12NE.							
		@ 32', slight seepage still emanating along some large roots.							
35		@ 32.5', minor fault enters boring. The fault is 1/8" to 2" wide, slightly cemented and oxidized stained, roughly 1" of apparent reverse offset. The fault exits boring at 36'. Fault Attitude: N62W, 65S.							
		@ 37', light gray sandstone bed with yellow brown silty sandstone interbeds and lenses, damp, locally very friable, and fractured. The fractures are generally sub parallel and spaced roughly every 12" apart. The fractures are typically 1/8" to 1/4" wide, weekly cemented with yellow brown oxidation staining.							
40		@ 38.5",Fracture Attitude: N45W, 65S.							
		@ 39', Fracture attitude: N56W, 77S.							
		@ 40.6', Fracture Attitude: N52W, 70S.							
		@ 43', some rusty orange and black oxidation staining.							
		@ 43.5', Fracture Attitude: N56W, 57S.							
45		@ 44', coarse grained sandstone bed with abundant siltstone rip-up clasts up to 6" in length, rusty oxidation stained throughout. The top of bed is well defined and irregular, dips crudely 60 degrees to the northeast. A fault offsets the top of the bed by as much as 18-inches. The apparent sense of offset is reverse. The fault is 1/4" wide and black stained. The fault exits boring at 47'. Fault Attitude: N43W, 62S.							

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-1**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.: 1707.01	**Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/7/08 - Logged 8/8/08**
Drill Method: Bucket Auger	**Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
50	**Qsp**								
		Boring not down holed logged below 47 feet							
		Total Depth Drilled 52 feet							
55		Slight caving throughout							
		Slight Seepage @27 and 32 feet							
60									
65									
70									

BORING LOG

Project:	Community Hospital of Long Beach		Boring No.: B-2
Location:	1720 Termino Ave., Long Beach, CA		Elevation:
J.N.:	1707.01	Client: Comm. Hospital of Long Beach	Date: Drilled 8/11/08 - Logged 8/12/08
Drill Method:	Bucket Auger	Driving Weight: 140-lb Autohammer	Logged by: MOS

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		0 - 3": Asphaltic Concrete							
	Af	ARTIFICIAL FILL (Af): Silty Sand, fine grained, yellow brown and gray brown, moist, medium dense, with varying amounts of concrete, red brick, asphalt, wood and glass bottle debris.							
5									
		@ 7.0', abundant asphalt debris.							
10									
		@ 11.0', some white plaster like debris.							
15									
		@ 20', contact at base of fill: N50E, 33NW.							
20	Qsp	**BEDROCK: San Pedro Formation "Weathered" (Qsp):** Silty Sandstone, yellow brown, fine grained, damp to moist, moderately hard, some fine grained sandstone lenses, highly bioturbated with abundant krotovinas and some roots. Generally becomes less weathered with depth.							

BORING LOG

Project:	**Community Hospital of Long Beach**		**Boring No.:**	**B-2**
Location:	**1720 Termino Ave., Long Beach, CA**		**Elevation:**	
J.N.:	**1707.01**	**Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/11/08 - Logged 8/12/08**
Drill Method:	**Bucket Auger**	**Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
25									
	Qsp	**BEDROCK: San Pedro Formation (Qsp):** Silty Sandstone and Sandstone, yellow brown, fine grained, slightly micaceous, damp to moist, slightly friable, massive to locally well stratified and cross-bedded, some interbeds and lenses of gravelly sandstone with occasional siltstone rip-up clasts.							
30		@ 26', bedding attitude on a thin silty sandstone bed: N35W, 7NE. Some krotovinas.							
		@ 28', bedding attitude on a thin silty sandstone bed: N75W, 6NE.							
		@ 33.5', fracture, ¼" wide, cemented with yellow brown oxidation staining, no apparent offset: N40W, 65NE.							
35		@ 35', very coarse grained sandstone bed with gravel and abundant siltstone rip-up clasts up to 6" in length, rusty oxidation stained throughout, base of bed at 36.5' is erosional and near horizontal.							
		@ 36.5', fine grained sandstone bed, slightly silty, light gray white with rusty oxidation staining along bedding, damp, moderately hard, well stratified with occasional coarse grained gravelly sandstone interbeds.							
40		@ 37', bedding attitude: N 30E, 18S.							
		@ 39', minor fault, lightly stained, approximately 2" of apparent normal offset. Fault terminates at 36.5 feet. Fault Attitude: N12E, 53W.							
		@ 41', bedding attitude along base of a gravel bed N10E, 22E.							
45		@ 43', bedding attitude along base of a gravel bed N10W, 50-60E.							
		Boring not down holed logged below 43 feet							
		Total Depth Drilled 50 feet							
		Slight caving throughout							
		No Groundwater							

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-3**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.:	**1707.01** — **Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/8/08 - Logged 8/11/08**
Drill Method:	**Bucket Auger** — **Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		0 - 3": Asphaltic Concrete							
	Af	ARTIFICIAL FILL (Af): Silty Sand, fine grained, yellow brown and gray brown, moist, medium dense, with varying amounts of concrete, red brick, asphalt, wood and glass bottle debris.							
5									
10		@ 17.5', abundant glass debris at base of fill. Contact: N45E, 45NW.							
		BEDROCK: San Pedro Formation "Weathered" (Qsp): Silty Sandstone, yellow brown, fine to medium grained, damp, moderately hard, faintly stratified, highly bioturbated with abundant krotovinas and some roots. Generally becomes less weathered with depth.							
15	Qsp								
		BEDROCK: San Pedro Formation (Qsp): Silty Sandstone and Sandstone, yellow brown, fine grained, slightly micaceous, damp to moist, slightly friable, massive to locally well stratified and cross-bedded, some interbeds and lenses of gravelly sandstone with occasional siltstone rip-up clasts, and some very irregular, 1/8" up to 2"-thick, dark yellow brown, Bt lams that decrease in thickness and frequency with depth. Bt lams appear to completely diminish at approx. 23.5'.							
20		@ 23.5', some fractures and minor faults in bedrock, generally 1/8" to ½ " wide ,lightly cemented with dark yellow brown oxidation staining.							
	Qsp	@ 23.5', bedding attitude on base of a thin silty sandstone bed: N75W, 5N.							
		@ 24.5', fault, 1" wide, cemented with dark yellow brown oxidation staining, lined with roots, very minor offset of ½", some sub parallel fractures: : N38W, 63NE.							

BORING LOG

Project:	Community Hospital of Long Beach		Boring No.: B-3
Location:	1720 Termino Ave., Long Beach, CA		Elevation:
J.N.:	1707.01	Client: Comm. Hospital of Long Beach	Date: Drilled 8/11/08 - Logged 8/12/08
Drill Method:	Bucket Auger	Driving Weight: 140-lb Autohammer	Logged by: MOS

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
25	Qsp	@ 29', attitude on minor fault: N43W, 45NE.							
		@ 32.', attitude on minor fault: N35W, 60E.							
		@ 32.5', attitude on minor fault: N22W, 84E.							
		@ 32.5', bedding attitude on base of a fine grained sandstone bed: N12E, 8E.							
30									
		@ 33.5', very coarse grained sandstone bed with gravel and abundant siltstone rip-up clasts up to 6" in length, rusty oxidation stained throughout, base of bed at 35.5' is irregular and erosional.							
35									
		@ 35.5', fine grained sandstone bed, slightly silty, light gray white with rusty oxidation staining along bedding, damp, moderately hard, well stratified with occasional interbeds of coarse grained gravelly sandstone.							
		@ 36', minor fault, lightly stained, approximately 1" of apparent offset. Fault terminates at 35.5 feet. Fault Attitude: N30W, 80-85SW.							
40		@ 37', bedding attitude along base of gravel bed: N75E, 18SE.							
		@ 44', bedding attitude on fine grained sandstone bed: N30E, 14SE.							
		@ 44', minor fault, lightly stained, approximately 5" of apparent normal offset. Fault Attitude: N32W, 53W.							
45									
		Boring not down holed logged below 44 feet							
		Total Depth Drilled 50 feet							
		Slight caving throughout							
		No Groundwater							

BORING LOG

Project:	**Community Hospital of Long Beach**		**Boring No.:** B-4
Location:	**1720 Termino Ave., Long Beach, CA**		**Elevation:**
J.N.:	**1707.01**	**Client: Comm. Hospital of Long Beach**	**Date:** Drilled 8/12/08 - Logged 8/13/08
Drill Method:	**Bucket Auger**	**Driving Weight: 140-lb Autohammer**	**Logged by:** MOS

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		0 - 3": Asphaltic Concrete							
	Af	**ARTIFICIAL FILL (Af):** Silty Sand, fine grained, yellow brown and gray brown, moist, medium dense, with varying amounts of concrete, red brick, asphalt, wood and glass bottle debris.							
5									
10		@ 10.5', very large concrete debris.							
15		@ 16', very large concrete debris.							
		@ 21.5', some minor burn debris at base of fill. Contact: E-W, 12N.							
20		**RESIDUAL SOIL / POSSIBLE MIDDEN DEPOSIT (No Map Symbol):** Silty Sand, dark gray brown, fine grained, moist, medium dense, highly bioturbated with abundant krotovinas and some fine roots.							
		@ 25', becomes more yellow brown in color and still very bioturbated. Shell fragment observed.							

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-4**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.:	**1707.01** — **Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/12/08 - Logged 8/13/08**
Drill Method:	**Bucket Auger** — **Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
25		@ 25.5', abundant krotovinas along contact.							
	Qlw_{Bt}	**BEDROCK: LAKEWOOD FORMATION (Qlw):** Silty Sandstone (slightly clayey), dark yellow brown, fine grained, moist, moderately hard, massive, locally porous, blocky ped development with clay films on ped surfaces.							
30									
	Qlw	@ 32', Sandstone, light brown, fine grained, slightly friable, closely spaced dark yellow brown near horizontal to slightly irregular well-developed clay rich Bt lams up to several inches thick. The Bt lams decrease in frequency and thickness with depth.							
35		@ 33', Fault? 12" wide zone of disrupted and broken Bt lams. Zone exits boring at 37' and narrows to approx. 3". Bt lams on either side of zone are near horizontal. Not able to assess offset, if any. Attitude: N40W, 56NE.							
40		@ 40', attitude on Bt lam: N30W, 7SW. @ 44', Basal portion of Lakewood Formation, very irregular carbonate cemented zone, up to 12 inches thick, locally present on the southwest side of boring. Remnant siltstone bed with carbonate cemented stringers and nodules present on northeast side at 50 ft. Contact with underlying San Pedro Formation is very steeply inclined to NE and appears erosional.							
45	Qsp	**BEDROCK: SAN PEDRO FORMATION (Qsp):** Silty Sandstone and Sandstone, light brown, fine grained, slightly micaceous, dry to damp, faintly stratified, very friable.							
		Boring not down holed logged below 50 feet Total Depth Drilled 58 feet Heavy Caving on southwest side of boring at 45 feet No Groundwater							

BORING LOG

Project:	**Community Hospital of Long Beach**		**Boring No.:** B-5
Location:	**1720 Termino Ave., Long Beach, CA**		**Elevation:**
J.N.:	**1707.01**	**Client: Comm. Hospital of Long Beach**	**Date:** Drilled 8/13/08 - Logged 8/14/08
Drill Method:	**Bucket Auger**	**Driving Weight: 140-lb Autohammer**	**Logged by:** MOS

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		0 - 3": Asphaltic Concrete							
	Af	ARTIFICIAL FILL (Af) Silty Sand, fine grained, yellow brown and gray brown, moist, medium dense, with varying amounts of concrete, red brick, asphalt, wood and glass bottle debris.							
5									
10									
		@ 11.0', very large concrete debris.							
15									
20									
		@ 24.5', contact at base of fill: N20E, 17E.							
		RESIDUAL SOIL / POSSIBLE MIDDEN DEPOSIT (No Map Symbol): Silty Sand, dark gray brown, fine grained, moist, medium dense, highly bioturbated with abundant krotovinas and some fine roots.							

BORING LOG

Project:	**Community Hospital of Long Beach**		**Boring No.:** B-5
Location:	**1720 Termino Ave., Long Beach, CA**		**Elevation:**
J.N.:	**1707.01**	**Client: Comm. Hospital of Long Beach**	**Date:** Drilled 8/13/08 - Logged 8/14/08
Drill Method:	**Bucket Auger**	**Driving Weight: 140-lb Autohammer**	**Logged by:** MOS

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
25		@ 26.5', soil becomes more yellow brown in color and still very bioturbated. @ 27.5', some shell fragments. @ 28.5', abundant krotovinas along contact.							
30	Qlw_{Bt}	<u>BEDROCK: LAKEWOOD FORMATION (Qlw):</u> Silty Sandstone, dark yellowish brown, fine grained, damp to moist, moderately hard, massive, locally porous, blocky ped development with clay films on ped surfaces.							
35	Qlw	@ 33.5', Sandstone, light brown, fine grained, slightly friable, closely spaced dark yellow brown near horizontal to slightly irregular well-developed clay rich Bt lams up to several inches thick. The Bt lams decrease in frequency and thickness with depth.							
40									
		@ 42.5', attitude on a Bt lam: N68E, 5S.							
45									

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-5**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.:	**1707.01** — **Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/13/08 - Logged 8/14/08**
Drill Method:	**Bucket Auger** — **Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
50	Qlw	@ 50', Basal portion of Lakewood Formation, irregular carbonate cemented zone up to 12" thick. Contact with underlying San Pedro Formation is near horizontal and appears erosional.							
	Qsp	**BEDROCK: SAN PEDRO FORMATION (Qsp):** Silty Sandstone and Sandstone, light brown, fine grained, slightly micaceous, dry to damp, faintly stratified, friable.							
		@ 54', bedding attitude on a faintly stratified sequence: N72W, 11N.							
55									
		@ 56', occasional light colored carbonate cemented concretions.							
60		Boring not down holed logged below 56 feet Total Depth Drilled 60 feet Heavy caving below 51 feet No Groundwater							
65									
70									

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-6**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.:	**1707.01** / **Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/14/08 - Logged 8/15/08**
Drill Method:	**Bucket Auger** / **Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		0 - 3": Asphaltic Concrete							
	Af	**ARTIFICIAL FILL (Af)** Silty Sand, fine grained, yellow brown and gray brown, moist, medium dense, with varying amounts of concrete, red brick, asphalt, wood and glass bottle debris.							
5									
10									
15									
		@ 20', some minor burn debris at base of fill. Contact: N-S, 15E.							
20		**RESIDUAL SOIL (No Map Symbol):** Silty Sand, gray brown, fine grained, damp to moist, porous, scattered roots.							
	Qsp	**BEDROCK: San Pedro Formation "Weathered" (Qsp):** Silty Sandstone, yellow brown, fine grained, damp to moist, moderately hard, porous, highly bioturbated with abundant krotovinas and some roots.							

BORING LOG

Project: Community Hospital of Long Beach		**Boring No.:** B-6	
Location: 1720 Termino Ave., Long Beach, CA		**Elevation:**	
J.N.: 1707.01	**Client: Comm. Hospital of Long Beach**	**Date:** Drilled 8/14/08 - Logged 8/15/08	
Drill Method: Bucket Auger	**Driving Weight: 140-lb Autohammer**	**Logged by:** MOS	

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
25	Qsp	**BEDROCK: San Pedro Formation (Qsp):** Silty Sandstone and Sandstone, yellow brown, fine grained, slightly micaceous, damp to moist, slightly friable, massive to locally well stratified and cross-bedded, some interbeds and lenses of gravelly sandstone with occasional siltstone rip-up clasts, well fractured. Fractures are 1/8" to 1/4" wide, slightly cemented, with dark yellow brown oxidation staining. Some very irregular, 1/2" to 1"-thick dark yellow brown Bt lams that decrease in thickness and frequency with depth. Bt lams appear to completely diminish at approx. 33'.							
30		@ 28', bedding attitude on a thin silty sandstone bed: N15W, 10 NE. @ 31', large krotovina in association with some sub-parallel closely spaced low angle faults with very minor offsets, faults are 1/8" to ¼ wide, slightly cemented with yellow brown oxidation staining, F: N32W, 7SW. @ 32.5', bedding attitude on a thin silty sandstone bed: N5W, 15E. Some krotovinas. @ 33.4', faults above becoming near vertical.							
35		@ 35', faults with apparent reverse offsets of 1" and 3" measured at the base of a gravely sandstone bed. F: N43W, 76SW. Bedding attitude at the base of a gravely sandstone bed: N42W, 23E. @ 38', bedding attitude defined by dark micaceous bands in a fine grained sandstone sequence: N40W, 27NE. @ 41', faults with 1" to 4" of apparent reverse offsets in a fine grained sandstone sequence, some roots and black oxidation staining along faults and bedding structure.							
40		@ 43', becomes lighter in color with lots of black oxidation staining and some roots along faults, fault attitude: N54W, vertical. @ 45', fault attitude: N80W, 72S. @ 46', very coarse grained sandstone bed with gravel and abundant siltstone rip-up clasts up to 6" in length, some local asphaltic-like staining in upper 2" to 4", base of bed at 47' is very irregular and erosional, offset by several minor faults, most significant offset is 4", northeast side is down. Fault attitude N25W, vertical.							
45		@ 47', fine grained sandstone bed, slightly silty, light gray white with rusty oxidation staining along bedding, damp, moderately hard, well stratified with occasional interbeds of coarse grained gravelly sandstone, extensively faulted, some of the faults terminate at top of bed, locally very heavy caving.							

BORING LOG

Project:	Community Hospital of Long Beach		Boring No.:	B-6
Location:	1720 Termino Ave., Long Beach, CA		Elevation:	
J.N.:	1707.01	Client: Comm. Hospital of Long Beach	Date:	Drilled 8/14/08 - Logged 8/15/08
Drill Method:	Bucket Auger	Driving Weight: 140-lb Autohammer	Logged by:	MOS

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
50	Qsp	@ 50', bedding attitude: N22W, 18-25NE.							
55									
60									
		Boring not down holed logged below 50 feet Total Depth Drilled 61 feet Slight caving throughout No Groundwater							
65									
70									

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-7**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.:	**1707.01** **Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/15/08 - Logged 8/18/08**
Drill Method:	**Bucket Auger** **Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		0 - 3": Asphaltic Concrete							
	Af	**ARTIFICIAL FILL (Af):** Silty Sand, fine grained, yellow brown and gray brown, moist, medium dense, with varying amounts of concrete, red brick, asphalt, wood and glass bottle debris.							
5									
10									
15									
20									
		@ 22.5', contact at base of fill is near horizontal.							
	Qsp	**BEDROCK: San Pedro Formation "Weathered" (Qsp):** Silty Sandstone, yellow brown, fine grained, damp to moist, moderately hard, faintly stratified, highly bioturbated with abundant krotovinas and roots, and some very thin, irregular, poorly developed Bt lams. Generally becomes less weathered with depth.							

BORING LOG

Project:	**Community Hospital of Long Beach**	**Boring No.:**	**B-7**
Location:	**1720 Termino Ave., Long Beach, CA**	**Elevation:**	
J.N.:	**1707.01** / **Client: Comm. Hospital of Long Beach**	**Date:**	**Drilled 8/15/08 - Logged 8/18/08**
Drill Method:	**Bucket Auger** / **Driving Weight: 140-lb Autohammer**	**Logged by:**	**MOS**

Depth (Feet)	Litho-logy	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
25	Qsp	**BEDROCK: San Pedro Formation (Qsp):** Silty Sandstone and Sandstone, yellow brown, fine grained, slightly micaceous, damp to moist, slightly friable, massive to locally well stratified and cross-bedded, some interbeds and lenses of gravelly sandstone with occasional siltstone rip-up clasts, and some thin faint dark yellow brown Bt lams that decrease in thickness and frequency with depth. Bt lams appear to completely diminish at approx. 29'. Bedrock is broken-up by sub-parallel multiple small faults breaks that are 1/8 ' to1/4" wide, weakly cemented and oxidized stained. Bt lams in bedrock are offset on the order of ½" to 1".							
30		@ 25.5', bedding attitude on a thin silty sandstone bed: N40W, 5-10NE. @ 27', fault attitude: N30W, vertical. @ 30', fault attitude: N26 to 50W, vertical. @ 34', fault attitude: N60W, vertical. Bedding structure is slightly wavy and appears near horizontal.							
35		@ 36', very coarse grained sandstone bed with gravel and abundant siltstone rip-up clasts up to 6" in length, rusty oxidation stained throughout, base of bed at 38' is sharp and faulted, most significant offset is 4", northeast side is down. Contact attitude N72W, 25N, Attitude on significant fault break: N60W, 78S.							
40		@ 38', fine grained sandstone bed, slightly silty, light gray white with rusty oxidation staining along bedding, damp, moderately hard, well stratified with occasional interbeds of coarse grained gravelly sandstone, broken by fault zone describe above as well as several other near vertical minor fault breaks, locally very heavy caving. @ 38', Fault zone from above becomes less steep and exits boring: Fault attitude: N72W, 45S @ 39', bedding attitude: N5E, 25E, @ 40', attitudes on some minor faults:,N68E, vertical and N80E, vertical, N60E, 63N							
45		Boring not down holed logged below 40 feet Total Depth Drilled 50 feet Slight caving throughout No Groundwater							

EXPLORATION LOG

Project:		Location:
Address:		Elevation:
Job Number:	Client:	Date:
Drill Method:	Driving Weight:	Logged By:

Depth (feet)	Lith- ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		EXPLANATION							
		Solid lines separate geologic units and/or material types.							
5		Dashed lines indicate unknown depth of geologic unit change or material type change.							
		Solid black rectangle in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).							
		Double triangle in core column represents SPT sampler.							
10		**Solid black rectangle** in Bulk column respresents large bag sample.							
		Other Laboratory Tests: Max = Maximum Dry Density/Optimum Moisture Content EI = Expansion Index SO4 = Soluble Sulfate Content DSR = Direct Shear, Remolded DS = Direct Shear, Undisturbed SA = Sieve Analysis (1" through #200 sieve) Hydro = Particle Size Analysis (SA with Hydrometer) 200 = Percent Passing #200 Sieve Consol = Consolidation SE = Sand Equivalent Rval = R-Value ATT = Atterberg Limits							
15									
20									

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-8
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 93.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Asphalt Concrete (AC): .4 feet							
		BEDROCK - San Pedro Formation (Qsp) Silty Sandstone : Olive-brown, damp, moderately hard, fine grained, slightly weathered.		23					
		Sandstone : Olive-brown with yellow-brown oxidation staining, dry to damp, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of silty sandstone.		23					
5				13					
		@ 6.8 ', bedrock becomes gray with yellow oxidation staining, damp.		25					
				31					
10				20					
		@ 12.5' to 20', fine to coarse grained sandstone bed with siltstone rip-up clasts and gravel.							
15				38					
20		@ 20 ', bedrock becomes gray with yellow oxidation staining, damp, hard, locally cemented.		50					

EXPLORATION LOG

Project: Community Hospital of Long Beach			Location: B-8
Address: 1720 Termino Ave, Long Beach, CA 90804			Elevation: 93.5
Job Number: 1707.01	Client: Community Hospital of Long Beach		Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in		Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				47					
		Total Depth: 27 feet No groundwater No caving Backfilled with soil cuttings and capped with AC cold patch							
30									
35									

Albus-Keefe & Associates, Inc.

EXPLORATION LOG

Project: Community Hospital of Long Beach	Location: B-9
Address: 1720 Termino Ave, Long Beach, CA 90804	Elevation: 92
Job Number: 1707.01 / Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger / Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Asphalt Concrete (AC): .5 feet							
		ARTIFICIAL FILL (Af) Silty Sand (SM): Dark brown, damp, dense, fine grained sand, some AC fragments.		21					
		BEDROCK - San Pedro Formation (Qsp) Sandstone : Olive-brown with yellow-brown oxidation staining, damp, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of silty sandstone.		26					
5				15					
		@ 6.5 ', bedrock becomes gray with orange oxidation staining, dry to damp.		30					
				26					
10				32					
		@ 12.5' to 20', fine to coarse grained gravelly sandstone bed with siltstone rip-up clasts.		22					
15				22					
				29					
				34					
20		@ 20 ', bedrock becomes gray with yellow oxidation staining, dry to damp.		45					
				35					

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-9
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 92
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				33					
		Total Depth: 26.5 feet No groundwater No caving Backfilled with soil cuttings and capped with AC cold patch							
30									
35									

Albus-Keefe & Associates, Inc.

Plate A-5

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-10
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 89.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith- ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Asphalt Concrete (AC): .4 feet							
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, damp to moist, dense, fine grained sand, some AC fragments		40					
				16					
5		**BEDROCK - San Pedro Formation (Qsp)** Sandstone : Olive-brown with yellow-brown oxidation staining, damp, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, some interbeds of silty sandstone.		15					
		@ 5.5 ', bedrock becomes gray with orange oxidation staining		42					
		@ 6.5 ', near veritical 1/8" to 1/4" wide fracture with black oxidation staining		47					
10									
		@ 10.5 ', fine to coarse grained sandstone bed, 6" thick		45					
		@ 12.5' to 21.5', fine to coarse grained sandstone bed with siltstone rip-up clasts and gravel.		28					
15				34					
				32					
				37					
20									
				41					
		@ 21.5 ', bedrock becomes hard		54					

Albus-Keefe & Associates, Inc. Plate A-7

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-10
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 89.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Total Depth: 24.5 feet No groundwater No caving Backfilled with soil cuttings and capped with AC cold patch							
30									
35									

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-11
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 88.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		Asphalt Concrete (AC): .35 feet							
		ARTIFICIAL FILL (Af) Silty Sand (SM): Dark brown, damp to moist, dense, fine grained sand, some gravel, some AC and concrete debris.		22					
4		**BEDROCK - San Pedro Formation (Qsp)** Sandstone : Olive- brown to yellow-brown, dry, soft to moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of silty sandstone.		12					
5									
6				16					
7		@ 7 ', bedrock becomes gray with some orange oxidation staining, damp, moderately hard.							
8				19					
10		@ 10' to 23', fine to coarse grained sandstone bed with siltstone rip-up clasts and gravel.		28					
12		@ 12 ', bedrock becomes dry.		30					
14				33					
15									
20				61					
22				55					
23.5		@ 23.5 ', bedrock becomes gray with yellow oxidation staining, damp, hard.							

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-11
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 88.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Total Depth: 24 feet No groundwater No caving Backfilled with soil cuttings and capped with AC cold patch							
30									
35									

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-12
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 93.2
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Asphalt Concrete (AC): .35 feet							
		BEDROCK - San Pedro Formation (Qsp) Silty Sandstone : Olive-brown, damp, moderately hard, fine grained, slightly weathered.							
		Sandstone : Olive-brown with some orange oxidation staining, damp, modertaly hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of silty sandstone.							
5				16					
		@ 6.5 ', bedrock becomes gray with yellow oxidation staining.							
10				26					
		@ 11.5' to 19', fine to coarse grained sandstone bed with siltstone rip-up clasts and gravel.		30					
				43					
15				42					
				39					
		@ 19 ', bedrock becomes gray with yellow oxidation staining, dry, hard, some interbedded gravel lenses.							
20				81					

Albus-Keefe & Associates, Inc.

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-12
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 93.2
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 6/25/2015
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Total Depth: 22 feet No groundwater No caving Backfilled with soil cuttings and capped with AC cold patch							
30									
35									

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-13
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 92.8
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 7/23/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Asphalt Concrete (AC): .4 feet							
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, moist, medium dense, fine grained sand, some concrete fragments.							
5		**BEDROCK - San Pedro Formation (Qsp)** Sandstone : Yellow-brown to gray, damp to moist, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, some interbeds of silty sandstone and fine to coarse grained sandstone with abundant siltstone rip-up clasts.							
		@ 4 ', fault 1/8" to 1/2" wide, slightly oxidized with some roots along fault, up to 6" of apparent normal offset. The fault exits boring at 10.6 feet. Fault attitude at 7': N45W, 72NE.							
10		@ 7.5 ', bedding attitude on fine to coarse grained sandstone bed: N20W, 10NE.							
		@ 9.5 ', bedding attitude on fine to coarse grained sandstone bed with abundant siltstone rip-up clasts up to 6": N40W, 14NE.							
15		@ 14 ', bedding attitude on fine to medium grained sandstone bed: N65E, 10 SE.							
		@ 18.5 ', bedding attitude on 6" gravel bed: N60E, 14SE.							
20		@ 20 ', bedrock becomes gray with yellow oxidation staining on fracture and bedding surfaces. Bedding attitude on fine grained sandstone bed: N65E, 27SE.							
		@ 23 ', bedding attitude on fine to medium grained sandstone bed: N70E, 7SE.							

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-13
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 92.8
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 7/23/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		@ 25 ', fracture with no apparent offset: N18W, 72E.							
30									
		@ 31 ', bedrock becomes locally cemented, difficult drilling.							
35		Boring not down hole logged below 28 feet Total Depth: 33 feet No groundwater encountered No caving Backfilled with soil cuttings and capped with AC cold patch							

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-14
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 93.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 7/24/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Asphalt Concrete : .4 feet							
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, dry to damp, medium dense, fine grained sand							
		BEDROCK - San Pedro Formation (Qsp) Sandstone : Light brown to gray, damp to moist, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of silty sandstone and fine to coarse grained sandstone with abundant siltstone rip-up clasts.							
5		@ 6.5 ', fault 1/8" wide, slightly oxidized, 1/2" to 1" of apparent normal offset. The fault exits boring at 13'. Fault attitude at 10': N30W, 85 NE.							
		@ 7 ', small krotovina.							
10									
		@ 12 ', bedding attitude on yellow-brown, fine to coarse grained sandstone bed with abundant siltstone rip-up clasts up to 12": N35-40W, 17NE.							
15		@ 16 ', bedding attitude on 6" fine to medium grained sandstone bed: N78E, 16N.							
		@ 17.5 ', bedding attitude on fine grained sandstone bed: N80W, 25S.							
20		@ 20 ', bedrock becomes gray with yellow brown oxidation staining, damp to moist, well indurated. Bedding attitude on 1" gravel bed: N80E, 3S.							

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-14
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 93.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 7/24/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Boring not down hole logged below 23 feet Total Depth: 27 feet No groundwater encountered No caving Backfilled with soil cuttings and capped with AC cold patch							
30									
35									

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-15
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 93
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 8/3/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		BEDROCK - San Pedro Formation (Qsp) Silty Sandstone : Brown, moist, moderately hard, fine grained, bioturbated and weathered, scattered siltstone rip-up clasts up to 2 ".							
		Sandstone : Gray with brown oxidation staining, moist, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, slightly weathered with scattered krotovinas, some interbeds of silty sandstone/sandy siltstone and fine to coarse grained sandstone with abundant siltstone rip-up clasts.							
5		@ 2.5 ', Fault 1/8" to 1/4" wide , oxidized, up to 3" of apparent normal offset. The fault exits boring at 10.8 feet. Fault attitude at 7': N15W, 77SW. Fault attitude at 10.8': N30W, 63SW.							
10		@ 4 ', bedrock becomes less weathered							
		@ 7 ', bedrock becomes gray with orange oxidation staining. Bedding attitude on fine to medium grained sandstone bed: N/S, 12E.							
		@ 11.5 ', bedding attitude on gray, silty sandstone/sandy siltstone bed: N85E, 30S. Bed pinches out on south side of boring.							
15		@ 14.5 ', fault 1/8" wide, slightly oxidized with some roots, up to 1/2" of apparent offset. Fault attitude: N35W, near vertical.							
		@ 15.5 ', bedding attitude on fine grained and fine to medium grained sandstone bed: N10E, 3W.							
		@ 18.5 ', bedding attitude on fine to medium grained sandstone bed: N65E, 28SE.							
20									
		@ 21.5 ', bedding attitude on 3.5' thick, gray, silty sandstone/sandy siltstone bed: N15E, 7SE. Bed is heavily oxidized at base and up to 1/2" of apparent offset by fault mentioned above.							

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-15
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 93
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 8/3/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		@ 26 ', bedding attitude on well cemented, fine grained sandstone bed: N70E, 10SE.							
30		@ 29.5 ', bedding attitude on base of fine to coarse grained, gravelly sandstone bed with some siltstone rip-up clasts: N70E,10SE. Bedrock becomes gray with orange oxidation staining, damp, locally cememented.							
35		Boring not down hole logged below 30 feet Total Depth: 33 feet No groundwater encountered No caving Backfilled with soil cuttings							

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-16
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 94
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 8/4/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, moist, medium dense, fine grained sand, abundant roots							
		BEDROCK - San Pedro Formation (Qsp) Silty Sandstone : Brown to olive-brown, moist, moderately hard, fine grained, micaceous, slightly weathered with scattered krotovina.							
5		Sandstone : Gray with brown oxidation staining, damp to moist, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of silty sandstone/sandy siltstone and fine to coarse grained sandstone with abundant siltstone rip-up clasts.							
		@ 8 ', bedrock becomes gray with orange oxidation staining.							
10									
		@ 11 ', fault 1/8" wide, 6" to 8" of apparent normal offset. Fault exits boring at 13 feet. Fault attitude: N43W, 45NE.							
15									
		@ 16 ', bedding attitude on fine to coarse grained sandstone bed with siltstone rip-up clasts up to 12": N80W, 5N.							
20		@ 21', fault 1/8" to 1/4" wide, carbonate infilled, 1/4" of apparent normal offset. Fault exits boring at 29.5 feet. Fault attitude at 24': N45W, near vertical. Fault attitude at 29': N35W, 60NE.							
		@ 22 ', bedding attitude on 3.5' thick, gray silty sandstone/sandy siltstone bed: N47E, 8SE.							

EXPLORATION LOG

Project: Community Hospital of Long Beach	Location: B-16
Address: 1720 Termino Ave, Long Beach, CA 90804	Elevation: 94
Job Number: 1707.01 / Client: Community Hospital of Long Beach	Date: 8/4/2015
Drill Method: Bucket Auger / Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
30		@ 29 ', fault zone, up to 6" wide extends below base of a fine to coarse grained gravelly sandsstone bed with siltstone rip up clasts, 2" of apparent normal offset. Fault attitude: N25W, 80NE. Bedrock becomes gray with yellow oxidation staining, damp.							
		@ 32 ', fault zone from above becomes narrower (2" to 3").							
35		@ 35 ', bedrock becomes locally cemented, difficult drilling, increased oxidation staining.							
		@ 36 ', fault zone from above exits boring.							
40		Boring not down hole logged below 36 feet Total Depth: 40 feet No groundwater encountered No caving Backfilled with soil cuttings							

Albus-Keefe & Associates, Inc.

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-17
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 94.5
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 8/5/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, moist, medium dense, fine grained sand, abundant roots							
		BEDROCK - San Pedro Formation (Qsp) Silty Sandstone : Gray with brown oxidation staining, moist, fine grained, some siltstone rip-up clasts, weathered with some krotovinas.							
5		Sandstone : Gray with orange oxidation staining, moist, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of fine to coarse grained sandstone with siltstone rip-up clasts. @ 6 ', fault 1/8" wide, slightly oxidized, up to 2.5" of apparent normal offset. The fault exits the boring at 8.4 feet. Fault attitude at 8': N40W, 42NE. Fault attitude at 8.4': N42W, 41NE. @ 8 ', some krotovinas along fault							
10									
15		Boring not down hole logged below 10 feet Total Depth: 15 feet No groundwater encountered No caving Backfilled with soil cuttings							

EXPLORATION LOG

Project: Community Hospital of Long Beach		Location: B-18
Address: 1720 Termino Ave, Long Beach, CA 90804		Elevation: 94
Job Number: 1707.01	Client: Community Hospital of Long Beach	Date: 8/5/2015
Drill Method: Bucket Auger	Driving Weight: 140 lbs / 30 in	Logged By: MOS

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, moist, medium dense, fine grained sand							
5									
		@ 6 ', 6" clay sewer line.							
		BEDROCK - San Pedro Formation (Qsp) Sandstone : Yellow-brown to gray, moist, moderately hard, fine and fine to medium grained, massive to thinly stratified and cross-bedded, micaceous, some interbeds of silty sandstone/sandy silstone and fine to coarse grained sandstone with siltstone rip-up clasts.							
10		@ 8 ', bedding attitude on base of fine to coarse grained sandstone bed with gravel and some siltstone rip up clasts: E/W, 5N. Base of bed is heavily oxidized with some cementation.							
		@ 8.5 ', 3' thick, gray silty sandstone/sandy siltstone bed with abundant calcium carbonate cementation and nodules. Local pockets of fine grained sandstone. Bedding attitude at base of bed:N47E, 18SE.							
15		@ 12 ', bedrock becomes gray with orange oxidation staining.							
		@ 13.5 ', abundant siltstone rip-up clasts.							
		@ 17.5 ', bedding attitude on fine to medium grained sandstone bed with scattered siltstone rip-up clasts up to 6": N22E 35SE.							
20		@ 20 ', bedrock becomes gray with yellow oxidation staining.							

EXPLORATION LOG

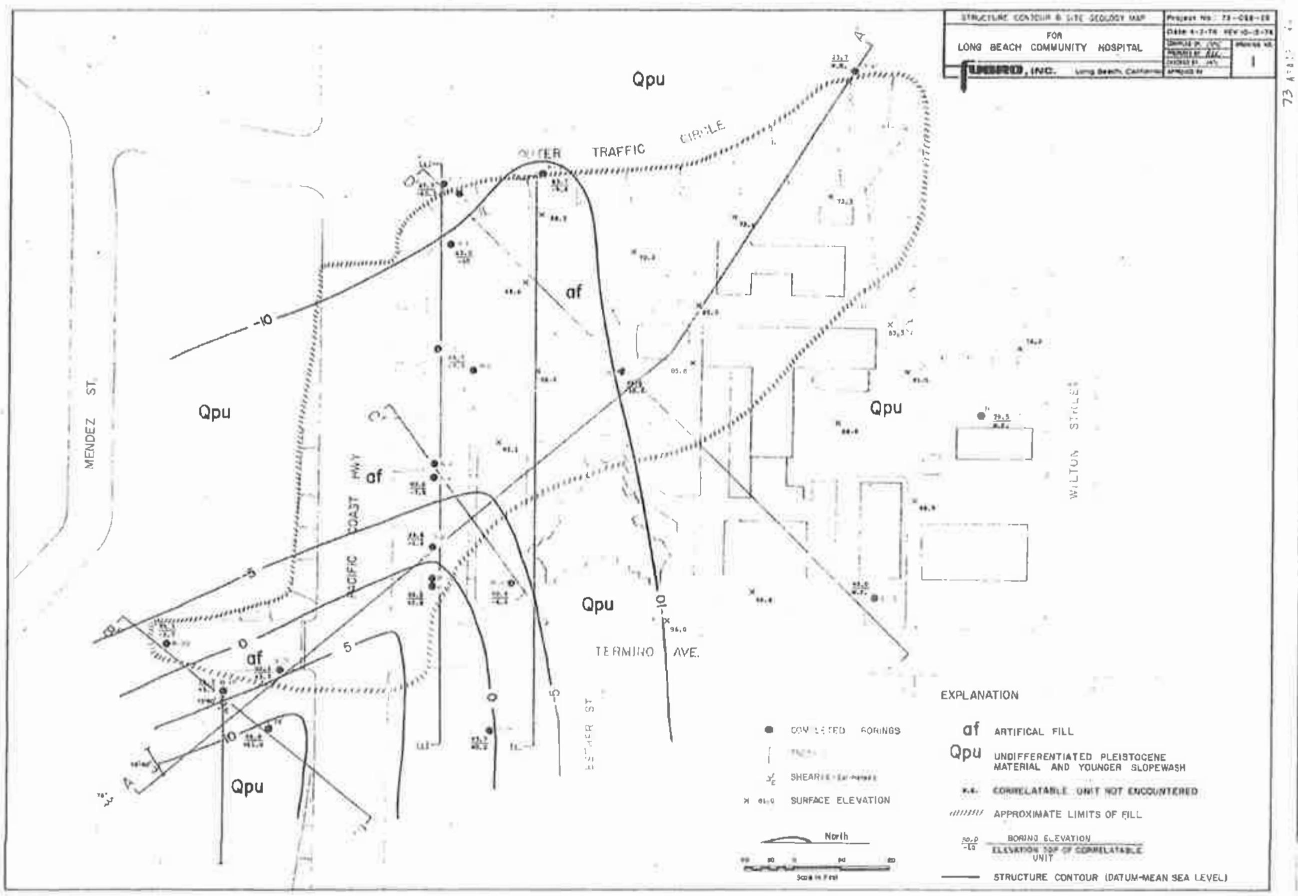
Project: Community Hospital of Long Beach									Location: B-18		
Address: 1720 Termino Ave, Long Beach, CA 90804									Elevation: 94		
Job Number: 1707.01		Client: Community Hospital of Long Beach							Date: 8/5/2015		
Drill Method: Bucket Auger		Driving Weight: 140 lbs / 30 in							Logged By: MOS		

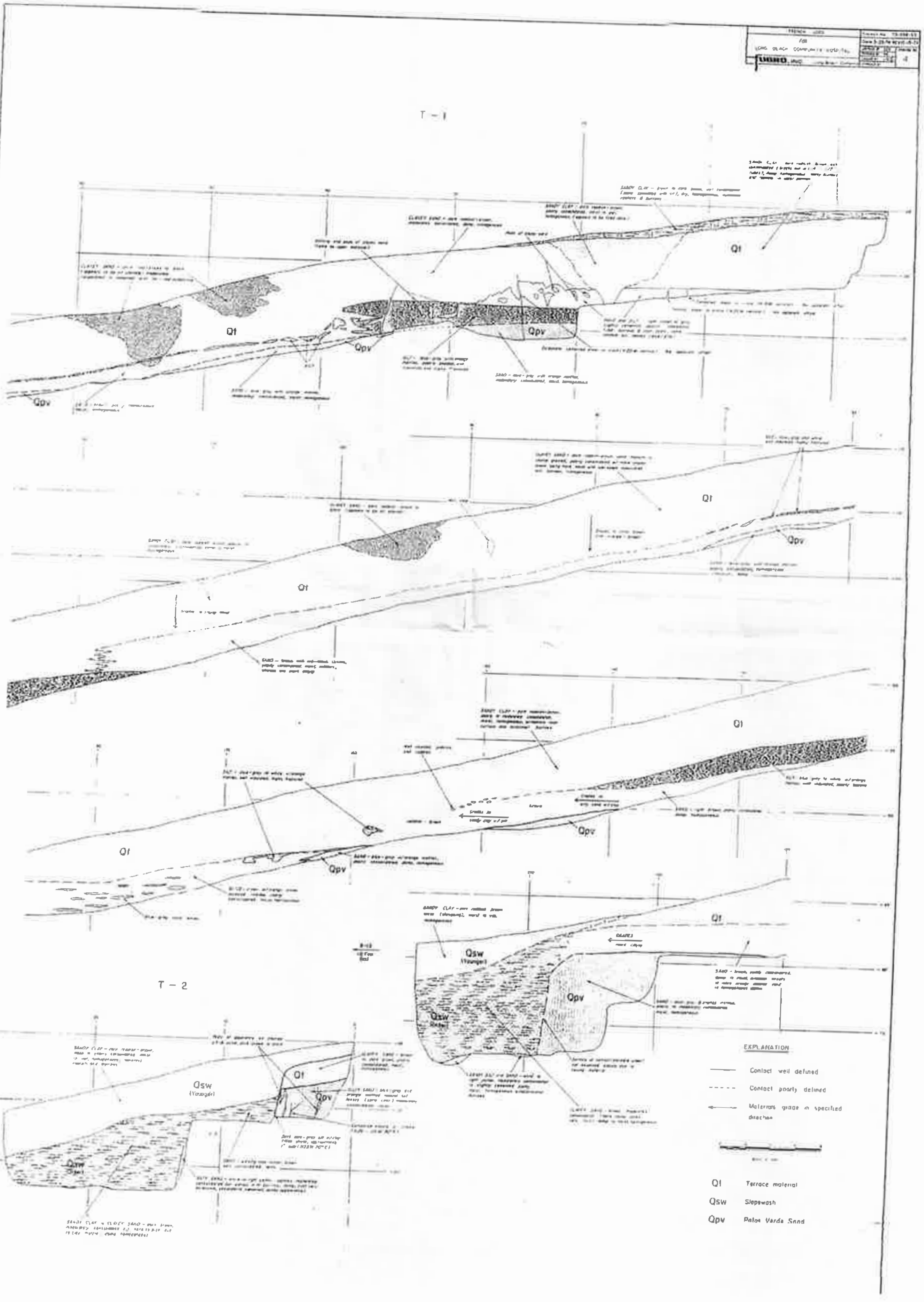
Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		@ 25 ', attitude on fine to coarse grained sandstone bed: N60W, 12SW.							
		@ 25.5 ', heavy orange-brown oxidation staining							
30		@ 30 ', bedrock becomes less oxidized.							
35									
		Boring not down hole logged below 30 feet Total Depth: 36 feet No groundwater No caving Backfilled with soil cuttings							

APPENDIX B

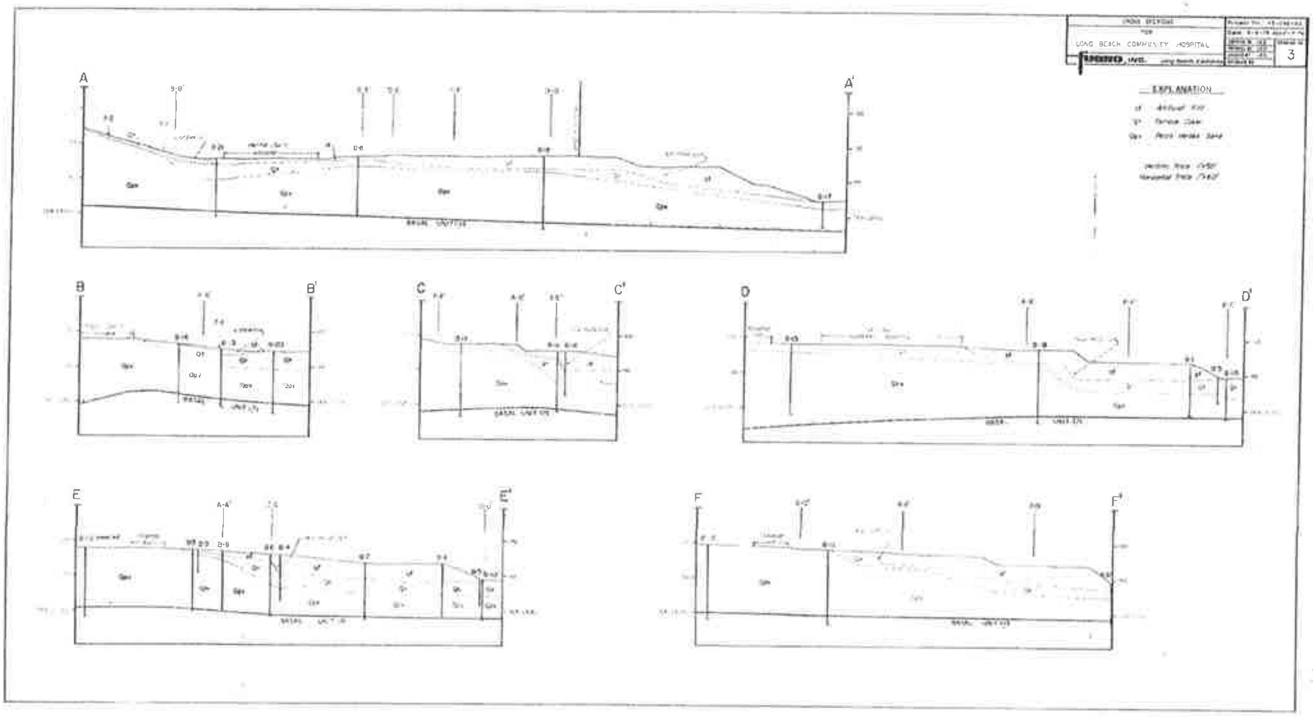
TRENCH LOGS, GEOLOGIC MAP AND CROSS-SECTIONS

Prepared by Fugro, Inc. (1974)


STRUCTURE CONTOUR & SITE GEOLOGY MAP
FOR
LONG BEACH COMMUNITY HOSPITAL
FUGRO, INC.
Long Beach, California
Project No. 73-058-28
1
Qpu
af
OUTER TRAFFIC CIRCLE
MENDEZ ST.
PACIFIC COAST HWY
TERMINO AVE.
WILTON STREET
-10
-5
0
5
10
A
A'
EXPLANATION
COMPLETED BORINGS
SHEARS
SURFACE ELEVATION
North
ARTIFICAL FILL
UNDIFFERENTIATED PLEISTOCENE MATERIAL AND YOUNGER SLOPEWASH
CORRELATABLE UNIT NOT ENCOUNTERED
APPROXIMATE LIMITS OF FILL
BORING ELEVATION
ELEVATION TOP OF CORRELATABLE UNIT
STRUCTURE CONTOUR (DATUM-MEAN SEA LEVEL)



FRENCH LOGS
FOR
LONG BEACH COMMUNITY HOSPITAL
FUGRO, INC.
T – 1
Qt
Qpv
T – 2
Qsw
(Younger)
EXPLANATION
Contact well defined
Contact poorly defined
Materials grade in specified direction
Qt Terrace material
Qsw Slopewash
Qpv Palos Verde Sand

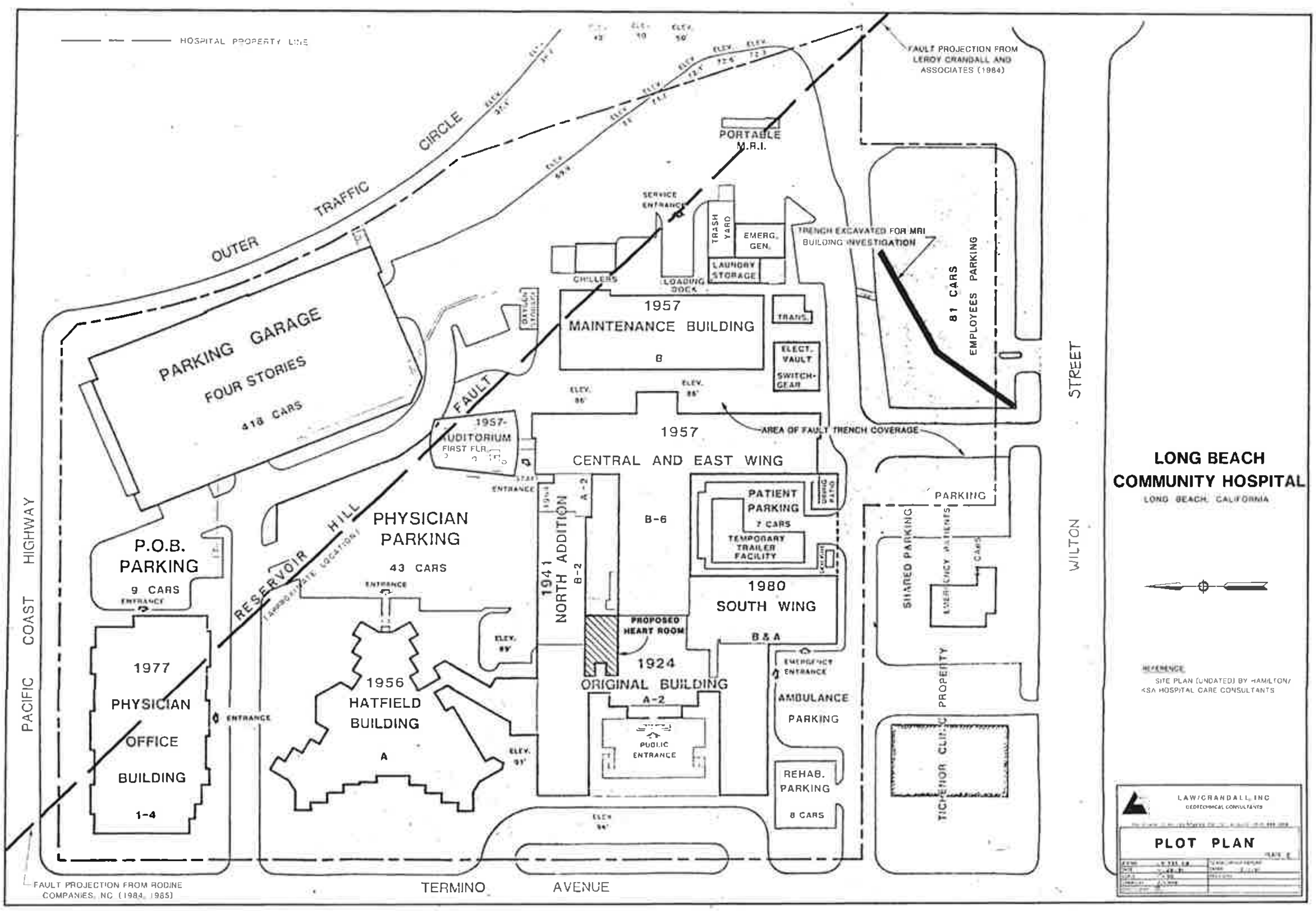


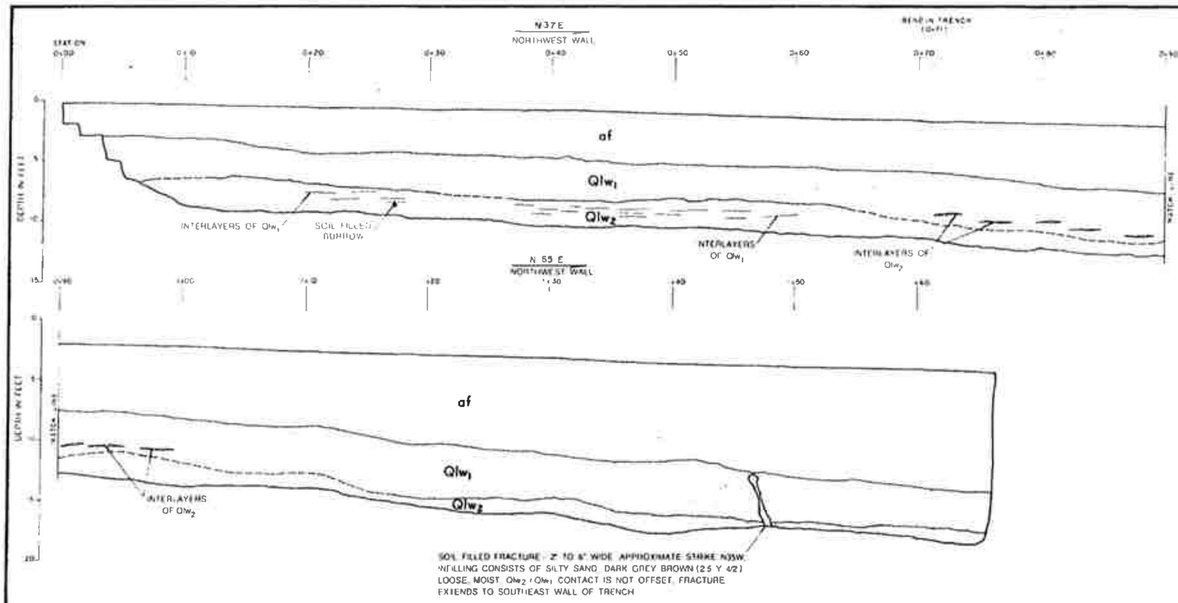
LONG BEACH COMMUNITY HOSPITAL
3
EXPLANATION
A
A'
B
B'
C
C'
D
D'
E
E'
F
F'

APPENDIX C

TRENCH LOGS

Prepared by Leroy Crandall and Associates (1991)


HOSPITAL PROPERTY LINE
FAULT PROJECTION FROM LEROY CRANDALL AND ASSOCIATES (1984)
OUTER TRAFFIC CIRCLE
PORTABLE M.R.I.
SERVICE ENTRANCE
TRASH YARD
EMERG. GEN.
TRENCH EXCAVATED FOR MRI BUILDING INVESTIGATION
LAUNDRY STORAGE
CHILLERS
LOADING DOCK
1957 MAINTENANCE BUILDING
B
TRANS.
ELECT. VAULT
SWITCH-GEAR
81 CARS EMPLOYEES PARKING
PARKING GARAGE FOUR STORIES 418 CARS
FAULT
1957 AUDITORIUM FIRST FLR.
1957 CENTRAL AND EAST WING
AREA OF FAULT TRENCH COVERAGE
LONG BEACH COMMUNITY HOSPITAL
LONG BEACH, CALIFORNIA
STREET
WILTON
PARKING
PATIENT PARKING 7 CARS
TEMPORARY TRAILER FACILITY
B-6
A-2
PHYSICIAN PARKING 43 CARS
P.O.B. PARKING 9 CARS
ENTRANCE
RESERVOIR HILL
(APPROXIMATE LOCATION)
1941 NORTH ADDITION B-2
SHARED PARKING
EMERGENCY PATIENTS CARS
1980 SOUTH WING B & A
PROPOSED HEART ROOM
PACIFIC COAST HIGHWAY
1977 PHYSICIAN OFFICE BUILDING 1-4
1956 HATFIELD BUILDING A
1924 ORIGINAL BUILDING A-2
PUBLIC ENTRANCE
EMERGENCY ENTRANCE
AMBULANCE PARKING
TICHENOR CLINIC PROPERTY
REHAB. PARKING 8 CARS
REFERENCE:
SITE PLAN (UNDATED) BY HAMILTON/KSA HOSPITAL CARE CONSULTANTS
LAW/CRANDALL, INC
GEOTECHNICAL CONSULTANTS
PLOT PLAN
FAULT PROJECTION FROM RODINE COMPANIES, INC (1984, 1985)
TERMINO AVENUE



EXPLANATION:

ARTIFICIAL FILL

af SILTY TO CLAYEY SAND BROWN, GREY BROWN DENSE TO VERY DENSE, MOIST, INCREASING DEBRIS TO THE EAST, SCATTERED TO LOCALLY ABUNDANT BRICKS CONCRETE, WOOD AND PAPER

LAKEWOOD FORMATION

Qlw_1 SILTY SAND WITH SOME LOCALIZED CLAYEY SAND BROWN (7.5 YR 4/4) TO DARK REDDISH BROWN (5 YR 3/4), VERY DENSE SLIGHTLY MOIST TO MOIST, GENERALLY MASSIVE WITH LOCALLY INTERLAYERED SAND LENSES (Qlw_2)

Qlw_2 SAND WITH LOCALLY INTERMIXED SILT, YELLOW BROWN (2.5 Y 6/4), VERY DENSE SLIGHTLY MOIST TO MOIST GENERALLY MASSIVE WITH LOCALLY INTERLAYED Qlw_1

EXPLORATORY TRENCH
MRI BUILDING

SCALE 1" = 5'

LAW/CRANDALL, INC.

PLATE 3

APPENDIX D

GEOPHYSICAL RESISTIVITY SURVEY

Prepared by Spectrum-Gash (1998)

SPECTRUM-GASCH Geophysics

September 20, 1998

Ken Bagahi
Bagahi Engineering
3901 Westerly Place, Ste. 109
Newport Beach, CA 92660

Spectrum-Gasch Project No. B9806041G

SUBJECT: Fault evaluation at parcel at
3801 East Pacific Coast Highway
Long Beach, CA

Dear Mr. Bagahi:

Executive Summary

A possible splay fault has been interpreted from conductivity anomalies on Profiles 1, 3, and 4. Substantiating this interpretation is the presence of a large anomaly on Profiles 1, 3, and 4 which is believed to be associated with the Reservoir Hill Fault.

Data Acquisition

Spectrum-Gasch has completed data acquisition along five field-selected dipole-dipole resistivity lines. Each line was acquired with a AGI Sting/Swift resistivity system using a total of 84 electrodes. Data acquired along each line was processed into Profiles 1 through 5. They are included as color profiles in this report as Figures 2 through 6. Figure 1 is a base map showing the location of each line.

Lines 1, 2, and 3 had a spacing of two meters between electrodes. Lines 4 and 5 had a spacing of only 1 meter between electrodes. The data was processed and modeled using RES2DINV, a program written and designed for the Sting/Swift system.

3174 Luyung Dr., Bldg. 2, Rancho Cordova, CA 95742 916-635-8906 fax 916-853-8907
www.spectrum-geophysics.com

Profile Descriptions

Line 1, Profile 1 (Fig. 2)

Our data has identified a conductivity anomaly that coincides approximately with the mapped trace of the Reservoir Hill Fault. Also, to the east of the tie point of Line 1 with Line 5 we have interpreted a possible splay fault.

Line 2, Profile 2 (Fig. 3)

This line began near the Pacific Coast Highway and extended north for approximately 160 meters. Line 2 crosses Line 4 at 114 meters and crosses Line 5 at 123 meters. We interpreted no significant anomalies on this profile that appear to be faults.

Line 3, Profile 3 (Fig. 4)

This line was run parallel and approximately 65 feet west of Line 1. Three possible conductivity anomalies have been identified on Profile 3. A near-surface anomaly is identified from approximately 48 to 66 meters. The cause of this is believed to be the presence of a ponded-water area. A second anomaly from approximately 98 meters to 108 meters is believed to be a possible splay fault.

Additionally our data has identified a third conductivity anomaly along this line. It is located at approximately 132 meters and we interpret this to be the Reservoir Hill Fault.

Line 4, Profile 4 (Fig. 5)

Line 4 was acquired perpendicular to the interpreted location of the Reservoir Hill Fault. Also, electrode spacing was reduced to 1 meter to enhance subsurface resolution. Two anomalies were identified along this profile. The possible splay fault was interpreted along this line at approximately 32 meters. The Reservoir Hill Fault is located at approximately 54 meters.

Line 5, Profile 5 (Fig. 6)

Line 5 crosses over Lines 1, 3, 4 and terminates at Line 2. No conductivity anomalies were identified along this profile. This line does however substantiate resistivity values collected along previous profiles.

For a detailed description of the Sting/Swift method and how we arrived at our interpretation please refer to Appendix A.

This completes our findings for this report. If you have questions please contact our Sacramento office at (916) 625-8906. Thank you.

Sincerely,

GEOPHYSICIST
JERRIE W. GASCH
GP-516
STATE OF CALIFORNIA

Jerrie W. Gasch

Jerrie W. Gasch
Registered Geophysicist No. 510

APPENDIX A

INSTRUMENTS
METHODS
PROCESSING
THE INFLUENCE OF GEOLOGY ON RESISTIVITY MODELING
QUALITY CONTROL

INSTRUMENTS

Direct current resistivity measurements were collected with a Sting/Swift earth resistivity meter made by Advanced Geosciences, Inc. (AGI). This instrument served as the main recording unit for the Sting/Swift multi-electrode cable system and are powered by an external 12-volt battery. Sting/Swift cables are manufactured in sections with 14 electrodes that can be connected together in series to produce long profiling arrays. Data from this survey were recorded using 84 electrodes, where each electrode was connected to the ground via a stainless steel stake. This configuration produced a good balance of lateral and vertical resolution and a depth of investigation of 20 to 30 meters (on Profiles 1 through 3) and 10 to 15 meters (on Profiles 4 and 5).

METHODS

The direct current resistivity method uses a man-made source of electrical current that is induced into the earth through grounded electrodes. The resulting potential field is measured along the ground using a second pair of electrodes. The transmitting and receiving electrode pairs are referred to as dipoles. By varying the unit length of the dipoles as well as the distance between them, the horizontal and vertical distribution of electrical properties can be recorded.

Resistivity is best understood if thought of as a volume or 'bulk resistance' measurement. It is based on Ohm's Law which is usually written as **V = IR** where a linear element **V** is the potential difference in volts, **I** is the electrical current in amperes, and **R** is resistance in ohms. If current is passed through the opposite faces of a unit cube of earth with side length equal to **L**, then its three-dimensional resistivity is

$$R = V / I \times (L^2 / L)$$

which has dimensions of ohms times length. The most common units for expressing resistivity is ohm-meters (ohm-m).

PROCESSING

Master command files were down-loaded to the recording unit and were used to control the automatic switching of transmitting and receiving dipoles. The array configuration used for the command files was Dipole-Dipole (DP-DP). The DP-DP array was selected because it provides the best lateral resolution of vertical structures such as faults and fractures.

Raw apparent data were down-loaded from the Sting instrument to a computer and were sorted according to distance, relative depth, and electrode separation. A second listing is made in which the potential measurements, in millivolts, are extracted from the data file.

The edited data sets were processed with RES2DINV (version 3.3) a two-dimensional inversion modeling program using the least-squares method (M.H. Loke, 1998).

RES2DINV uses a finite element mesh composed of small rectangular blocks to convert apparent resistivity pseudo sections to model cross sections. Each block is assigned an initial resistivity value. A forward modeling algorithm, based on a non-linear least-squares optimization technique, was then used to calculate apparent resistivity values for each field data point. The calculated values are compared to the recorded field values and the difference were used to adjust the model blocks to produce a better root-mean-square (RMS) error fit. The program advances through a series of iterations until an acceptable error level is reached or the model fails to improve.

It should be noted that the resolution of the resistivity method decreases with increasing depth. Therefore, the finite-element mesh becomes coarser with depth providing less resolution and a more generalized model. This tends to produce general broadening and flattening of the model along the lower boundary. The highest resolution and most accurate depth conversion is provided in the upper 30% of the modeled cross section where the overall resolution is approximately 1/2 the unit electrode spacing.

In preparing the final cross sections, an attempt was made to adopt a universal contour interval and color scheme that could be used for displaying the results from all survey lines. The obvious benefit would be the ability to associate color with geological conditions from line to line. However, the wide range of resistivity found across this site precluded a universal scheme.

The following four resistivity groups are provided as a generalized guide to help interpret the inversion models. These are approximate ranges, actual values may be quite variable based on soil conditions or rock type.

Generalized Guide To Interpreting Resistivity Data

(ohm-m)	Suggested Interpretation
10-30	water-saturated sediments, clay, high total dissolved solids
30-60	unconsolidated sediments or weathered bedrock
60-120	transition to unweathered bedrock
>120	unweathered bedrock
>500	unweathered metamorphic or igneous rock that may represent a groundwater barrier

THE INFLUENCE OF GEOLOGY ON RESISTIVITY MODELING

Since most minerals are insulators, current flow through near-surface soil and rock is primarily electrolytic and takes place through pore spaces, along grain boundaries, and through fractures. Ionic conduction is enhanced by the presence of dissolved salts in the pore fluid. Thus, for a given porosity, rocks that have high levels of saline water will have significantly lower resistivity than rock bearing fresh water. In sedimentary rocks, the bulk resistivity is approximately equal to the resistivity of the pore fluid divided by the fractional porosity.

Rock texture is another important factor. For example, a well sorted sandstone has large void spaces and yields a lower resistivity compared to a poorly-sorted sandstone. In limestone, dissolution along fractures will enhance porosity and hence lower resistivity.

Current flow through igneous rocks is mainly through cracks and along grain boundaries. As a consequence, resistivity is usually very high through igneous rocks.

Most geologic processes tend to reduce the resistivity of most rocks. Weathering and hydrothermal alteration of igneous rock has a substantial lowering affect. Any process that increases porosity and fluid permeability will usually result in a lowering of the rock's resistivity. Faulting, fracturing, and dissolution are common examples. Processes that would likely increase resistivity include the precipitation of calcium, silicification, induration, compaction and metamorphism.

The presence of clay in rocks and soil has a significant impact on lowering resistivity. The ion absorption phenomenon that takes place along the surface of clay particles allows the particle to act as a separate conducting path in addition to the electrolytic path. When the conductance through pores becomes diminished, the effect of disseminated clay becomes important.

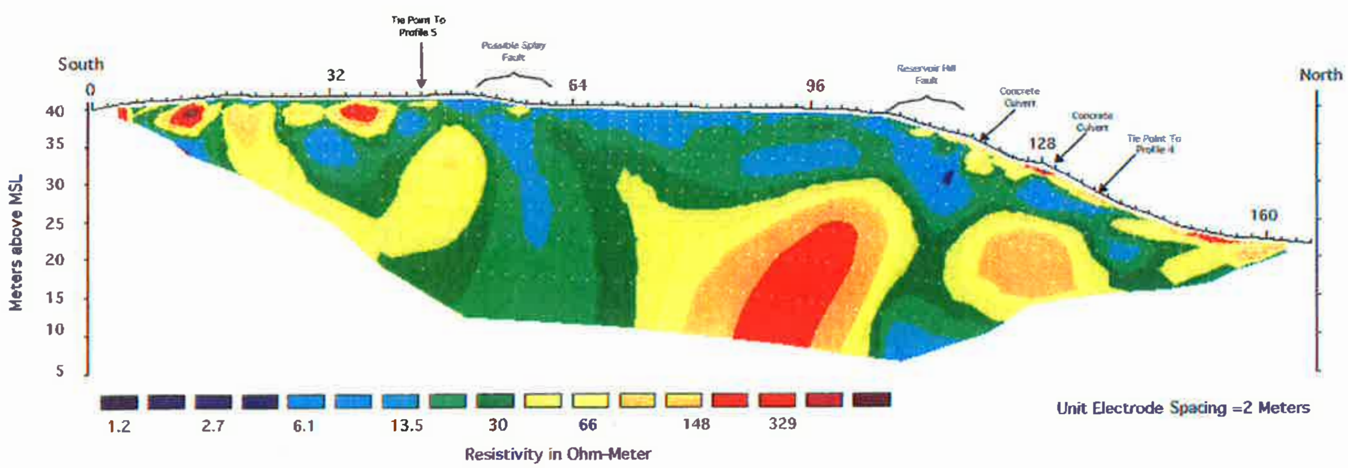
Prior to beginning fieldwork, the locations of grounded fences, powerlines, and buried pipelines were determined during a pre-survey "walk through". Several survey lines were relocated to avoid and/or to minimize the interfering effects of these objects.

QUALITY CONTROL

Two readings were obtained at each datum point if there was a standard error of 0.02 variation between the readings or greater the values are automatically discarded. An interactive graphic display was used in combination with the millivolt listings to remove invalid data points or groups of readings, as necessary. These are typically negative readings (values with high standard error) or readings contaminated by noise.

FIGURE 2 - PROFILE 1
INVERSE MODEL RESISTIVITY SECTION
VACANT PROPERTY
3801 EAST PACIFIC COAST HIGHWAY
LONG BEACH, CALIFORNIA

SPECTRUM - GASCH GEOPHYSICS
3174 Luyung Drive Bldg. 2
Rancho Cordova, CA 95742

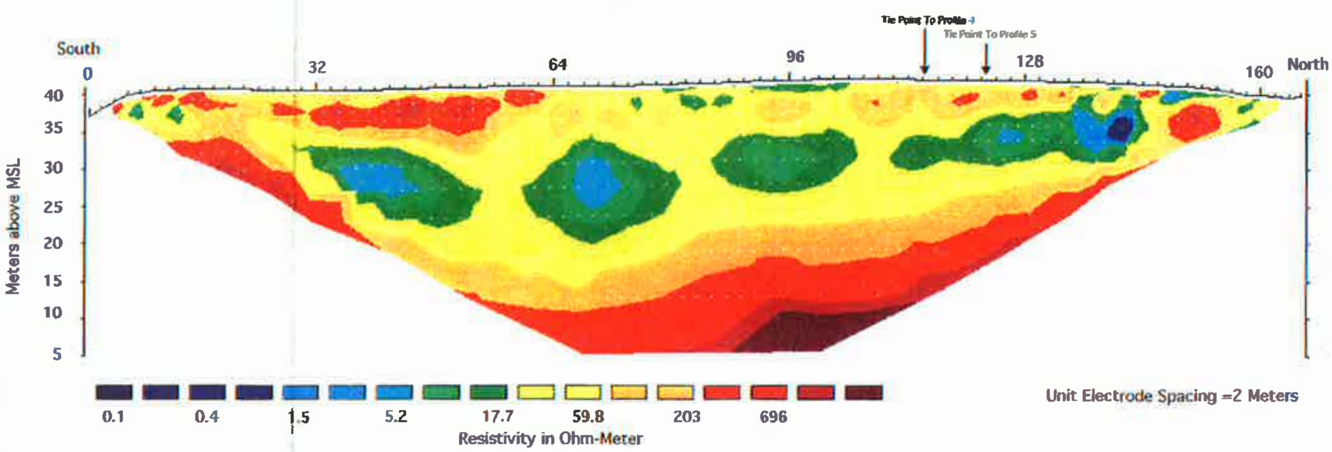


Vertical exaggeration in model section display = 1
Horizontal scale in Meters

Project Number: B9806041G

FIGURE 3 - PROFILE 2
INVERSE MODEL RESISTIVITY SECTION
VACANT PROPERTY
3801 EAST PACIFIC COAST HIGHWAY
LONG BEACH, CALIFORNIA

SPECTRUM - GASCH GEOPHYSICS



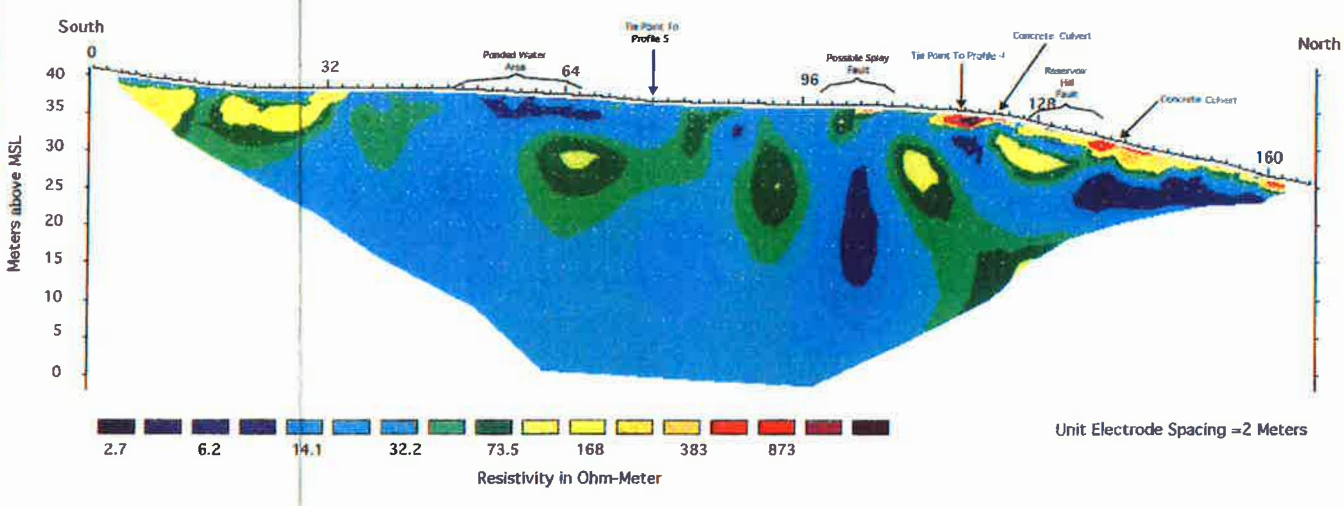
Unit Electrode Spacing =2 Meters

Vertical exaggeration in model section display = 1
Horizontal scale in Meters

Project Number: B9806041G

FIGURE 4 - PROFILE 3
INVERSE MODEL RESISTIVITY SECTION
VACANT PROPERTY
3801 EAST PACIFIC COAST HIGHWAY
LONG BEACH, CALIFORNIA

SPECTRUM - GASCH GEOPHYSICS
3174 Luyung Drive Bldg. 2
Rancho Cordova, CA 95742

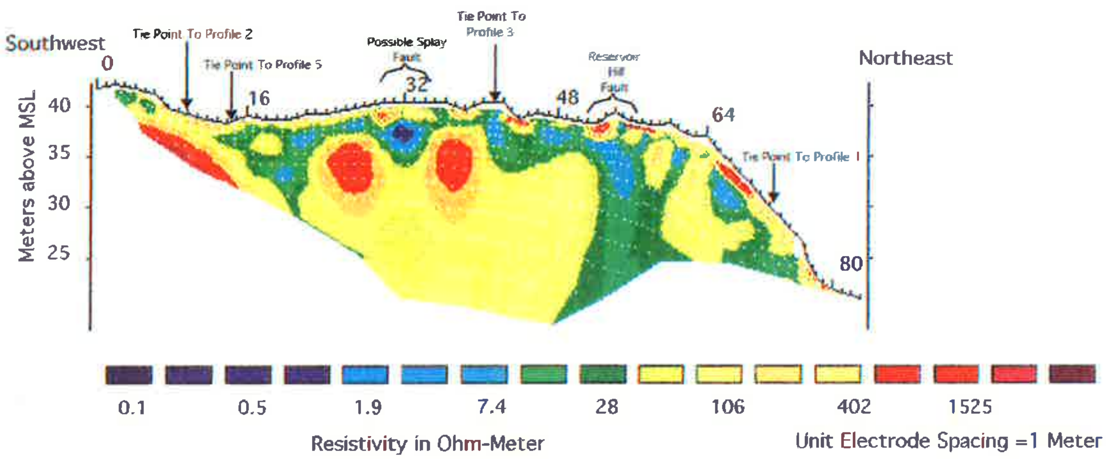


Vertical exaggeration in model section display = 1
Horizontal scale in Meters

Project Number: B9806041G

FIGURE 5 - PROFILE 4
INVERSE MODEL RESISTIVITY SECTION
VACANT PROPERTY
3801 EAST PACIFIC COAST HIGHWAY
LONG BEACH, CALIFORNIA

SPECTRUM - GASCH GEOPHYSICS
3174 Luyung Drive Bldg. 2
Rancho Cordova, CA 95742

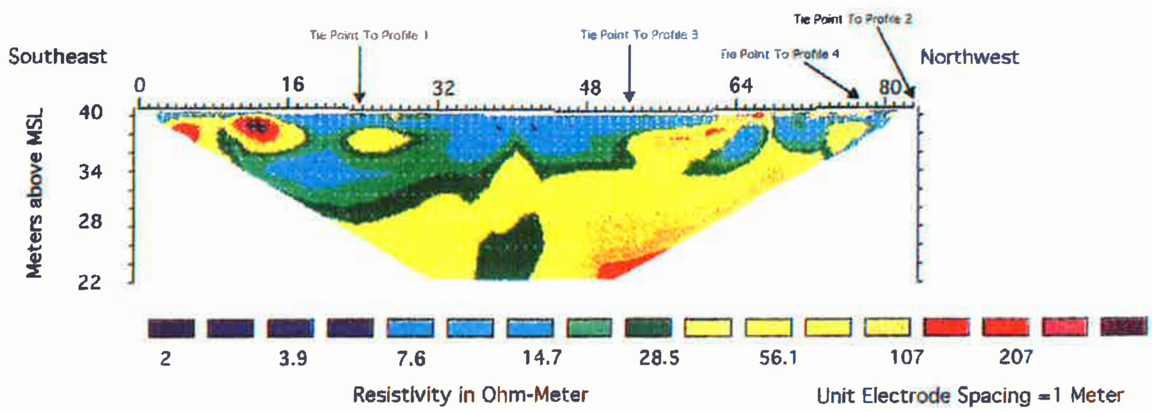


Vertical exaggeration in model section display = 1
Horizontal scale in Meters

Project Number: B9806041G

FIGURE 6 - PROFILE 5
INVERSE MODEL RESISTIVITY SECTION
VACANT PROPERTY
3801 EAST PACIFIC COAST HIGHWAY
LONG BEACH, CALIFORNIA

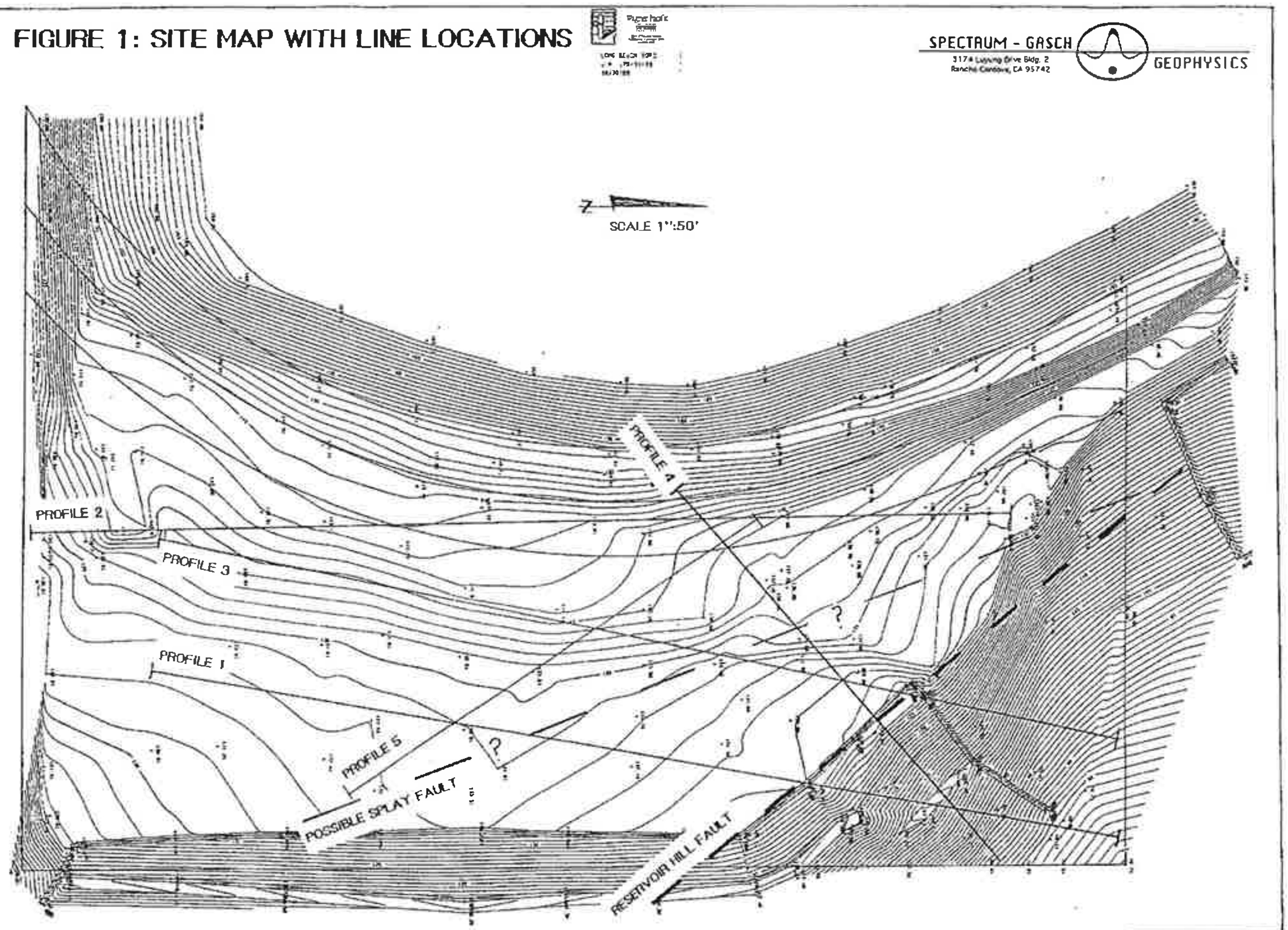
SPECTRUM - GASCH GEOPHYSICS
3174 Luyung Drive Bldg. 2
Rancho Cordova, CA 95742



Vertical exaggeration in model section display = 1
Horizontal scale in Meters

Project Number: B9806041G

FIGURE 1: SITE MAP WITH LINE LOCATIONS



APPENDIX E

Radiocarbon Dating Results of Midden Deposits and Fault Infill Exposed in a Trench at the Community Hospital of Long Beach, 1720 Termino Avenue, Long Beach, California.

Prepared by Earth Consultants International, Inc., 2009

Earth Consultants International

January 6, 2009
ECI Project No. 2817

To: **ALBUS-KEEFE & ASSOCIATES, INC.**
1011 N. Armando Street
Anaheim, California 92806

Attention: **Mr. Patrick Keefe and Mr. Michael Spira**

Subject: **Radiocarbon Dating Results of Midden Deposits and Fault Infill Exposed in a Trench at the Community Hospital of Long Beach, 1720 Termino Avenue, Long Beach, California**

Introduction and Purpose of the Study

At your request, Earth Consultants International, Inc. (ECI) collected, cleaned, and submitted three samples of organic material collected from a midden (or shell heap) and associated deposits that were exposed in a trench that you excavated north of Wilton Street, to the south and east of the main campus of the Community Hospital of Long Beach. Two of the samples submitted for dating consisted of shell material, whereas one sample consisted of charcoal.

Scope of Work

Our scope of work included the following tasks:

1. We picked through the bulk samples identified for dating to look for shell fragments, seeds, charcoal, or other organic materials that may be useful for dating. The organic materials encountered were generally shell fragments. The bulk samples are dark colored and likely to yield humic acids that could be dated yielding a minimum age, but this method was not attempted;
2. We re-packaged the organic materials picked from the bulk samples and submitted them to the dating laboratory;
3. Filled in the laboratory data sheets and mailed, via overnight delivery, the samples to Beta Analytical, Inc. in Florida. Upon arrival, the laboratory signed in the samples and sent us a schedule that we forwarded to you for your records;
4. Upon receipt of the laboratory results, we ran the results through OxCal, a radiocarbon calibration and analysis software to convert the conventional radiocarbon ages to calendric ages and compare the results with those submitted by the laboratory; and
5. Prepared this letter report summarizing the results. The report includes the laboratory data sheets submitted by Beta Analytical, Inc. for the individual samples, and a graphic showing the location of the samples.

Findings

The samples collected and tested are described further below:

1. S1: Large shell sample collected from near the base of the midden deposit, approximately 2 m east of the fault zone. Although the sample was fairly large, after pre-treatment the laboratory determined that it was best to date it using mass spectrometry (AMS method). This sample yielded a conventional radiocarbon age of 3,610±40 years before present (BP). To account for the local carbon reservoir differences between the atmosphere and the Pacific Ocean water where the shell originated, the laboratory adjusted this value. The adjusted radiocarbon age is 2,440±50 BP, which translates to a calendar age of 290 to 10 BC (OxCal yields an older calendar age of 756 to 405 BC).
2. C1: Charcoal sample collected from within the fault zone. This sample was very small and required mass spectrometry (AMS) dating. The conventional radiocarbon age for this charred material is reportedly 310±40 BP. This radiocarbon age yields several intercepts on the calendar age calibration curve, as follows: AD 1,500 to 1,600 and AD 1,610 to 1,650 (OxCal yields a calendar age of AD 1,470 to 1,655).
3. C2: Sample collected near the bottom of the sandy deposit that overlies the faulted midden. The age of this sample, combined with that of C1 above, was expected to help us constrain the age of the last surface-rupturing event on this fault. This sample was thought to be of charcoal, but during the cleaning process it became obvious that it was not organic, but rather consisted of manganese and/or iron oxide. Therefore, this sample was not dated.
4. C3: Small charcoal sample collected from near the base of the midden deposit on the west side of the fault zone. This sample was not dated, and is still available.
5. B1: Bulk sample collected from the bottom section of the midden deposit on the east side of the fault zone, near to, but west of S1. Several shell fragments were picked out of this sample and submitted to the laboratory for dating. The shell material available was sufficiently small that AMS dating was required. The conventional radiocarbon age of this sample is 3,610±40 BP; with the local carbon reservoir correction this yields an age of 3,390±50 BP. The corresponding calendar age reported by the laboratory is 1,380 to 1,260 BC (Oxcal yields a calendar age of 1,875 to 1,531 BC).
6. B2: Sediment sample from the San Pedro Formation to the east of the fault zone. This sample was collected for comparison purposes only, as this unit is older, and therefore not datable using the radiocarbon dating method.
7. B3: Bulk sample collected from the fissure fill in the fault zone, immediately below C1. This sample was collected as an alternate to C1, in the event that C1 did not yield sufficient carbon for dating. The sample is still available for processing and dating.
8. B4: Bulk sample from the top of the midden deposit, near to, but east of the fault zone. This sample was not processed and is still available for dating.
9. B5: Bulk sample from the upthrown midden deposit to the west of the fault zone. The sample was processed, yielding a few shell fragments. These were not submitted for dating and are still available.
10. B6: Sediment sample from the San Pedro Formation to the west of the fault zone. This sample was not collected for dating purposes.

11. B7: Bulk sample from the sandy deposit above the fault zone. This sample was processed, and it yielded no organics suitable for radiocarbon dating.
12. B8: Bulk sample from the bottom of the sandy deposit above the fault zone. This sample was processed, yielding a few shell fragments that could have been originally from the midden deposit below, transported upward by bioturbation. Given these concerns, the shell fragments were not submitted to the laboratory for dating.
13. B9: Bulk sample from a well-sorted, light-colored sand lens within the sandy deposit that overlies the fault zone. Very small white grains could be shell fragments, but combined would still amount to a very small sample that may not be datable.
14. B10: Sediment sample from the San Pedro Formation, collected from the middle bench. This sample was collected for comparison purposes only, and not for dating.

The radiocarbon dating results indicate that the bottom of the midden deposit dates to about 3,400 to 2,400 years old, with the variation in the ages of two samples collected fairly close together suggesting that this midden was used for a long period of time by Native Americans. Samples from various sections of the midden, collected at different vertical intervals would be required to better define the occupational history of Reservoir Hill.

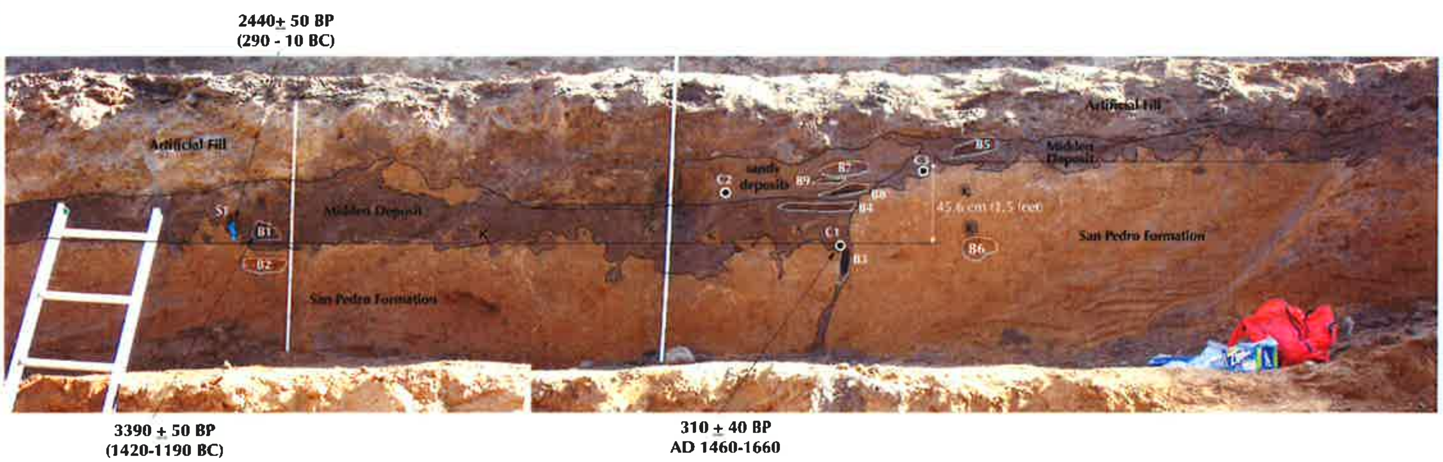
Although the bottom contact of the midden deposit is irregular due to bioturbation, the unit is vertically offset by the main fault zone exposed in the trench (Fault F2), with the midden deposit on the east side of the fault zone down-dropped a minimum of about 1.5 feet relative to the midden deposit on the west side of the fault zone (as observed on the south wall of the trench – see accompanying graphic). The thickness of the midden also varies across the fault zone, with the section west of the fault zone locally about half as thick as the section east of the fault zone. Whether this thickness variation is the result of the lateral placement, as a result of strike-slip faulting, of two different sections of midden, or due to removal of the uppermost portion of the western deposit due to grading prior to placement of the overlying artificial fill is unclear. Variations in the thickness of the overlying artificial fill across the fault zone suggest that prior to grading there was a scarp coincident with the fault zone. The sandy deposit tucked against the scarp may be a colluvial wedge, although additional work would be required to confirm this observation.

The dating results indicate that at least one earthquake has occurred since the midden was deposited, post about 2,400 years BP. The charcoal sample collected from within the fault zone could be interpreted to indicate that the last surface-rupturing earthquake on this segment of the Newport-Inglewood fault occurred about 300 years BP, sometime between AD 1,470 and AD 1,655. These results confirm that the Newport-Inglewood fault is a Holocene active fault. If the most-recent-event interpretation of about 300 years ago is correct, it also means that the risk of another surface-rupturing earthquake occurring on this fault in the next few hundred years is relatively low.

We hope that the information above provides you with the information that you need at this time. We appreciate the opportunity to help you on this project, and understand the sensitivity of these findings. We will not discuss or divulge the results of this study with anyone without your prior authorization. However, these findings are, to the best of our knowledge, the best documentation yet available regarding the most recent earthquake history on the Newport-Inglewood fault, and as such, this site has the potential to contribute significantly to our understanding of the seismic risk in the Los Angeles basin. If you have any questions regarding the material presented above, or if we can be of further assistance with this or other similar projects, please do not hesitate to contact us.

Respectfully submitted,

Tania Gonzalez, CEG 1859
Vice-President and Senior Consultant
Earth Consultants International, Inc.



Earth Consultants International

Project Number: 2817
Date: January 2009

Photo-Mosaic of Upper Bench in the South Wall of Trench Showing Sample Locations and Radiocarbon Dating Results

Community Hospital of Long Beach, California
for Albus-Keefe & Associates, Inc.

Figure 1

BETA

Consistent Accuracy . . .
. . . Delivered On-time

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

December 29, 2008

Dr. Tania Gonzalez
Earth Consultants International, Incorporated
1642 E. Fourth Street
Santa Ana, CA 92701
USA

RE: Radiocarbon Dating Results For Samples AK-LBCH-B1, AK-LBCH-C1, AK-LBCH-S1

Dear Tania:

Enclosed are the radiocarbon dating results for three 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 the analysis was charged to the VISA card provided. A receipt is enclosed with the mailed report copy. Thank you. 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

BETA ANALYTIC INC.
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

Dr. Tania Gonzalez | Report Date: 12/29/2008

Earth Consultants International, Incorporated | Material Received: 12/9/2008

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 253061 SAMPLE : AK-LBCH-B1 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (shell): acid etch 2 SIGMA CALIBRATION : Cal BC 1420 to 1190 (Cal BP 3370 to 3140)	3190 +/- 40 BP	+0.5 o/oo	3610 +/- 40 BP
Beta - 253062 SAMPLE : AK-LBCH-C1 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1460 to 1660 (Cal BP 490 to 290)	320 +/- 40 BP	-25.9 o/oo	310 +/- 40 BP
Beta - 253063 SAMPLE : AK-LBCH-S1 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (shell): acid etch 2 SIGMA CALIBRATION : Cal BC 290 to 10 (Cal BP 2240 to 1960)	2220 +/- 40 BP	+1.6 o/oo	2660 +/- 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=0.5:Delta-R=225±35:Glob res=-200 to 500:lab. mult=1)

Laboratory number: **Beta-253061**

Conventional radiocarbon age: **3610±40 BP**

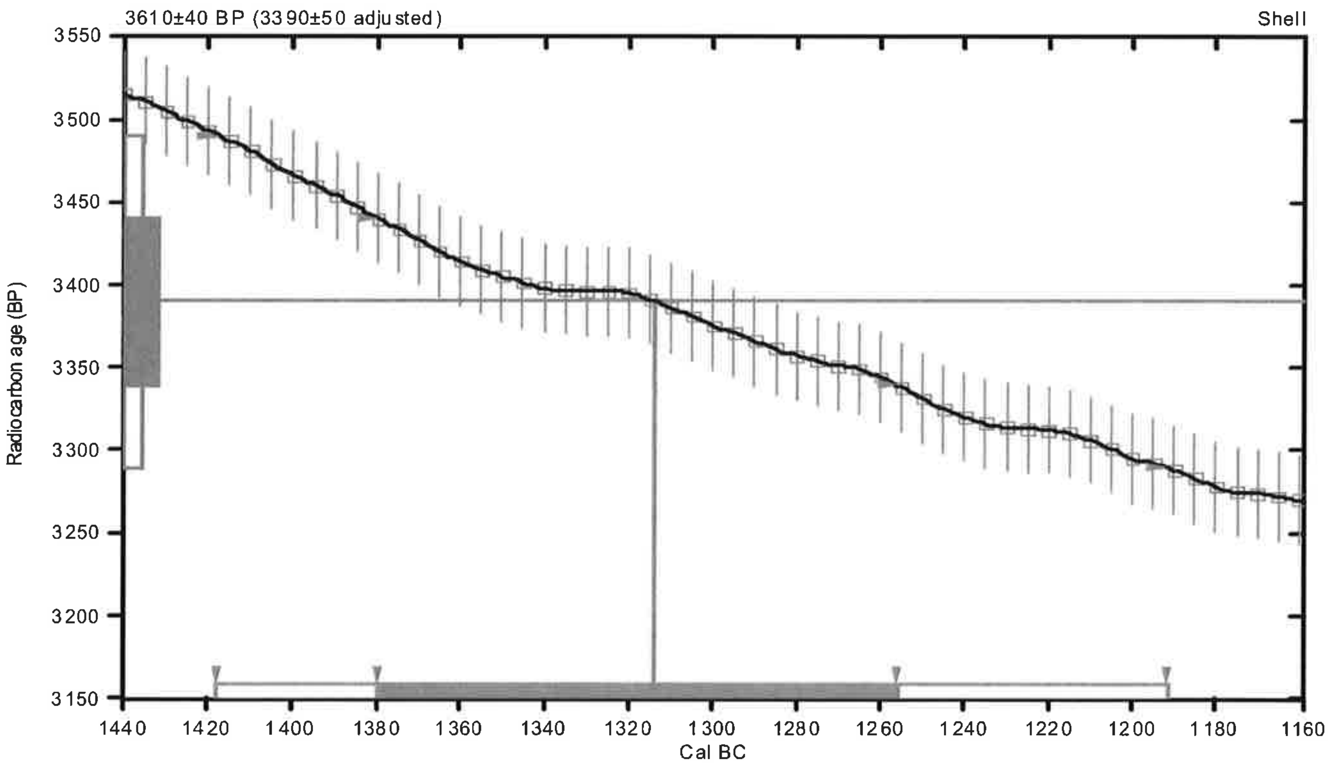
(3390±50 adjusted for local reservoir correction)

2 Sigma calibrated result: **Cal BC 1420 to 1190 (Cal BP 3370 to 3140)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 1310 (Cal BP 3260)

1 Sigma calibrated result: Cal BC 1380 to 1260 (Cal BP 3330 to 3210)
(68% probability)



References:

Database used

MARINE04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.9:lab. mult=1)

Laboratory number: **Beta-253062**

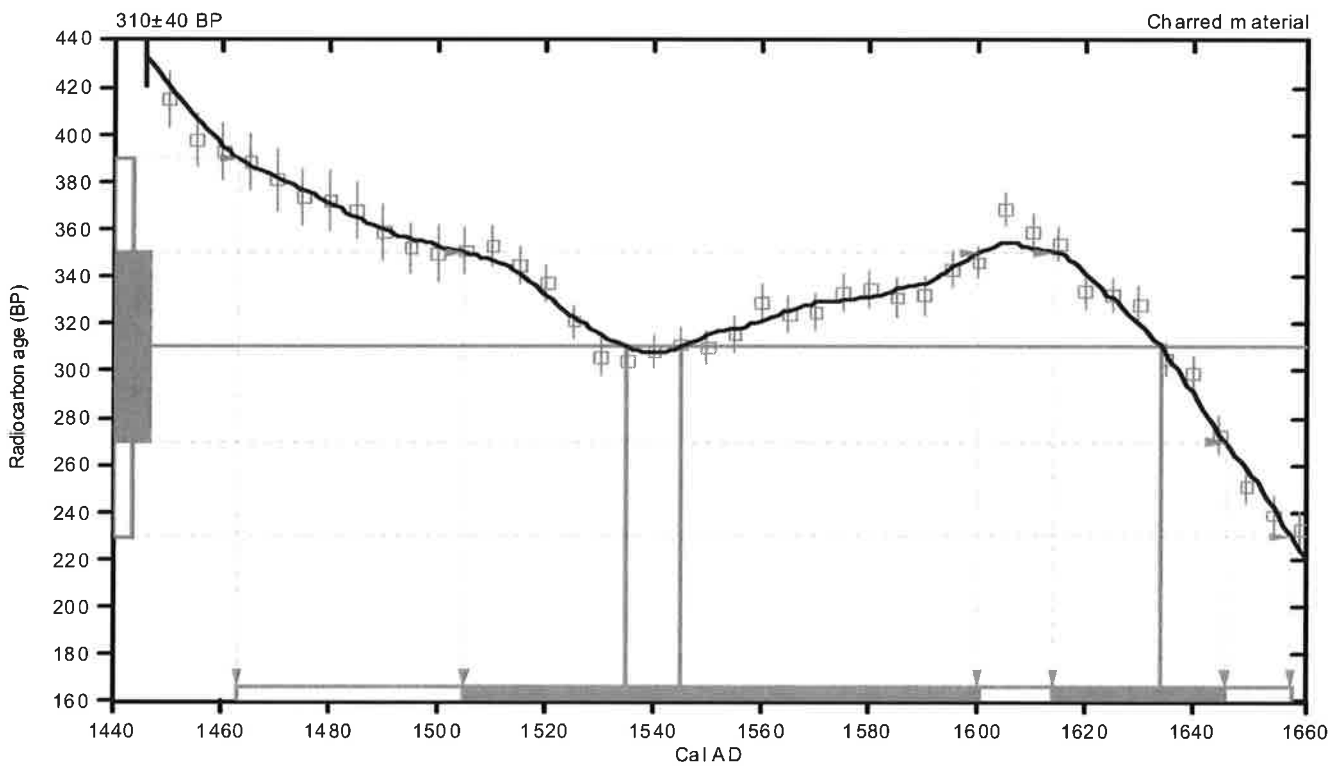
Conventional radiocarbon age: **310±40 BP**

2 Sigma calibrated result: **Cal AD 1460 to 1660 (Cal BP 490 to 290)**
(95% probability)

Intercept data

Intercepts of radiocarbon age
with calibration curve: Cal AD 1540 (Cal BP 420) and
Cal AD 1540 (Cal BP 400) and
Cal AD 1630 (Cal BP 320)

1 Sigma calibrated results: Cal AD 1500 to 1600 (Cal BP 440 to 350) and
(68% probability) Cal AD 1610 to 1650 (Cal BP 340 to 300)



References:

Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=1.6:Delta-R=225±35:Glob res=-200 to 500:lab. mult=1)

Laboratory number: **Beta-253063**

Conventional radiocarbon age: **2660±40 BP**

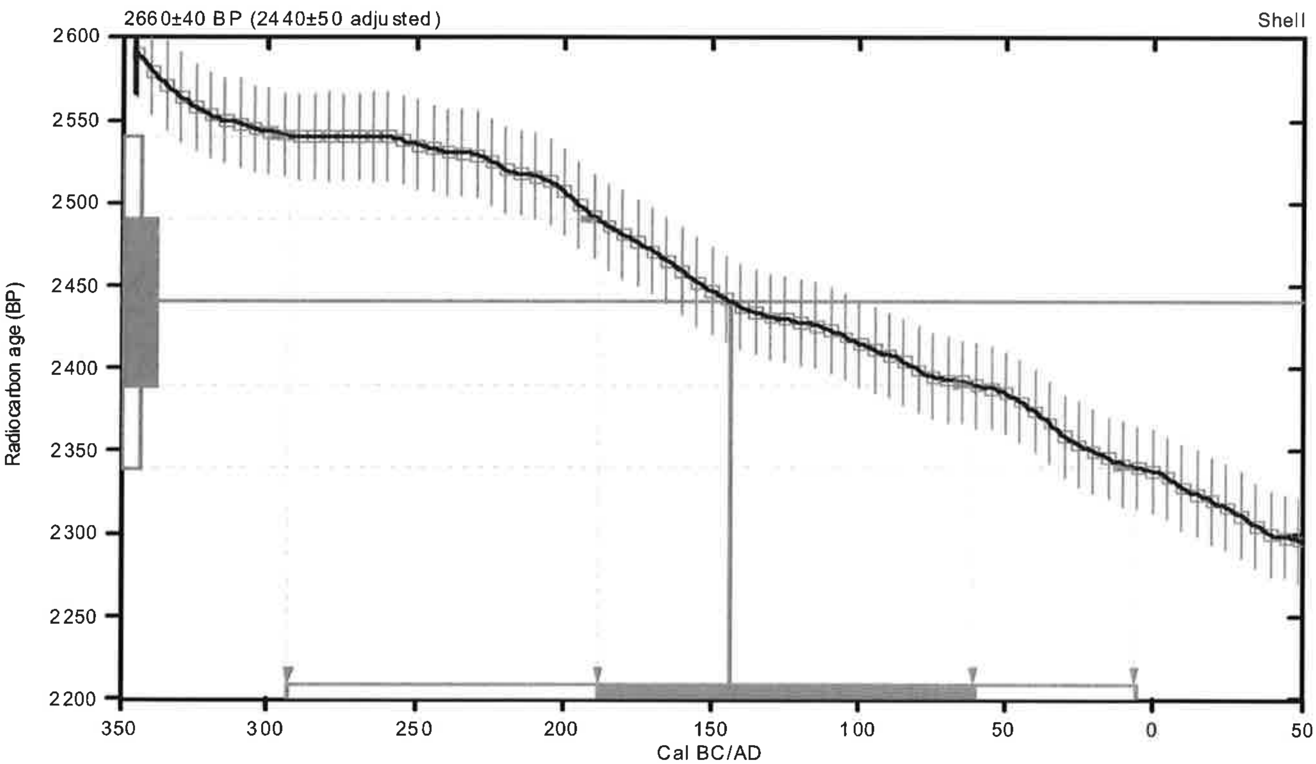
(2440±50 adjusted for local reservoir correction)

2 Sigma calibrated result: **Cal BC 290 to 10 (Cal BP 2240 to 1960)**
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 140 (Cal BP 2090)

1 Sigma calibrated result: Cal BC 190 to 60 (Cal BP 2140 to 2010)
(68% probability)



References:

Database used
MARINE04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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Attachment D

GROUP DELTA

January 17, 2017 GDC Project No. LA-1299A

Long Beach Memorial Medical Center
2801 Atlantic Avenue
Long Beach, California 90806

Attention: Mr. John Bishop

Subject: Third Party Review of Surface Fault Rupture Potential
Community Hospital of Long Beach (Facility #11792)
1720 Termino Avenue, Long Beach, California

Referenced Report

Albus-Keefe & Associates, Inc., 2017, Updated Geologic Assessment of Surface Fault Rupture Potential, Community Hospital of Long Beach, 1720 Termino Avenue, Long Beach, California, J.N. 1707.02, January 3, 2017.

Mr. Bishop:

Group Delta is pleased to submit this letter presenting our third party review of the above-referenced report. In addition to reviewing the report, Group Delta participated in meetings and phone calls with the Albus-Keefe geologists who performed the field investigation and authored the report referenced above. The consultants were eager to share any available data pertaining to the fault investigation and were both knowledgeable and forthcoming.

This 3rd Party Review letter was written in context with the referenced report and with the intent to evaluate the potential for future surface fault rupture at the hospital site. Albus-Keefe presents sufficient evidence for the presence of an “active” Fault Zone at the site, delineated in Plates 1 and 2 of the referenced report. A brief discussion of the data utilized in our evaluation and our conclusions follow.

Background Review

We understand the referenced report was prepared to assist in the Office of Statewide Health Planning and Development (OSHPD) evaluation and Structural Performance Category (SPC) reclassification for the hospital buildings at the Community Hospital of Long Beach site; and to evaluate options for future hospital-related development at the site. The hospital site is located within the Reservoir Hill Earthquake Fault Zone, delineated by the California Geological Survey (CGS) under the Alquist-Priolo Act. Within an Earthquake Fault Zone, faults with evident Holocene offset or uncapped pre-Holocene offset, in context, are considered "active" with a potential hazard for future surface fault rupture.

California Geological Survey (CGS) Fault Evaluation Report (FER-173)

The Reservoir Hill Fault Zone was evaluated for surface-rupture hazard, concurrently with several nearby en echelon fault segments, stepping northwest along the Newport-Inglewood Fault Zone by the CGS. The findings are summarized in the Fault Evaluation Report FER-173 by Bryant in 1985. At the time of this report, the Reservoir Hill Fault had already been recognized through deep oil and gas exploration wells; recent surface rupture was speculated by evident geomorphic scarp expression along the northeast margin of Reservoir Hill; and the fault zone had a history of related seismic activity (including the 1933 magnitude 6.4 Long Beach Earthquake).

Several fault investigation trenches had been performed along the Reservoir Hills Fault which exposed evidence of faulting. Specifically, north and southeast of the hospital Site, trenches exposed evidence of faulting within deposits at least as young as late Pleistocene and possibly as young as 15,000 years old. Evidence of possible historic surface rupture was reported in a fault trench at the northeast escarpment of Reservoir Hill, where infilled fractures were preserved within old fill materials. While independent interpretations of the localized fault evidence varied from non-fault related erosional features to faults with potential surface fault rupture; collectively the evidence indicates the Reservoir Hill Fault Zone extends across the hospital site.

Prior Onsite Fault Investigation Data Presented in Albus-Keefe Report Appendices

Albus-Keefe report included review and data for two fault investigations previously performed at the hospital site. The first of the two investigations was performed in 1974, prior to the release of the FER-173 in 1985, and prior to much of the fault trench work performed along the Reservoir Hill Fault. The data presented in the 1974 report identified a significant offset along the prefill ground surface; which aligns reasonably well with the location of the Reservoir Hill Fault. The second of the two investigations was performed in 1991, in the southwest portion of the site, off the main trace of the Reservoir Hill Fault. The investigation included a fault trench which exposed soil infilled fractures within the prefill ground surface.

ALBUS-KEEFE FAULTING EVIDENCE REVIEW

The Albus-Keefe investigation provided evidence for, 1) a history of surface fault rupture within the Reservoir Hill Fault Earthquake Fault Zone at the site; 2) the location of the main trace of the Reservoir Hill Fault below the site; and 3) splays of faulting extending at least 180 feet west of the main Reservoir Hill Fault and continuing northwest along strike below the site. Logged data from boring and trench exploration at the site is consistent with prior fault investigation findings within the Reservoir Hill Fault Zone and provide further understanding of the fault history beneath the hospital site.

The Reservoir Hill Fault Zone is comprised of multiple faulting events during the Pleistocene time and at least one surface fault rupturing event in the last estimated 20,000 years. Furthermore, the rupture surface contact with younger Holocene-age deposits may be offset and open surface fault fractures are infilled with these younger deposits. Radiocarbon dating results indicate the Holocene deposits may be at least as old as 3,400 years before present (bp) and at least as young as 300 years bp. A brief discussion of the data follows.

Stratigraphy Review

Historical grading obscures the natural ground surface at the site. Thick fill materials have been placed to develop level areas along the northeast descending slope. The natural slope descends gently to the northeast at about a 6:1 and steepens near the northeast margin, along the main trace of the Reservoir Hill Fault. The fill appears to have been placed over the natural surface with no significant overexcavation logged or anticipated. No faulting or fracturing was logged within the fill, therefore faulting at the site predates the placement of the historical grading at the site.

Young Holocene-age deposits are preserved blanketing the northeast descending slope from about Elevation 55 to 60 feet and continue down slope. The upper and lower contacts along the deposit are vastly obscured due to profuse bioturbation. Krotovena are found throughout the natural ground surface materials. The paleosurface below the soil has distinctive pedogenic development characteristics of a Bt horizon, which is estimated to develop over a period of 35,000 to 45,000 years. It is estimated to have initiated sometime during Stage 3 climate conditions about 35,000 to 55,000 years ago, when sedimentation rates were relatively low and the ground surface had opportunity to be exposed for a prolonged period of time.

Mid-Pleistocene (650,000 to 800,000 years ago) near shore, marine sediments of the San Pedro Formation (Qsp) and late Pleistocene (220,000 years ago) shoreline transitional sediments of the Lakewood Formation (Qlw) underlie the site at depth. Silt lenses have formed within at least the upper 10 to 15 feet. The lenses are thin and near horizontal with some subvertical shoots. They are associated with post deposition water flow and can indicate a history of a progressive wetting zone or groundwater withdrawl. The silt lenses are likely related to the last episode of sea level recession and uplift of the Reservoir Hill within the last 20,000 to 80,000 years.

Faulting Review

Faulting within the San Pedro and Lakewood formations offsets bedding and silt lenses. In fault trench FT-2, east of Station 0+70, faulting regularly extends through the Bt horizon (estimated to have developed during Stage 3 climate, 35,000 to 55,000 years ago). The fault break through the upper Holocene deposits, are obscured by bioturbation and relatively loose consistency. However, fractures through the near surface bedrock are infilled with these Holocene deposits. The infilled fractures are evidence of two likely scenarios. One, the infill of the fractures has occurred during surface fault rupture events, which would indicate the last event within the Reservoir Hill Earthquake Fault Zone was during the Holocene time. Or, two, the infill occurred subsequent the surface fault rupture event, in which case the last event occurred no more recent than 3,400 years ago, but no later than possibly 20,000 years ago after the development of the Bt horizon (~climate conditions 55,000 years ago minus developmental time period of 35,000 years). Furthermore, the case can be made that if the infill occurred after the rupture event, it likely occurred soon after the event due to the lack of weathering evidence along the fracture surfaces (such as secondary mineral development or washing out). In either case, the faulting is defined by the CGS guidelines as having a potential for future surface fault rupture.

Location and History of the Reservoir Hill Fault Zone Across the Site

The location of the main trace of the Reservoir Hill Fault presented in Plates 1 and 2 of the referenced report, is consistent with the fault trace projection between neighboring fault investigations. Geologic evidence for the location of the inferred fault presented in Albus-Keefe's report included distinct stratigraphic and structural changes across closely spaced borings as well as encountered intensely faulted sandstone. The logged distinctions outlined below in the Data Table are considered (conclusions follow):

Data Table

a) Ripup Clast Layer	The San Pedro Formation contains regular ripup clast lenses and strata that are not observed in borings east of the inferred Reservoir Hill Fault.
	Within the west wall of the Reservoir Hill Fault, a ripup clast layer was recorded at about Elevation 50 feet and faulted down to the east, to Elevation 35 feet, as it approaches the inferred fault, illustrated in Cross Section A-A'.
	In FT-2 a similar ripup clast layer is logged at about Elevation 45 to 50 feet and faulted down to Elevation 40 feet, east of the Station 0+70 fault.
	Boring logs of explorations at the northwest portion of the site indicate a similar ripup clast layer is at about Elevation 75 to 80 feet

b) Cemented/ Hard Layer	A distinct cemented layer/zone is at about Elevation 30 feet east of the inferred Reservoir Hill Fault zone and not observed in borings directly west of the fault zone along Cross Section A-A'.
	The layer is underlain by an erosional contact which is steeply dipping to the east in boring B4 adjacent the inferred fault location and near horizontal in boring B-5 further east from the inferred fault.
	Borings drilled in the northwest portion of the site encountered a similar cemented/hard layer at elevations between about 60 feet to 75 feet.
	The cemented layer was not logged within fault trenches.
c) Faulting and Bedding	The west-wall of the inferred Reservoir Hill Fault contains frequent minor faults, and bedding dips steepen closer to the main inferred fault.
	The westward extension of fault splays is also present in FT-2 and borings logged within the northwest portion of the site.
	Faulting was not encountered in FT-1, west of Station 0+90 in FT-2, and Boring B-18.
d) Silt Lenses	Along Cross Section A-A', preserved silt lenses associated with the last episode of groundwater withdrawl are isolated to the upper 5 feet of San Pedro Formation (Elevation 50 feet) west of the inferred fault with no evidence of impeding underlying layer.
	East of the inferred fault the silt lenses extend down 15 feet to a concretionary erosional layer at about Elevation 30 feet.
	Fault trench logs indicate silt lenses extend to at least Elevation 40 feet east of the Station 0+70 fault, and are essentially isolated above the ripup clast layer at Elevation 45 feet west of the Station 0+70 fault.
	Silt lenses are not noted in borings logged in the northwest portion of the site.
e) Bt Horizon	Along Cross Section A-A' and boring locations within the northwest portion of the site, the formational material near the upper contact with the fill is noted as weathered, but lacking any progressive pedogenic development as noted within the paleosurface east of the main inferred fault.
	The Bt horizon was logged within the paleosurface in FT-1 and FT-2; however, it was absent in borings logged within the northwest portion of the site.

The differing elevations, inclined bedding, fracturing, and faulting within the San Pedro and Lakewood formations (distinctions a, b, and c above), indicate a likely history of tilting and faulting within the southeastern margin of Reservoir Hill as illustrated by the Fault Zone delineated in Plates 1 and 2 of Albus-Keefe reference report. Uplift rates appear to increase toward the northwest across the site which is consistent with the topographic expression of the hill and mapped anticlinal folding along the hill. The steeply dipping erosional contact logged in B-4 east of the main fault is an indication that the uplift of the Reservoir Hill may have initiated and the hillside incised prior to the deposition of the Lakewood Formation (220,000 years ago).

The lack of silt lenses within the northwest portion of the site indicate portions of the Reservoir Hill had been uplifted prior to the groundwater conditions which facilitated the deposition of the silt lenses, over 20,000 to 80,000 years ago. The apparent offset silt lens zones within the formational material (distinction d) indicate significant offset between borings B-4 and B-6 at the location of the inferred Reservoir Hill Fault within at least the last 20,000 to 80,000 years.

Lastly, the absence of the Bt horizon west of the inferred Reservoir Hill Fault along Cross Section A-A' (distinction e) indicates the last surface rupture along the Reservoir Hill Fault occurred after significant pedogenic development occurred within the Bt horizon. If the pedogenic development occurred 35,000 to 55,000 years ago and requires 35,000 to 45,000 years to develop, an estimate last faulting event is within the last 55,000 minus 35,000 years which is 20,000 years. Further conclusions can be drawn in context with the last surface fault rupture event captured in FT-2. An event along a fault splay likely also occurs on the main fault. Therefore, it is reasonable to assume the same likely-Holocene rupture event (possibly 300 years ago) logged at Station 0+70 fault splay in FT-2, also impacted the prefill surface along the main Reservoir Hill Fault.

CONCLUSIONS

Based on our review of the Albus-Keefe report, it is our professional opinion that sufficient geologic evidence of Holocene surface fault rupture was documented at the Community Hospital of Long Beach site. Under CGS guidelines, faulting which has ruptured the surface during Holocene time is considered to have a higher potential for future surface fault rupture events. Therefore, the hospital buildings impacted by the Fault Zone (delineated within the Albus-Keefe's report Plates 1 and 2) fail the Administrative Code check for surface fault rupture and as per Chapter 6 Article 9.3.3 nonconforming buildings within the footprint of the fault zone should be classified SPC-1 and conforming buildings should be classified SPC-4. Additionally, new hospital buildings should not be planned within the delineated Fault Zone per the Alquist-Priolo Act.

We appreciate the opportunity to work with you on this project. Please don't hesitate to contact us with any questions.

Sincerely,
Group Delta Consultants

Michelle A. Sutherland

Michelle A. Sutherland, CEG
Senior Engineering Geologist

Distribution: E-mail John Bishop jbishop@memorialcare.org
cc: Mark Schuck mshuck@memorialcare.org

Attachment E

Tom Modica

From: John Bishop <JBishop@memorialcare.org>
Sent: Wednesday, November 08, 2017 2:50 PM
To: Tom Modica
Subject: FW: Community Hospital Long Beach- OSHPD Correspondence
Attachments: attachment 1.pdf

1 of 2 e-mails for our 4:30pm call

John Bishop
562.933.1111

From: Oakley, Gordon@OSHPD [mailto:Gordon.Oakley@oshpd.ca.gov]
Sent: Wednesday, July 05, 2017 10:34 AM
To: John Bishop <JBishop@memorialcare.org>
Subject: RE: Community Hospital Long Beach

The attached letter correctly summarizes our meeting from June 15th, 2017, and captures succinctly the issues with the site specifics and the limitations placed on the future use of this site with regards to Senate Bills, 1953 and 90.

Gordon Oakley ☺
Deputy Division Chief -FDD
Los Angeles

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contained in it or attached to it is strictly prohibited. If you have received this email in error, please delete it and immediately notify the person named above by reply email. Thank you.

June 29, 2017

Gordon Oakley
Deputy Division Chief
Office of Statewide Health Planning and Development Address
700 No Alameda Avenue, Suite 2-546
Los Angeles, CA 90012

Re: Community Hospital of Long Beach, Facility ID 11792 -
Follow up to our Meeting on June 15, 2017

Dear Mr. Oakley,

Thank you Mr. Bhatia, Mr. Beekman and Mr. Fong for meeting with me, Mark Shuck, and Ed Caruana on June 15, 2017, regarding Community Hospital Long Beach ("CHLB") and the Structural Performance Category requirements for seismic safety of an acute care hospital under California law.

As we discussed, CHLB is located on an active geologic fault zone. We discussed and determined that after much diligence, including consulting with seismic experts, structural engineers, and architects that the seismic remediation necessary to achieve SB1953 compliance for CHLB as it currently exists is not feasible.

As we explained, we have previously considered a remediation that would have reduced the number of beds at CHLB to 33. But more current information about the geologic condition of the site, including the discovery of a splay fault that runs under the North Wing Bldg-03143, demonstrates that remediation is also unfeasible.

We also reported that we have explored other options and determined that in order to utilize the existing SPC compliant structures for acute care, portions of those structures that comprise CHLB and are within 25'" of the fault would have to be demolished. This would result in a further reduction in the number of acute care beds, but even then, exiting would be compromised, and extensive structural upgrading of the remaining building would be required. The end result of this approach would result in a 100 year-old facility with no more than 20 acute care beds requiring extensive maintenance. We all agreed that this approach was also not viable.

We also advised you that a community needs assessment was commissioned at the direction of CHLB's legal counsel. The assessment confirmed that (1) CHLB is not an essential provider of inpatient general acute care services and if it were no longer in operation, there would be minimal impact on the availability and accessibility of inpatient health care services to the community, and (2) CHLB is an important operator of emergency and behavioral health services, and closure of these services could moderately impact patient access.

However, we also discussed how any impact on emergency service access would be mitigated by the recently completed expansion of Long Beach Memorial's emergency department. We also discussed how planned emergency service expansions at nearby St. Mary's Medical Center in Long Beach, College Medical Center in Long Beach and Long Beach Memorial Medical Center would reduce, if not eliminate, any impact on access to emergency services.

Finally, we discussed CHLB's desire to explore how the facility might be used to better address the behavioral health service needs of the community, and the concept of an acute psychiatric hospital at the CHLB site. This was followed by a discussion of the general OSHPD requirements for an acute psychiatric hospital and the process for conversion to that use.

In short, after much discussion, we all agreed that given all of these circumstances, CHLB cannot reasonably continue to operate as an acute care hospital in light of current seismic requirements for such facilities. We also concluded that those seismic requirements would not apply to an acute psychiatric facility, and discussed various issues and options to be considered for conversion of CHLB to an acute psychiatric facility.

I trust that this summary of the meeting on June 15 is consistent with your recollection of our discussions. Please let me know if that is not the case so that any misunderstandings can be resolved.

Sincerely,

John Bishop

John Bishop
Chief Executive Officer

cc: Mark Shuck, Executive Director Facility Operation-Development
Terri W Cammarano, General Counsel

Attachment F

Acute Care Needs Assessment: Executive Summary

October 18, 2017

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Overview

Community Hospital Long Beach (CHLB) is a small community hospital that operates with a low average daily census and, as such, is not an essential provider of inpatient acute care services for Long Beach. If it were no longer in operation, there would be minimal impact on the availability and accessibility of acute care inpatient healthcare services to the community. CHLB is an important provider of behavioral health services and closure of these services could impact patient access. It also serves the local community with its emergency services; however, its volume of patient visits per year could be absorbed by other area emergency rooms, urgent care centers, and Federally Qualified Health Centers, if necessary.

Background & Methodology

MemorialCare Health System retained the services of Vizient, Inc. to conduct an assessment and prepare a report to evaluate current and future medical service demand for the purposes of understanding the need for general acute care hospital services in the Long Beach community. The analysis considered the following components:

- Inpatient and emergency demand and utilization rates
- Demographics
- Volume analysis and forecast
- Current hospital competition, market share, and strategies for inpatient services
- Supply of area inpatient healthcare services versus the projected demand
- Urgent care centers and Federally Qualified Health Centers
- Healthcare trends that may affect utilization

Community Hospital Long Beach Profile

CHLB is a 158 licensed bed, general acute care hospital located at 1720 Termino Avenue in Long Beach. Currently, CHLB provides medical/surgical services, emergency services, outpatient services, psychiatric services, respiratory services, and outpatient rehabilitation services to the residents of the Long Beach community. While the hospital has a long history of providing services to the community (opened in 1924), it is built on an active geologic fault. CHLB recently (June 15, 2017) reviewed with the Office of Statewide Health Planning and Development (OSHPD) the results of analytic diligence involving seismic experts, structural engineers and architects, concluding with OSHPD's agreement, that seismic remediation to achieve SB 1953 compliance as it currently exists is not feasible. As a result CHLB would be required to cease acute care operations by June 30, 2019.

KEY STATISTICS: FY 2014-2016			
	2014	2015	2016
Inpatient Discharges	4,584	5,502	5,584
Licensed Beds	158	158	158
Patient Days	19,607	23,235	23,905
Total Average Daily Census	54	64	65
Average Daily Census - Med/Surg	24	32	35
Average Daily Census - ICU/CCU	6	7	8
Average Daily Census - Psych	24	24	23
Occupancy	33.9%	40.3%	41.3%
Average Length of Stay	4.3	4.2	4.3
Emergency Services Visits[1]	23,872	26,386	27,206

Source: OSHPD Annual Disclosure Reports, FY 2014-2016

[1] OSHPD Alirts Annual Utilization Reports

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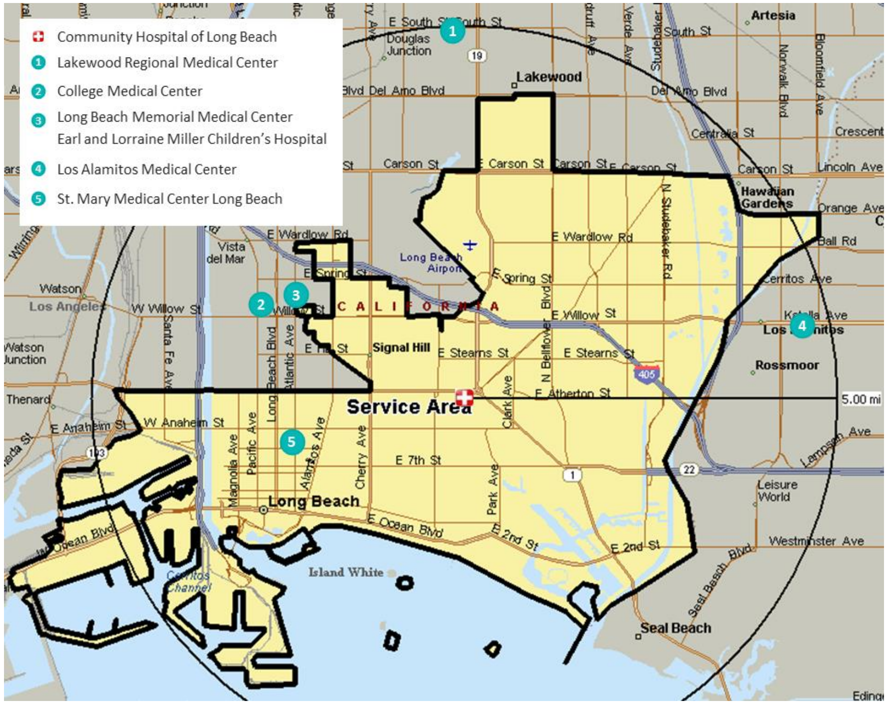
Acute Care Analysis

CHLB's service area currently has seven operating acute care hospitals within a short travel distance, all with a large number of available beds and excess capacity. These hospitals are licensed for a combined total of 1,833 inpatient beds. The analysis shows a low combined occupancy rate of only 56% of licensed inpatient beds. This means that, on average, area hospitals have approximately 800 licensed beds that are vacant and available for additional patients. Due to the large number of available beds, CHLB's service area is "over-bedded" for acute care services.

If CHLB's acute care beds were no longer in use, there would be minimal impact on the overall occupancy of hospital beds in the area. Additionally, it is likely that the need for acute care beds will decrease further due to the industry-wide, ongoing shift from inpatient care settings to outpatient care settings, continued reductions in the average length of stay, and increasing population health initiatives that are meant to improve the management of patients.



Acute Care Hospital	Licensed Beds	Occupancy Rate
Community Hospital of Long Beach	158	41%
St. Mary Medical Center Long Beach	302	49%
Long Beach Memorial Medical Center	458	62%
Earl and Lorraine Miller Children's Hospital	371	56%
College Medical Center	221	47%
Los Alamitos Medical Center	167	74%
Lakewood Regional Medical Center	158	63%

Source: OSHPD Annual Disclosure Reports, FY 2016

Emergency Services Analysis

The analysis of the seven area hospitals shows that area hospitals' emergency departments are busy. However, over half of the service area's 279,300 emergency visits are low acuity and these patients could be seen in other settings, such as urgent care centers and Federally Qualified Health Centers. Additionally, St. Mary Medical Center Long Beach, Long Beach Memorial Medical Center and College Medical Center are planning emergency department expansions in order to alleviate capacity constraints. The City of Long Beach Planning Commission approved a behavioral health urgent care center that would be equipped for up to six adolescents and 12 adults that is expected to open in spring or summer of 2018. This would also reduce the burden on area emergency rooms. While CHLB currently assists with area emergency needs, it represents only about 10% of the area's emergency room patient visits.

The appropriate use of urgent care centers and Federally Qualified Health Centers, the development of a psychiatric urgent care center in Long Beach, and the expansion of other hospitals' emergency departments could mitigate any negative impact from a potential closure of CHLB's emergency department.

Behavioral Health Analysis

There are seven other providers of licensed psychiatric beds within 15 miles of CHLB. The analysis of these behavioral health providers shows a high combined occupancy rate of nearly 90%. Hospitals located outside of Long Beach captured nearly 50% of the service area behavioral health market share. This indicates that service area residents need CHLB's behavioral health services, however, without sufficient capacity, they often travel outside of the service area and surrounding communities of Long Beach to receive these types of services.

Hospital	Licensed Psych Beds	Occupancy
Community Hospital of Long Beach	**28**	**81.4%**
College Medical Center	137	88.4%
Los Alamitos Medical Center	25	90.5%
La Casa Psychiatric Health Facility	16	98.0%
Providence Little Company of Mary San Pedro	25	85.7%
College Hospital	187	91.5%
Del Amo Hospital	111	84.5%
LAC/Harbor UCLA Medical Center	38	93.0%
Total	**567**	**88.9%**

Source: OSHPD Annual Disclosure Reports, FY 2016

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Conclusion

Based on the following key considerations, the ability to continue to operate CHLB as a general acute care hospital is not viable on a long-term basis:

- There are several full-service, reputable hospitals within close proximity of CHLB’s location. Hence, patient access to acute hospital services including emergency care would only be minimally affected if operations were discontinued;
- Three hospitals are located within 4.0 miles or less and have sufficient available capacity to absorb the volume from CHLB;
- There is substantial available hospital bed capacity in the area for general acute care services. Thus, CHLB is not an essential hospital; and
- The community does have a need for behavioral health services. Area facilities operate at high occupancy rates.

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