3.4 GEOLOGY AND SOILS

As a result of the analysis undertaken in the Initial Study for the Long Beach Memorial Medical Center Expansion (proposed project),[1] the City of Long Beach (City) Department of Planning and Building determined that the proposed project may result in environmental impacts related to geology and soils. Therefore, this issue is carried forward for detailed analysis in this Environmental Impact Report (EIR). This analysis was undertaken to identify opportunities to avoid, reduce, or otherwise mitigate potential significant impacts related to geology and soils and to identify potential alternatives.

The analysis of geology and soils includes a description of the regulatory framework that guides the decision-making process, existing conditions of the proposed project area, thresholds for determining if the proposed project would result in significant impacts, anticipated impacts (direct, indirect, and cumulative), mitigation measures, and level of significance after mitigation.

Geology and soils at the proposed project site were evaluated in accordance with the methodologies and information provided by the City of Long Beach General Plan,[2,3] the Environmental Summary Report for the Long Beach Memorial Medical Center Expansion Area,[4] the geology and soils report prepared by SCS Engineers (Appendix E, *Geology and Soils*), publications of the California Geological Survey (CGS; formerly known as California Division of Mines and Geology, CDMG), and published maps.[5,6]

3.4.1 Regulatory Framework

This regulatory framework identifies the federal, state, and local statutes and policies that relate to geology and soils that must be considered by the City of Long Beach during the decision-making process for proposed project elements that involve grading (excavation or fill), modification of existing structures, or construction of new structures.

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[1] City of Long Beach, Department of Planning and Building. 20 August 2004. *Initial Study for the Long Beach Memorial Medical Center Expansion Project*. Prepared by: Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, CA 91105.

[2] City of Long Beach, Department of Planning and Building. 30 April 1973. *Conservation Element of the Long Beach General Plan*. Prepared by: City of Long Beach, Department of Planning and Building, City Hall, 333 West Ocean Boulevard, Long Beach, CA 90802.

[3] City of Long Beach, Department of Planning and Building. October 1988. *Seismic Safety Element of the Long Beach General Plan*. Prepared by: City of Long Beach, Department of Planning and Building, City Hall, 333 West Ocean Boulevard, Long Beach, CA 90802.

[4] SCS Engineers. May 2004. *Environmental Summary Report, Long Beach Memorial Medical Center Expansion Area, Long Beach, California*. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

[5] California Department of Conservation, Division of Mines and Geology. 1986. *Special Studies Zones Map, Long Beach Quadrangle*. Contact: California Department of Conservation, Division of Mines and Geology, 801 K Street, MS 14-33, Sacramento, CA 95814-3531.

[6] U.S. Geological Survey. Photorevised 1981 (1964). Long Beach, California, 7.5-Minute Series Topographic Quadrangle. (Scale = 1:24,000.) Contact: U.S. Geological Survey National Center, 12201 Sunrise Valley Drive, Reston, VA 20192.

State

California Geological Survey

The CGS identifies several earth resource issues that should be taken into consideration when evaluating whether the proposed project would likely be subject to geologic hazards, particularly hazards related to earthquake damage. These considerations include both the potential for existing geologic and soil conditions to pose a risk to the proposed project and the potential for the proposed project to result in an impact to the existing geologic and soil conditions by creating or exacerbating a geologic hazard.

The CGS conducts studies related to geologic hazards (e.g., faulting, liquefaction, seismically induced landslides, and ground shaking) as they affect people and structures. These studies relate to the Alquist-Priolo Earthquake Fault Zone (APEFZ) Act[7] and Seismic Hazards Mapping Act.[8] The CGS also issues guidelines for the evaluation of geologic and seismic factors that may impact a project or that a project may affect:

- CDMG Special Publication No. 42, Fault-Rupture Hazard Zones in California[9]
- CDMG Special Publication No. 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California[10]
- CDMG Special Publication No. 99, Planning Scenario for a Major Earthquake on the Newport-Inglewood Fault Zone (Los Angeles and Orange Counties, California)[11]
- CDMG Open File Report 88-14, Recently Active Traces of the Newport-Inglewood Fault Zone, Los Angeles and Orange Counties, California[12]

Each set of guidelines provides checklists and outlines to help ensure a comprehensive report of geologic/seismic conditions. Although not mandatory, these guidelines characterize the standards for technical and procedural adequacy in the characterization of geology, soils, and related environmental hazards.

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[7] State of California. 1972. Alquist-Priolo Earthquake Fault Zoning Act. California Public Resources Code, Section 2621 et seq. Available at: http://www.leginfo.ca.gov/calaw.html

[8] State of California. 1990. Seismic Hazards Mapping Act. California Public Resources Code. Section 2690 et seq. Available at: http://www.leginfo.ca.gov/calaw.html

[9] California Department of Conservation, Division of Mines and Geology. Revised 1997 (Supplements 1 and 2 added 1999). *Fault-Rupture Hazard Zones in California*. Special Publication No. 42. Contact: California Department of Conservation, Division of Mines and Geology, 801 K Street, MS 14-33, Sacramento, CA 95814-3531.

[10] California Department of Conservation, Division of Mines and Geology. 1997. *Guidelines for Evaluating and Mitigating Seismic Hazards in California*. Special Publication No. 117. Contact: California Department of Conservation, Division of Mines and Geology, 801 K Street, MS 14-33, Sacramento, CA 95814-3531.

[11] California Department of Conservation, Division of Mines and Geology. 1988. *Planning Scenario for a Major Earthquake on the Newport-Inglewood Fault Zone (Los Angeles and Orange Counties, California)*. Special Publication No. 99. Contact: California Department of Conservation, Division of Mines and Geology, 801 K Street, MS 14-33, Sacramento, CA 95814-3531.

[12] California Department of Conservation, Division of Mines and Geology. 1988. *Recently Active Traces of the Newport-Inglewood Fault Zone, Los Angeles and Orange Counties, California*. Open File Report 88-14. Contact: California Department of Conservation, Division of Mines and Geology, 801 K Street, MS 14-33, Sacramento, CA 95814-3531

Alquist-Priolo Earthquake Fault Zone Act of 1972

The CGS has delineated earthquake fault zones along known active or potentially active faults in California pursuant to the APEFZ Act of 1972.[13] The State of California delegates the authority to local government to regulate development within the APEFZ. Construction of habitable structures is not permitted over potential rupture zones. The closest APEFZ, established for the active Cherry Hill fault of the Newport-Inglewood Fault Zone, is located approximately 1,000 feet northeast of the proposed project site. Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located directly beneath or projecting toward the proposed project site. Therefore, the potential for surface rupture due to fault plane displacement propagating to the surface at the site during the design life of the proposed project is considered to be low (Appendix E).

Seismic Hazards Mapping Act of 1990

The CGS has also identified seismic hazard zones that are delineated in accordance with the seismic hazards mapping program (SHMP) of the Seismic Hazards Mapping Act of 1990.[14] The Seismic Hazards Mapping Act provides for the following:

> …a statewide seismic hazard mapping and technical advisory program to assist cities and counties in fulfilling their responsibilities for protecting the public health and safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other seismic hazards caused by earthquakes.

The proposed project site is identified on the seismic hazard zone map, Long Beach quadrangle, within a zone of liquefaction potential.[15]

California Building Code

The majority of the State of California, including the proposed project site, lies within Seismic Zone 4, the highest level hazard zone designated by the current Uniform Building Code (UBC). The California Building Standards Code, or California Building Code (CBC), augments and supersedes the UBC with stricter requirements to reduce the risks associated with building in Seismic Zone 4 to the maximum extent practicable. The CBC[16] sets standards for the investigation and mitigation of the site conditions related to fault movement, liquefaction, landslides, differential compaction/seismic settlement, ground rupture, ground shaking, tsunami, seiche, and seismically induced flooding.

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[13] State of California. 1972. Alquist-Priolo Earthquake Fault Zoning Act. California Public Resources Code, Section 2621 et seq. Available at: http://www.leginfo.ca.gov/calaw.html

[14] State of California. 1990. Seismic Hazards Mapping Act. California Public Resources Code. Section 2690 et seq. Available at: http://www.leginfo.ca.gov/calaw.html

[15] California Department of Conservation, Division of Mines and Geology. 1986. *Special Studies Zones Map, Long Beach Quadrangle*. Contact: California Department of Conservation, Division of Mines and Geology, 801 K Street, MS 14-33, Sacramento, CA 95814-3531.

[16] California Building Standards Commission. 1 November 2002a. California Code of Regulations, Title 24: "California Building Standards Code." Sacramento, CA: California Building Standards Commission. Available at: http://www.bsc.ca.gov

Mitigation of geological (including earthquake) and soil (geotechnical) issues must be undertaken in compliance with the CBC. Within the CBC, there are two subsections: the California Historical Building Code[17] and California Code for Building Conservation.[18] The California Historical Building Code, more commonly known as the State Historical Building Code (SHBC), contains alternative building standards for the renovation of qualified historical buildings or structures. The goal of the SHBC is to maintain currently acceptable life-safety standards for historic buildings and to ensure that implementation of this code is performance based. The California Code for Building Conservation contains amendments to the federal Uniform Code for Building Conservation, which relates to seismic strengthening of unreinforced masonry bearing wall buildings, such as those at the proposed project site.

Seismic retrofit for any hospital buildings would be performed in accordance with CBC. Seismic evaluation procedures for seismic retrofit of hospital buildings are outlined in Part 1, Title 24 of the California Code of Regulations (CCR), Chapter 6.

Senate Bill 1953

The OSHPD is responsible for overseeing all aspects of construction for general acute care, and psychiatric hospitals, as well as multistory skilled nursing homes and intermediate care facilities in California. Senate Bill (SB) 1953 standards ensure patient safety during an earthquake and functioning medical facilities to care for injured people immediately following earthquakes. If a facility is to remain a general acute care hospital facility beyond a specified date, the owner must conduct seismic evaluations and prepare both a comprehensive evaluation report and a compliance plan to attain specified structural and nonstructural performance categories. The plan must be submitted to OSHPD in accordance with these regulations.

Review of design plans and related information for hospital inpatient buildings and related utilities is completed by the Office of Statewide Health Planning and Development (OSHPD). However, OSHPD relies on the local building and safety authority to review design plans and related information for hospital outpatient buildings and related structures for appurtenant commercial uses. When design plans and related information are submitted for review by the OSHPD and the CGS, the data and analysis requirements of the CBC and Chapter 6 must be satisfied before construction approval could be granted.

Local

City of Long Beach

Building and construction within the City of Long Beach are subject to the regulations of the City Municipal Code. Municipal Code Chapter 18.24, Building Codes, adopts and incorporates by reference the CBC (Volumes I and II, 2001 Edition), and includes amendments and modifications to the CBC that are specific to the City of Long Beach. The CBC in turn incorporates provisions of the UBC, which contains seismic design criteria and grading standards.

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[17] California Building Standards Commission. 1 November 2002b. California Code of Regulations, Title 24, Part 8: "California Historical Building Code." Sacramento, CA: California Building Standards Commission. Available at: http://www.bsc.ca.gov

[18] California Building Standards Commission. 1 November 2002a. California Code of Regulations, Title 24: "California Building Standards Code." Sacramento, CA: California Building Standards Commission. Available at: http://www.bsc.ca.gov

The City of Long Beach General Plan adopted the Seismic Safety element of the General Plan on October 1988. The purpose of this element is to provide a comprehensive analysis of seismic factors in order to reduce the loss of life, injuries, damage to property, and social and economic impacts resulting from future earthquakes. The Seismic Safety element is a seismic safety planning tool and contains goals and recommendations that provide guidance for development in seismically active areas. To achieve maximum feasible safety from seismic risk, the Seismic Safety element focuses on current developmental policies and the allocation of future land uses.

Building Codes

The County has adopted and amended the CBC to reflect local geologic and seismic conditions. The County of Los Angeles Building Code[19] would be the standard for evaluating the adequacy of geotechnical and engineering geology studies needed for design and construction in the County. The proposed project would be subject to the provisions of both the CBC and the County of Los Angeles Building Code. The County of Los Angeles Building Code, Chapter 96, identifies collapse prevention performance recommendations to be used in the evaluation of feasibility of conservation for historic structures consistent with the guidelines provided by the SHBC, the Uniform Code for Building Conservation, and The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.[20]

3.4.2 Existing Conditions

The existing conditions for geology and soils at the Long Beach Memorial Medical Center campus (Campus) are described in relation to surficial geologic units, bedrock formations, artificial fill, faulting, seismicity, soils, and groundwater hydrology.

Surficial Geologic Units

Surficial geologic materials in the area consist of Pleistocene and Recent nonmarine and marine units, predominantly sand, silty sand, sandy silt, silt, and clay. Undisturbed soil at the proposed project site is not considered to be significantly erodable. In addition to native materials and engineered fill placed in connection with construction activities, an unknown volume of unclassified fill, including gravel, debris, and waste oil field material, was used to bring a former on-site ravine up to grade prior to using the site for hospital facilities. Native and fill soils were encountered in borings drilled during subsurface site investigations. There are no unique geological features at the proposed project site.[21]

[19] County of Los Angeles, Department of Public Works. 1 November 2002. Building Code, Title 26: "County of Los Angeles Building Code." Available at: http://www.bpcnet.com/cgi-bin/hilite.pl/codes/lacounty/maintoc.htm

[20] Weeks, Kay D. and Anne E. Grimmer. 1995. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings*. Washington, DC: U.S. Department of the Interior, Cultural Resource Stewardship and Partnerships.

[21] SCS Engineers. 2004a. *Technical Background Report, Engineering Geology Investigation to Support Environmental Documentation for the Long Beach Hospital, Long Beach, California*. Prepared for: Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, CA 91105. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

Bedrock Formations

Geologically, the proposed project area is located in the southwestern portion of the Los Angeles Basin (Basin). The Basin formed when basement (older) rocks were structurally downwarped, allowing a thick sequence of Upper Cretaceous through Recent age (approximately 100 million years ago to present) sedimentary units to form. The sedimentary basin fill in the proposed project area is estimated to be 12,000 feet thick.[22] The basin fill in this area consists predominantly of marine origin sandstone, siltstone, and shale of Middle Miocene to Pliocene age (approximately 16 to 1.8 million years ago) overlain by predominantly marine sand and silt of Pleistocene to Recent age (approximately 1.8 million years ago to present).[23]

Artificial Fill

Artificial fill is used to provide a foundation material with consistent and measurable qualities that compensate for site-specific geotechnical constraints. Because the proposed project site and vicinity are entirely developed, artificial fill would most likely be the first "unit" encountered during excavation. Artificial fill may partially or wholly replace native soils or alluvial deposits, depending on the extent of use during original placement. There is also unclassified fill, located in a former ravine that was historically filled using petroleum-containing soil and miscellaneous oil field and other debris (see Section 3.5, Hazards and Hazardous Materials). As discussed in Section 3.5 of this EIR, soil with field indications of potential contamination encountered during project earthwork will be tested and removed if found to be contaminated or otherwise unsuitable.

Faulting

Faults are fractures, or lines of weakness, in the earth's crust along which earthquakes occur. An earthquake occurs when rock units on one side of a fault are suddenly offset relative to the same rock units on the other side of the fault. In cases where earthquakes are large enough, or shallow enough, surface rupture can occur along the fault plane where it intersects the earth's surface. Active faults, those exhibiting movement during the Holocene age, and potentially active faults, those exhibiting movement during the Pleistocene age (between 1.8 million and 11,000 years ago), must be considered as potential sources for surface rupture where they intersect the surface. In general, the more recently there has been movement on a fault, the higher the potential for future movement on that fault.

The rocks of the Basin are cut by numerous faults, many of which are strike-slip faults of generally northwest-southeast orientation. Of these, the Newport-Inglewood Fault Zone is located closest to the proposed project site, within approximately 1,000 feet northeast. The Newport-Inglewood Fault Zone extends from the Baldwin Hills to Newport Bay and is considered to be active[24] (Figure 3.4.2-1, *Map of Active Faults, Los Angeles Basin*).

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[22] R.F. Yerkes, T. H. McCullog, J.E. Shoellhamer, and J.G. Vedder. 1965. *Geology of the Los Angeles Basin, California: An Introduction.* (U.S. Geological Survey Professional Paper 420). Contact: U.S. Geological Survey, USGS National Center, 12201 Sunrise Valley Drive, Reston, VA 20192.

[23] SCS Engineers. 2004a. *Technical Background Report, Engineering Geology Investigation to Support Environmental Documentation for the Long Beach Hospital, Long Beach, California*. Prepared for: Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, CA 91105. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

[24] SCS Engineers. 2004a. *Technical Background Report, Engineering Geology Investigation to Support Environmental Documentation for the Long Beach Hospital, Long Beach, California*. Prepared for: Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, CA 91105. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

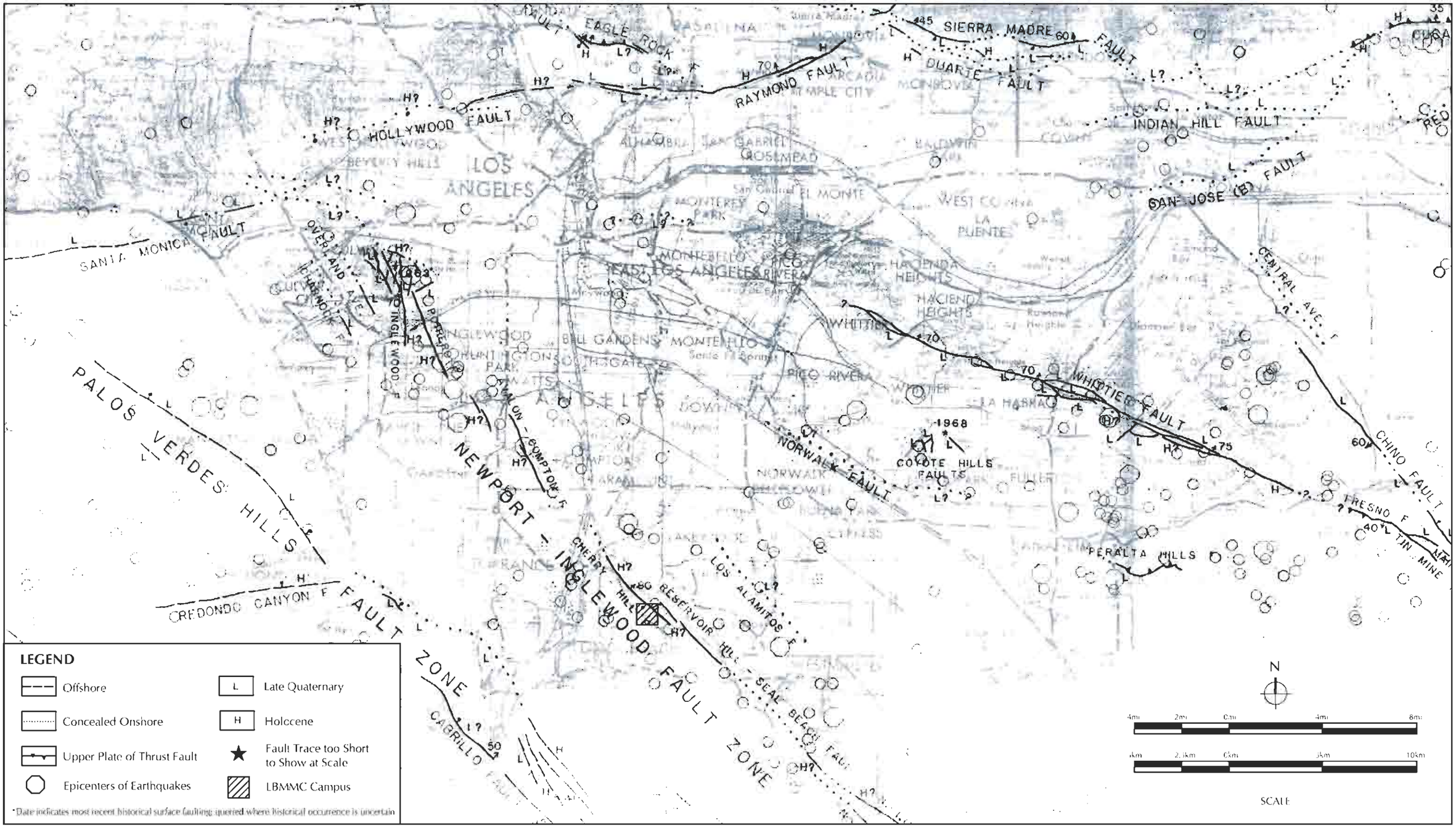

FIGURE 3.4.2-1
Map of Active Faults, Los Angeles Basin

Research has also indicated that several blind thrust faults (low-angle faults that do not break the surface) are active or potentially active and could cause significant ground shaking. Some recent research also indicates that the Compton-Los Alamitos Blind Thrust, which may be located in the deep subsurface under the proposed project site, may or may not be active or potentially active (Appendix E).

Seismicity

Plate tectonics, the movement of plates within the earth's crust, is experienced as an earthquake when there is a sudden release of energy along a fault line. The fault ruptures to accommodate this energy, propagating the energy throughout the land area surrounding the epicenter. Depending on the intensity of the earthquake, the propagation of energy creates strong ground motion and other potential seismic hazards such as surface fault rupture, ground failure (including liquefaction), and landslides.

The Richter magnitude scale was developed as a mathematical device to compare the size of earthquakes but not the measurement of damage. Richter showed that the greater the energy, the greater the amplitude of ground motion at a given distance. Because the Richter scale is based on a logarithmic scale, or base-10 scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude, or height, of the earthquake wave. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 32 times more energy than the amount associated with the preceding whole number value.

Seismologists have more recently developed a standard magnitude scale that addresses some of the limitations of earlier scales. This is called Moment magnitude. The Moment magnitude gives a more reliable estimate of energy release, particularly for very large earthquakes. The Moment scale is computed based on information gathered on seismographs. Seismographs are machines that measure and record vibrations within the earth and on the ground.

Ground motion or ground-shaking intensity is described by the modified Mercalli intensity scale (Table 3.4.2-1, *Modified Mercalli Intensity Scale*). Values in the modified Mercalli intensity scale are dependent on several factors: earthquake size, type, depth, distance to fault, subsurface geologic conditions, and direction of motion.

Another measure of the potential for seismic-related damage is the peak horizontal ground acceleration (PHGA). PHGA is a measure of ground motion expressed as a percentage of gravity (g) as it reflects the amplitude of an earthquake wave relative to earth's surface. The greater the ground acceleration, the more damage a seismic event is likely to cause.

TABLE 3.4.2-1
MODIFIED MERCALLI INTENSITY SCALE

Intensity	Description of Potential Effects
I.	Not felt. Marginal and long-period effects of large earthquakes.*
II.	Felt by persons at rest, on upper floors, or favorably placed.
III.	Felt indoors. Hanging objects swing. Vibration-like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV.	Hanging objects swing. Vibration-like passing of heavy trucks, or sensation of a jolt like a ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frames creak.
V.	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
VI.	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken; knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D* cracked. Small bells ring (church, school). Trees, bushes shaken (visible, or heard to rustle).
VII.	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII.	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX.	General panic. Masonry D destroyed; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas, sand and mud ejected; earthquake fountains; and sand craters.
X.	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks to canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI.	Rails bent greatly. Underground pipelines completely out of service.
XII.	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

NOTES:

*Wave period is the time calculated between two consecutive wave peaks.

*The quality of masonry, brick, or other material is defined by the following lettering system, which is unrelated to the conventional construction classes A, B, and C:

Masonry A. Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.

Masonry B. Good workmanship and mortar; reinforced, but not designed to resist lateral forces.

Masonry C. Ordinary workmanship and mortar; no extreme weaknesses, like failing to tie in at corners, but neither reinforced nor designed to resist horizontal forces.

Masonry D. Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

SOURCE: Richter, C.F. 1957. *Elementary Seismology*. San Francisco, CA: W. H. Freeman Co.

Numerous regional and local faults are capable of producing severe earthquakes, those of Richter magnitude of 6.0 or greater (Table 3.4.2-2, *List of Recorded Earthquakes with Magnitude of Greater than 6.0 within 100 Kilometers of the Proposed Project Site*). Several earthquakes have occurred in historic time in the general Southern California region. Historic events are both preinstrumental (all information is very approximate) and instrumental events. The primary earthquake associated with the Newport-Inglewood Fault Zone is the year 1933 magnitude 6.3 event. Table 3.4.2-2 summarizes data for recorded moderate to severe earthquakes within the area of potential effect for the proposed project site.

TABLE 3.4.2-2
LIST OF RECORDED EARTHQUAKES WITH MAGNITUDE OF GREATER THAN 6.0 WITHIN 100 KILOMETERS OF THE PROPOSED PROJECT SITE

Date	Location (latitude, longitude)	Moment Magnitude	Local Magnitude*	Distance from the Proposed Project Site (kilometers)
December 8, 1812	33.70, –117.90	7.5**	6.90**	33
July 22, 1899	34.30, –117.50	—	6.50**	85
May 15, 1910	33.70, –117.40	—	6.00	78
July 23, 1923	34.00, –117.25	—	6.25	92
March 11, 1933	33.62, –117.97	6.4	6.30	33
February 9, 1971	34.41, –118.40	6.6	6.40	66
October 1, 1987	34.06, –118.08	5.9	6.10	29
February 28, 1990	34.21, –118.54	—	6.20	59
January 17, 1994	34.21, –118.54	6.7	6.80***	51

NOTES:
* Moment magnitude is preferred to local or Richter magnitude because it provides a more reliable estimate of the size of an event, particularly for very large earthquakes.
** Estimated
*** Surface-wave magnitude
SOURCE: U.S. Geological Survey. Last modified 10 July 2003. *Earthquake Hazards Program*. Earthquake Search: Circular Area. Web site: http://neic.usgs.gov/neis/epic/epic_circ.html

As indicated above, a portion of the Newport-Inglewood Fault Zone, known as the Cherry Hill segment, is located within approximately 1,000 feet of portions of the proposed project area. The Newport-Inglewood fault is capable of a 7.1 magnitude earthquake.[25] PHGAs were estimated on a design and upper-bound earthquake basis in a recent study,[26] with a 10-percent chance of exceedance during 50- and 100-year time periods, respectively. The design and upper-bound basis PHGAs were estimated at 0.52 g and 0.65 g, respectively.

The proposed project is located in an area that is susceptible to strong ground shaking from severe earthquakes. Earthquakes on faults, such as the nearby Newport-Inglewood Fault (capable of 7.1 magnitude), can generate seismic shaking. There are also a number of other active and potentially active faults within 60 miles (100 kilometers) of the proposed project site, any of which could cause significant ground shaking at the site (Figure 3.4.2-1).

[25] T. Cao, W.A. Bryant, B. Rowshandel, D. Branum, and C.J. Wills. June 2003. *The Revised 2002 California Probabilistic Seismic Hazard Maps*. Contact: California Geological Survey, 801 K Street, MS 14-33, Sacramento, CA 95814-3531.

[26] MACTEC. 2003. *Report of Geotechnical Investigation, Proposed Pediatric Hospital Additions, Long Beach Memorial Medical Center, Long Beach, California*. Prepared by: MACTEC, 1105 Sanctuary Parkway, Suite 300, Alpharetta, GA 30004.

Potential seismic forces resulting from an earthquake as they might affect buildings and other structures are often quantified as PHGAs. MACTEC[27] has determined site-specific PHGAs of 0.52 g and 0.65 g using the design basis earthquake with a 10-percent probability of exceedance during a 50-year time period and the upper-bound earthquake with a 10-percent probability of exceedance during a 100-year time period, respectively.[28,29]

Soils

Expansive soils have relatively high clay mineral content and are usually found in areas where underlying formations contain an abundance of clay minerals or where coarse-grained materials are weathered and broken down into clay-rich materials. Although there is some clay in the natural soils in the proposed project area, the soil is primarily silt and silty sand. The foundation investigation indicates that the clay soils are somewhat expansive.[30] Following standard engineering practice, all expansive soil that could potentially negatively affect buildings or other proposed project components would be removed and replaced with properly engineered fill soil prior to building construction.

Groundwater Hydrology

A complex system of alternating aquifers (highly permeable sand and gravel beds) and aquicludes (relatively low permeability sediments with a high proportion of clay and silt) characterizes the Basin subsurface geology, including the proposed project site area. In some parts of the Basin, aquicludes are "leaky," allowing groundwater to move upward or downward through them, depending on differential pressure gradients. Due to this leakage, precipitation, and surface water infiltration, localized shallow perched-water zones may accumulate above the regional groundwater level. Delineating shallow, perched groundwater is critical during the evaluation of liquefaction potential.

The uppermost regional aquifer in this area is anticipated to be the Gage Aquifer, located at a depth of approximately 200 to 250 feet below ground surface (BGS).[31] The uppermost groundwater beneath most of the area occurs at a depth estimated at 50 feet BGS within sands of the Lakewood Formation; however, a thin perched zone of groundwater was encountered as shallow as 15 feet BGS in the northern portion of the expansion area.

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[27] MACTEC. 2003. *Report of Geotechnical Investigation, Proposed Pediatric Hospital Additions, Long Beach Memorial Medical Center, Long Beach, California*. Prepared by: MACTEC, 1105 Sanctuary Parkway, Suite 300, Alpharetta, GA 30004.

[28] MACTEC. 2003. *Report of Geotechnical Investigation, Proposed Pediatric Hospital Additions, Long Beach Memorial Medical Center, Long Beach, California*. Prepared by: MACTEC, 1105 Sanctuary Parkway, Suite 300, Alpharetta, GA 30004.

[29] SCS Engineers. 2004a. *Technical Background Report, Engineering Geology Investigation to Support Environmental Documentation for the Long Beach Hospital, Long Beach, California*. Prepared for: Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, CA 91105. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

[30] Leroy Crandall and Associates. 10 April 1969. *Report of Foundation Investigation, Proposed Hospital Addition and Parking Structure*. Contact: Leroy Crandall and Associates, 1700 South Main Street, Santa Monica, CA 90401.

[31] California Department of Water Resources. June 1961. *Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County*. Bulletin 104, Appendix A, Ground Water Geology. Contact: California Department of Water Resources, 1416 9th Street, Sacramento, CA 95814.

Groundwater has been encountered at depths of 40 to 50 feet BGS in the proposed project area. Approximately 10 to 15 percent of the proposed project site overlies an area that is potentially susceptible to liquefaction, as indicated on the California State Seismic Hazard Maps. A portion of the proposed project site, extending from near the intersection of Columbia Street and Atlantic Avenue in the northeast to the intersection of Patterson Avenue and Long Beach Boulevard on the west, is susceptible to liquefaction (Figure 3.4.2-2, *Mapped Liquefaction Hazard Zone*). This area is the former location of a ravine crossing the area that was backfilled with unclassified fill soil prior to the construction of the present hospital buildings. Some of this unclassified fill has subsequently been removed and replaced by engineered fill. Perched groundwater has been encountered in this fill material.[32] The perched water may be seasonal. Although much of this unsuitable fill material has been removed and replaced with compacted engineered fill, some of the fill remains and would need to be addressed in conjunction with site-specific geotechnical investigation.

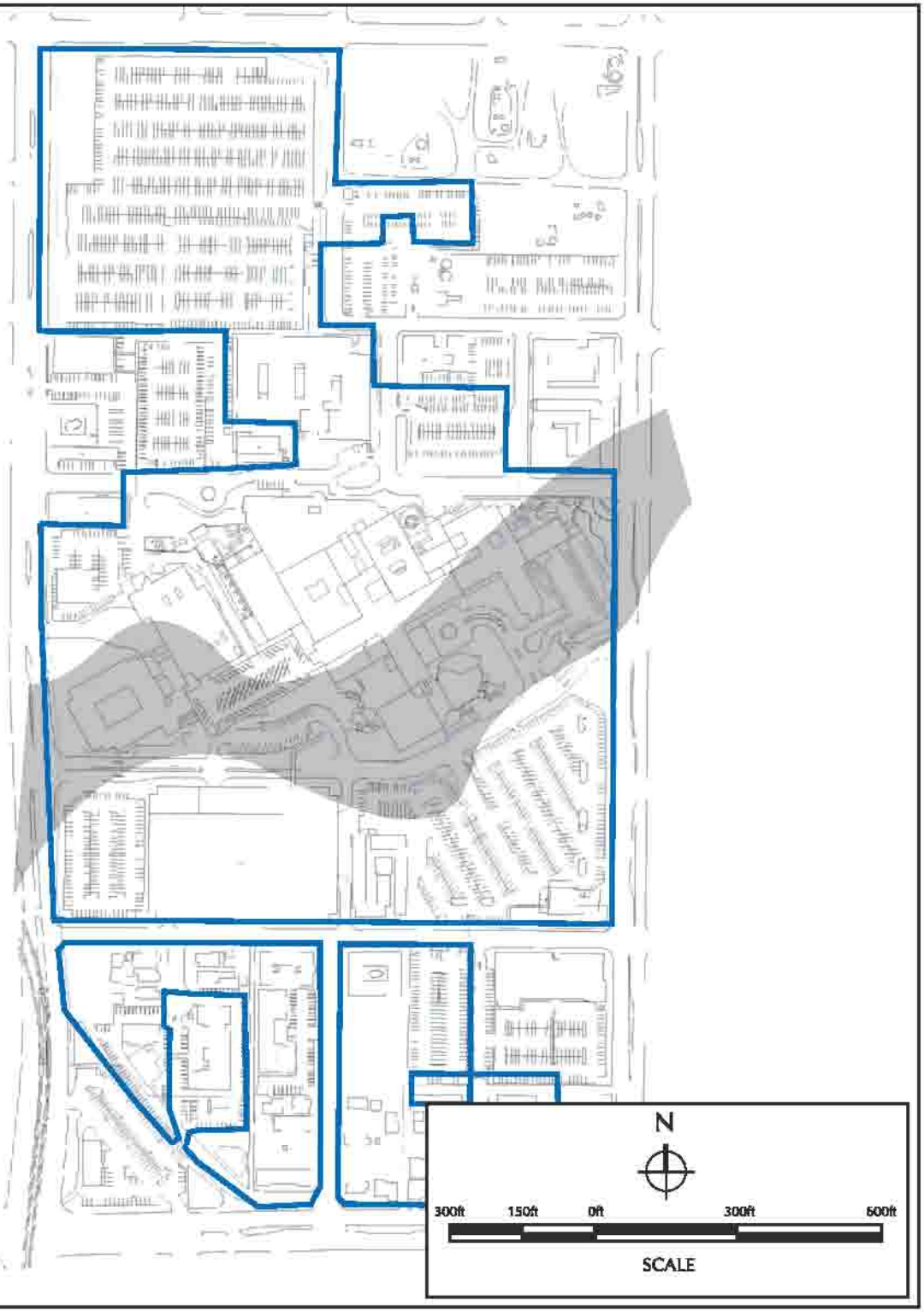
Substrate Stability

Substrate stability refers to the existing potential for the alluvium and artificial fill overlying the bedrock to exhibit seismic-related and geologic hazards, such as liquefaction, on- or off-site landslide, settlement/collapse, expansive soils, and subsidence.

Liquefaction is the transformation of surficial materials from a solid to a near-liquid state when moderate to severe seismic ground shaking causes pore-water pressure to increase in cohesionless (low relative density) materials (usually sand or silty sand). Loose granular soils and a temporary or permanent source of shallow groundwater are required for liquefaction to occur. Liquefaction can cause overlying structures to settle nonuniformly and cause buried structures to float within or atop liquefied soils. The liquefaction potential of an area is also controlled both by the depth of the water table and the relative density of the sediments. Based on soil parameters measured at the proposed project site, MACTEC has calculated the liquefaction-induced settlement to be less than 0.25 inches.[33] Where liquefaction does not occur, soils may be subject to seismic settlement from densification during severe shaking.

[32] SCS Engineers, Inc. 2004a. *Technical Background Report, Engineering Geology Investigation to Support Environmental Documentation for the Long Beach Hospital, Long Beach, California*. Prepared for: Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, CA 91105. Prepared by: SCS Engineers Inc., 3711 Long Beach Boulevard, Long Beach, CA 90807.

[33] MACTEC. 2003. Report of Geotechnical Investigation, Proposed Pediatric Hospital Additions, Long Beach Memorial Medical Center, Long Beach, California. Prepared by: MACTEC, 1105 Sanctuary Parkway, Suite 300, Alpharetta, GA 30004.



SOURCE: SCS Engineers

LEGEND

- Liquefaction Hazard Zone
- Long Beach Memorial Medical Center Campus Boundary

FIGURE 3.4.2-2
Mapped Liquefaction Hazard Zone

3.4.3 Significance Thresholds

The potential for the proposed project to result in impacts related to geology and soils was analyzed in relation to the questions contained in Appendix G of the State of California Environmental Quality Act (CEQA) Guidelines. The proposed project would normally be considered to have a significant impact related to geology and soils when the potential for any one of the following five thresholds occurs:

- Exposure of people or structures to potential substantial adverse effects, including the risk for loss, injury, or death involving the following:
    - Rupture of a known earthquake fault, as delineated on the most recent APEFZ Map, issued by the State Geologist for the area, or based on other substantial evidence of a known fault
    - Strong seismic ground shaking
    - Seismic-related ground failure, including liquefaction
    - Landslides
- Existence of substantial soil erosion (greater than 10 percent) or the loss of topsoil
- Location on a geologic unit or soil that is unstable, or that would become unstable as a result of the proposed project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse
- Location on expansive soil, as defined in Table 18-1-B of the UBC of 1994, creating substantial risks to life or property
- In addition to the State CEQA Guidelines above, the proposed project would be considered to result in significant impacts if implementation of the proposed project resulted in the exposure of people to hazardous concentrations of methane and/or hydrogen sulfide or damage to structures from the unexpected presence of an abandoned well or dry hole associated with oil and gas field–related activities.

3.4.4 Impact Analysis

Seismicity

The proposed project would not be expected to result in significant impacts to people or structures related to surface fault rupture. There are no active or potentially active faults that exhibit a surface expression that intersects the proposed project site. However, a number of known regional active faults are located at distances where they could produce substantial ground shaking at the proposed project site. Similar to development throughout most of Southern California, implementation of the proposed project would result in the exposure of persons at the proposed project site to substantial ground shaking, and thus a degree of seismic hazard risk. The proposed project would be constructed in accordance with the CBC, Long Beach Municipal Code, and UBC. In addition, the maximum probable seismic ground acceleration would be taken into consideration when designing all structures in order to minimize potential hazards. Furthermore, geotechnical studies prepared for each phase of building would be undertaken in accordance with the CGS

Guidelines for Evaluating and Mitigating Seismic Hazards in California.[34] The proposed project would be consistent with the goals and recommendations of the Seismic Safety element[35] of the Long Beach General Plan. Therefore, impacts associated with seismic hazards would be reduced to the least extent possible with incorporation of the recommendations of the site-specific geotechnical investigation into the proposed project plans and specifications.

Ground Failure/Liquefaction

While most of the Campus is not subject to liquefaction, portions of the proposed MCH improvements are located within the CGS liquefaction hazard zone (Figure 3.4.2-2). Potential impacts due to liquefaction could include foundation bearing failure or large foundation settlements, imposition of additional loads on foundations, localized lateral displacement (spreading) or compression, floatation of light structures, and damage to infrastructure such as streets and utilities. The liquefaction potential would be evaluated as part of the detailed geotechnical study for each new building phase and for any new infrastructure, as required by the CBC and UBC. Unsuitable fill soils located under proposed structures would be removed and replaced with properly engineered fill. Subsurface drainage would be provided where necessary to prevent near-surface soil saturation. Geotechnical studies and design would be undertaken in accordance with the CGS guidelines.[36] Therefore, impacts associated with potential liquefaction would be less than significant with the incorporation of CGS guidelines specifications.

Landslides

The proposed project would not result in significant impacts from seismically induced landslides. Due to the absence of steep slopes at the proposed project site, no nearby areas would likely be subject to landslides. No areas susceptible to seismically induced landslides are shown in the proposed project vicinity of the CGS Seismic Hazards Map. Landslides are not considered to be a potential hazard at the proposed project site; therefore, the proposed project would not result in an impact from landslides and no mitigation is required.

Soil Erosion

The proposed project would be expected to result in less than significant impacts related to a substantial increase in soil erosion or loss of topsoil. The materials most susceptible to erosion are artificial fill, younger alluvium (comparatively more recent deposits), and soil; all three materials may be present beneath the proposed project site. The largest source of erosion, particularly in an urban environment, is uncontrolled drainage during construction. The proposed project site does not contain any steep slopes or a drainage course. Erosion potential during construction would be managed to the maximum extent practicable with best management practices (BMPs) as part of compliance with the required National Pollutant Discharge Elimination System (NPDES) permit and associated Urban Storm Water Management Plan.

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[34] California Department of Conservation, Division of Mines and Geology. 1997. *Guidelines for Evaluating and Mitigating Seismic Hazards in California*. Special Publication No. 117. Contact: California Department of Conservation, Division of Mines and Geology, 801 K Street, MS 14-33, Sacramento, CA 95814-3531.

[35] City of Long Beach, Department of Planning and Building. October 1988. *Seismic Safety Element of the Long Beach General Plan*. Prepared by: City of Long Beach, Department of Planning and Building, City Hall, 333 West Ocean Boulevard, Long Beach, CA 90802.

[36] California Geological Survey. 1997. *Guidelines for Evaluating and Mitigating Seismic Hazards in California*. CDMG Bulletin 117. Prepared by: California Geological Survey, 801 K Street, MS 12-30, Sacramento, CA 95814.

The City of Long Beach and the California Stormwater Best Management Practice Handbook[37] has identified standard BMPs that are capable of reducing impacts to soil erosion to below the level of significance. Therefore, impacts associated with erosion for exposed sections would be expected to be minimized to below the level of significance with the incorporation of standard BMPs.

Stability of Geologic Units and Soils

Substrate Stability

The proposed project would result in less than significant impacts related to the location of the proposed project on a geologic unit that is unstable, or that would become unstable as a result of the proposed project; therefore, no further mitigation is required.

Expansive Soil

The proposed project would be expected to result in less than significant impacts from expansive soils. Expansive soils expand with the addition of water, and shrink when dried due to a high clay content, which absorbs water. This can cause damage to overlying structures. The proposed project site substrate is high in granular content and low in clay content. This type of geologic unit has a very low risk factor for expansion (Appendix E). Therefore, the proposed project would not result in an impact from expansive soil and no further mitigation is required.

Oil and Gas Field–Related Issues

Subsidence and Settlement

The proposed project would not result in significant impacts related to subsidence. Subsidence hazard may be found in areas with active groundwater or petroleum production, or in areas with collapsible soil. No water production well fields large enough to overdraft aquifers are known to exist in the vicinity of the proposed project site. Portions of the proposed project area are within the Long Beach oil field. Historical research was conducted, and the approximate locations of former oil wells located at the site were determined. In the early 1920s, six oil wells were drilled in the MCH area and four were drilled in the Todd Cancer Institute (TCI) area. The recent investigation resulted in the identification of anomalies, characteristic of wells in the suspected locations of five of the ten oil wells (see Section 3.5, Hazards and Hazardous Materials, for additional details). Collapsible soils, including organic-rich peat deposits, have not been encountered during on-site subsurface exploration and have not been mapped in this area on a regional basis. For this reason, and because the proposed project site is directly over the oil field, the potential for future surface subsidence effects at the site is very low. Therefore, the proposed project would not result in an impact from subsidence and no further mitigation is required.

Contaminated Soil

As described in Section 3.5, evaluation of California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) records for the proposed project area revealed nine former oil well locations on the proposed project site. Activities associated with oil well drilling and oil production, including drilling mud pits, sumps, and pipelines, may be encountered in the

[37] California Stormwater Quality Association. 2003. *California Stormwater Best Management Practice Handbook*. Contact: California Stormwater Quality Association, P.O. Box 2105, Menlo Park, CA 94026.

vicinity of the former wells. Some of these facilities may be associated with soil contaminated with hydrocarbons, metals, or other potentially hazardous substances. Soil with field indications of potential contamination encountered during project earthwork will be tested and removed if found to be contaminated or otherwise unsuitable. This approach will apply also to soils, described above as unclassified fill, located in a former ravine that was historically filled using petroleum-containing soil and miscellaneous oil field and other debris (see Section 3.5).

3.4.5 Cumulative Impacts

The incremental impact of the proposed project, when added to the related past, present, or reasonably foreseeable, probable future projects listed in Section 2, Project Description, would not result in cumulative impacts related to geology and soils. Because the geology and soils impacts expected from the implementation of the proposed project do not affect lands outside the boundaries of the proposed project site, these impacts do not create any cumulative impacts on the environment outside of the proposed project boundaries.

3.4.6 Mitigation Measures

Measure Geology-1

Exposure of people or property to potentially adverse effects, including the risk of loss or injury, involving seismic ground shaking from the operation of the Miller Children's Hospital (MCH) pediatric inpatient tower, Phases I and II, and the central plant building, shall be minimized through conformance with California Geological Survey's Guidelines for Evaluating and Mitigating Seismic Hazards in California and all applicable City of Long Beach codes and regulations related to seismic activity. MCH shall ensure that the site-specific geotechnical investigations for the MCH pediatric inpatient tower, Phases I and II, and the central plant building are incorporated into proposed project plans and specifications. Prior to approval of final plans and specifications for the MCH pediatric inpatient tower, Phases I and II, and the central plant building, the Office of Statewide Health Planning and Development shall review and ensure that all recommendations of the site-specific geotechnical recommendations are incorporated into the final plans and specifications.

Measure Geology-2

Exposure of people or property to potentially adverse effects, including the risk of loss or injury, involving seismic ground shaking from the operation of the Miller Children's Hospital (MCH) pediatric outpatient building, MCH link building, Todd Cancer Institute (TCI) Phases I and II, and the parking structure, shall be minimized through conformance with California Geological Survey's Guidelines for Evaluating and Mitigating Seismic Hazards in California and all applicable City of Long Beach codes and regulations related to seismic activity. The Long Beach Memorial Medical Center (LBMMC) and MCH shall ensure that the site-specific geotechnical investigations for the MCH pediatric outpatient building, MCH link building, TCI Phases I and II, and the parking structure are incorporated into proposed project plans and specifications. Prior to approval of final plans and specifications for the MCH pediatric outpatient building, MCH link building, TCI Phases I and II, and the parking structure, the City of Long Beach Department of Public Works shall review and ensure that all recommendations of the site-specific geotechnical recommendations are incorporated into the final plans and specifications.

Measure Geology-3

Exposure of people or property to potentially adverse effects, including the risk of loss or injury, involving geologic hazards related to liquefaction from seismic ground shaking from the operation of the Miller Children's Hospital (MCH) pediatric inpatient tower, Phases I and II, and the central plant building, shall be minimized through conformance with all applicable State of California and City of Long Beach codes and regulations. MCH shall ensure that the site-specific geotechnical investigations for the MCH pediatric inpatient tower, Phases I and II, and the central plant building are incorporated into proposed project plans and specifications. Prior to approval of final plans and specifications for the MCH pediatric inpatient tower, Phases I and II, and the central plant building, the Office of Statewide Health Planning and Development shall review and ensure that all recommendations of the site-specific geotechnical recommendations are incorporated into the final plans and specifications.

Measure Geology-4

Exposure of people or property to potentially adverse effects, including the risk of loss or injury, involving geologic hazards related to liquefaction from seismic ground shaking from the operation of the Miller Children's Hospital (MCH) pediatric outpatient building, MCH link building, Todd Cancer Institute (TCI) Phases I and II, and the parking structure, shall be minimized through conformance with all applicable State of California and City of Long Beach codes and regulations. The Long Beach Memorial Medical Center (LBMMC) and MCH shall ensure that the site-specific geotechnical investigations for the MCH pediatric outpatient building, MCH link building, TCI Phases I and II, and the parking structure are incorporated into proposed project plans and specifications. Prior to approval of final plans and specifications for the MCH pediatric outpatient building, MCH link building, TCI Phases I and II, and the parking structure, the City of Long Beach Department of Public Works shall review and ensure that all recommendations of the site-specific geotechnical recommendations are incorporated into the final plans and specifications.

Measure Geology-5

The City of Long Beach Department of Planning and Building shall require the construction contractor to implement best management practices that are consistent with the National Pollution Discharge Elimination System (NPDES) Permit No. CAS 004003 to avoid soil erosion during construction of the Miller Children's Hospital (MCH) pediatric inpatient tower Phases I and II, and central plant building. Prior to approval of final plans and specifications, the Office of Statewide Health Planning and Development (OSHPD) shall ensure that the requirement to comply with NPDES Permit No. CAS 004003 is included in the specifications. The OSHPD Inspector of Record shall monitor construction to ensure compliance with NPDES Permit No. CAS 004003.

Measure Geology-6

The City of Long Beach Department of Planning and Building shall require the construction contractor to implement best management practices that are consistent with the National Pollution Discharge Elimination System (NPDES) Permit No. CAS 004003 to avoid soil erosion during construction of the Todd Cancer Institute (TCI) Phases I and II, Miller Children's Hospital (MCH) pediatric outpatient building and utility trench, MCH link building, roadway realignment, on-site parking areas (Lots N, P, Q, R, S, and T), and parking structure. Prior to approval of final plans and specifications, the City of Long Beach Department of Planning and Building shall ensure that the requirement to comply with NPDES Permit No. CAS 004003 is included in the specifications. The

City of Long Beach Department of Planning and Building shall monitor construction to ensure compliance with NPDES Permit No. CAS 004003.

3.4.7 Level of Significance after Mitigation

Implementation of mitigation measures Geology-1 through Geology-6 and adherence to the standards of the UBC would reduce impacts associated with seismic hazards to the maximum extent practicable and impacts related to geology and soils to below the level of significance.

3.5 HAZARDS AND HAZARDOUS MATERIALS

As a result of the analysis undertaken in the Initial Study for the Long Beach Memorial Medical Center Expansion (proposed project),[1] the City of Long Beach (City) Department of Planning and Building determined that the proposed project may result in environmental impacts related to hazards and hazardous materials. Therefore, this issue is being carried forward for detailed analysis in this Environmental Impact Report (EIR). This analysis was undertaken to identify opportunities to avoid, reduce, or otherwise mitigate potential significant impacts from hazards and hazardous materials and to identify potential alternatives.

The analysis of hazards and hazardous materials includes a description of the regulatory framework that guides the decision-making process, existing conditions of the proposed project area, thresholds for determining if the proposed project would result in significant impacts, anticipated impacts (direct, indirect, and cumulative), mitigation measures, and level of significance after mitigation.

The potential hazards and hazardous materials that could be associated with the proposed project site were evaluated in accordance with the protocol established by the American Society for Testing and Material (ASTM) Standard E 1527-00, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessments. Published and unpublished literature was also reviewed. The potential impacts from hazards and hazardous materials have been analyzed in accordance with the data compiled by Sapphos Environmental, Inc. and the technical reports prepared by SCS Engineers (Appendix F, *Health Risk Assessment and Environmental Summary Report*)[2] and Signal Geoscience (Appendix G, *Phase I Environmental Site Assessment*).[3]

3.5.1 Regulatory Framework

Federal

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA, also known as Superfund, outlines the potential liability related to the cleanup of hazardous substances, available defenses to such liability, appropriate inquiry into site status under Superfund, statutory definitions of hazardous substances and petroleum products, and the petroleum product exclusion under CERCLA. The proposed project would be subject to CERCLA for the cleanup of any hazardous substances.

[1] City of Long Beach, Department of Planning and Building. 20 August 2004. *Initial Study for the Long Beach Memorial Medical Center Expansion Project*. Prepared by: Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, CA 91105.

[2] SCS Engineers. May 2004. *Environmental Summary Report, Long Beach Memorial Medical Center Expansion Area, Long Beach, California*. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

[3] Signal Geoscience. 2001. *Phase I Environmental Site Assessment Report, 300 East Spring Street, Long Beach, California*. Contact: Signal Geoscience, 3125 South Maddock Street, Santa Ana, CA 92704.

Superfund Amendment and Reauthorization Act Title III (SARA)

SARA of 1986 is the Emergency Planning and Community Right-to-Know Act.[4] Facilities are required to report the following items on U.S. Environmental Protection Agency (EPA) Form R, the Toxic Chemical Release Inventory Reporting Form: facility identification, off-site locations to which toxic chemicals are transferred in wastes, chemical-specific information, and supplemental information.

Form R requires a facility to list the hazardous substances that are handled on site and to account for the total aggregate releases of listed toxic chemicals for the calendar year. Releases to the environment are to include emissions to the air, discharges to surface water, and on-site releases to land and underground injection wells. The proposed project would be subject to SARA for the use, storage, transport, disposal, or release of toxic chemicals.

Resource Conservation and Recovery Act (RCRA)

RCRA[5] was the first major federal act regulating the potential health and environmental problems associated with solid waste hazards and nonhazardous waste. It gave the U.S. EPA the authority to control hazardous waste from the cradle to the grave.

RCRA regulates the potential health and environmental problems associated with hazardous and nonhazardous solid waste. RCRA and the implementation regulations developed by the U.S. EPA provide the general framework for the national hazardous and nonhazardous waste management systems. This framework includes the determination of whether hazardous wastes are being generated, techniques for tracking wastes to eventual disposal, and the design and permitting of hazardous waste management facilities.

RCRA amendments enacted in 1986 began the process of eliminating land disposal as the principal hazardous waste disposal method. Hazardous waste regulations promulgated in 1991 address siting, design, construction, operation, monitoring, corrective action, and closure of disposal facilities. Additional regulations addressing solid waste issues are contained in Title 40, Code of Federal Regulations (CFR), Part 258. The proposed project would be subject to the requirements of RCRA related to the generation, storage, or disposal of hazardous and nonhazardous solid wastes.

State

Hazardous Waste Control Law of 1972

The Hazardous Waste Control Law of 1972 is the original hazardous waste control law in California. This law initiated programs that track hazardous waste generators and their hazardous waste streams and handling practices. The proposed project would be subject to requirements of this law related to the generation, storage, and disposal of hazardous wastes.

[4] Office of the Law Revision Counsel. 22 January 2002. 42 U.S. Code, Chapter 116 et seq.: "Emergency Planning and Community Right-To-Know Act." Available at: http://uscode.house.gov

[5] Office of the Law Revision Counsel. 22 January 2002. 42 U.S. Code, §§6901–6987: "Solid Waste Disposal Act, Resource Conservation and Recovery Act of 1986." Available at: http://uscode.house.gov

Titles 22, 23, and 27 of the California Code of Regulations

In California, Titles 22 and 23 of the California Code of Regulations (CCR) address hazardous materials and wastes. Title 22 defines, categorizes, and lists hazardous materials and wastes. Title 23 addresses public health and safety issues related to hazardous materials and wastes, and it specifies disposal options. Title 27 of the CCR addresses landfill closure standards and landfill-related public health and safety issues. The proposed project would be subject to requirements of this law related to the use, generation, storage, and disposal of hazardous wastes.

The Hazardous Materials Release Response Plans and Inventory Law of 1986

The Hazardous Materials Release Response Plans and Inventory Law of 1986 (California Health and Safety Code, Section 25500 et seq.) governs hazardous materials handling, reporting requirements, and local agency surveillance programs. The proposed project would be subject to requirements of this law related to maintaining hazardous material inventories, business plans, and emergency response plans.

Title 8 of the California Code of Regulations

The California Occupational Safety and Health Administration (Cal/OSHA) has established requirements to limit occupational exposure to lead. Construction, alteration and repair work, including demolition, is subject to Title 8, CCR, Section 1532.1 for lead, which outlines permissible exposure limits, exposure assessment requirements, methods of compliance, and necessary respiratory protection and protective clothing. Demolition work associated with construction of the proposed project will be subject to this law.

California Laws for Conservation of Petroleum and Gas

The California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) regulates the oil, natural gas, and geothermal industries throughout the State of California. DOGGR oversees both active and abandoned wells and maintains records on well locations. In addition, the state legislature provides funding to DOGGR for the proper abandonment of hazardous, idle, and orphaned oil and gas wells.[6] Oil wells located at the proposed project site are subject to DOGGR oversight.

Regional

Asbestos-Containing Materials

Title 40, CFR, Part 61.145, National Emission Standard for Asbestos, Standard for Demolition and Renovation; and the South Coast Air Quality Management District (SCAQMD) Rule 1403, Asbestos Emissions from Demolition/Renovation Activities, require the following:

- The facility must conduct a survey to inspect, identify, and quantify all friable and Class I and Class II nonfriable asbestos-containing materials (ACMs) prior to demolition or restoration.
- Proper notification must be submitted to SCAQMD.

[6] California Department of Conservation, Division of Oil, Gas and Geothermal Resources. October 2003. *California Laws for Conservation of Petroleum & Gas*. Article 4.2. Publication No. PRC01. Available at: ftp://ftp.consrv.ca.gov/pub/oil/laws/PRC01.pdf

- An on-site representative must be present during removal, disturbance, and handling of ACMs.
- ACMs must be removed in accordance with the required schedule and procedures and following the proper handling operations.
- ACMs must be disposed of following proper disposal methodology, including maintaining waste shipment records and using appropriate labeling.

Underground Storage Tanks

The Los Angeles Regional Water Quality Control Board (RWQCB) oversees the Underground Storage Tank (UST) Program for the Los Angeles regional area. Specific areas of concern within the Los Angeles RWQCB jurisdiction are the Los Angeles River Watershed, the San Gabriel River Watershed, and the Los Angeles/Ventura Coastal Area. Regulatory authority for USTs in the proposed project area is held by the Long Beach/Signal Hill Certified Unified Program Agency (CUPA). As part of the CUPA, the Long Beach Fire Department oversees tank monitoring, installation, and removal, and the Long Beach Department of Health and Human Services oversees site mitigation.

Contaminated Soil and Groundwater

Under California Water Code, Division 7, Section 13304, the Los Angeles RWQCB oversees investigation and mitigation of sites contaminated from USTs, wells, or other sources. Oversight by the Los Angeles RWQCB is not limited to specific pollutants or specific media but is focused on determining if an unauthorized release may result in pollution of regional water bodies. In addition, SCAQMD Rule 1166 sets control requirements for volatile organic compound (VOC) emissions from excavating, grading, handling, or treating contaminated soil and SCAQMD Rule 1150 requires implementation of an approved Excavation Management Plan for excavations of landfill material. Requirements include development and approval of a mitigation plan, notification to SCAQMD, monitoring, and handling requirements for the contaminated soil.

Local

Medical Waste

The City of Long Beach Bureau of Environmental Health manages the enforcement and compliance program for medical waste generation facilities. As defined in the Medical Waste Management Act, registration and/or permitting by the local enforcement agency (LEA) is required for medical waste generation facilities that perform on-site treatment of medical waste, produce greater than 200 pounds per month of medical waste, or store medical wastes from multiple small generators prior to disposal using a registered hazardous waste transporter. Qualifying medical waste generation facilities may be granted a limited quantity hauling exemption.[7]

Handling, Storage, and Transport of Hazardous Materials

Regulatory authority hazardous materials management in the City of Long Beach is held by a CUPA. As part of the CUPA, the Long Beach Department of Health and Human Services regulates storage and disposal of hazardous materials through enforcement and education programs. The Long Beach Department of Health and Human Services manages the Hazardous Waste Generator Inspection

[7] City of Long Beach, Bureau of Environmental Health. 2004a. Accessed August 2004. "Medical Waste Generators." Available at: http://www.longbeach.gov/health/organization/eh/hazmat/med_waste.asp

Program and California Accidental Risk Prevention (CalARP) Program, which requires facilities with greater than threshold levels of hazardous materials to file a hazardous materials inventory that includes storage locations and emergency contact information for the facility. The Long Beach Fire Department oversees the Hazardous Materials Inspection/Business Plan Program to monitor compliance with hazardous materials storage requirements. The Hazardous Materials Division also works with the Long Beach Fire Department to respond to chemical emergencies to ensure proper containment and clean up.[8] Regulation 29, CFR, Section 1910.120, Hazardous Waste Operations and Emergency Response, under the authority of the federal Occupational Safety and Health Administration (OSHA) and Cal/OSHA, outlines methods and requirements for workers who handle or are potentially exposed to hazardous wastes and materials.

Airport Land Use Plan

Development in the area of an airport must comply with federal, state, and local regulations designed to protect public safety. The Federal Aviation Administration (FAA), under Title 14, CFR, Chapter 1, sets height restrictions for developments near airports to avoid any potential interference with the navigable airspace. The Los Angeles County Regional Planning Commission also serves as the Airport Land Use Commission (ALUC) to evaluate public safety and noise issues related to airports within the County of Los Angeles. The ALUC adopted the Los Angeles County Comprehensive Airport Land Use Plan (ALUP) to guide development within the vicinity of County of Los Angeles airports in order to ensure land use compatibility. Safety policies within the plan include establishment of approach surfaces and runway protection zones patterned after guidance from the FAA Federal Aviation Regulations (FAR) Part 77, and restrictions in the vicinity of airports on flammable or toxic materials storage, lights, electrical interferences, structure heights, and uses that could interfere with visibility (e.g., attraction of birds, smoke generation, etc.). The Long Beach Airport is listed in the County of Los Angeles ALUP; however, no specific Airport Master Plan has been adopted to guide development in and around the Long Beach Airport.

3.5.2 Existing Conditions

Routine Transport, Use, or Disposal of Hazardous Materials

The medical uses of buildings, within and adjacent to the existing Long Beach Memorial Medical Center campus (Campus), produce hazardous, biomedical, and radiological wastes, which are disposed of in off-site disposal facilities. Medical wastes include, but are not be limited to, soiled or blood-soaked bandages, culture dishes and other glassware, discarded surgical gloves, discarded surgical instruments (e.g., scalpels and needles), cultures, stocks, swabs, removed body organs (e.g., tonsils, appendices, limbs, etc.), and lancets.

Release of Hazardous Materials into the Environment

Buildings located within the proposed project area that were constructed prior to 1979 have the potential for ACMs and lead-based paints (LBPs).

Site investigations in the expansion areas have identified the presence of former oil wells, a former ravine-fill landfill, and hydrocarbon contaminated soil (Figure 3.5.2-1, *Abandoned Pipelines, Contours of Former Ravine, and Geotechnical Borings*). Site investigation reports have been completed for both

[8] City of Long Beach, Bureau of Environmental Health. 2004b. Accessed August 2004. "Hazardous Materials Division Information Guide." Available at: http://www.longbeach.gov/civica/filebank/blobdload.asp?BlobID=1989

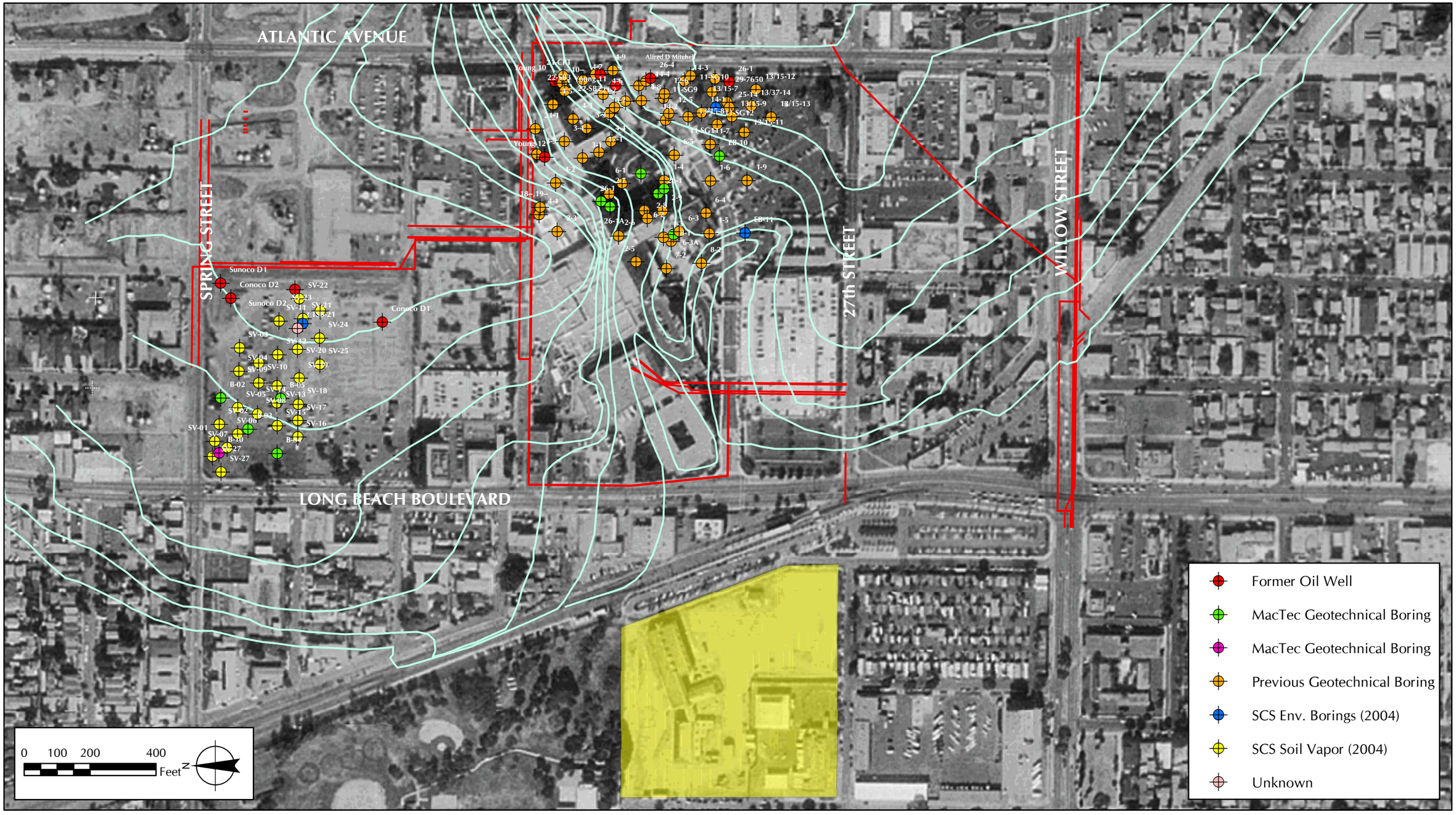

FIGURE 3.5.2-1
Abandoned Pipelines, Contours of Former Ravine, and Geotechnical Borings

the Miller Children's Hospital (MCH) and Todd Cancer Institute (TCI) (Appendix F). The MCH pediatric inpatient tower Phase I and II, MCH pediatric outpatient building, MCH link building, and TCI Phases I and II are located above or near former oil wells, as identified by the DOGGR.[9]

Todd Cancer Institute

From the mid to late 1920s, four oil wells were drilled in the TCI area. Two of these wells were improperly abandoned in the early 1900s. The other two wells were abandoned following acceptable methods in 1958 and 1972. Pipelines and other associated oil production facilities may still be located below ground surface. Geophysical surveys were conducted by SCS Engineers to locate the abandoned oil wells in July and October 2004 in the TCI area. The investigations resulted in the identification of anomalies characteristic of wells in the suspected locations of two of the four oil wells.

Soil and soil vapor investigation of the TCI site indicated detectable total petroleum hydrocarbons (TPH) in samples from only one of the five soil boring locations, thus confirming the presence of diesel or heavier hydrocarbon contamination. The maximum TPH concentration detected was 1,300 milligrams per kilogram (mg/kg) of hydrocarbons in the C23 to C32 range in the sample from the 5-foot depth. The location of the boring where TPH was detected is approximately 175 feet from the proposed footprint of the Phase I TCI building and approximately 50 feet from the footprint of the Phase II TCI building. The sampling analysis also resulted in limited detections of VOCs and metals. Metals, with the exception of arsenic and selenium, were detected in the range of background concentrations.[10] All metals, with the exception of arsenic, were present at concentrations below the U.S. EPA's residential or industrial Preliminary Remediation Goals (PRG).[11] The maximum concentration of arsenic detected was 23 mg/kg in the 20-foot depth of one soil boring. To date, the soil sample tests in the TCI area have not revealed hazardous waste to a degree of contamination that would be subject to regulation under RCRA.

Miller Children's Hospital

From the early to late 1920s, six oil wells were drilled in the MCH area. Geophysical surveys were conducted by SCS Engineers to locate the abandoned oil wells in March 2004. The investigations resulted in the identification of anomalies characteristic of wells in the suspected locations of three of the six oil wells. Investigation in the area proposed for MCH expansion, undertaken by SCS Engineers in March 2004, indicated that the site includes a former ravine that was historically used as landfill, and which was filled using petroleum-containing soil and miscellaneous oil field wastes and other debris, including wood, concrete, and asphalt. The former ravine fill area is listed as an inactive landfill site on the California Integrated Waste Management Board's Solid Waste Information System (SWIS). Soil samples were collected and vapor monitoring was conducted as part of the investigation. Soil samples were analyzed for TPH, VOCs, trace metals, polychlorinated biphenyls (PCBs), and chlorinated pesticides. Soil-sampling results indicated the presence of petroleum hydrocarbons, benzene, and petroleum-related VOCs throughout the former ravine area. The maximum detected concentration of TPH as diesel and heavy hydrocarbons was 49,700 mg/kg from a boring taken near

[9] Signal Geoscience. 2001. *Phase I Environmental Site Assessment Report, 300 East Spring Street, Long Beach, California*. Contact: Signal Geoscience, 3125 South Maddock Street, Santa Ana, CA 92704.

[10] G.R. Bradford, et al. 1996. *Background Concentrations of Trace and Major Elements in California Soils*. Contact: University of California at Berkeley, Division of Agriculture and Natural Resources, Kearney Foundation of Soil Science, 140 Giannini Hall, #3100, Berkeley, CA 94720.

[11] U.S. Environmental Protection Agency. 27 October 2004. "Preliminary Remediation Goals." Available at: http://www.epa.gov/region09/waste/sfund/prg/index.htm

the corner of Atlantic Avenue and Columbia Street. Metals, such as lead, arsenic, mercury, and zinc, were also detected at levels greater than would be expected in background soils. Both arsenic and lead were detected at levels greater than residential PRGs. Arsenic was detected at levels greater than the industrial PRG[12] at a maximum concentration of 26.8 mg/kg. The soil sample tests in the MCH area to date have not revealed hazardous waste of a degree of contamination that would be subject to regulation under RCRA.

Vapor monitoring probes were installed in three of the boring locations in the MCH area to analyze for methane. One boring measured detectable concentrations of methane at 0.6 percent by volume. The source of the methane was not identified. Soil characterization indicated the presence of construction debris (e.g., concrete, wood, glass, metal, and broken brick) in the former ravine area at varying depths below ground surface.[13]

Previous site investigations have revealed visual evidence of oil contamination in the perched zone of groundwater.[14] Deeper groundwater monitoring has shown detectable concentrations of petroleum in samples taken from monitoring wells in the area near the MCH.

Existing or Proposed Schools

One elementary school is located within 0.25 mile of the proposed project. Jackie Robinson Elementary is located at 2750 Pine Avenue in Long Beach, approximately 0.21 miles west of the location proposed for the new parking structure at the southern edge of the proposed project on 27th Street.

Hazardous Materials Sites Pursuant to Government Code Section 65962.5

A portion of the proposed project is located on land formerly occupied by USTs, as indicated on the RWQCB Leaking Underground Storage Tank (LUST) listing.[15] Although records of tank removals were not available, results of the site geophysical survey did not indicate the presence of any remaining USTs.[16]

In addition, former oil wells, petroleum hydrocarbon–contaminated soil, and a former ravine filled with oil production wastes and construction debris exist at the proposed project site.

Proposed Project Located Near Airport or Private Airstrip

The proposed project is located approximately 1.8 miles west of the Long Beach Airport.

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[12] U.S. Environmental Protection Agency. 27 October 2004. "Preliminary Remediation Goals." Available at: http://www.epa.gov/region09/waste/sfund/prg/index.htm

[13] SCS Engineers. May 2004. *Environmental Summary Report, Long Beach Memorial Medical Center Expansion Area, Long Beach, California*. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

[14] Law/Crandall, Inc. 1991. *Report of Phase I and Limited Phase II Site Assessment Proposed Children's Medical Office Building Long Beach, California for the Long Beach Memorial Medical Center*. Contact: Leroy Crandall and Associates, 1700 South Main Street, Santa Monica, CA 90401.

[15] Signal Geoscience. 2001. *Phase I Environmental Site Assessment Report, 300 East Spring Street, Long Beach, California*. Contact: Signal Geoscience, 3125 South Maddock Street, Santa Ana, CA 92704.

[16] SCS Engineers. May 2004. *Environmental Summary Report, Long Beach Memorial Medical Center Expansion Area, Long Beach, California*. Prepared by: SCS Engineers, 3711 Long Beach, Boulevard Long Beach, CA 90807.

Emergency Response Plan or Emergency Evacuation Plan

The Campus is served by a network of public roadways and private driveways. Columbia Street is the primary route of travel for emergency response vehicles (Figure 3.5.2-2, *Emergency Vehicular Access*). In addition, there are six primary entrances that are used by the medical staff, employees, patients, and visitors to access the Long Beach Memorial Medical Center (LBMMC) and MCH from the surrounding parking facilities (Figure 3.5.2-3, *Pedestrian Access to Hospitals*).

Wildland Fires

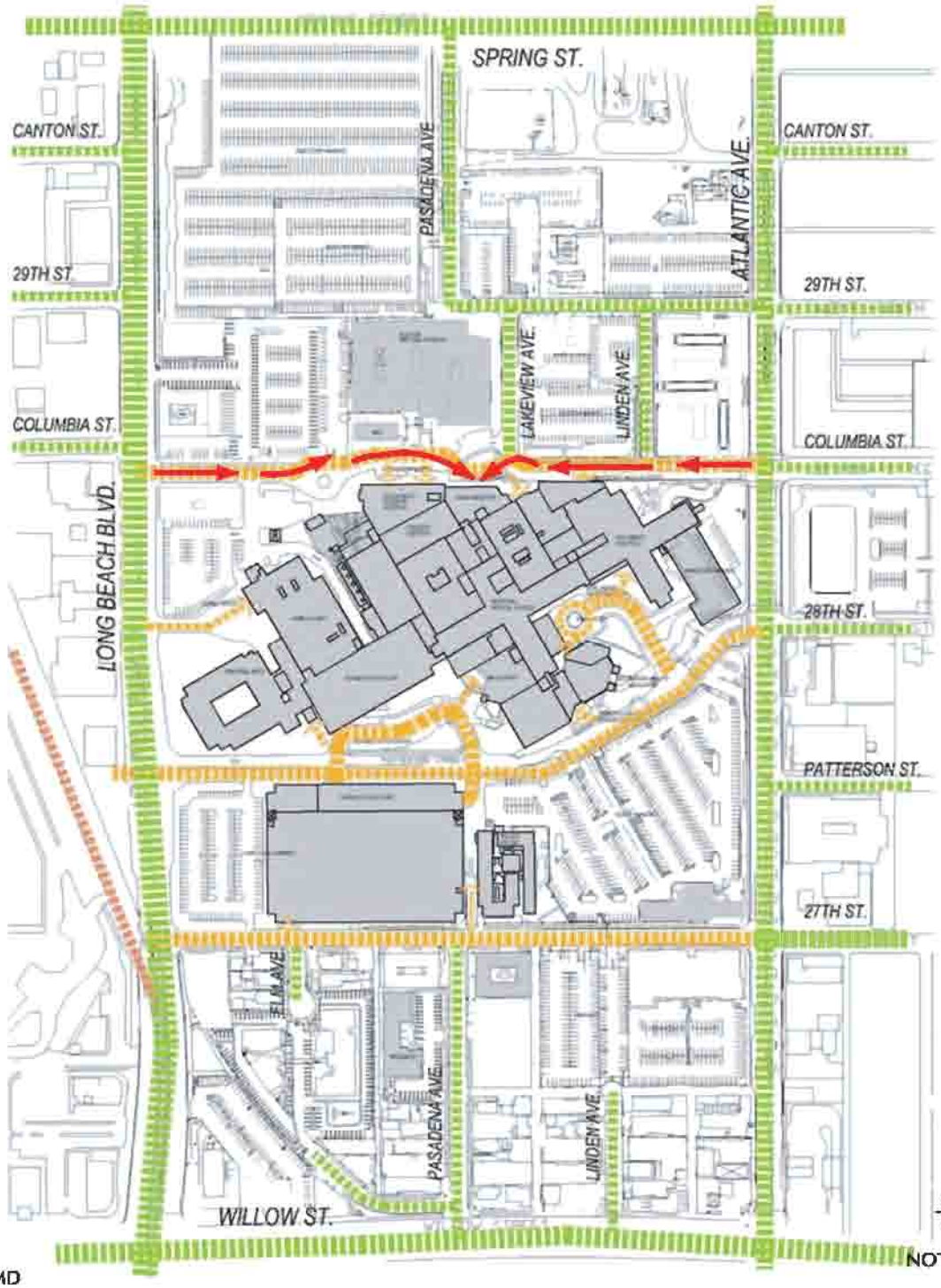
The proposed project is located entirely in a developed urban area. Therefore, the proposed project would not expose people or property to wildland fire hazards.

3.5.3 Significance Thresholds

The potential for the proposed project to result in impacts related to hazards and hazardous materials was analyzed in relation to the questions contained in Appendix G of the State of California Environmental Quality Act (CEQA) Guidelines.

A project would normally be considered to have a significant impact related to hazards and hazardous materials when the potential for any one of the following eight thresholds occurs:

- Creates a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials
- Creates a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment
- Emits hazardous emissions or handles hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school
- Is located on a site that is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5, and as a result, would create a significant hazard to the public or the environment
- Is located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, and results in a safety hazard for people residing or working in the project area
- Is within the vicinity of a private airstrip and would result in a safety hazard for people residing or working in the project area
- Impairs implementation of, or physically interferes with, an adopted emergency response plan or emergency evacuation plan
- Exposes people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands

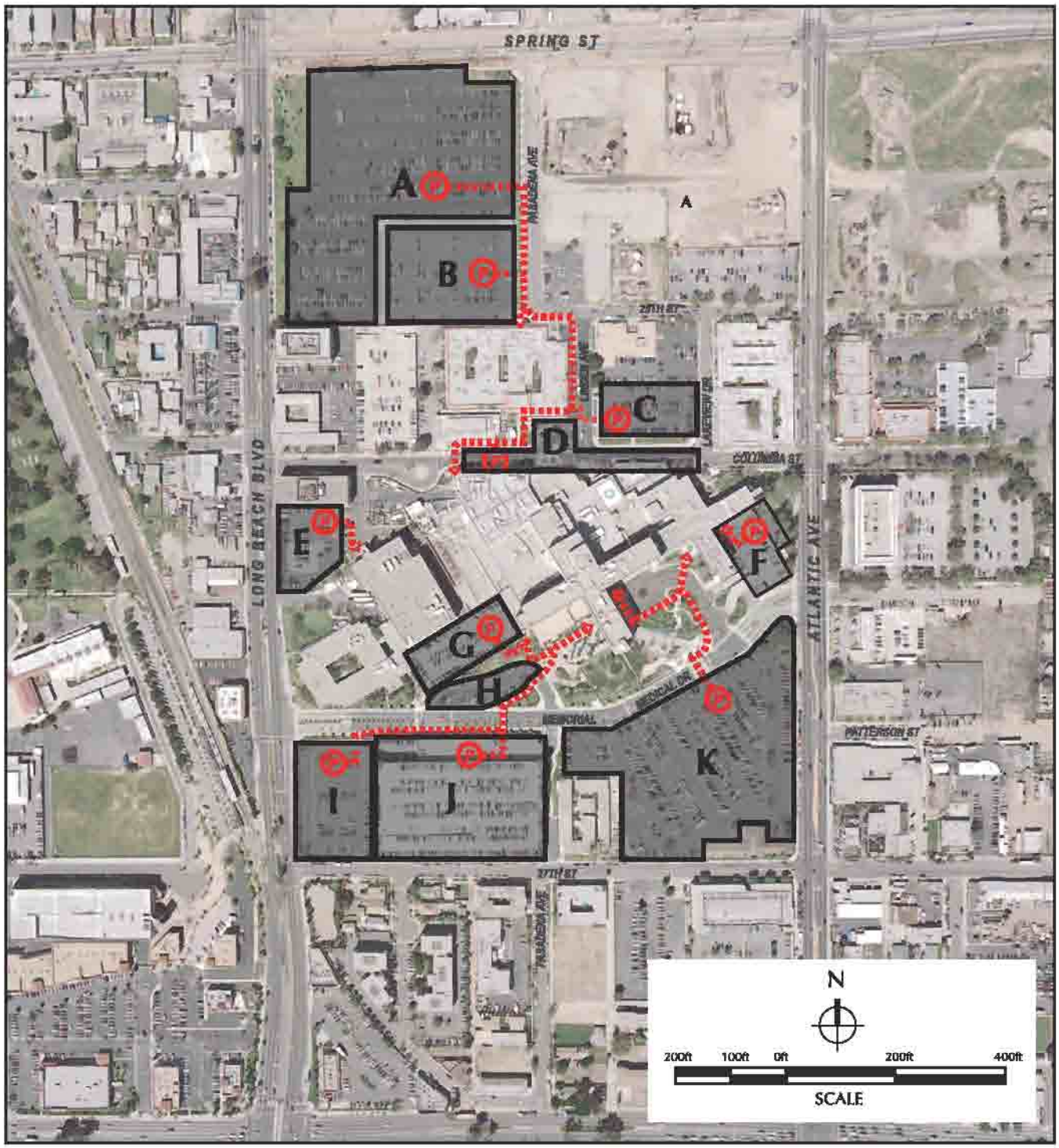


SOURCE: KMD

LEGEND

- General Traffic
- Campus Traffic
- Emergency Response Vehicles Route of Travel

FIGURE 3.5.2-2
Emergency Vehicular Access



LEGEND

- Accessible Pedestrian Path from Parking Lot to Building Entry
- Parking
- A Staff/Employee
- B Patient/Visitor
- C Patient
- D Doctors
- E Staff/Employee
- F Patient
- G Doctor
- H Patient/Visitor
- I Staff/Employee
- J Staff/Employee and Patient/Visitor
- K Patient/Visitor

FIGURE 3.5.2-3
Pedestrian Access to Hospitals

3.5.4 Impact Analysis

Routine Transport, Use, or Disposal of Hazardous Materials

The proposed project would involve the excavation and disposal of hydrocarbon-contaminated soils and generation of possible hazardous building materials (e.g., ACMs and LBPs) from demolition activities. An asbestos- and lead-sampling survey would be conducted prior to demolition activities at the site, and the material resulting from demolition would be disposed of accordingly. In addition, the excavation of contaminated soils associated with both the MCH and the TCI projects would result in the off-site disposal of contaminated soils and possibly groundwater impacted by petroleum hydrocarbons.

The proposed project would create a hazard that could affect the public or the environment through the routine transport, use, or disposal of hazardous materials generated during the construction phase of the proposed project. Potential ACMs and LBPs, previously identified hydrocarbon-contaminated soils, and potentially contaminated groundwater would have to be properly removed or abated by licensed contractors and properly disposed. Soils containing petroleum hydrocarbons will be excavated from the footprint of the buildings and possibly from areas of roadway construction and transported off site for disposal at the appropriate facilities. In addition, fuels and lubricants used for construction vehicles could impact the site due to leakage.

Medical wastes (i.e., biomedical and radiological waste) produced by hospital facilities are subject to both federal and state waste-hauling regulations; the use and disposal of these materials pose significant impacts on the environment. Therefore, implementation of the proposed project has the potential to result in significant impacts to the public or the environment related to the transport, use, or disposal of hazardous materials, and will require consideration of appropriate mitigation measures.

Release of Hazardous Materials into the Environment

Construction of the proposed project would require the demolition of the WIC Building and parking structure and may result in the accidental release of ACMs or LBPs into the environment. Construction equipment–related fuels and lubricants also have the potential for accidental release into the environment if proper care is not utilized. Soils containing petroleum hydrocarbons and potentially contaminated groundwater may be encountered during excavation and building foundation construction and will require proper treatment and disposal. In addition, during operation of the proposed project, hazardous materials may be disposed off site on a frequent basis during normal operations of both the MCH and TCI facilities.

The proposed project would create a hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. The removal of ACMs and LBPs at the proposed project site creates the potential for a release of asbestos and lead into the environment. In addition, fuels and lubricants used for construction vehicles may impact the site due to leakage, spillage, or accidents. Therefore, implementation of the proposed project has the potential to result in significant impacts to the environment related to the accidental release of ACMs and LBPs, and will require the consideration of mitigation measures.

Summary of Health Risk Assessment for Miller Children's Hospital and Todd Cancer Institute

A human Health Risk Assessment (HRA) was prepared to evaluate the potential current or baseline (i.e., current conditions) risks to human health prior to the expansion of MCH and construction of TCI, as well as risks during and after construction activities at MCH and TCI (Appendix F). The primary objective of the HRA was to provide upper-bound, reasonable maximum exposure (RME), health-conservative estimates of the potential human health effects associated with exposures to chemicals detected in soil at the proposed project site. Analytical results from chemical analyses of soil and groundwater samples collected during investigations at the proposed project site were used to evaluate risks to human receptors that have the potential to be exposed to contaminants at the proposed project site. Based on the evaluation of analytical data collected at the proposed project site, chemicals of potential concern (COPCs) were identified and further evaluated in the HRA. COPCs included VOCs, inorganic substances (metals), and petroleum hydrocarbons.

Potential receptors identified and evaluated in a current land use scenario include the following:

- Off-site populations
    - Residents (adults and children)
    - Hospital patients (adults and children)
    - Commercial, industrial, and hospital workers

The following populations were considered to be potentially exposed under a project land use scenario, during and after construction of the MCH expansion facilities:

- On-site populations
    - Construction workers
    - Hospital patients (adults and children)
    - Commercial, industrial, and hospital workers
- Off-site populations
    - Residents (adults and children)
    - Hospital patients (adults and children)
    - Commercial, industrial, and hospital workers

In addition to potential exposure via inhalation of VOCs, the measures to protect the health of workers involved in grading, excavation, trenching, or other earthwork may be appropriate if petroleum-containing soil is encountered during construction of the proposed project.

On-site hospital patients and commercial, industrial, and hospital workers were considered to be located in either the MCH inpatient tower or the TCI facility, whereas off-site hospital patients and commercial, industrial, and hospital workers were considered to be located in the LBMMC main building, which is located approximately 800 feet from the center of the MCH inpatient tower Phase I and 1,160 feet from the center of the proposed TCI facility.

For risk assessment purposes, chemicals are separated into two categories of toxic effects, carcinogenic and noncarcinogenic. For chemicals exhibiting noncarcinogenic effects, a hazard index (HI) is calculated by summing the ratios of the exposure levels (chronic daily intakes or CDIs) and the safe long-term dose levels (reference doses or RfDs). An HI less than 1 indicates that there is not likely to be any adverse health effects from the exposure, whereas an HI greater than 1 indicates that there is a potential health hazard associated with exposure to COPCs.

For chemicals exhibiting carcinogenic effects, a cancer slope factor (CSF) is used to determine how potent the chemical is in causing cancer. The CSF is an expression of the cancer-causing potential of a particular contaminant; the larger the CSF, the greater the potential for that contaminant to cause cancer. To determine the theoretical excess lifetime cancer risk (ELCR) for a particular chemical contaminant, CSFs are multiplied by the CDI of the contaminant under consideration. The total lifetime cancer risk for a site is determined by summing all the individualized cancer risks for the various COPCs.

Based on the risk evaluation, the total HI and ELCR for all current scenario and project scenario potential receptors evaluated at the MCH and TCI sites were at or below the thresholds established for the proposed project (HI = 1; ELCR = 1×10^{-5}). However, measures to protect the health of workers involved in grading, excavation, trenching, or other earthwork may be appropriate if petroleum-containing soil is encountered during construction of the proposed project.

The proposed project may result in significant impacts to exposed individuals or the environment if exposure to COPCs in soil occurs; therefore, consideration of mitigation measures may be appropriate.

Sapphos Environmental, Inc. met with the Department of Toxic Substances Control (DTSC) on January 11, 2005, to present the proposed project and HRA (Appendix F). As a result of the meeting, LBMMC agreed to enter into a Voluntary Clean-up Agreement (VCA) with DTSC, which would serve as the mechanism for DTSC to complete the site characterization study and HRA. LBMMC will work directly with DTSC to finalize the mitigation measures specified in the EIR to ensure their adequacy in remediating health risks to below the level of significance.

Existing or Proposed Schools

Off-site transport and disposal routes for biomedical, radiological, hazardous, and nonhazardous wastes may include the route along Long Beach Boulevard from LBMMC to Interstate 405, which is within 0.25 miles of the school. No other school sites are located within 0.25 miles of that route. The proposed project is expected to result in impacts from hazardous emissions or the handling of hazardous or acutely hazardous materials, substances, or waste, to existing or proposed schools located within 0.25 mile of the proposed project site. One existing school, Jackie Robinson Elementary, is located at 2750 Pine Avenue in Long Beach, within 0.25 miles west of the proposed project site and the likely transport path along Long Beach Boulevard to Interstate 405. Therefore, implementation of the proposed project has the potential to result in significant impacts to the environment related to hazardous emissions or the handling of hazardous or acutely hazardous materials, substances, or waste to existing or proposed schools and will require the consideration of mitigation measures.

Hazardous Waste Sites

The proposed project would result in significant impacts to the public or the environment due to its proposed location on a prior oil field–related disposal site. The proposed project is located in an area where soils containing petroleum hydrocarbons from oil field operations have been identified. The existence of abandoned and improperly abandoned oil wells, and the existence of petroleum hydrocarbon–contaminated soils, water, and buried construction debris have the potential to expose the public or the environment to risks related to potential release of hazards and hazardous materials.

According to DOGGR, all oil wells must be identified and properly abandoned prior to site redevelopment. Several former oil wells at the MCH site could not be located using geophysical survey methods. The two unidentified wells at the TCI site were listed as being improperly abandoned in 1927. These wells will need to be located and abandoned prior to developing the proposed project site to avoid potential hazards. Improperly abandoned oil wells can allow for vertical migration of methane, hydrogen sulfide, and other petroleum-related compounds. If structures are constructed over these structures, gases may accumulate in underground areas (e.g., basements) or inside buildings. Methane and other petroleum-related compounds are flammable, and without proper ventilation, risk of fire or explosion could exist. Incorporation of appropriate mitigation measures during excavation of soils associated with the proposed project would be necessary to avoid hazards to the public or the environment.

Proposed Project Located Near Airport or Private Airstrip

The proposed project is located within 2 miles of an existing airport. However, as indicated by the County of Los Angeles ALUP, the proposed project site is not located in a runway protection zone. In addition, the proposed project is not located in the flight path for the airport.

Guidance included in the County of Los Angeles ALUP and listed in FAR Section 77.13, Part 77, indicates that notification to the FAA administrator is required when construction or alteration of any structure or the use of construction equipment is greater than 200 feet in height, within 5 miles of an airport, or greater in height than an imaginary surface extending proportionally upward and outward from the end of a runway. The proposed project involves the construction of the combined Phase I and Phase II MCH pediatric inpatient tower, with the highest point being approximately 148 feet above grade. In addition, construction activities for the proposed project may involve the use of tall cranes associated with building construction. FAR Section 77.15, Part 77, also states that notification to the FAA administrator is not required for construction where:

> Any object that would be shielded by existing structures of a permanent of substantial character or by natural terrain or topographic features of equal or greater height, and would be located in a congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation.

Other tall buildings exist in the immediate area of the proposed project. In addition, elevation gains for Signal Hill rise toward the west of the proposed project site and continue to a peak elevation of greater than 350 feet within 1.5 miles southwest of the site. Adjacent buildings within the existing hospital area reach seven stories high. Across Atlantic Avenue, between Spring Street and Willow Street, existing buildings are up to five stories high. According to the Airport Bureau at the Long Beach Airport, proposed buildings located at the Campus will not interfere with the flight path due to the

distance from the airport and the shielding provided by Signal Hill and nearby structures.[17] In addition, buildings or structures less than 200 feet high, located as far away from the airport as the Campus, will not require notification to the FAA.[18] Therefore, building heights at the proposed project do not have the potential for significant impact to airport safety and do not require implementation of mitigation measures.

Emergency Response Plan or Emergency Evacuation Plan

The proposed project would result in significant impacts to the emergency response plan or emergency evacuation plan. Construction, demolition, and roadway realignment in the area of the MCH expansion will eliminate a short-term emergency water supply, affect existing evacuation routes for personnel from the southern and eastern wings of the current MCH facility, and temporarily affect emergency response vehicle routing as well as the evacuation routes from the main hospital facility and MCH. Therefore, mitigation measures will be required to address these impacts.

Wildland Fires

The proposed project would not be expected to expose people or structures to a significant risk of loss, injury, or death involving wildland fires. There are no wildlands that would be subject to fire on or near the proposed project site. Therefore, the proposed project would not be expected to result in significant impacts related to the exposure of people or property to risks from wildland fires, and the consideration of mitigation measures is not required.

The proposed project includes the demolition of the parking structure located adjacent to the MCH facility. Currently, a short-term emergency water supply is located in this parking structure. The construction of the MCH expansion facility would also affect existing evacuation routes for personnel from the southern and eastern wings of the current MCH facility.

In addition, the roadway realignment associated with the proposed project would temporarily affect emergency response vehicle routing and the evacuation routes from the main hospital facility and MCH.

3.5.5 Cumulative Impacts

The incremental impact of the proposed project, when added to the related past, present, or reasonably foreseeable, probable future projects listed in Section 2, Project Description, would not result in cumulative impacts related to hazards and hazardous materials. Because the hazards and hazardous materials impacts expected from the implementation of the proposed project do not affect lands outside the boundaries of the proposed project site, these impacts do not create any cumulative impacts on the environment outside of the proposed project boundaries.

[17] Christine Edwards, *Personal Communication*, 4 November 2004. Long Beach Airport Special Projects, 4100 Donald Douglas Drive, Long Beach, CA 90808.

[18] Government Printing Office. 1 January 2004. Code of Federal Regulation, Title 14, Part 77.13: "Construction or Alteration Requiring Notice." Available at: http://www.faa.gov/regulations/index.cfm

3.5.6 Mitigation Measures

Measure Hazards-1

To avoid exposure to asbestos-containing materials (ACMs) and lead-based paints (LBPs) during demolition, construction, and remediation activities, the City of Long Beach and the Office of Statewide Health Planning and Development shall require that all such materials and wastes be identified and an Operations and Maintenance (O&M) Plan developed prior to the issuance of demolition permits for each structure constructed prior to 1979. The O&M Plan shall ensure compliance with all applicable federal, state, and local requirements and specify all work to be done, including lead and asbestos surveys of structures to be demolished, proper handling and storage of lubricants and fuels for construction equipment, and methods for remediation of ACMs and LBPs, if necessary. The O&M Plan must be submitted to the City of Long Beach Department of Health for review and approval prior to initiation of construction and demolition activities for the Miller Children's Hospital pediatric inpatient tower and central plant building, and the construction of parking lots requiring the demolition of pre-1979 constructed buildings. The O&M Plan shall, as appropriate and necessary, conform to the requirements of the Los Angeles County Department of Health Services (Local Enforcement Agency for landfills), South Coast Air Quality Management District, the Los Angeles Regional Water Quality Control Board, and the Department of Toxic Substances Control. Compliance with the O&M Plan shall be monitored by the City of Long Beach Department of Planning and Building throughout construction and demolition.

Measure Hazards-2

To reduce the potential for exposure of people or property to petroleum hydrocarbon–contaminated soils and water, the Office of Statewide Health Planning and Development (OSHPD) shall require that petroleum hydrocarbon–contaminated soils and water be tested, treated, and disposed of as necessary under the oversight of the Department of Toxic Substances Control (DTSC). The OSHPD shall review plans and specifications for those elements of the proposed project to be constructed over unclassified fill: Miller Children's Hospital (MCH) pediatric inpatient tower Phase I, central plant building, and utility trench. The OSHPD shall ensure that the proposed project plans and specifications disclose the potential to encounter petroleum hydrocarbon–contaminated soils and water, and require the construction contractor to remove petroleum hydrocarbon–contaminated soils and water within the construction zone, in accordance with all applicable federal, state, and local statutes and regulations and consistent with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and DTSC.

Measure Hazards-3

To reduce the potential for exposure of people or property to petroleum hydrocarbon–contaminated soils and water, the City of Long Beach shall require that petroleum hydrocarbon–contaminated soils and water be tested, treated, and disposed of as necessary under the oversight of the Department of Toxic Substances Control (DTSC). The City of Long Beach shall review plans and specifications for those elements of the proposed project to be constructed over unclassified fill: Miller Children's Hospital (MCH) pediatric outpatient building, MCH link building, and the Todd Cancer Institute Phases I and II. The City of Long Beach shall ensure that the proposed project plans and specifications disclose the potential to encounter petroleum hydrocarbon–contaminated soils and water, and require the construction contractor to remove petroleum hydrocarbon–contaminated soils and water within the construction zone, in accordance with all applicable federal, state, and local statutes and

regulations and consistent with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and DTSC.

Measure Hazards-4

Oil wells underlying the Miller Children's Hospital (MCH) pediatric inpatient tower Phase I, central plant building, and utility trench shall be identified by the remediation contractor and properly abandoned to the current standards of the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR). The project applicant shall ensure that coordination with DOGGR and proper remediation be incorporated into the construction plans, prior to final approval of plans for the MCH pediatric inpatient building Phase I, central plant building, and utility trench. If the oil wells cannot be identified through site survey by a licensed surveyor, excavation shall be undertaken to locate the wells under the oversight of the DOGGR and/or the Office of Statewide Health Planning and Development. If the abandoned oil wells are determined to be leaking, remediation shall be conducted to seal all leaks or venting systems shall be required to transmit gas safely away from the proposed project site, in accordance with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

Measure Hazards-5

Oil wells underlying the Miller Children's Hospital (MCH) pediatric outpatient building, MCH link building, and Todd Cancer Institute Phases I and II shall be identified by the remediation contractor and properly abandoned to the current standards of the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR). The project applicant shall ensure that coordination with DOGGR and proper remediation be incorporated into the construction plans, prior to final approval of plans for the MCH pediatric outpatient building, MCH link building, and Todd Cancer Institute Phases I and II. If the oil wells cannot be identified through site survey by a licensed surveyor, excavation shall be undertaken to locate the wells under the oversight of DOGGR and/or the City of Long Beach. If the abandoned oil wells are determined to be leaking, remediation shall be conducted to seal all leaks or venting systems shall be required to transmit gas safely away from the proposed project site, in accordance with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

Measure Hazards-6

To mitigate potential accumulation of methane, hydrogen sulfide, or other petroleum-related gases into underground areas (i.e., basements) or inside buildings, the Office of Statewide Health Planning and Development (OSHPD) shall require the installation of vapor barriers (i.e., high-density polyethylene membrane liners) and passive venting systems in the foundations of the Miller Children's Hospital pediatric inpatient tower and central plant building, if determined to be required by the Health Risk Assessment. Prior to the issuance of building permits for the specified buildings, the OSHPD shall review the plans and specifications to ensure that the appropriate vapor barriers or passive venting systems have been incorporated into the design and are consistent with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

Measure Hazards-7

To mitigate potential accumulation of methane, hydrogen sulfide, or other petroleum-related gases into underground areas (i.e., basements) or inside buildings, the City of Long Beach shall require the installation of vapor barriers (i.e., high-density polyethylene membrane liners) and passive venting systems in the foundations of the Miller Children's Hospital (MCH) pediatric outpatient building and the Todd Cancer Institute Phases I and II, if determined to be required by the Health Risk Assessment. Prior to the issuance of building permits for the specified buildings, the City of Long Beach shall review the plans and specifications to ensure that the appropriate vapor barriers or passive venting systems have been incorporated into the design and are consistent with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

Measure Hazards-8

Prior to the issuance of grading permits for the Miller Children's Hospital pediatric inpatient tower, central plant building, and utility trench, the Office of Statewide Health Planning and Development shall review the grading plans to ensure that there is a note requiring the construction contractor to stop work and notify the Certified Unified Program Agency of the unanticipated encounter of underground storage tanks (USTs) during grading activities. The UST shall be remediated in accordance with County of Los Angeles guidelines and consistent with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

Measure Hazards-9

Prior to the issuance of grading permits for the Miller Children's Hospital (MCH) pediatric outpatient building, MCH link building, and Todd Cancer Institute Phases I and II, the City of Long Beach shall review the grading plans to ensure that there is a note requiring the construction contractor to stop work and notify the Certified Unified Program Agency of the unanticipated encounter of underground storage tanks (USTs) during grading activities. The UST shall be remediated in accordance with County of Los Angeles guidelines and consistent with specifications of the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

Measure Hazards-10

To avoid exposure to asbestos-containing materials, lead-based paints, petroleum hydrocarbon–contaminated soils, biomedical waste, and radiological waste during routine transport and disposal for both the construction phase and operational phase of the proposed project, the City of Long Beach shall require that the construction contractor and the Long Beach Memorial Medical Center (LBMMC) store, use, and transport all hazardous materials in compliance with all relevant regulations and guidelines. The routine transport of hazardous materials to and from the LBMMC campus during construction and operation of the elements of the proposed project shall be accomplished via Atlantic Avenue, Spring Street, Columbia Street, Patterson Street, 27th Street, and Willow Street. Compliance shall be determined by monitoring by regulatory agencies. Transport, storage, and handling of construction-related hazardous materials shall be consistent with the guidelines provided by the California Department of Transportation, Los Angeles Regional Water Quality Control Board, the South Coast Air Quality Management District, and the Certified Unified Program Agency. Each agency shall regulate and enforce, through permitting and record keeping, the monitoring and enforcement of this mitigation measure.

Measure Hazards-11

To avoid impacts on the existing emergency response and evacuation plan, the City of Long Beach shall require the identification of an alternative emergency water supply source, evacuation routes, and emergency response vehicle routes during roadway realignment and upon expansion of the Miller Children's Hospital facility. The revised emergency response and evacuation plan shall be updated by the construction contractor prior to initiation of construction activities.

Measure Hazards-12

To avoid exposure to chemicals of potential concern (COPCs) in the soil, the Office of Statewide Health Planning and Development shall require that volatile organic compounds (VOCs) be monitored during excavation requested for the Miller Children's Hospital pediatric inpatient tower, central plant building, and utility trench, in compliance with the South Coast Air Quality Management District Rule 1166 or Rule 1150, which sets requirements to control the emission of VOCs from excavating, grading, handling, and treating VOC-contaminated soil. The procedures for removing, handling, and disposing of petroleum hydrocarbon–contaminated soil and water shall include and require adherence to health and safety protocols (e.g., no eating in the construction zone, use of personal protective equipment) as provided in a site health and safety plan, as well as monitoring and control of emissions of COPCs that may occur during the construction work.

Measure Hazards-13

To avoid exposure to chemicals of potential concern (COPCs) in the soil, the City of Long Beach shall require that volatile organic compounds (VOCs) be monitored during excavation requested for the Miller Children's Hospital (MCH) pediatric outpatient building, MCH link building, and Todd Cancer Institute Phases I and II, in compliance with the South Coast Air Quality Management District Rule 1166 or Rule 1150, which sets requirements to control the emission of VOCs from excavating, grading, handling, and treating VOC-contaminated soil. The procedures for removing, handling, and disposing of petroleum hydrocarbon–contaminated soil and water shall include and require adherence to health and safety protocols (e.g., no eating in the construction zone, use of personal protective equipment) as provided in a site health and safety plan, as well as monitoring and control of emissions of COPCs that may occur during the construction work.

Measure Hazards-14

At least 30 days prior to approval of final plans and specifications for the Miller Children's Hospital pediatric inpatient tower, central plant building, and utility trench, the Office of Statewide Health Planning and Development shall review and provide comments on the plans and specifications to ensure compliance with all requirements resulting from the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

Measure Hazards-15

Prior to approval of final plans and specifications for the Miller Children's Hospital link building and Todd Cancer Institute Phases I and II, the City of Long Beach shall review the plans and specifications to ensure compliance with all requirements resulting from the Voluntary Clean-up Agreement between the Long Beach Memorial Medical Center and the Department of Toxic Substances Control.

3.5.7 Level of Significance after Mitigation

Implementation of mitigation measures Hazards-1 through Hazards-15 would reduce potential impacts from hazards and hazardous materials to below the level of significance.