HCAI/CSMIP

HOSPITAL INSTRUMENTATION

Annual Report

July 1, 2024 through June 30, 2025

HCAI Agreement No. 23-24002
(DOC No. 1023-004R)

California Strong Motion Instrumentation Program
California Department of Conservation
California Geological Survey

715 P Street, MS 1901
Sacramento, California 95814

October 1, 2025

Annual Report

HCAI/CSMIP Hospital Instrumentation

California Strong Motion Instrumentation Program

July 1, 2024 through June 30, 2025

I. INTRODUCTION

The California Geological Survey's Strong Motion Instrumentation Program (CSMIP) performs installation, maintenance, and data recovery for strong motion instrumentation in hospitals through an interagency agreement with the Department of Health Care Access and Information (HCAI). Funding strong motion instrumentation of hospitals through the interagency agreement is in lieu of normal building-permit fee funding referenced in Chapter 8 of the Public Resources Code.

Hospital buildings have been instrumented under twelve Interagency Agreements. The first eleven agreements extended from July 1989 through June 2023, each covering a period of three fiscal years. The twelfth contract was approved by the Department of General Services (DGS) on September 5, 2023. This Report covers activities performed between July 1, 2024 and June 30, 2025 (FY24-25).

The code requirements regarding the instrumentation of hospitals were updated in 2019. Previously, the code stipulated that HCAI was responsible for subsidizing the maintenance of instrumentation installed at hospitals. With the updated requirements, however, the code requires hospital owners to pay for maintenance. When a maintenance issue is identified, CSMIP reports it to HCAI, then either HCAI authorizes CSMIP to perform the work, or advises the hospital owner that they are responsible for maintenance. If CSMIP performs maintenance on instrumentation that the hospital owner has responsibility for, the hospital owner can be billed to recover the cost of the work performed.

The Hospital Building Safety Board (HBSB) Instrumentation Committee has recommended seven one-story wood-framed hospitals for instrumentation, with funding to be provided by HCAI. CSMIP worked with HCAI to prepare preliminary sensor layouts and coordinate with representatives of five of these seven hospitals. The sensor layout was finalized, and a project kick-off meeting was held with the hospital representative of one of them (Monterey Park Hospital). In addition, there was progress on owner-funded hospital instrumentation projects as CSMIP prepared and issued Technical Specifications Letters for three hospitals and continued to provide technical guidance and assistance to the general contractors and structural engineers on other instrumentation projects currently underway.

In addition to new instrumentation projects under the CGS/HCAI agreement, CSMIP upgraded the recording systems at 19 instrumented hospitals and their free-field stations at no charge for

equipment to HCAI. The instrumentation at these stations was upgraded from obsolete recording systems to modern higher resolution recorders capable of real-time data streaming. The funding for purchasing recording systems for these upgrades was provided by CGS through its Statewide Seismic Hazard Mitigation BCP Upgrade Project. HCAI paid only for the labor cost of these upgrades. So far, CSMIP has upgraded 53 hospitals and free-field stations as part of the Statewide Seismic Hazard Mitigation project.

II. HOSPITAL INSTRUMENTATION STATUS

Hospital buildings with instrumentation installations completed or underway are listed in Tables 1, 2, and 3. Like the other hospitals recently instrumented by the CSMIP, the new stations will have near-real-time data communication capability to allow the recorded motion to be automatically transmitted to the CSMIP servers after an earthquake where it will be automatically processed and made available for use in post-earthquake response by the HCAI and the hospital owners.

1) Type 1 - HCAI-Funded Regular Instrumentation of Hospitals (Table 1)

The Hospital Building Safety Board (HBSB) Instrumentation Committee has recommended seven one-story wood-framed hospitals for instrumentation, with funding to be provided by HCAI. CSMIP worked with HCAI to prepare preliminary sensor layouts and coordinate with representatives of five of these seven hospitals. The sensor layout has been finalized for the Monterey Park Hospital, and a project kick-off meeting was held on May 22, 2025 with a hospital representative. CSMIP will be scheduling a site visit to this hospital to mark sensor locations in preparation for equipment installation.

2) Types 2 and 3 - Owner-Funded Instrumentation of Hospitals with CSMIP Guidance and Assistance (Tables 2 and 3)

In addition to the hospital instrumentation funded under the HCAI/CSMIP contract discussed above, a significant component of CSMIP hospital instrumentation work involves detailed technical guidance and assistance with hospital instrumentation projects for which the owner absorbs the capital cost of instrumentation under HCAI regulations. These may be in new hospitals (Type 2), or in existing hospitals being retrofitted (Type 3). Nine CSMIP-assisted hospital instrumentation projects are currently underway.

Background on Instrumentation Guidance

CSMIP guidance and assistance in the instrumentation of hospitals includes the following steps:

1. **Development or review of the proposed sensor locations to ensure sensor coverage is sufficient to characterize the building's seismic response.** CSMIP performs design work in-house, or reviews plans and specifications submitted by the design structural engineer of record (SE). In either case, an instrumentation planning meeting or conference call among the SE, architect of record, HCAI and CSMIP staff is held to discuss and develop consensus on sensor locations and quantity.
2. **Establishment of the specific locations of all sensors, based on detailed study of the architectural plans by the design architect or SE**. Sensor locations need to avoid

conflict with other non-structural components and sensors need to be accessible after they are installed.

3. **Development of the comprehensive, detailed design of the system, called the Technical Specifications Letter (TSL), by CSMIP staff.** The TSL is provided to the owner, HCAI, and the contractor, and is included in the plans. It specifies acceptable instruments and approved installation practices as well as details for the locations and interconnection of the components. The final instrumentation plans are approved by HCAI.
4. **Sensor marking field visit by CSMIP staff with representatives of the owner, construction contractor, and HCAI Inspector of Record**. During this visit the actual sensor locations are approved and physically marked on the structural members. During the subsequent work by the contractor, CSMIP staff approves the submittals, and assists with problems and issues as they arise.
5. **Acceptance field testing of the completed instrumentation system, some months or years later, by CSMIP staff**. If problems are found in the installation or operation, the contractor is called back in for repairs, followed by a repeat of tests. Once the installed system is accepted, HCAI is notified, and CSMIP is supported by HCAI to take on long-term maintenance of the instrumentation, as well as data recovery and processing.
6. CSMIP staff prepare sensor location diagram, building descriptions and station photo for the building, which are made available at the Center for Engineering Strong Motion Data (CESMD) after the instrumentation is completed.

Type 2 Instrumentation Projects

Type 2 Instrumentation Projects are hospital buildings that have base-isolation and/or energy dissipation devices or use an Alternate Method of Compliance (AMOC) in their design. These are required to have owner-paid instrumentation installed during construction per the California Building Code and HCAI regulations. The following progress on Type 2 projects occurred during FY24-25.

- Cedars-Sinai Medical Center Replacement Hospital in Marina Del Rey: Prepared and shipped sensor mounting plates to contractor on March 17, 2025.
- UC Irvine Medical Center New Hospital: Prepared and shipped sensor mounting plates and T-Brackets to contractor on September 26, 2024, and May 4, 2025, respectively. Met and coordinated with design team on minor location adjustments of the recorder and select sensors on May 2, 2025, and June 17, 2025.
- UC Davis Health New Hospital in Sacramento: An updated Technical Specifications Letter was completed and sent to the design team on November 19, 2024. The sensor marking visit for this project is not anticipated until FY29-30.
- Harbor UCLA Medical Center in Torrance: An updated Technical Specifications Letter was completed and sent to the design team on August 20, 2024.
- Kaiser Replacement Hospital in San Jose: An instrumentation planning meeting was held on August 16, 2024. The Technical Specifications Letter was completed and sent to the design team on October 4, 2024. On October 10, 2024, the updated instrumentation plans were submitted by the design team to CSMIP and then reviewed and approved.

- Scripps Tower II in La Jolla: Installation of equipment completed by contractor. CSMIP coordinating with equipment manufacturer to resolve communications issue so CSMIP can certify completion.

Type 3 Instrumentation Projects

Type 3 Instrumentation Project buildings are retrofitted under the Voluntary Seismic Improvement (VSI) regulations of the hospital building design code. Because of an AMOC design used in their retrofit, these buildings are required to be instrumented at the owner's expense. There are no Type 3 hospital instrumentation projects underway in the current interagency agreement.

Table 1

Regular Hospital Buildings (Type 1)
Instrumented under HCAI/CSMIP Hospital Instrumentation Project

(HCAI Funded - HBSB Instrumentation Committee Recommended)

Hospital Name	CSMIP Sta. No.	HCAI Approval No.	Year Built	No. of Stories	No. of Sensors	Completion Date
Instrumentation Completed or Underway						
1. Fortuna – Providence Redwood Memorial Hospital						
	89nnn	--	1955	1/0	24	FY TBD
	Wood shear wall					
	[**STATUS:** Hospital representative provided plans to HCAI; Preliminary sensor layout completed]					
2. Healdsburg – Healdsburg Hospital						
	68nnn	--	1972	1/0	12	FY TBD
	Wood shear wall					
	[**STATUS:** Hospital representative provided plans to HCAI; Preliminary sensor layout completed]					
3. Santa Rosa – Providence Santa Rosa Memorial Hospital						
	68nnn	--	1961	1/0	16	FY TBD
	Wood shear wall					
	[**STATUS**: Hospital representative provided plans to HCAI; Preliminary sensor layout completed]					
4. Hollister – Hazel Hawkins Memorial Hospital						
	47nnn	--	1960	1/0	9	FY TBD
	Wood shear wall					
	[**STATUS**: Hospital representative provided plans to HCAI; Preliminary sensor layout completed]					
5. Ojai – Community Memorial Hospital						
	25nnn	--	1960	1/0	TBD	FY TBD
	Wood shear wall					
	[**STATUS**: HCAI to establish contact with hospital representative]					
6. Monterey Park – Monterey Park Hospital						
	24nnn	--	1971	1/1	14+FF	FY 25-26
	Wood shear wall					
	[**STATUS**: Sensor layout finalized; Kick-off meeting held with hospital representative on 5/22/25]					
7. San Bernardino – Community Hospital						
	23nnn	--	1969	1/0	TBD	FY TBD
	Wood shear wall					
	[**STATUS**: HCAI to establish contact with hospital representative]					

Table 2

New Hospital Buildings (Type 2) – Assisted Instrumentation Base-Isolated or Alternate Method of Compliance

(Owner-Funded with CSMIP Assistance and Guidance)

Hospital Name	CSMIP Sta. No.	HCAI Approval No.	Year Built	No. of Stories	No. of Sensors	Completion Date

Instrumentation Completed or Underway

1. Loma Linda – University Medical Center Replacement Hospital

23M01 | I 150010-36 | ca 2021 | 16/2 | 42+FF | FY 25-26

Steel BRB and SidePlate moment frames isolated with triple pendulum bearings and viscous dampers.

[**STATUS:** TSL completed 4/26/17; Sensor locations marked 9/6/2018, 4/11/2019 and 1/30/2020; Accelerometers installed 10/21/2020]; Relative Displacement sensors to be installed.

Reference free-field station: Loma Linda – Barton & Anderson, CSMIP Sta. 23702

2. Los Angeles - Hollywood Presbyterian Medical Center Acute Care Services Replacement Building

24758 | I 17002-19-02 | ca 2026 | 4/1 | 16 | FY 25-26

Steel moment frames with SidePlate connections

[**STATUS:** TSL completed 10/26/17; Sensor locations marked 5/6/2020]

(Pre-existing reference FF station: Los Angeles – Vermont & Fountain, CSMIP Sta. 24642)

3. Marina Del Rey – Cedars-Sinai Medical Center Replacement Hospital

14756 | I 180008-19-00 | ca 2026 | 9/0 | 24+FF | FY 25-26

Steel moment frames with SidePlate connections.

[**STATUS:** TSL completed 7/16/21; Sensor locations marked 4/3/2024]

(To include a reference free-field station)

4. La Jolla – Scripps Tower II

03754 | I 190018-37-00 | ca 2026 | 8/1 | 18 | FY 25-26

Steel moment frames with bolted SidePlate connections

[**STATUS:** TSL completed 2/8/22; Sensor locations marked 6/28/2023]

(Pre-existing reference FF station: La Jolla – I5 & Genesee**,** CSMIP Sta. 03539)

5. San Diego – Sharp Metropolitan Medical Center New Tower

03755 | I 210010-37-01 | ca 2030 | 7/0 | 18+FF | FY 29-30

Steel moment frames with bolted SidePlate connections.

[**STATUS:** TSL completed 5/31/22]

(To include a reference free-field station)

6. Irvine – UC Irvine Medical Center New Hospital

13751 | I 210005-30-03 | ca 2026 | 7/0 | 15+FF | FY 25-26

Steel buckling restrained braced frames

[**STATUS:** TSL completed 3/9/23; Sensor locations marked 11/30/2023]

(To include a reference free-field station)

7. Sacramento – UC Davis Health New Hospital

67759 | I 210013-34-05 | ca 2030 | 14/1 | 47+FF | FY 29-30

Steel moment frames with SidePlate connections.

[**STATUS:** Kickoff meeting with design team held 1/30/23; TSL completed 6/19/24; updated TSL completed 11/19/24]

(To include a reference free-field station)

Table 2 (continued)

New Hospital Buildings (Type 2) – Assisted Instrumentation Base-Isolated or Alternate Method of Compliance

(Owner-Funded with CSMIP Assistance and Guidance)

Hospital Name	CSMIP Sta. No.	HCAI Approval No.	Year Built	No. of Stories	No. of Sensors	Completion Date
8. Torrance – Harbor UCLA Medical Center						
	14757	I 230003-19-03	ca 2028	9/1	23+FF	FY 27-28
	Steel moment frames with SidePlate connections. [**STATUS:** Instrumentation planning meeting held 11/14/23; TSL completed 3/21/24; updated TSL completed 8/20/24] (To include a reference free-field station)					
9. San Jose – Kaiser Replacement Hospital						
	57nnn	I 230010-43	ca 2028	6/1	28+FF	FY 27-28
	Steel moment frames with SidePlate connections. [**STATUS:** Instrumentation planning meeting held 8/16/24; TSL completed 10/4/24] (To include a reference free-field station)					

Table 3

Existing Hospital Buildings (Type 3) – Assisted Instrumentation Voluntary Seismic Improvement (VSI) Projects

(Owner-Funded with CSMIP Assistance and Guidance)

Hospital Name	CSMIP Sta. No.	HCAI Approval No.	Year Design	No. of Stories	No. of Sensors	Installation Date

**No Type 3 projects currently underway*

III. HOSPITAL INSTRUMENTATION MAINTENANCE

In this section, the previously instrumented hospital buildings for which ongoing maintenance was performed throughout FY24-25 are listed. During FY24-25, CSMIP performed periodic maintenance of the strong-motion instrumentation installed in the 85 previously instrumented hospital buildings, 66 of which have an associated free-field instrument.

The 85 hospital buildings instrumented as of the beginning of FY24-25 (buildings with an associated reference free-field station are indicated by an *), are listed alphabetically by city below:

1. Alameda - Alameda Hospital *
2. Bakersfield - Kern County Hospital *
3. Berkeley - Alta Bates Hospital
4. Burlingame - Mills Peninsula Hospital *
5. Castro Valley - Sutter Eden Medical Center *
6. Colton - Arrowhead Regional Medical Center (base-isolated) *
7. Crescent City - Sutter Coast Hospital *
8. Downey - Kaiser Hospital Tower Expansion *
9. Downey - PIH Health Medical Center (VSI) *
10. El Centro - El Centro Regional Medical Center *
11. Encino - Encino Hospital (VSI) *
12. Escondido - Palomar West Medical Center, Central Plant
13. Escondido - Palomar West Medical Center, Main Tower *
14. Eureka - St. Joseph Hospital *
15. Fairfield - North Bay Medical Center *
16. Fremont - Kaiser Hospital *
17. Fremont - Washington Hospital (base isolated) *
18. Gilroy - St. Louise Hospital *
19. Greenbrae - Marin General Hospital Replacement Building *
20. Hemet - Hemet Valley Medical Center *
21. Indio - JFK Memorial Hospital *
22. Irvine - Kaiser Sand Canyon Hospital *
23. King City - Mee Hospital *
24. La Jolla - Scripps Memorial Hospital (VSI) *
25. La Jolla - UCSD Hospital *
26. La Jolla - UCSD Jacobs Medical Center
27. Lancaster - Antelope Valley Hospital *
28. Long Beach - Miller Children's Hospital *
29. Los Angeles - Children's Hospital
30. Los Angeles - Good Samaritan Hospital
31. Los Angeles - Hollywood Presbyterian Medical Center, Doctor's Tower (VSI)
32. Los Angeles - Hollywood Presbyterian Medical Center, South Wing (VSI) *
33. Los Angeles - LAC+USC Hospital D&T (base-isolated) *
34. Los Angeles - LAC+USC Hospital Inpatient Bldg
35. Los Angeles - MLK Hospital (base-isolated) *
36. Los Angeles - USC Hospital (base-isolated)
37. Los Angeles - USC Hospital Addition

38. Mammoth Lakes - Mammoth Hospital *
39. Moreno Valley - Riverside County Hospital *
40. Murrieta - Rancho Springs Medical Center *
41. Newport Beach - Hoag Hospital West Tower *
42. Newport Beach - Hoag Hospital East Tower (base-isolated)
43. Novato - Community Hospital *
44. Oakland - Kaiser Hospital
45. Ontario - Kaiser Hospital *
46. Oxnard - St. John's Medical Center *
47. Palm Springs - Desert Hospital
48. Palmdale - Palmdale Regional Medical Center *
49. Palo Alto - Lucile Packard Children's Hospital Stanford *
50. Redlands - Community Hospital (VSI) *
51. Riverside - Community Hospital (VSI) *
52. Salinas - Natividad Medical Center *
53. San Bernardino - Community Hospital *
54. San Bernardino - St. Bernardine Hospital (VSI) *
55. San Diego - Sharp Memorial Hospital (VSI) *
56. San Diego - UCSD Medical Center *
57. San Francisco - CPMC Cathedral Hill Hospital
58. San Francisco - General Hospital (base-isolated) *
59. San Francisco - Kaiser Hospital
60. San Francisco - St. Luke's Hospital
61. San Francisco - UCSF Hospital *
62. San Francisco - UCSF Mission Bay Hospital *
63. San Jose - O'Connor Hospital *
64. San Jose - Santa Clara Valley Hospital Bed Bldg 1
65. San Jose - Santa Clara Valley Hospital Bldg K
66. San Pedro - Providence LCOM Medical Center Bldg 1T (VSI) *
67. San Pedro - Providence LCOM Medical Center Bldg 2 (VSI)
68. San Rafael - Marin General Hospital West Wing *
69. Santa Ana - Orange County Global Med Center (VSI) *
70. Santa Barbara - Cottage Hospital *
71. Santa Clara - Kaiser Hospital *
72. Santa Maria - Marian Hospital *
73. Santa Monica - St. John's Hospital (base-isolated) *
74. Santa Rosa - Kaiser Hospital *
75. Simi Valley - Simi Valley Hospital *
76. Stanford - 7-story Hospital (base-isolated) *
77. Stanford - University Hospital *
78. Sylmar - Olive View Hospital *
79. Templeton - Twin Cities Hospital *
80. Torrance - Providence LCOM Medical Center (VSI)*
81. Valencia - Mayo Hospital *
82. Ventura - Community Memorial Hospital *
83. Ventura - Ventura County Hospital *
84. Walnut Creek - Kaiser Hospital
85. Whittier - Presbyterian Intercommunity Hospital *

In addition to periodic maintenance, CSMIP upgraded the recorders, without charge to HCAI, at the following 19 hospitals and free-field stations in FY 24-25.

1. Bakersfield - Kern County Hospital
2. Bakersfield - Kern County Hospital Grnds
3. Castro Valley - Sutter Hospital
4. Castro Valley - Sutter Hospital Grnds
5. Escondido - Hospital Central Plant
6. Escondido - PMC West Hospital
7. Fremont - Kaiser Hospital
8. Hemet - Valley Hospital
9. La Jolla - UCSD Hospital
10. La Jolla - UCSD Jacobs Med Center
11. Mammoth Lakes - Mammoth Hospital
12. Moreno Valley - Riverside Co Hospital
13. Ontario - Kaiser Hospital
14. San Bernardino - Community Hospital
15. San Francisco - UCSF Hospital
16. San Pedro - Providence Hosp FF
17. San Pedro - Providence LCOM Hosp Bldg 1
18. San Pedro - Providence LCOM Hosp Bldg 2
19. Santa Monica - St Johns Hospital

The instrumentation at these stations was upgraded from obsolete recording systems to modern higher resolution recorders capable of real-time data streaming. The upgrade of one of these hospitals (Hemet – Valley Hospital) also included new cabling and sensors. As part of this total re-instrumentation, seven additional sensors were added to this hospital bringing the total sensor quantity from 10 to 17. The funding for these upgrades was provided by CSMIP through its Statewide Seismic Hazard Mitigation BCP Upgrade Project. A total of 53 hospital and free-field stations have now been upgraded as part of this project, without charge for equipment to HCAI.

CSMIP also performs monitoring and data recovery for the code-type instrumentation systems (three tri-axial accelerographs) in the following four hospitals without charge to HCAI:

1. Los Angeles – White Memorial Hospital (7-story)
2. Pasadena – Huntington Memorial Hospital (7-story)
3. Downey – Kaiser Hospital (6-story)
4. Los Angeles – Kaiser LAMC Sunset Hospital (7-story)

IV. STRONG-MOTION RECORDS FROM HOSPITALS

From July 1, 2024, to June 30, 2025, a total of 15 earthquakes with magnitude 3.0 or larger were recorded at 30 instrumented hospitals. General information about each earthquake, and the maximum accelerations recorded at the hospital buildings (base and superstructure) and at their reference free-field stations (ground), are listed below.

Station 03233: La Jolla – University Hospital (2-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	61.1	--	1.8	5.9

* Station 03521

Station 03538: La Jolla – Scripps Memorial Hospital (7-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	61.3	2.9	2.0	7.5

* Station 03539

Station 03546: San Diego – Sharp Memorial Hospital (8-story concrete shear wall)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	58.6	1.9	1.7	12.9

* Station 03544

Station 03593: La Jolla – UCSD Jacobs Med Center (10-story steel moment frame) arthquake Ma

				Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	61.6	--	1.6	3.0

* Station 03521

Station 03743: San Diego – UCSD Medical Center (11-story concrete moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground	Base	Structure
Julian	5.2	04/14/2025	61.9	No FF	1.9	7.5

Station 12267: Hemet – Hemet Valley Medical Center (4-story concrete shear wall)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	86.2	5.1	2.7	8.7

* Station 12653

Station 12759: Indio – JFK Memorial Hospital (1-story wood shear wall) arthquake Magnitu

		Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	81.5	2.6	2.1	5.4

* Station 12904

Station 13213: Moreno Valley– Riverside County Hospital (3-story steel moment frame)

Earthquake	Magnitude		Epicentral Distance (km)	Max. Horizontal Acceleration (%g)

		Date		Ground	Base	Structure
Malibu	4.7	09/12/2024	150.3	0.5	0.3	1.4

Station 13439: Kaiser Sand Canyon Hospital (6-story buckling-restrained steel braced frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	129.7	--	1.4	4.4

* Station 13441

Station 13473: Escondido – Palomar West Medical Center, Main Tower (11-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	50.1	5.3	4.6	2.3

* Station 13477

Station 13601: Murrieta – Rancho Springs Medical Center (2-story concrete moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Julian	5.2	04/14/2025	79.8	--	1.3	2.6

* Station 13602

Station 14689: Downey – Kaiser Hospital Tower Expansion (6-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Highland Park	4.4	08/12/2024	18.6	9.8	7.7	14.2

* Station 14675

Station 14724: Los Angeles – MLK Hospital (5-story, isolated, concentrically braced steel frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Highland Park	4.4	08/12/2024	18.7	8.9	6.6	11.9

* Station 14787

Station 14737: Whittier – Presbyterian Intercommunity Hospital (3-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Highland Park	4.4	08/12/2024	17.3	3.9	3.4	5.2
Malibu	4.7	09/12/2024	71.1	1.6	0.8	3.2

* Station 14740

Station 23416: Ontario – Kaiser Hospital (5-story buckling-restrained steel braced frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Malibu	4.7	09/12/2024	111.4	--	0.3	1.1

Ontario	3.5	10/01/2024	0.9	5.7	3.8	5.4
Ontario	4.0	10/06/2024	1.7	20.8	8.4	6.8

* Station 23417

Station 24104: Simi Valley – Simi Valley Hospital (2-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Malibu	4.7	09/12/2024	26.5	2.9	1.9	5.7
Malibu	4.1	03/09/2025	27.1	2.3	1.4	3.8

* Station 24126

Station 24248: Los Angeles – LAC+USC Hospital IP Bldg (9-story eccentrically braced steel frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground	Base	Structure
Highland Park	4.4	08/12/2024	3.8	No FF	19.7	12.9
North Hollywood	3.8	03/02/2025	18.2	No FF	2.4	2.6

Station 24250: Los Angeles – LAC+USC Hospital D&T Bldg (6-story, isolated, concentrically braced steel frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Highland Park	4.4	08/12/2024	3.9	--	18.3	11.1

* Station 24363

Station 24344: Valencia – Mayo Hospital (2-story concentrically braced steel frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Lamont	5.2	08/06/2024	93.3	--	1.1	3.3
Highland Park	4.4	08/12/2024	49.1	--	0.8	1.7
Malibu	4.7	09/12/2024	44.8	--	0.6	1.7

* Station 24354

Station 24397: Los Angeles – Children's Hospital (7-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground	Base	Structure
Highland Park	4.4	08/12/2024	10.3	No FF	3.5	5.4

Station 24457: Palmdale – Palmdale Regional Medical Center (5-story concrete shear wall)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Barstow	4.9	07/29/2024	130.8	--	0.7	1.5

* Station 24458

Station 24514: Sylmar – Olive View Medical Center (6-story concrete/steel shear wall)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Lamont	5.2	08/07/2024	105.4	1.0	0.7	2.1

Highland Park	4.4	08/12/2024	36.5	--	0.4	1.6

* Station 24763

Station 24605: Los Angeles – USC Hospital (7-story, isolated, diagonally braced steel frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground	Base	Structure
Highland Park	4.4	08/12/2024	3.1	No FF	9.6	12.2

Station 24713: Los Angeles – Good Samaritan Hospital (8-story k-braced steel frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground	Base	Structure
Highland Park	4.4	08/12/2024	8.5	No FF	5.3	20.3

Station 24M01: Pasadena – Huntington Memorial Hospital (7-story)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground	Base	Structure
Lamont	5.2	08/07/2024	138.5	No FF	0.5	--

Station 34234: Bakersfield – Kern County Hospital (4-story concrete shear wall)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Lamont	5.2	08/07/2024	32.4	--	1.3	2.2
Grapevine	4.4	08/08/2024	32.4	--	0.4	1.2

* Station 34235

Station 58199: Walnut Creek – Kaiser Hospital (3-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground	Base	Structure
Pleasant Hill	3.5	01/12/2025	9.9	No FF	0.7	2.2
Hayward	3.3	02/13/2025	27	No FF	0.5	1.2
Hayward	3.6	02/13/2025	27.1	No FF	0.6	1.6
Dublin	3.9	03/18/2025	21.3	No FF	0.9	3.8

Station 58396: Alameda – Alameda Hospital (3-story steel moment frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Pleasant Hill	3.5	01/12/2025	31.4	--	0.5	2.1
Dublin	3.9	03/18/2025	23.7	--	0.8	6.6

* Station 58398

Station 58494: Castro Valley – Sutter Eden Medical Center (6-story concrete shear wall, concentrically braced steel frame)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Dublin	3.9	03/18/2025	8.5	3.0	3.6	13.8

* Station 58493

Station 89770: Eureka – St Joseph Hospital (4-story concrete shear wall)

Earthquake	Magnitude	Date	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
				Ground*	Base	Structure
Offshore Cape Mendocino	7.0	12/05/2024	87.3	7.3	4.6	19.5

* Station 89781

The strong-motion records are made available rapidly after an earthquake by the CSMIP Strong-motion Automated Recovery and Analysis (SARA) system, and posted in the Internet Quick Reports at the web site of the Center for Engineering Strong Motion Data (CESMD), at **https://www.strongmotioncenter.org**.

The largest earthquake recorded by an instrumented hospital during FY24–25 was the M7.0 Cape Mendocino earthquake on December 5, 2024. This event was recorded only at the 4-story St. Joseph Hospital in Eureka, located 87 km from the source, and produced a peak floor acceleration of 19.5% g. Acceleration records from each instrumented level of the building are shown in Figure 1.

The largest acceleration recorded inside a hospital during FY24–25 was from the M4.4 Highland earthquake on August 12, 2024, at the Good Samaritan Hospital in Los Angeles (Station 24713), which is located only 8.5 km from the epicenter. This event caused a peak floor acceleration of 20.3% g measured at the top of the penthouse roof in the east–west direction. Considering the peak acceleration of 3.9% g recorded at the base in the same direction, the amplification was nearly 5.2 times. The accelerations recorded at each instrumented level of the building during this earthquake are shown in Figure 2.

The M4.4 Highland earthquake was recorded by ten hospital stations, with epicentral distances ranging from 3 to 50 km. Two hospitals (Stations 24250 and 24248) were even closer to the source (~4 km) than Good Samaritan Hospital and recorded much larger base accelerations of 18.3% g and 19.7% g, respectively. However, the maximum accelerations inside these structures were only 8.7% g and 12.9% g. The Los Angeles LAC+USC Hospital D&T building (Station 24250) is a base-isolated structure, and the presence of the isolators helped reduce the acceleration response of the building (see Figure 3). The reduction in horizontal acceleration observed at the Los Angeles LAC+USC Hospital IP building (Station 24248) requires further investigation. A possible explanation is the mismatch between the dominant frequency content of the ground motion and the building's natural frequencies. The accelerations recorded at each instrumented level of this building during this earthquake are shown in Figure 4.

Another notable observation is the large vertical acceleration recorded at the Los Angeles LAC+USC Hospital D&T building. As shown in Figure 3, the peak vertical acceleration at the base of the building (below the isolators) during the M4.4 Highland earthquake was 7% g, compared to 11.1% g on the 6th floor.

V. Real Time Strong Motion Data Stream

In response to the HCAI request, CSMIP started a pilot project on streaming data in real time to the HCAI Earthworm system. Currently data from Santa Rosa Kaiser Hospital and Lancaster Antelope Valley Hospital are being streamed in real time.

VI. FISCAL REPORT

The current contract was executed on September 5, 2023. A summary of the budget and expenditures is provided below:

Total amount of Agreement (September 5, 2023 – June 30, 2026)		$1,470,963.00
1)	Budgeted for FY23-24	$490,321.00
	Expended in FY23-24	($192,995.32)
	Remaining amount from FY23-24	$297,325.68
2)	Budgeted for FY24-25	$490,321.00
	Expended in FY24-25	($172,088.95)
	Remaining amount from FY24-25	$318,232.05

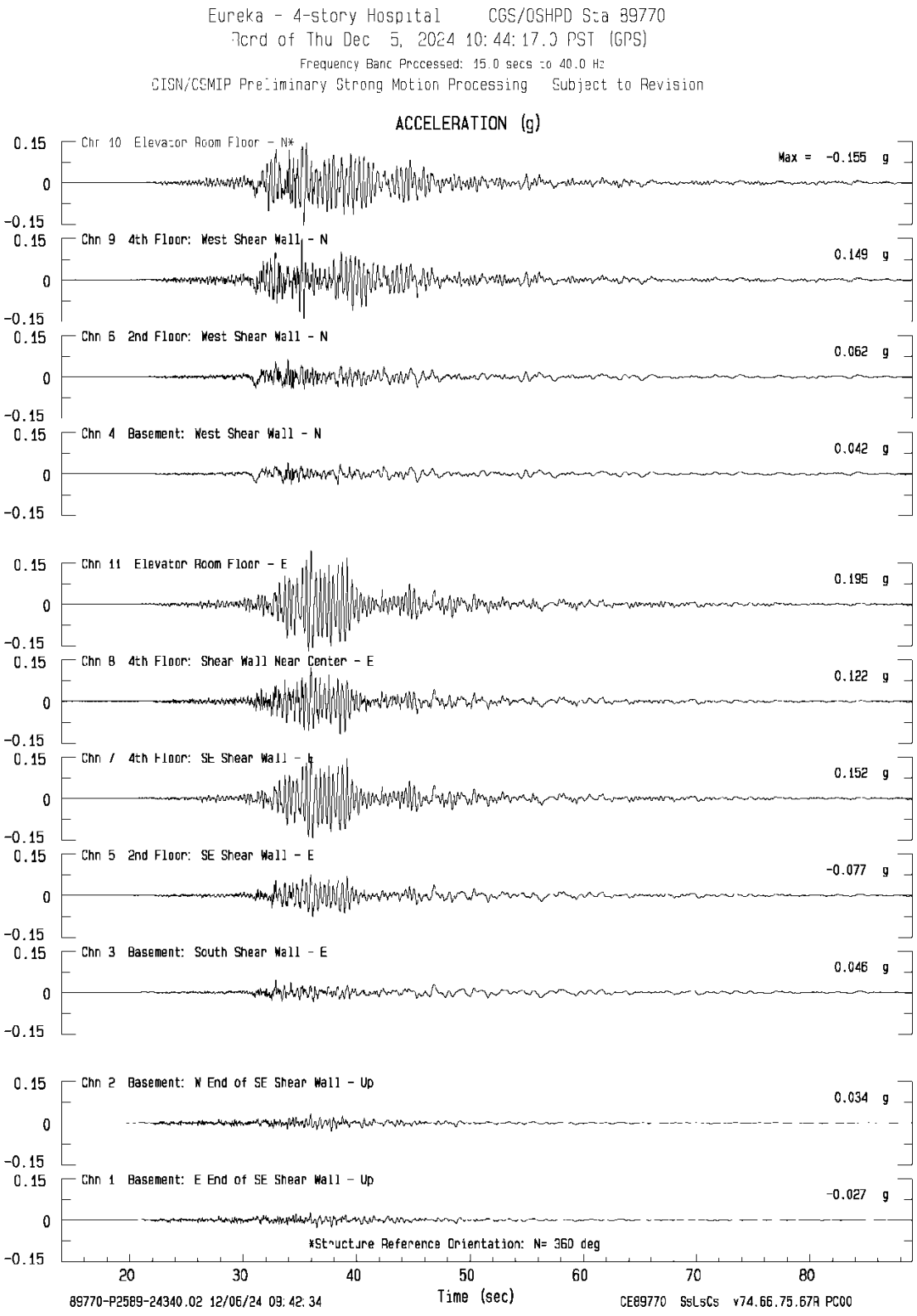


Figure 1. Accelerations recorded at the St Joseph Hospital during the M7.0 Cape Mendocino earthquake of December 5, 2024.

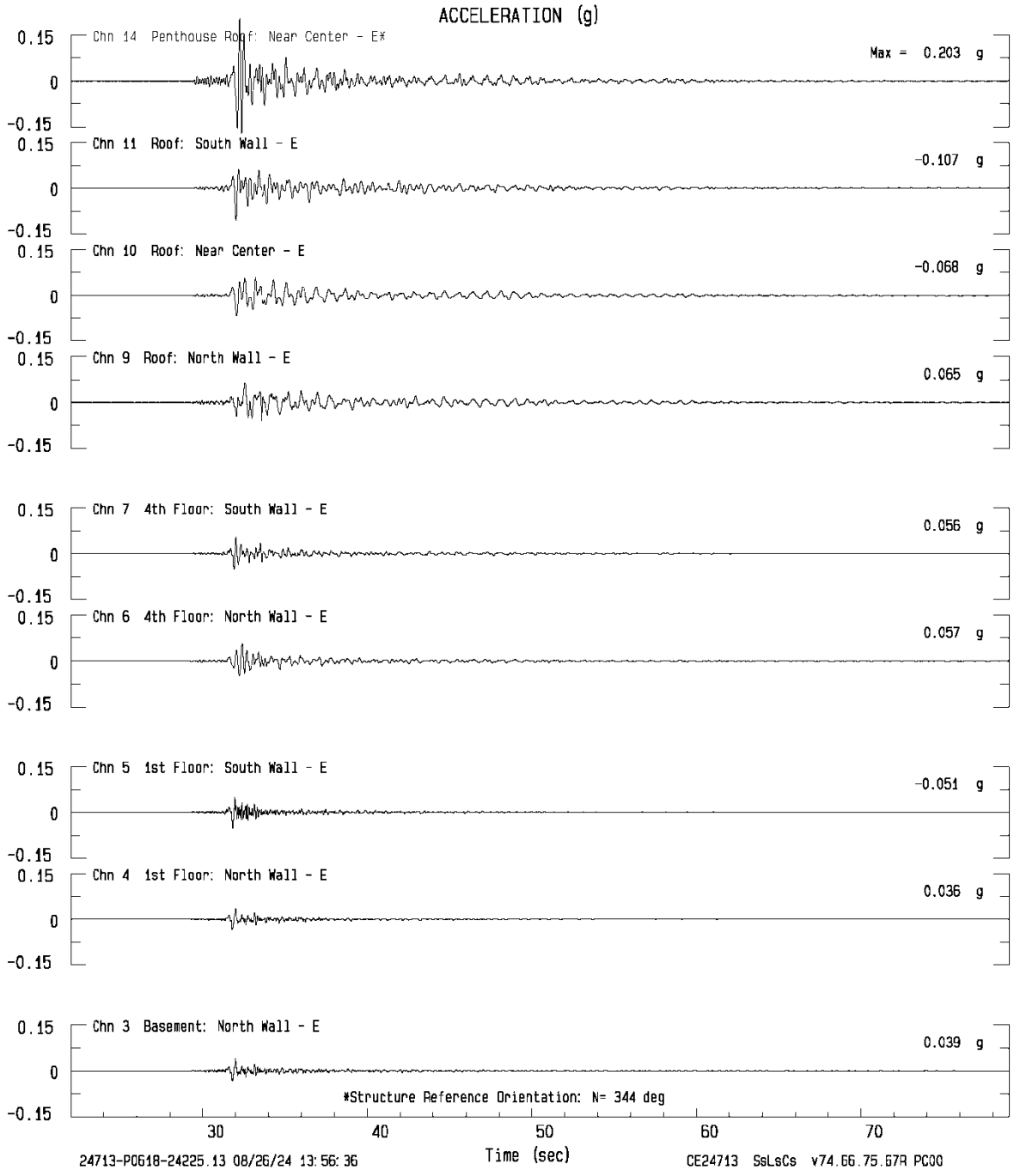


Figure 2. Accelerations recorded at the Good Samaritan Hospital during the M4.4 Highland earthquake of August 12, 2024.

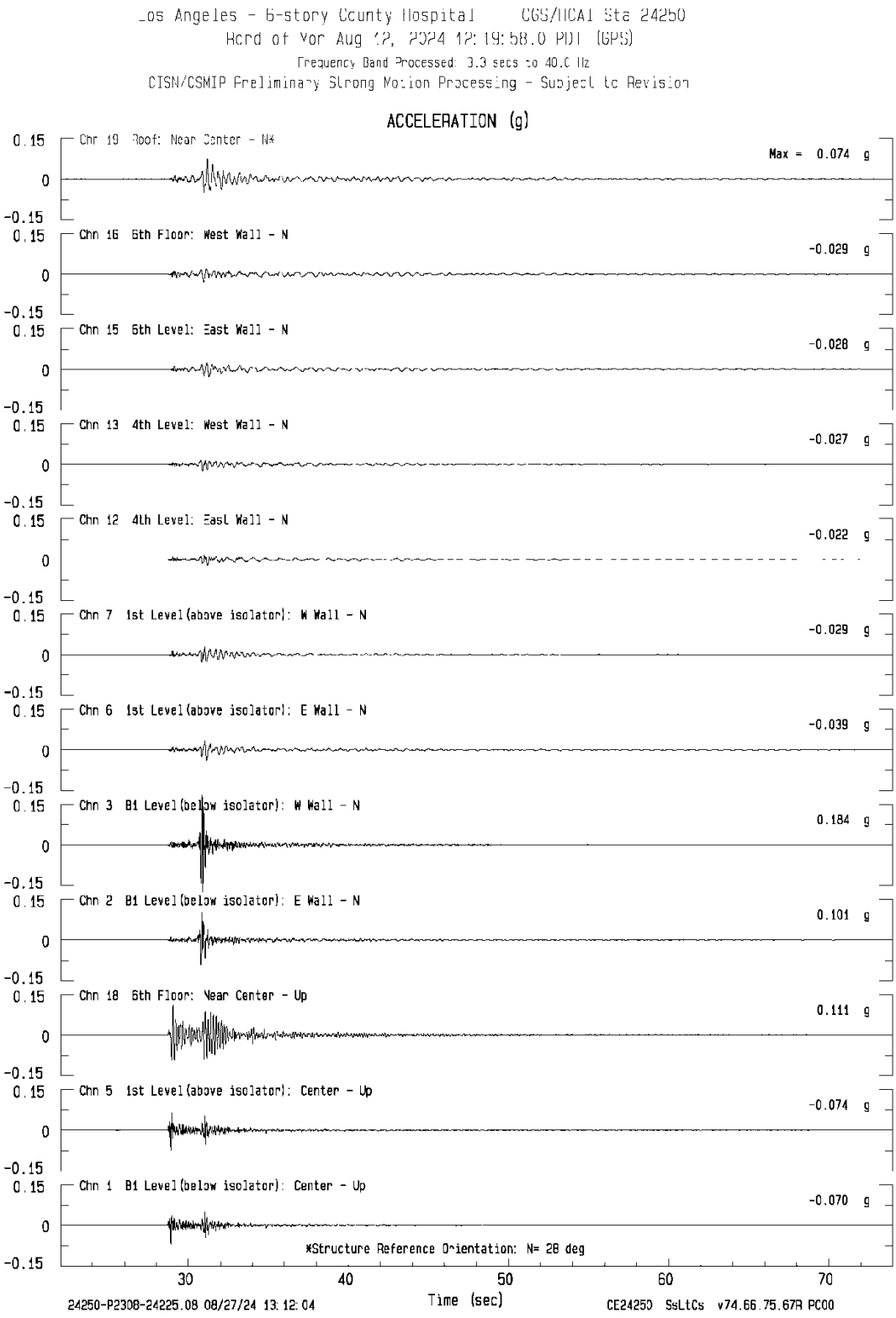


Figure 3. Accelerations recorded at the Los Angeles LAC+USC Hospital D&T building (Station 24250) during the M4.4 Highland earthquake of August 12, 2024.

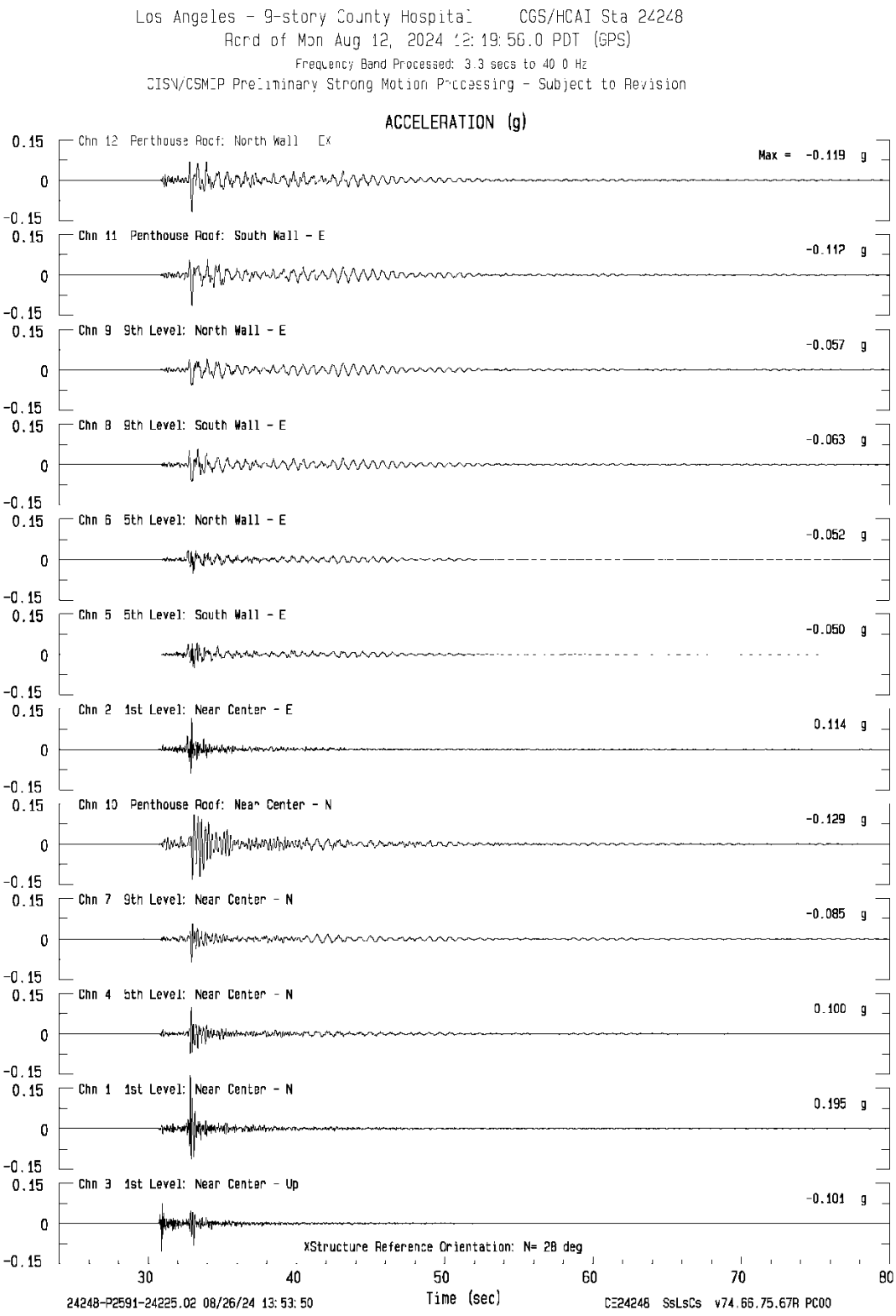
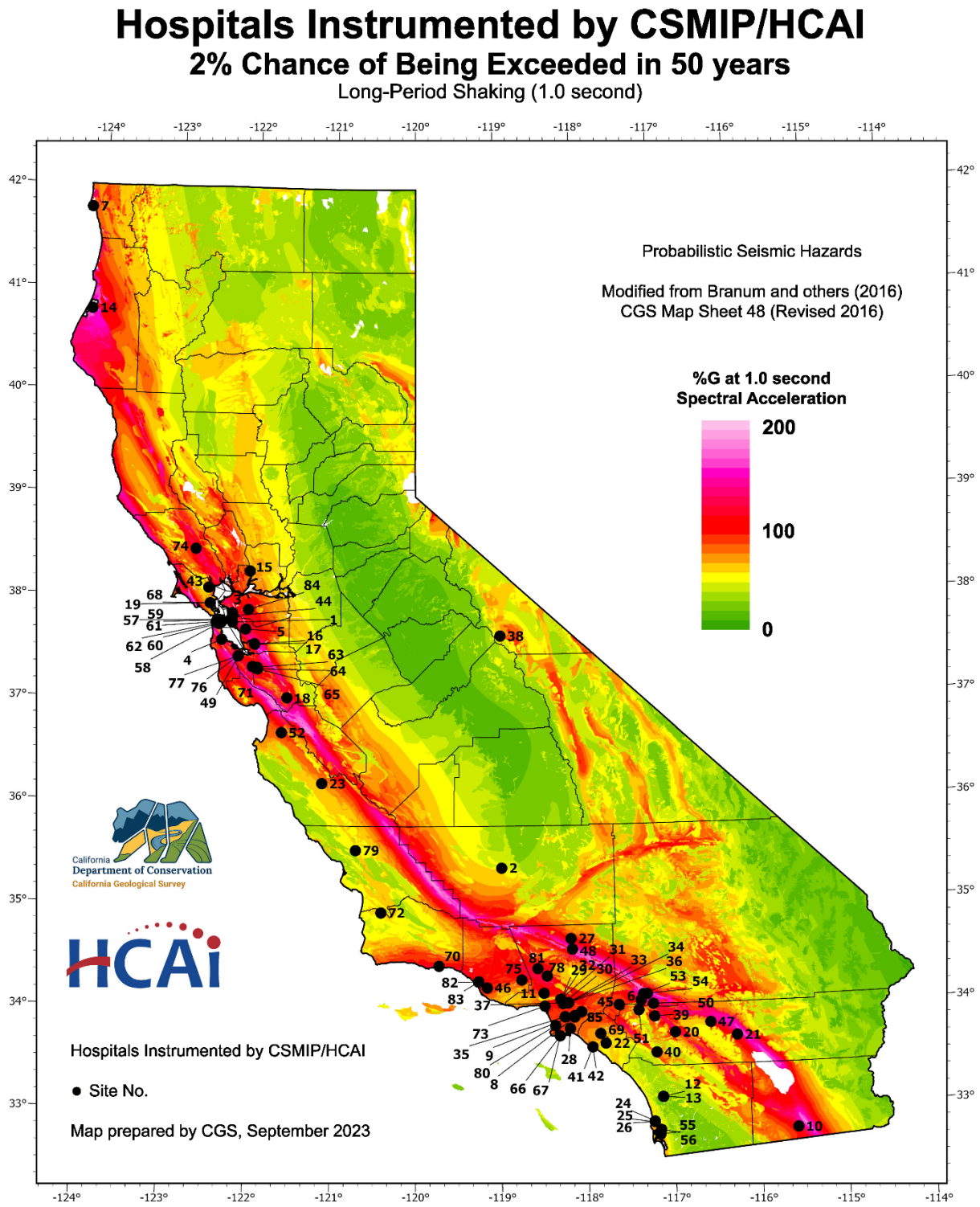


Figure 4. Accelerations recorded at the Los Angeles LAC+USC Hospital IP building (Station 24248) during the M4.4 Highland earthquake of August 12, 2024.

Appendix A

A total of 85 hospital buildings have been instrumented in the HCAI/CSMIP project through the end of FY24-25. The locations of the 85 hospital buildings are shown on a probabilistic seismic Hazard map below.



Appendix B

The hospital buildings and information about their structural systems are listed in the table below. The number of strong-motion recorders at each building and the communication speed are also shown in the table as these will determine how quickly data can be recovered for application after earthquakes. Note that the recovery speeds of 16 hospitals, shown in red in the table, increased in FY 24-25 from Low (L) or Medium (M) to High (H) as a result of the instrumentation upgrade described in Section III of this report.

BUILDINGS INSTRUMENTED BY CSMIP/HCAI 10/1/2025

Site No. on Map	CSMIP Sta. No.	Station Name	No. of Stories	No. of Sensors	No. of Rcrdrs	Recov. Speed	FEMA-310 Bldg Type	SMIAC Bldg Type
1	58396	Alameda - Alameda Hospital	3/0	12+FF	1	M	S1L	K1
2	34234	Bakersfield - Kern County Hospital	4/1	12+FF	1	H	C2M	H2b
3	58496	Berkeley - Alta Bates Hospital	2/1	12	1	L	S2L	I1c
4	58390	Burlingame - Mills Peninsula Hospital (isolated)	6/0	27+FF	1	M	IM	Q2
5	58494	Castro Valley - Sutter Eden Medical Center	6/1	19+FF	1	H	S2M	I2a
6	23788	Colton - San Bernardino Co. Med. Center (isolated)	6/0,4/0,2/0	27+FF	2	H	IM	Q2
7	99261	Crescent City - Sutter Hospital	1/0	10+FF	1	H	S2L	I1c
8	14689	Downey - Kaiser Hospital Tower Expansion	6/partial	16+FF	1	M	S1M	J2b
9	14646	Downey - PIH Health Hospital (VSI)	4/1	12+FF	1	M	C2M	G2b
10	01699	El Centro - Community Hospital	1/0	12+FF	1	H	S2L	I1b
11	24648	Encino - Encino Hospital (VSI)	4/1	12+FF	1	H	RM2M	F2a
12	13476	Escondido - PMC West Hospital Central Plant	2/0	6	1	H	C2L	H1f
13	13473	Escondido - PMC West Hospital (Main Tower)	11/1	12+FF	1	H	S1H	K3a
14	89770	Eureka - St. Joseph Hospital	4/1	11+FF	1	H	C2M	G2d
15	68032	Fairfield - NorthBay Medical Center	3/0	12+FF	1	L	S2L	I1d
16	57301	Fremont - Kaiser Hospital	2/0	15+FF	1	H	S1L	K1
17	57643	Fremont - Washington Hospital (isolated)	3/1	24+FF	1	M	IL	Q1
18	57200	Gilroy - St. Louise Hospital	2/0	10+FF	1	H	S1L	K1
19	58M15	Greenbrae - Marin General Hospital Replacement Building	4/1	16+FF	1	H	S1M	J2b
20	12267	Hemet - Valley Hospital	4/1	17+FF	1	H	C2M	G2d
21	12759	Indio - JFK Hospital	1/0	8+FF	1	H	W1	A1
22	13439	Irvine - Kaiser Sand Canyon Hospital	6/partial	15+FF	1	M	S2M	I2b
23	47231	King City - Mee Hospital	2/0	10+FF	1	L	S2L	I1c
24	03538	La Jolla - Scripps Memorial Hospital	7/1	12+FF	1	M	S1M	J2b
25	03233	La Jolla - UCSD Hospital	2/0	16+FF	1	H	S1L	J1b
26	03593	La Jolla - UCSD Jacobs Medical Center	10/2	24	1	H	S1H	K3a
27	24609	Lancaster - Antelope Valley Hospital	5/0	12+FF	1	H	S1M	K2
28	14735	Long Beach - Miller Children's Hospital	4/0	15+FF	1	H	S1M	J2b
29	24397	Los Angeles - Childrens Hospital	7/1	12	1	H	S1M	K2
30	24713	Los Angeles - Good Samaritan Hospital	8/1	15	1	H	S2H	I3b
31	24662	Los Angeles - Hollywood Presbyterian MC S. Wing (VSI)	4/1	12+FF	1	M	C2M	H2b
32	24682	Los Angeles - Hollywood Presbyterian MC Drs Tower (VSI)	10/2	15	1	M	S1H	J3b
33	24250	Los Angeles - LAC+USC Hospital D&T Bldg (isolated)	6/0	20+FF	1	H	IM	Q2
34	24248	Los Angeles - LAC+USC Hospital IP Bldg	9/0	12	1	H	S2H	I3b
35	14724	Los Angeles - MLK Hospital (isolated)	5/1	21+FF	2	H	IM	Q2
36	24605	Los Angeles - USC Hospital (isolated)	7/1	24	1	H	IH	Q3
37	24260	Los Angeles - USC Hospital Addition	9/1	12	1	L	S2H	I3b
38	54331	Mammoth Lakes - Mammoth Hospital	1/0	10+FF	1	H	S2L	I1b
39	13213	Moreno Valley - Riverside County Hospital	3/1	12+FF	1	H	S1L	K1
40	13601	Murrieta - Rancho Springs Medical Center	2/0	9+FF	1	M	C1L	L1
41	13291	Newport Beach - Hoag Hospital East Tower (isolated)	7/1	27	1	H	IM	Q3
42	13589	Newport Beach - Hoag Hospital West Tower	11/0	18+FF	1	H	C2H	H3a
43	68430	Novato - Community Hospital	2/0	12+FF	1	M	S2L	I1b
44	58590	Oakland - Kaiser Hospital	12/1	18	1	M	S2H	I3b
45	23416	Ontario - Kaiser Hospital	5/partial	18+FF	1	H	S2M	I2b
46	25949	Oxnard - St. Johns Hospital	4/1	16+FF	1	H	S1M	K2
47	12299	Palm Springs - Desert Hospital	4/1	13	1	H	S1M	K2
48	24457	Palmdale - Palmdale Regional Hospital	5/0	16+FF	1	M	C2M	H2d
49	58604	Palo Alto - Lucile Packard Childrens Hospital Stanford	6/2	21	2	M	S2M	J2a
50	23548	Redlands - Community Hospital (VSI)	2/1	9+FF	1	M	C2L	H1c
51	13633	Riverside - Community Hospital (VSI)	6/1	12+FF	1	M	C2M	G2e

Appendix B

BUILDINGS INSTRUMENTED BY CSMIP/HCAI

10/1/2025

Site No. on Map	CSMIP Sta. No.	Station Name	No. of Stories	No. of Sensors	No. of Rcrdrs	Recov. Speed	FEMA-310 Bldg Type	SMIAC Bldg Type
52	47796	Salinas - Natividad Medical Center	3/0	15+FF	1	H	S2L	I1b
53	23634	San Bernardino - Community Hospital	5/0	12+FF	1	H	S1M	K2
54	23697	San Bernardino - St. Bernardine Medical Center	6/0	12+FF	1	H	S1M	J2a
55	03546	San Diego - Sharp Memorial Hospital (VSI)	8/1	15+FF	1	M	C2H	H3b
56	03743	San Diego - UCSD Hospital	11/1	12+FF	1	H	C1H	M3
57	58640	San Francisco - CPMC Cathedral Hill Hospital	12/2	24	1	H	S1H	K3a
58	58574	San Francisco - General Hospital (isolated)	7/2	24+FF	2	M	IM	Q2
59	58718	San Francisco - Kaiser Hospital	6/0	18	1	H	C2M	H2d
60	58649	San Francisco - St. Luke's Hospital	6/1	16	1	M	S2M	I2b
61	58257	San Francisco - UCSF Hospital	15/1	16+FF	1	H	U	U
62	58572	San Francisco - UCSF Mission Bay Hospital	6/0	18+FF	1	M	S2M	I2b
63	57594	San Jose - O'Connor Hospital	5/0	16+FF	1	H	S2M	I2c
64	57495	San Jose - Santa Clara Valley Hospital (Bldg K)	4/1	15	1	M	S1M	K2
65	57537	San Jose - Santa Clara Valley Hospital (Bed Bldg 1)	7/1	20+FF	1	M	S1M	K2
66	14535	San Pedro - Providence LCOM Hosp (Bldg 1T) (VSI)	5/partial	12+FF	1	H	S2M	I2d
67	14536	San Pedro - Providence LCOM Hosp (Bldg 02) (VSI)	4/1	12	1	H	C2M	H2d
68	58755	San Rafael - Marin General Hospital	5/1	12+FF	1	H	S1M	J2b
69	13611	Santa Ana - Orange County Global Medical Center (VSI)	1/0	6+FF	1	M	S2L	I1a
70	25777	Santa Barbara - Cottage Hospital	3/1	9+FF	1	H	C2L	H1e
71	57251	Santa Clara - Kaiser Hospital	3/1	18+FF	1	H	S2L	I1b
72	26470	Santa Maria - Marian Hospital	4/partial	12+FF	1	M	S2M	I2c
73	24202	Santa Monica - St. John's Hospital (isolated)	5/1	24+FF	1	H	IM	Q2
74	68669	Santa Rosa - Kaiser Hospital	4/1	13+FF	1	H	S1M	K2
75	24104	Simi Valley - Simi Valley Hospital	2/1	12+FF	1	H	S1L	K1
76	58623	Stanford - 7-story Hospital (isolated)	7/1	34+FF	1	M	IM	Q2
77	58055	Stanford - University Hospital	3/1	12+FF	1	H	S1L	K1
78	24514	Sylmar - Olive View Medical Center	6/0	13+FF	1	L	UM	R
79	36695	Templeton - Twin Cities Hospital	1/0	9+FF	1	H	W1	A1
80	14529	Torrance - Providence LCOM Hospital (VSI)	4/2	21+FF	2	M	C2M	H2d
81	24344	Valencia - Mayo Hospital	2/partial	12+FF	1	M	S1L	K1
82	25594	Ventura - Community Memorial Hospital	6/1	24+GA	2	M	S2M	I2b
83	25744	Ventura - County Hospital	4/1	12+FF	3	VL	C2M	H2b
84	58199	Walnut Creek - Kaiser Hospital	3/1	16	1	L	S1L	K1
85	14737	Whittier - Presbyterian Intercommunity Hospital	4/1	18+FF	1	H	S1M	J2b