PACIFIC EARTHQUAKE ENGINEERING RESEARCH CENTER

Ground Motion Estimates for Emergency Response

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A report to the PEER Program of Applied Earthquake Engineering Research on Lifeline Systems

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PEER UTILITIES PROGRAM
REPORT NO. 2000/06

AGBABIAN ASSOCIATES
engineers and consultants

ROSRINE 4A

FINAL REPORT

August 18, 1999

ROSRINE 4A
Final Report

by

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Report No. R-9818-6695
August 18, 1999

Final Progress Report

TABLE OF CONTENTS

Final Progress Report i

TABLE OF CONTENTS ii

1.0 INTRODUCTION 1

2.0 Brentwood VA Hospital 4

3.0 Dayton Heights School 8

4.0 ETEC RD-7 18

5.0 ETEC RD-20 22

6.0 LADWP Receiving Station East 26

7.0 Saturn Street School 30

1.0 INTRODUCTION

OVERVIEW: ROSRINE is a collaborative research project ultimately focused on improving engineering models for estimation of earthquake ground motions. The central component of this project is the collection, synthesis, and dissemination to both the research and design communities of high quality subsurface data obtained primarily from instrument sites that recorded strong shaking during the 1994 Northridge earthquake. Project funding initially came from NSF (this grant), Caltrans, and the Electric Power Research Institute. Additional follow-on funding has come from CEC/PEER/PG&E through the current grant. Support by CEC, PEER, and PG&E of our ongoing efforts is gratefully acknowledged.

Cost sharing has been contributed by all of the investigating organizations, and in-kind contributions have been made by the USGS, LADWP, LAWRD, SCEC, and other organizations.

ROSRINE-related strong motion site characterization is being accomplished by geologists, geotechnical engineers and geophysicists from a variety of public and private organizations. Typical field data includes geologic and geophysical logs to depths of 100 meters or more. To date, approximately 45 strong-motion recording sites have been characterized. A web site (**http://rccg03.usc.edu/rosrine/**) has been established for data dissemination, and geophysical information have been presented and published. Results show that many strong motion sites had been previously misclassified.

SUMMARY OF EFFORTS:
Under Contract No. 500-97-010 between Pacific Gas & Electric and University of California Berkeley, UCB Subaward SA2121-59652 to University of Southern California, and Purchase Order No. 036709 between Agbabian Associates, Inc. and University of Southern California, the following work was performed:

1. Site Characterization (drilling, sampling, logging) at the following ROSRINE sites:
   - Saturn School
   - Dayton Heights School
2. Collaborative site characterization (logging only) at the following USGS sites:
   - Brentwood VA Hospital
   - LADWP Receiving Station East
   - ETEC RD-7
   - ETEC RD-20
3. Index property testing of selected soil samples at a commercial soil laboratory (Hydrologue).
4. Preparation and transmittal to UCLA Soils Lab of selected soil samples.
5. Preparation for data workshop.
6. Participation in ROSRINE Data Dissemination Workshop at USC on December 15-16, 1998.
7. Attempt logging in existing borehole at Caltech/Kresge lab.
8. Data dissemination through the project website (rccg03.usc.edu/rosrine).

DATA/INFORMATION DISSEMINATION:

The project's Web page is designed to be the main vehicle for data and information dissemination from the ROSRINE project. The address is *rccg03.usc.edu/Rosrine*.

Members of the ROSRINE project have presented papers at various conferences and workshops.

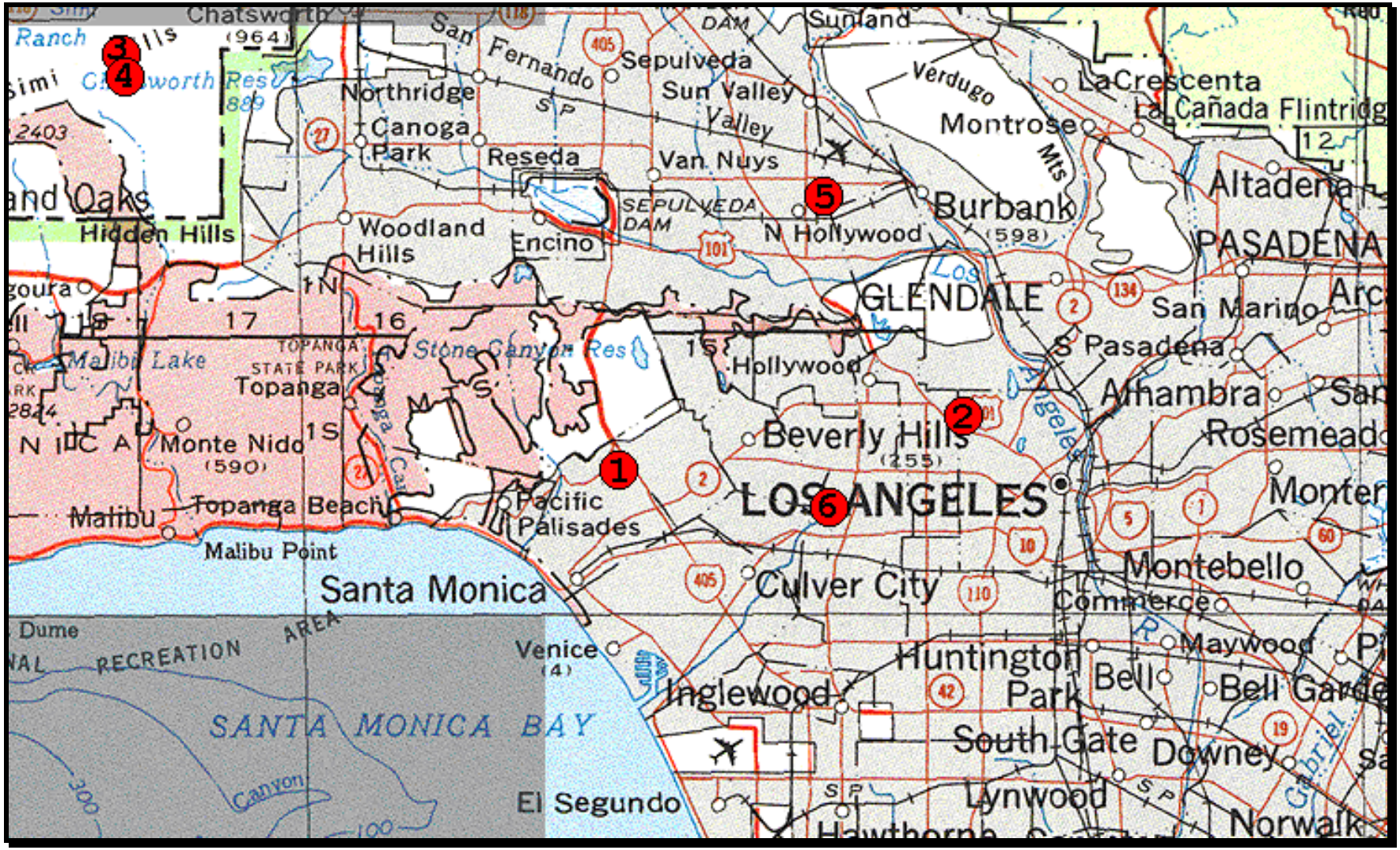

Fig. 1-1 Site Map

2.0 Brentwood VA Hospital

Site Description

- Located in Brentwood, CA
- Latitude = 34.063, Longitude = -118.463

Work Performed

- P- & S-Wave Velocity Measurements Using Suspension Logging

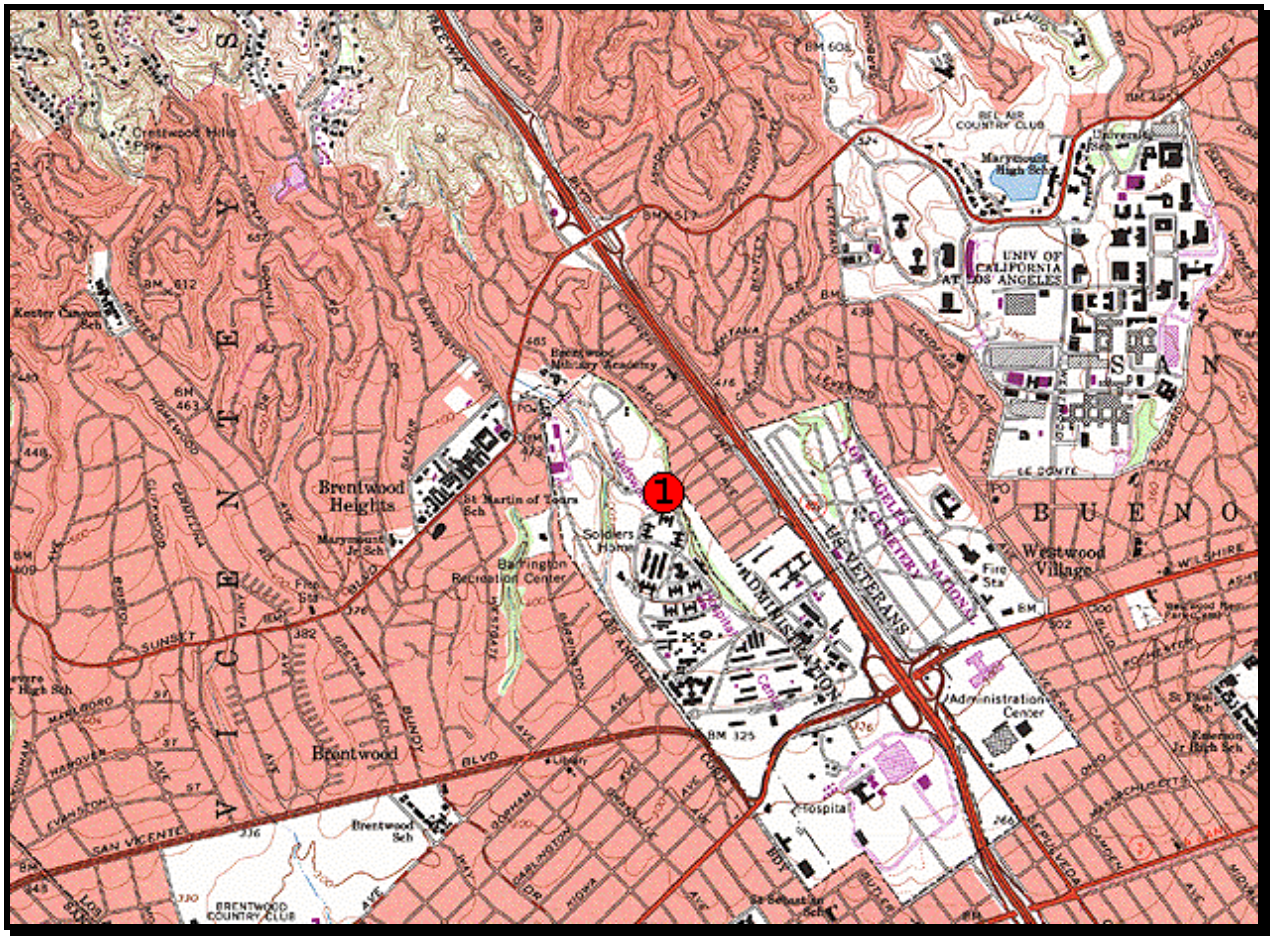

Fig. 2-1 Local Site Map of Brentwood Hospital Location

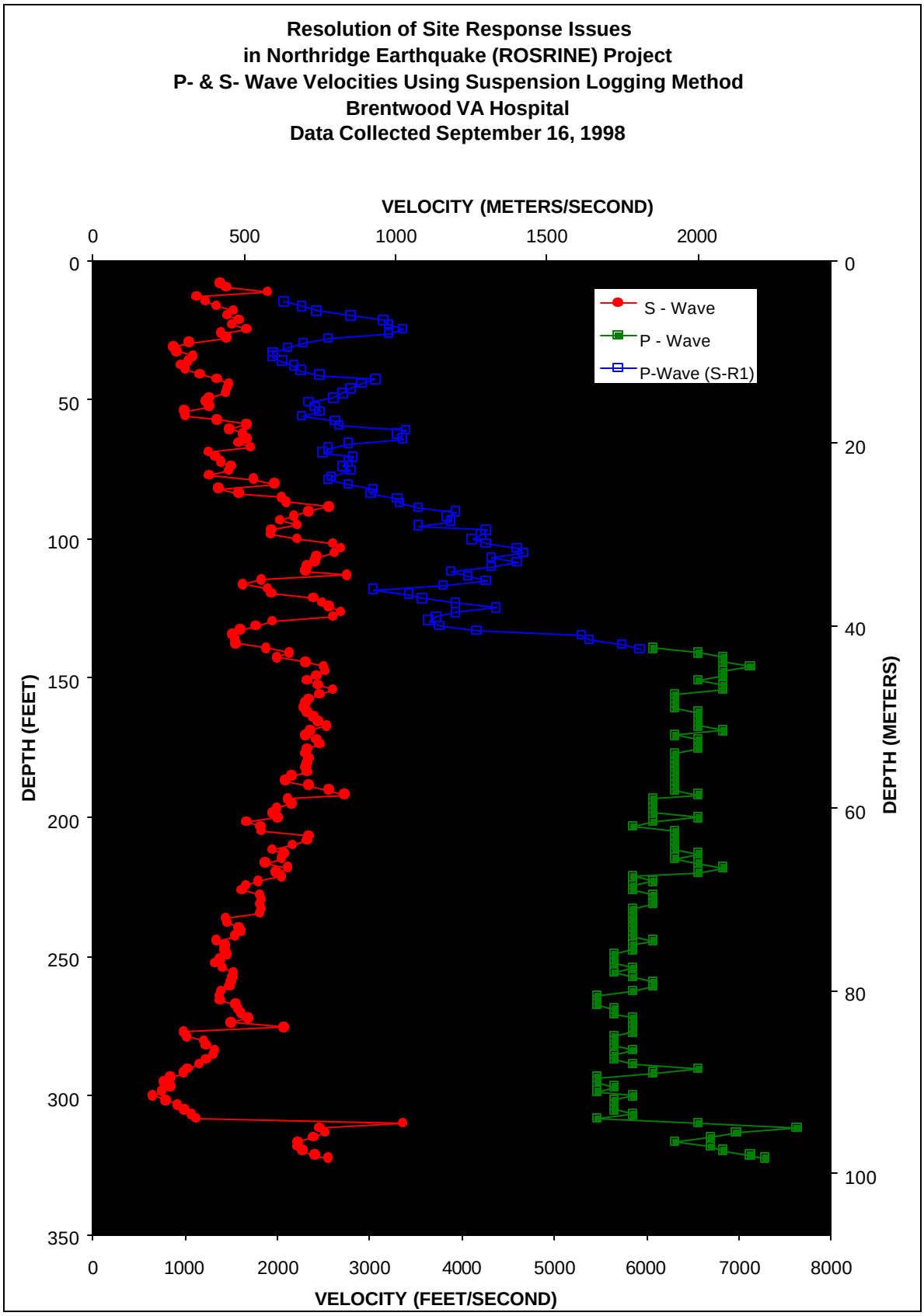

Fig. 2-2 Brentwood VA Hospital Suspension Logging

Depth (feet)	V_s (ft/s)	V_p (ft/s)	Avg. Depth (feet)	V_p (S-R1) (ft/s)
5.3			15.0	2071
6.6			16.6	2273
8.2	1384		18.3	2431
9.8	1452		19.9	2800
11.5	1896		21.5	3153
13.1	1131		23.2	3211
14.8	1229		24.8	3365
16.4	1345		26.5	3211
18.0	1526		28.1	2555
19.7	1465		29.8	2288
21.3	1585		31.4	2121
23.0	1512		33.0	1955
24.6	1674		34.7	1955
26.3	1396		36.3	2059
27.9	1452		38.0	2188
29.5	1052		39.6	2258
31.2	882		41.2	2465
32.8	914		42.9	3070
34.5	1086		44.2	2917
36.1	1042		46.2	2800
37.7	968		47.8	2713
39.0	1006		49.4	2612
41.0	1172		51.1	2349
42.7	1350		52.7	2414
44.3	1478		54.4	2465
45.9	1465		56.0	2273
47.6	1445		57.6	2632
49.2	1272		59.3	2672
50.9	1224		60.9	3398
52.5	1272		62.6	3302
54.1	1000		64.2	3365
55.8	1003		65.8	2778
57.4	1350		67.5	2555
59.1	1674		69.1	2500
60.7	1491		70.8	2823
62.3	1632		72.4	2778
64.0	1674		74.0	2713
65.6	1585		75.7	2800
67.3	1718		77.7	2593
68.9	1257		79.0	2555
70.5	1334		80.6	2778
72.5	1390		82.2	3043
73.8	1505		83.9	3017
75.5	1478		85.5	3302
77.1	1267		87.2	3333
78.7	1745		88.8	3535
80.4	1976		90.4	3933
82.0	1373		92.1	3846
83.7	1585		93.7	3889
85.3	2051		95.4	3535
86.9	2103		97.0	4268
88.6	2563		98.6	4217
90.2	2343		100.3	4118
91.9	2187		101.9	4268
93.5	2038		103.6	4605
95.1	2217		105.2	4667
96.8	1941		106.9	4321
98.4	1930		108.5	4605
100.1	2217		110.1	4321
101.7	2604		111.8	3889
103.4	2689		113.4	4070
105.0	2625		115.1	4268
106.6	2430		116.7	3804
108.3	2412		118.3	3043
109.9	2327		120.0	3431

Depth (feet)	V_s (ft/s)	V_p (ft/s)	Avg. Depth (feet)	V_p (S-R1) (ft/s)
111.6	2310		121.6	3571
113.2	2757		123.3	3933
114.8	1833		124.9	4375
116.5	1632		126.5	3933
118.1	1896		128.2	3723
119.8	1941		129.5	3646
121.4	2395		131.5	3763
123.0	2485		133.1	4167
124.3	2563		134.7	5303
126.3	2689		136.4	5385
128.0	2604		138.0	5738
129.6	1953		139.7	5932
131.2	1773		141.3	6364
132.9	1600			
134.5	1519			
136.2	1548			
137.8	1555			
139.4	1886	6076		
141.1	2130	6562		
142.7	2001	6835		
144.4	2310	6835		
146.0	2504	7132		
147.6	2524	6835		
149.3	2430	6835		
150.9	2327	6562		
152.6	2448	6835		
154.2	2604	6835		
155.8	2467	6309		
157.5	2343	6309		
159.1	2310	6309		
160.8	2294	6309		
162.4	2327	6562		
164.0	2395	6562		
165.7	2448	6562		
167.3	2543	6562		
169.0	2360	6835		
170.6	2310	6309		
172.2	2430	6562		
173.9	2467	6562		
175.5	2327	6562		
177.2	2310	6309		
178.8	2343	6309		
180.5	2327	6309		
182.1	2310	6309		
183.7	2327	6309		
185.4	2158	6309		
187.0	2090	6309		
188.7	2343	6309		
190.3	2563	6309		
191.9	2734	6562		
193.6	2117	6076		
195.2	2158	6076		
196.9	2001	6076		
198.5	1953	6076		
200.1	2013	6562		
201.8	1674	6076		
203.4	1823	5859		
205.1	1833	6309		
206.7	2343	6309		
208.3	2327	6309		
210.0	2173	6309		
211.6	1953	6309		
213.3	2076	6562		
214.9	2051	6309		
216.5	1875	6562		

Depth (feet)	V_s (ft/s)	V_p (ft/s)
218.2	2117	6835
219.8	1988	6562
221.5	2051	5859
223.1	1803	6076
224.7	1665	5859
226.4	1624	5859
228.0	1813	6076
229.7	1833	6076
231.3	1813	6076
232.9	1833	5859
234.6	1813	5859
236.2	1445	5859
237.9	1465	5859
239.5	1593	5859
241.1	1608	5859
242.8	1548	5859
244.4	1345	6076
246.1	1439	5859
247.7	1439	5859
249.3	1458	5657
251.0	1384	5657
252.6	1328	5657
254.3	1414	5859
255.9	1533	5657
257.6	1519	5859
259.2	1505	6076
260.8	1491	6076
262.5	1390	5859
264.1	1379	5468
265.8	1384	5468
267.4	1555	5468
269.0	1577	5657
270.7	1616	5657
272.3	1691	5859
274.0	1505	5859
275.6	2076	5859
277.2	988	5859
278.9	1019	5657
280.5	1211	5657
282.2	1233	5657
283.8	1328	5859
285.4	1312	5657
287.1	1233	5657
288.7	1159	5859
290.4	1032	6562
292.0	991	6076
293.6	846	5468
295.3	774	5468
296.9	850	5657
298.6	756	5468
300.2	655	5859
301.8	800	5657
303.5	919	5657
305.1	997	5657
306.8	1076	5859
308.4	1124	5468
310.0	3365	6562
311.7	2467	7630
313.3	2524	6981
315.0	2395	6696
316.6	2224	6309
318.2	2232	6696
319.9	2278	6835
321.5	2412	7132
322.5	2553	7291

Fig. 2-3 Brentwood VA Hospital Suspension Data

3.0 Dayton Heights School

Site Description

- Located in Los Angeles, CA off Westmoreland Avenue
- Latitude = 34.082, Longitude = -118.286

Work Performed

- P- & S-Wave Velocity Measurements Using Suspension Logging
- Geologic Logging

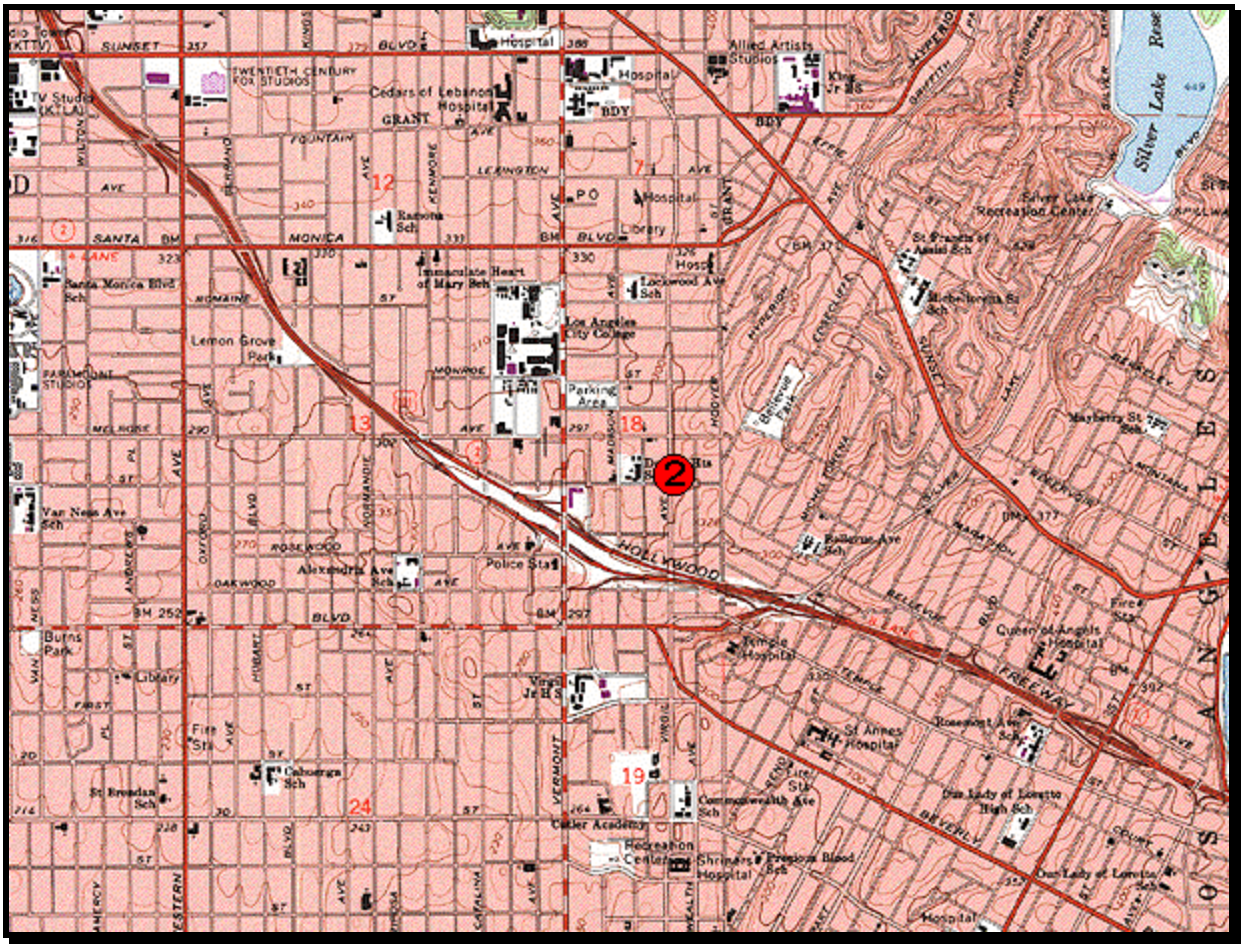

Fig. 3-1 Local Site Map of Dayton Heights Location

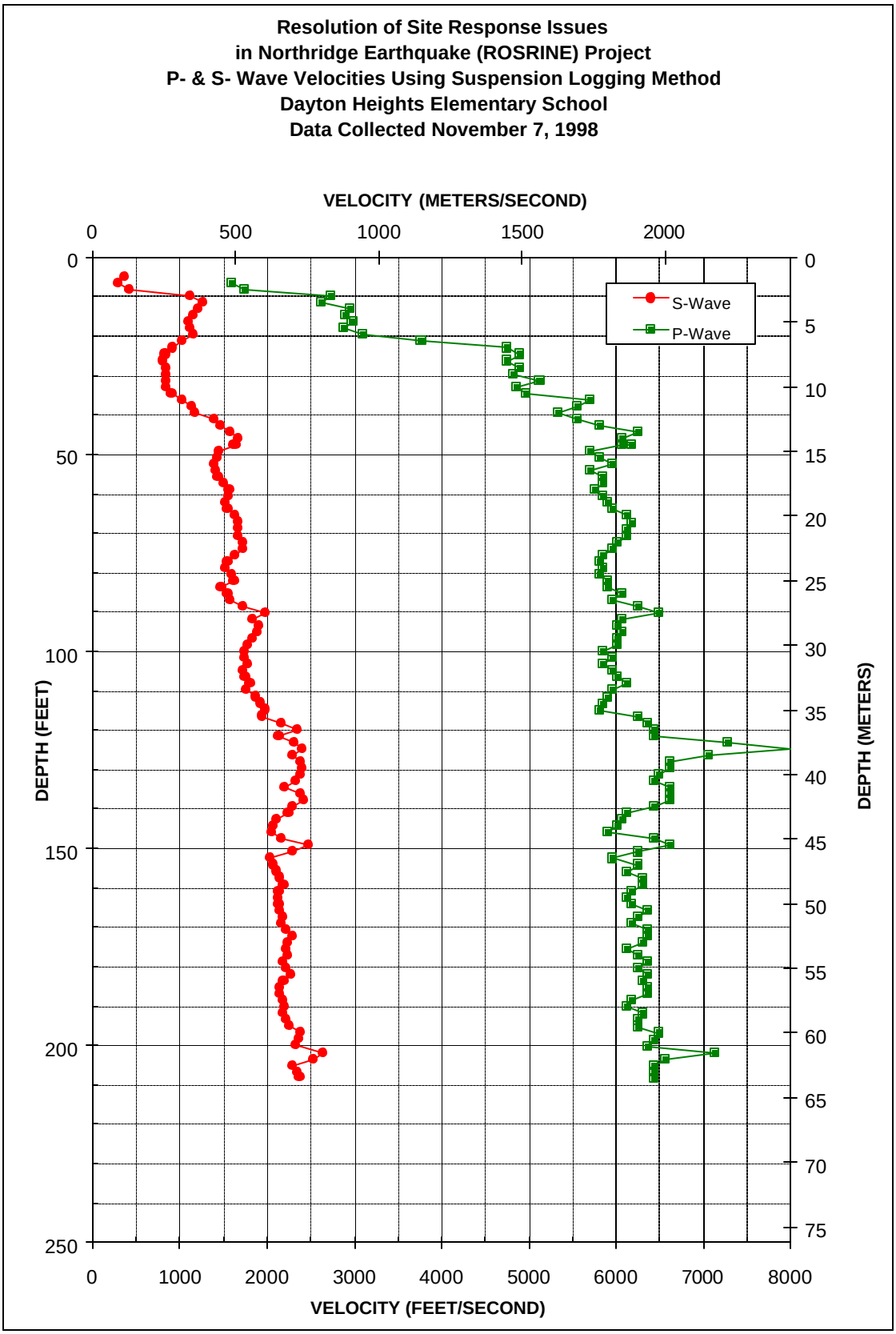

Fig. 3-2 Dayton Heights School Suspension Logging

Depth (feet)	Vs (feet/s)	Vp (feet/s)
4.9	365	
6.6	299	1593
8.2	421	1745
9.8	1116	2734
11.5	1267	2625
13.1	1206	2956
14.8	1151	2903
16.4	1101	2983
18.1	1124	2878
19.7	1151	3095
21.3	1025	3771
23.0	924	4755
24.6	835	4897
26.3	812	4755
27.9	850	4897
29.5	850	4825
31.2	841	5126
32.8	851	4861
34.5	909	4971
36.1	1022	5706
37.7	1143	5561
39.4	1180	5335
41.0	1387	5561
42.7	1475	5807
44.3	1574	6249
45.9	1678	6076
47.6	1620	6190
47.6	1645	6076
49.2	1455	5706
50.9	1436	5807
52.5	1387	5965
54.1	1414	5706
55.8	1442	5859
57.4	1512	5859
59.1	1570	5756
60.7	1555	5859
62.3	1522	5911
64.0	1551	5965
65.6	1632	6132
67.3	1670	6190
68.9	1665	6132
70.5	1665	6132

Depth (feet)	Vs (feet/s)	Vp (feet/s)
72.2	1722	6020
73.8	1718	5965
75.5	1632	5859
77.1	1551	5807
78.7	1519	5859
80.4	1600	5807
82.0	1624	5911
83.7	1478	5911
85.3	1551	6076
86.9	1581	5965
88.6	1727	6249
90.2	1988	6497
91.9	1838	6076
93.5	1913	6020
95.2	1891	6076
96.8	1833	6020
98.4	1788	6020
100.1	1740	5859
101.7	1750	5965
103.4	1783	5859
105.0	1727	5965
106.6	1754	6020
108.3	1808	6132
109.9	1769	5965
111.6	1875	5911
113.2	1930	5859
114.8	1982	5807
116.5	1947	6249
118.1	2166	6371
119.8	2352	6433
121.4	2137	6433
123.0	2319	7291
124.7	2404	8002
126.3	2302	7056
128.0	2377	6628
129.6	2412	6628
131.2	2386	6497
132.9	2327	6433
134.5	2209	6628
136.2	2377	6628
137.8	2421	6628
139.4	2294	6433

Depth (feet)	Vs (feet/s)	Vp (feet/s)
141.1	2247	6132
142.7	2110	6076
144.4	2070	6020
146.0	2057	5911
147.6	2166	6433
149.3	2476	6628
150.9	2286	6249
152.6	2038	5965
154.2	2070	6249
155.8	2110	6132
157.5	2151	6309
159.1	2195	6309
160.8	2137	6190
162.4	2124	6132
164.0	2137	6190
165.7	2151	6371
167.3	2180	6249
169.0	2173	6190
170.6	2217	6371
172.2	2302	6371
173.9	2239	6309
175.5	2224	6132
177.2	2239	6249
178.8	2187	6371
180.5	2224	6249
182.1	2278	6371
183.7	2195	6309
185.4	2151	6371
187.0	2151	6371
188.7	2180	6190
190.3	2202	6132
191.9	2187	6309
193.6	2217	6249
195.2	2255	6249
196.9	2386	6497
198.5	2360	6433
200.1	2335	6371
201.8	2646	7132
203.4	2533	6562
205.1	2286	6433
206.7	2352	6433
208.2	2377	6433

Fig. 3-3 Dayton Heights School Suspension Logging

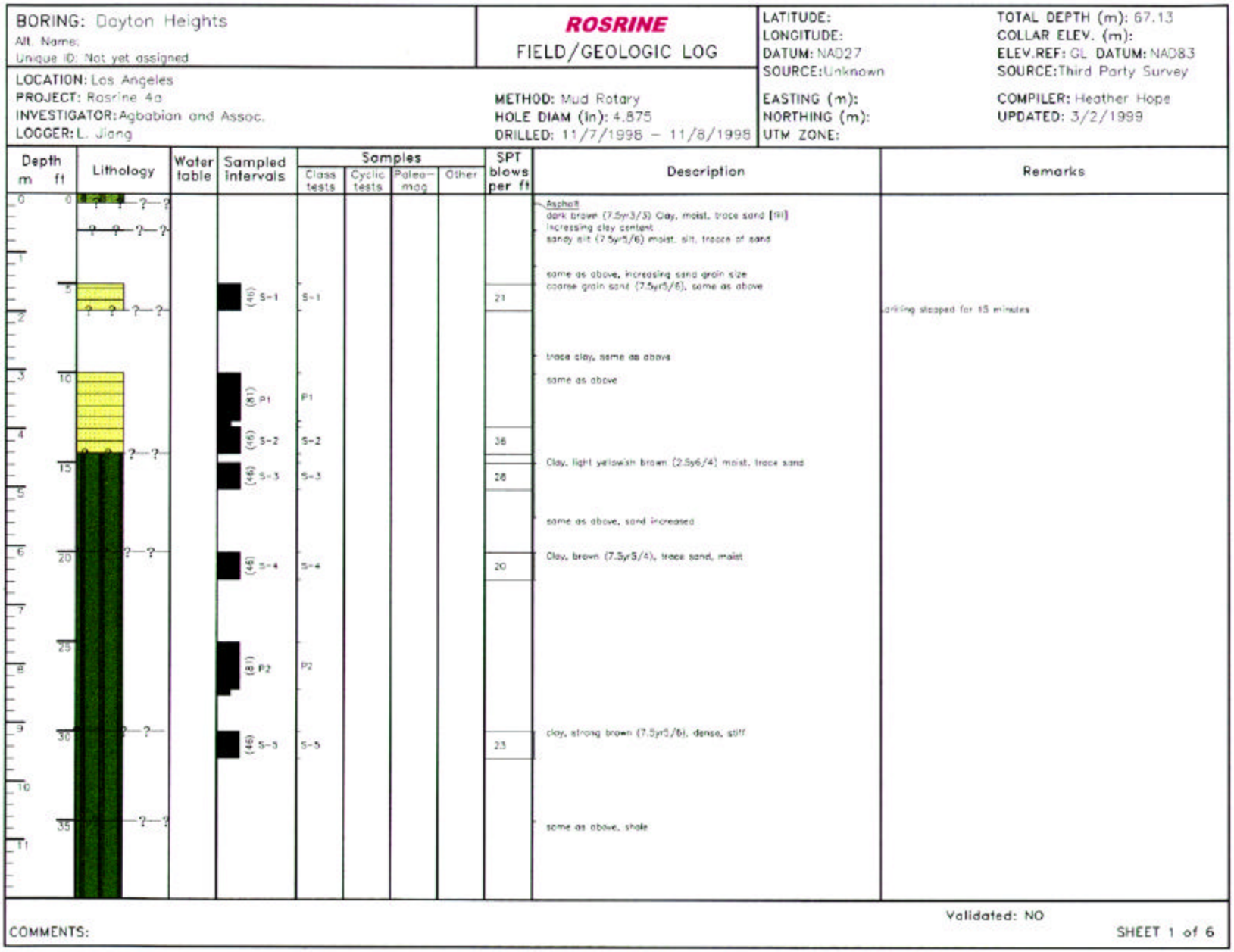

Fig 3-4 Dayton Heights School Geologic Log

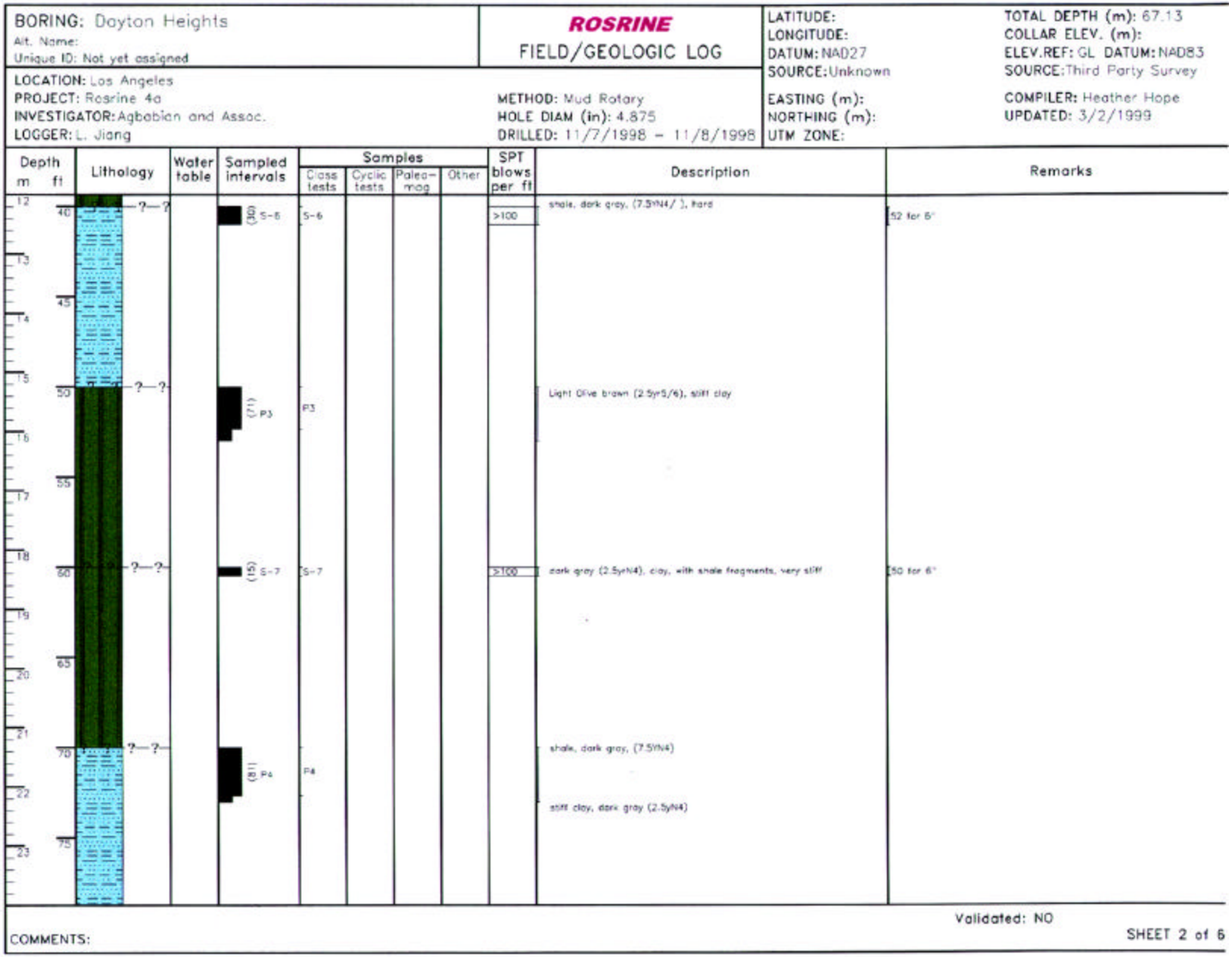

Fig 3-4 (Continued) Dayton Heights School Geologic Log

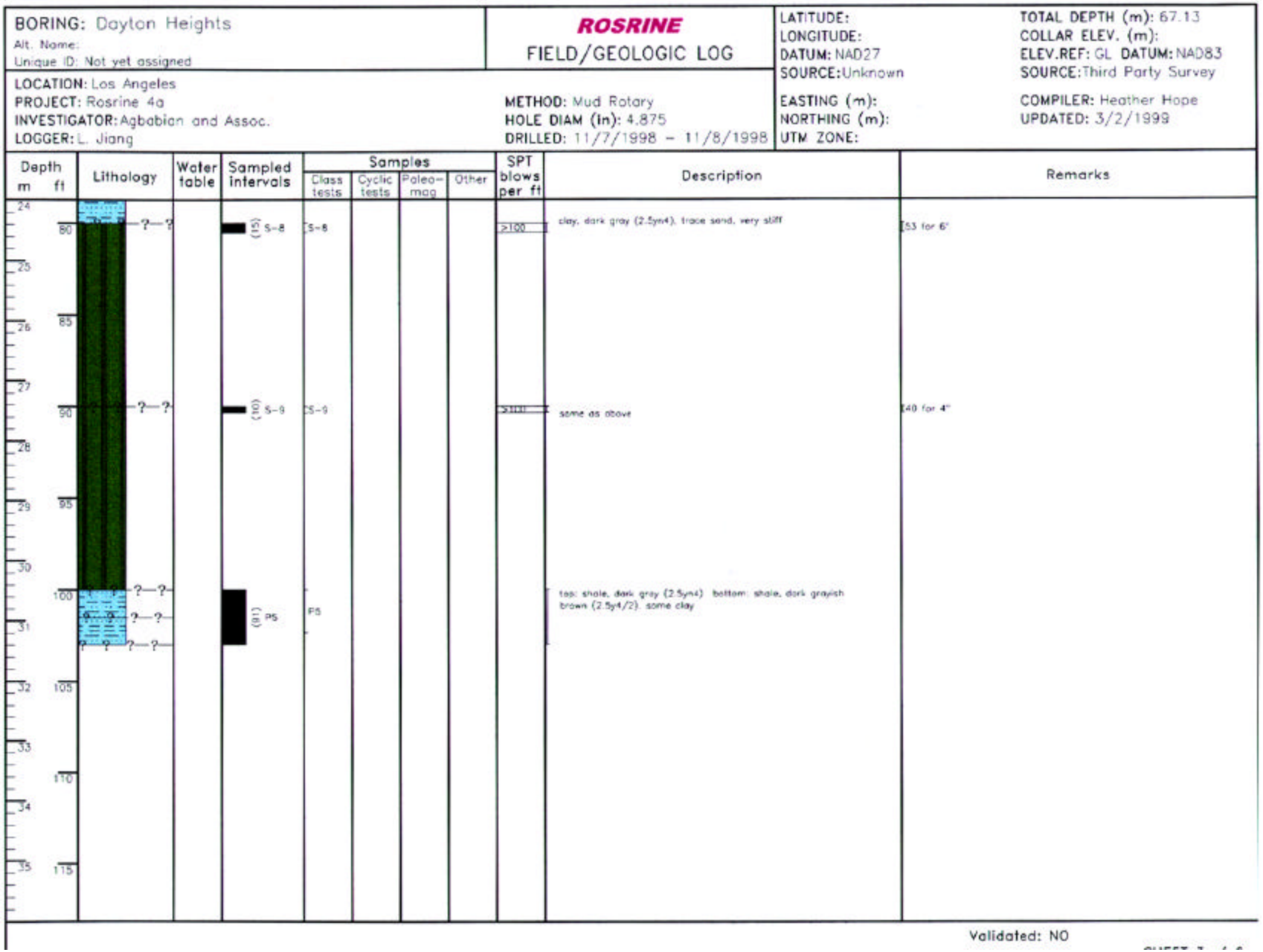

Fig 3-4 (Continued) Dayton Heights School Geologic Log

BORING: Dayton Heights
Alt. Name:
Unique ID: Not yet assigned

ROSRINE
FIELD/GEOLOGIC LOG

LATITUDE:
LONGITUDE:
DATUM: NAD27
SOURCE: Unknown
EASTING (m):
NORTHING (m):
UTM ZONE:

TOTAL DEPTH (m): 67.13
COLLAR ELEV. (m):
ELEV.REF: GL DATUM: NAD83
SOURCE: Third Party Survey
COMPILER: Heather Hope
UPDATED: 3/2/1999

LOCATION: Los Angeles
PROJECT: Rosrine 4a
INVESTIGATOR: Agbabian and Assoc.
LOGGER: L. Jiang

METHOD: Mud Rotary
HOLE DIAM (in): 4.875
DRILLED: 11/7/1998 – 11/8/1998

Depth m	Depth ft	Lithology	Water table	Sampled intervals	Samples: Class tests	Samples: Cyclic tests	Samples: Paleo-mag	Samples: Other	SPT blows per ft	Description	Remarks
36	120										
37											
38	125										
39											
	130										
40											
41	135										
42											
	140										
43		? ?		(13) 5-10	5-10				>100	clay, dark gray (2.5y4).very stiff, oil	54 for 6"
44	145										
45											
	150										
46										shale, cemented, hard, about 1' thick, concretion	
47	155										

COMMENTS:

Validated: NO

SHEET 4 of 6

Fig 3-4 (Continued) Dayton Heights School Geologic Log

BORING: Dayton Heights
Alt. Name:
Unique ID: Not yet assigned

ROSRINE
FIELD/GEOLOGIC LOG

LATITUDE:
LONGITUDE:
DATUM: NAD27
SOURCE: Unknown
EASTING (m):
NORTHING (m):
UTM ZONE:

TOTAL DEPTH (m): 67.13
COLLAR ELEV. (m):
ELEV.REF: GL DATUM: NAD83
SOURCE: Third Party Survey
COMPILER: Heather Hope
UPDATED: 3/2/1999

LOCATION: Los Angeles
PROJECT: Rosrine 4a
INVESTIGATOR: Agbabian and Assoc.
LOGGER: L. Jiang

METHOD: Mud Rotary
HOLE DIAM (in): 4.875
DRILLED: 11/7/1998 – 11/8/1998

Depth m	Depth ft	Lithology	Water table	Sampled intervals	Samples: Class tests	Samples: Cyclic tests	Samples: Paleo-mag	Samples: Other	SPT blows per ft	Description	Remarks
48											
	160										
49											
50											
	165										
51											
	170										
52										hard layer, same as above, 6" thick, cemented concretion	
53											
	175										
54											
55	180	?—?		S-11	S-11				>100	Clay, dark gray (2.5YN3), stiff	57 for 6"
56											
	185										
57											
58	190										
59											
	195									enter hard layer, same as above, 1' thick	

COMMENTS:

Validated: NO

SHEET 5 of 6

Fig 3-4 (Continued) Dayton Heights School Geologic Log

BORING: Dayton Heights
Alt. Name:
Unique ID: Not yet assigned

ROSRINE
FIELD/GEOLOGIC LOG

LATITUDE:
LONGITUDE:
DATUM: NAD27
SOURCE: Unknown
EASTING (m):
NORTHING (m):
UTM ZONE:

TOTAL DEPTH (m): 67.13
COLLAR ELEV. (m):
ELEV.REF: GL DATUM: NAD83
SOURCE: Third Party Survey
COMPILER: Heather Hope
UPDATED: 3/2/1999

LOCATION: Los Angeles
PROJECT: Rosrine 4a
INVESTIGATOR: Agbabian and Assoc.
LOGGER: L. Jiang

METHOD: Mud Rotary
HOLE DIAM (in): 4.875
DRILLED: 11/7/1998 – 11/8/1998

Depth m	Depth ft	Lithology	Water table	Sampled intervals	Samples: Class tests	Samples: Cyclic tests	Samples: Paleo-mag	Samples: Other	SPT blows per ft	Description	Remarks
60											
61	200										
62	205									hard layer, same as above, 3" – 6" thick, cemented concretion	
63											
64	210										
65	215										
66											
67	220										

E.O.H 67.13 m

COMMENTS:

Validated: NO

SHEET 6 of 6

Fig 3-4 (Continued) Dayton Heights School Geologic Log

4.0 ETEC RD-7

Site Description

- Located at ETEC Santa Susana Field Laboratory
- Latitude = 34.231, Longitude = -118.715

Work Performed

- P- & S-Wave Velocity Measurements Using Suspension Logging

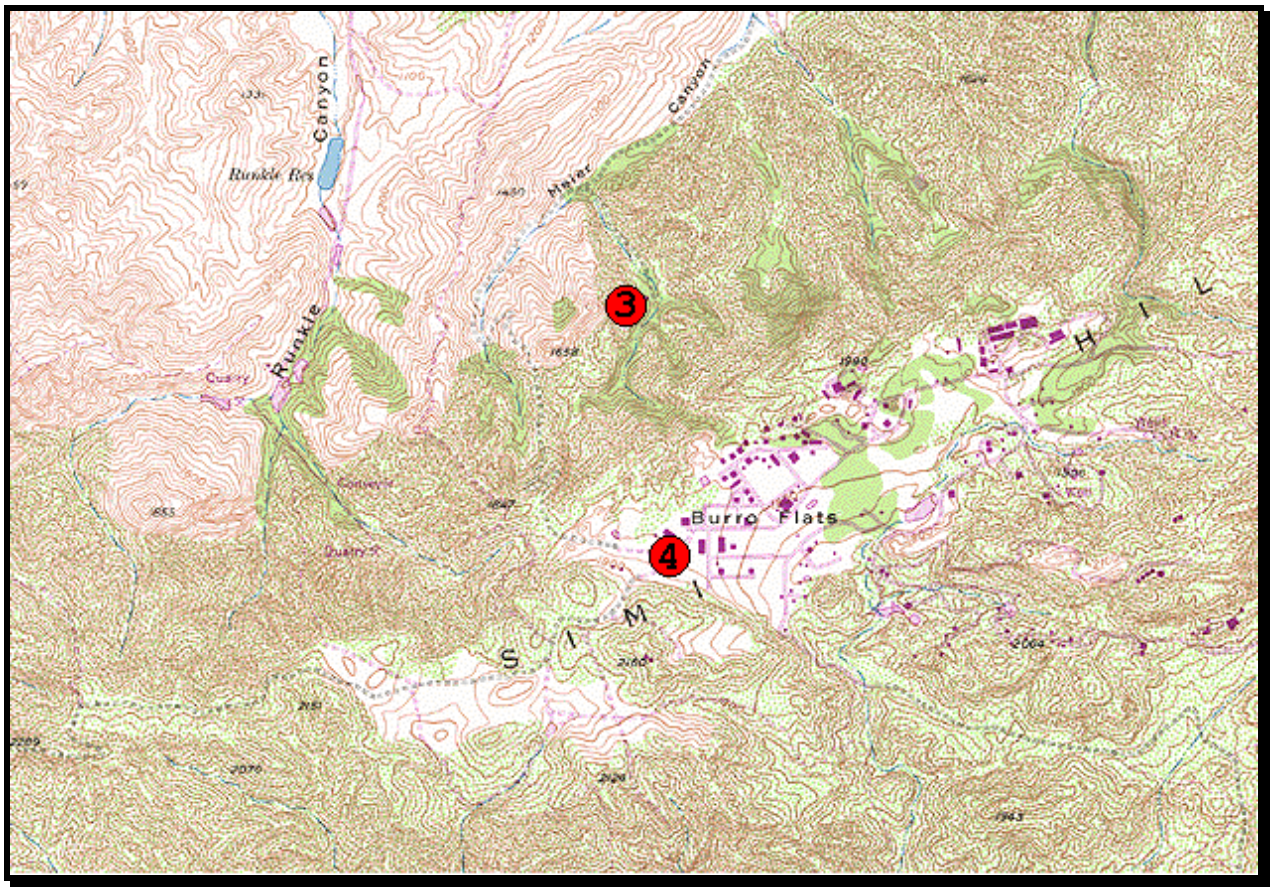

Fig. 4-1 Local Site Map of ETEC RD-7 Location

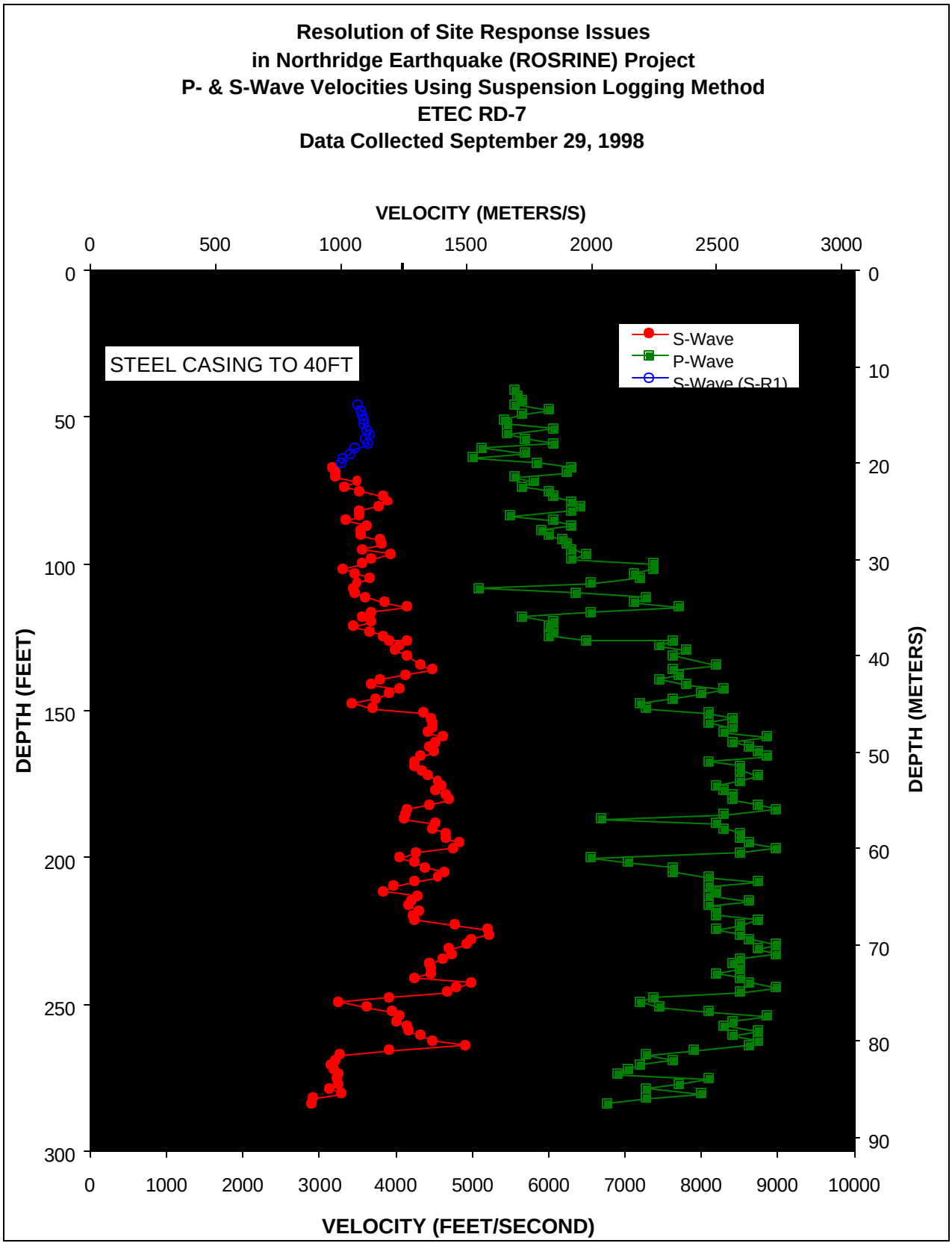

Fig. 4-2 ETEC RD-07 Suspension Logging

Depth (feet)	V_s (ft/s)	V_p (ft/s)
41.0		5561
42.7		5608
44.3		5657
45.9		5561
47.6		6020
49.2		5657
50.9		5423
52.5		5468
54.1		6076
55.8		5468
57.4		5706
59.1		6076
60.7		5126
62.3		5706
64.0		5009
65.6		5859
67.3	3178	6309
68.9	3209	6249
70.5	3224	5561
72.2	3500	5807
73.8	3331	5657
75.5	3537	6020
77.1	3848	6076
79	3906	6309
80.4	3782	6433
82.0	3537	6309
83.7	3537	5514
85.3	3356	6076
86.9	3625	6309
88.6	3556	5911
90.2	3547	6020
91.9	3804	6190
93.5	3826	6249
95.1	3566	6309
96.8	3941	6497
98.4	3686	6309
100.1	3576	7373
101.7	3314	7373
103.4	3463	7132
105.0	3666	7211
106.6	3500	6562
108.3	3454	5087
109.9	3463	6371
111.6	3615	7291
113.2	3860	7132
114.8	4153	7720
116.5	3676	6562
118.1	3566	5657
119.8	3676	6076
121.4	3444	6020

Avg. Depth (feet)	V_s (S-R1) (ft/s)
46.2	3509
47.8	3553
49.4	3567
51.1	3585
52.7	3581
54.4	3622
56.0	3675
57.6	3608
59.3	3655
60.9	3461
62.6	3410
64.2	3318
65.8	3290

Depth (feet)	V_s (ft/s)	V_p (ft/s)
123.0	3666	6076
124.7	3848	6020
126.3	3929	6497
126.3	4153	7630
128.0	4050	7456
129.6	4001	7812
131.2	4153	7630
134.5	4331	8202
136.2	4479	7630
137.8	4127	7720
139.4	3804	7456
141.1	3676	7812
142.7	4063	8306
144.4	3917	8002
146.0	3739	7630
147.6	3435	7211
149.3	3697	7291
150.9	4374	8101
152.6	4464	8412
154.2	4479	8101
155.8	4479	8412
157.5	4419	8306
159.1	4621	8867
160.8	4525	8412
162.4	4449	8634
164.0	4510	8749
165.7	4331	8867
167.3	4261	8101
169.0	4261	8522
170.6	4345	8522
172.2	4434	8749
173.9	4557	8522
175.5	4605	8202
177.2	4525	8306
178.8	4654	8412
180.5	4704	8412
182.1	4449	8749
183.7	4153	8989
185.4	4127	8306
187.0	4114	6696
188.7	4525	8202
190.3	4479	8306
191.9	4654	8522
193.6	4670	8522
195.2	4843	8634
196.9	4755	8989
198.5	4275	8522
200.1	4063	6562
201.8	4261	7056
203.4	4389	7630

Depth (feet)	V_s (ft/s)	V_p (ft/s)
205.1	4637	7630
206.7	4557	8101
208.3	4247	8749
210.0	3977	8101
211.6	3848	8202
213.3	4289	8101
214.9	4206	8634
216.5	4166	8101
218.2	4303	8202
219.8	4233	8202
221.5	4247	8749
223.1	4772	8522
224.7	5208	8202
226.4	5228	8522
228.0	4990	8634
229.7	4934	8989
231.3	4704	8749
232.9	4738	8989
234.6	4621	8522
236.2	4449	8412
236.2	4449	8412
237.9	4464	8522
239.5	4464	8202
241.1	4247	8522
242.8	4990	8634
244.4	4807	8989
246.1	4687	8522
247.7	3929	7373
249.3	3256	7211
251.0	3625	7456
252.6	3953	8101
254.3	4050	8867
255.9	4026	8412
257.6	4153	8306
259.2	4166	8749
260.8	4331	8412
262.5	4479	8749
264.1	4915	8634
265.8	3917	7906
267.4	3281	7291
269.0	3217	7630
270.7	3162	7211
272.3	3201	7056
274.0	3256	6907
275.6	3232	8101
277.2	3256	7720
278.9	3140	7291
280.5	3297	8002
282.2	2923	7291
283.8	2897	6765

Fig. 4-3 ETEC RD-07 Suspension Logging

5.0 ETEC RD-20

Site Description

- Located at ETEC Santa Susana Field Laboratory
- Latitude = 34.239, Longitude = -118.719

Work Performed

- P- & S-Wave Velocity Measurements Using Suspension Logging

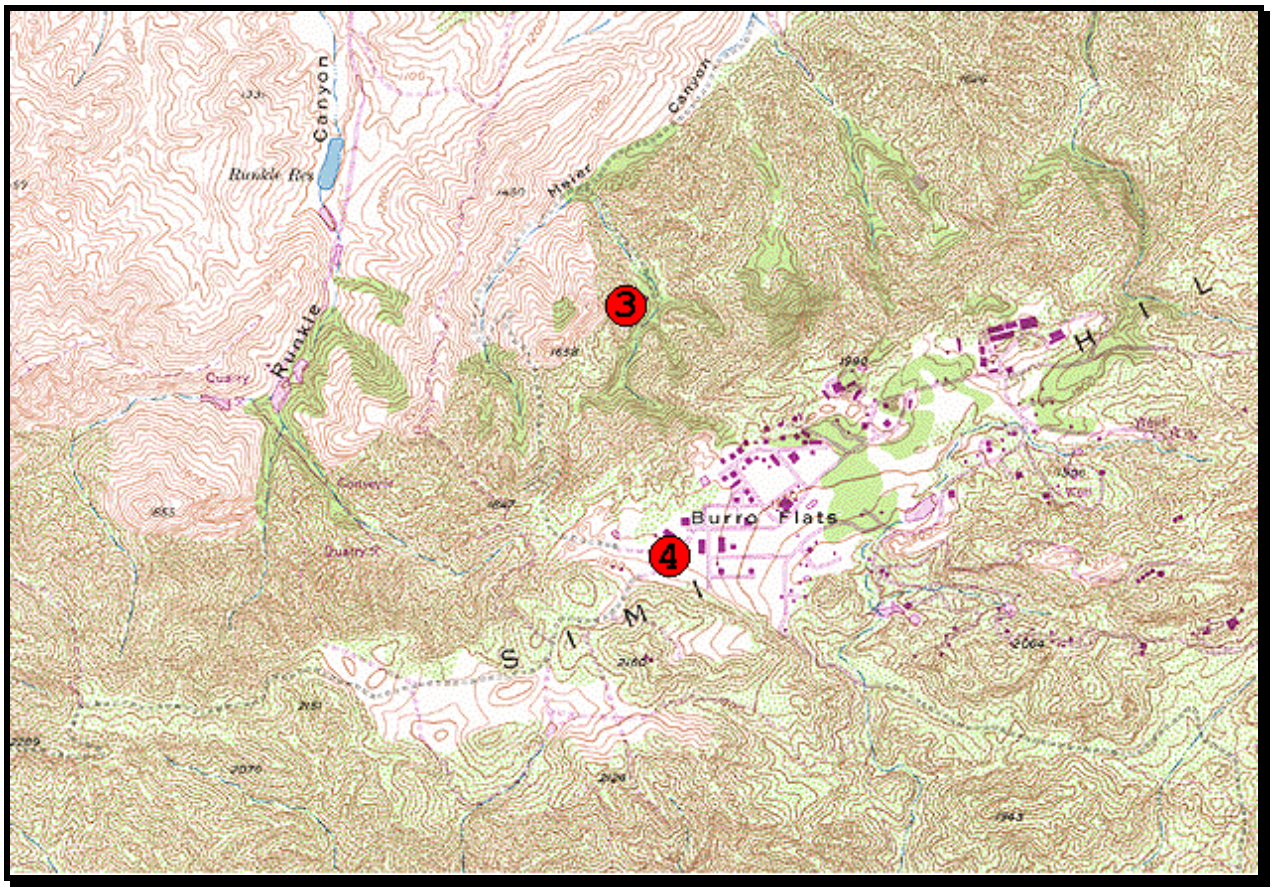

Fig. 5-1 Site Map of ETEC RD-20 Location

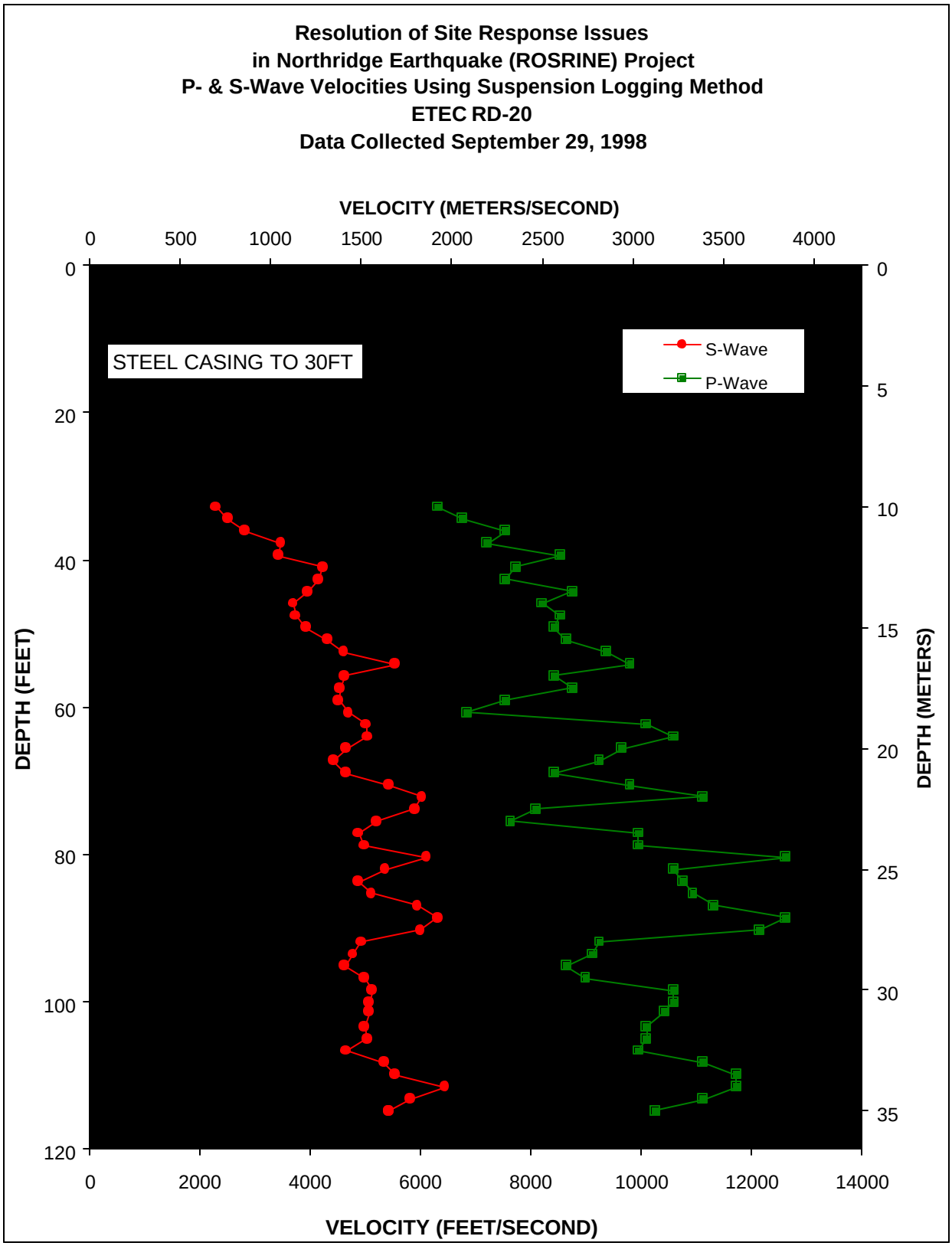

Fig. 5-2 ETEC RD-20 Suspension Logging

Depth (feet)	V_s (feet/s)	V_p (feet/s)
32.8	2286	6309
34.5	2504	6765
36.1	2822	7542
37.7	3463	7211
39.4	3418	8522
41.0	4220	7720
42.7	4153	7542
44.3	3953	8749
45.9	3686	8202
47.6	3739	8522
49.2	3917	8412
50.9	4303	8634
52.5	4605	9374
54.1	5537	9794
55.8	4621	8412
57.4	4541	8749
59.1	4510	7542
60.7	4687	6835
62.3	5009	10095
64.0	5028	10583
65.6	4654	9650
67.3	4419	9242
68.9	4637	8412
70.5	5423	9794
72.2	6020	11122

Depth (feet)	V_s (feet/s)	V_p (feet/s)
75.5	5208	7630
77.1	4879	9942
78.7	4971	9942
80.4	6104	12619
82.0	5356	10583
83.7	4879	10757
85.3	5106	10936
86.9	5938	11313
88.6	6309	12619
90.2	5992	12151
91.9	4915	9242
93.5	4772	9113
95.1	4621	8634
96.8	4990	8989
98.4	5126	10583
100.1	5067	10583
101.4	5067	10415
103.4	4990	10095
105.0	5028	10095
106.6	4654	9942
108.3	5335	11121
109.9	5537	11717
111.6	6433	11717
113.2	5807	11121
114.8	5423	10253

Fig. 5-3 ETEC RD-20 Suspension Logging

6.0 LADWP Receiving Station East

Site Description

- Located in North Hollywood, CA
- Latitude = 34.177, Longitude = -118.359

Work Performed

- P- & S-Wave Velocity Measurements Using Suspension Logging

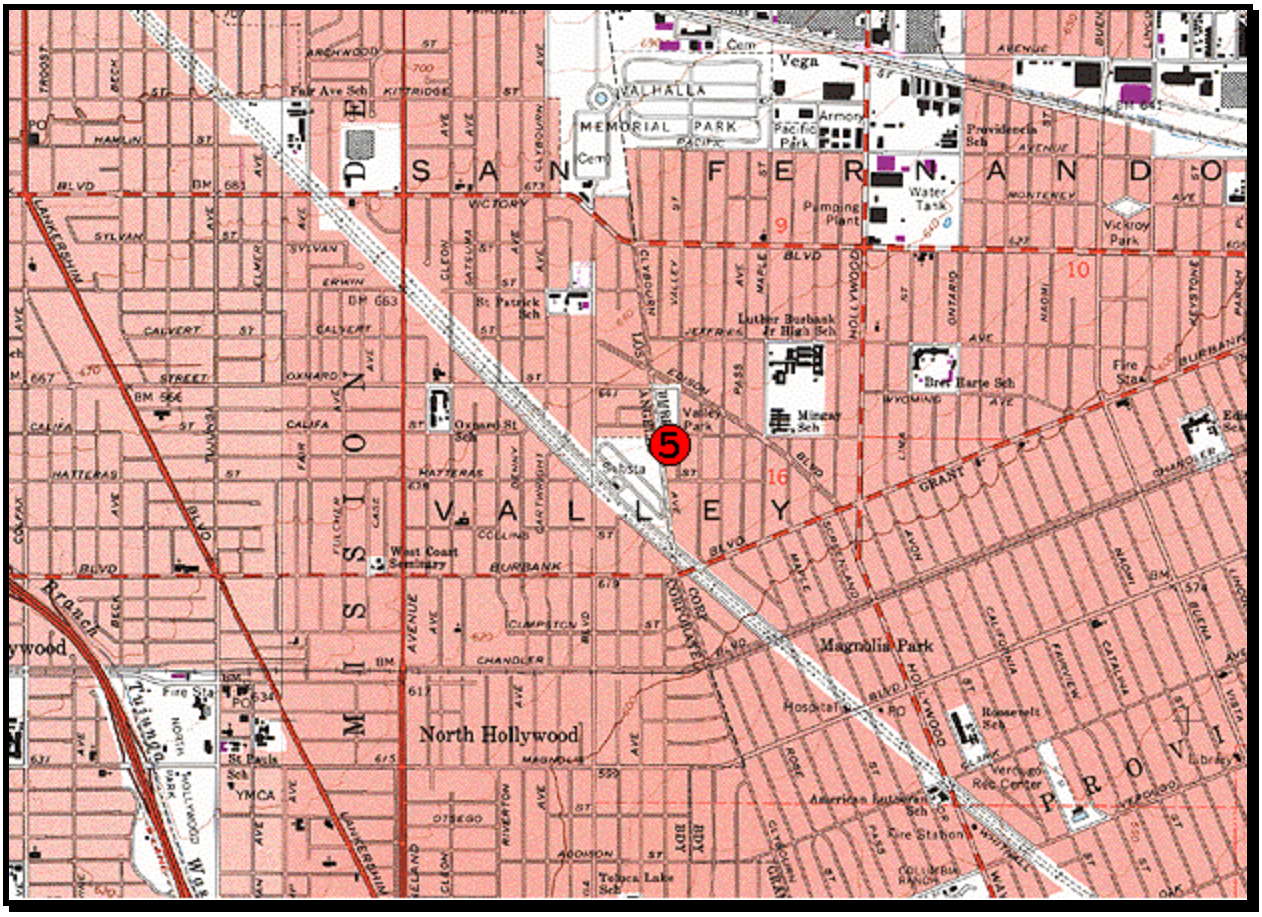

Fig. 6-1 Site Map of LADWP Receiving Station East Location

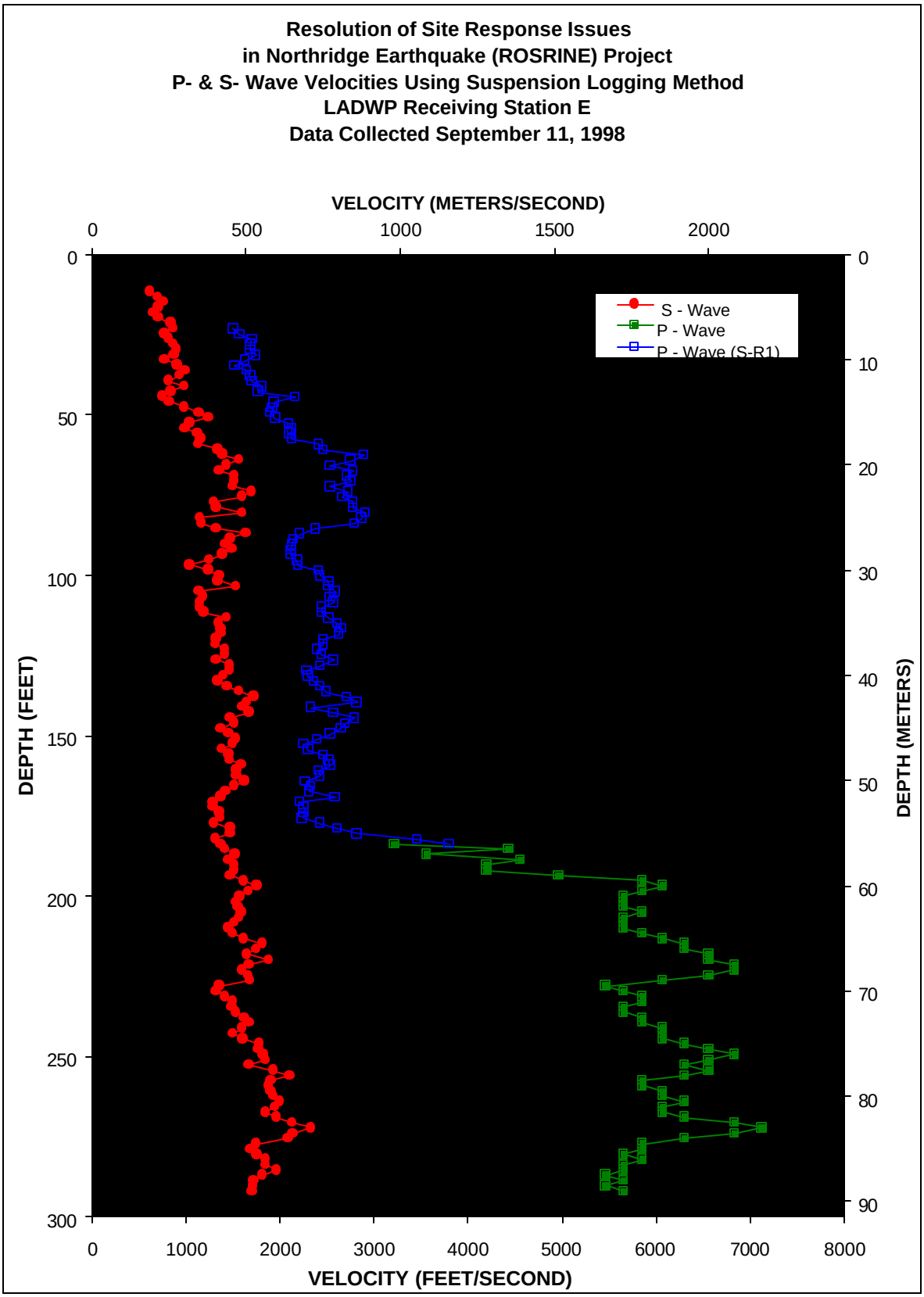

Fig. 6-2 LADWP Receiving Station East Suspension Logging

Depth (feet)	V_s (ft/s)	V_p (ft/s)	Depth (feet)	V_p (S-R1) (ft/s)
11.5	619		23.2	1505
13.1	706		24.8	1573
14.8	763		26.5	1707
16.4	713		28.1	1687
18.0	650		29.8	1687
19.7	709		31.4	1750
21.3	841		33.0	1628
23.0	863		34.7	1522
24.6	777		36.3	1647
26.3	820		38.0	1687
27.9	869		39.6	1707
29.5	905		41.2	1818
31.2	875		42.9	1772
32.8	777		44.5	2160
34.5	911		46.2	1944
36.1	994		47.8	1923
37.7	937		49.4	1902
39.4	814		51.1	1955
41.0	979		52.7	2096
42.7	841		54.4	2134
44.3	752		56.0	2108
45.9	828		57.6	2134
47.6	979		59.3	2414
49.2	1139		60.9	2465
50.9	1238		62.6	2893
52.5	1045		64.2	2756
54.1	991		65.8	2536
55.8	1127		67.5	2778
57.4	1159		69.1	2713
59.1	1131		70.8	2756
60.7	1345		72.4	2536
62.3	1390		74.0	2734
64.0	1562		75.7	2672
65.6	1433		77.3	2778
67.3	1356		79.0	2778
68.9	1512		80.6	2917
70.5	1512		82.2	2869
72.2	1505		83.9	2800
73.8	1700		85.5	2381
75.5	1600		87.2	2215
77.1	1302		88.8	2147
78.7	1323		90.4	2134
80.4	1600		92.1	2121
82.0	1151		93.7	2121
83.7	1163		95.4	2188
85.3	1328		97.0	2201
86.9	1640		98.6	2414
88.6	1471		100.3	2431
90.2	1426		101.9	2518
91.9	1491		103.6	2518
93.5	1390		105.2	2593
95.1	1247		106.9	2536
96.8	1045		108.5	2574
98.4	1243		110.1	2448
100.1	1356		111.8	2448
101.7	1345		113.4	2518
103.4	1533		115.1	2612
105.0	1143		116.7	2652

Depth (feet)	V_s (ft/s)	V_p (ft/s)	Depth (feet)	V_p (S-R1) (ft/s)
106.6	1180		118.3	2632
108.3	1151		120.0	2465
109.9	1151		121.6	2465
111.6	1189		123.3	2397
113.2	1433		124.9	2448
114.8	1350		126.5	2574
116.5	1373		128.2	2431
118.1	1379		129.8	2288
119.8	1328		131.5	2303
121.4	1318		133.1	2365
123.0	1414		134.7	2431
124.7	1414		136.4	2500
126.3	1328		138.0	2713
128.0	1465		139.7	2823
129.6	1465		141.3	2333
131.2	1396		142.9	2574
132.9	1345		144.6	2800
134.5	1439		146.2	2692
136.2	1562		147.9	2652
137.8	1727		149.5	2536
139.4	1649		151.1	2397
141.1	1608		152.8	2258
142.7	1674		154.4	2303
144.4	1478		156.1	2465
146.0	1512		157.7	2518
147.6	1379		159.3	2536
149.3	1458		161.0	2414
150.9	1533		162.6	2431
152.6	1498		164.3	2273
154.2	1384		165.9	2333
155.8	1458		167.5	2318
157.5	1465		169.2	2593
159.1	1593		170.8	2215
160.8	1540		172.5	2258
162.4	1540		174.1	2258
164.0	1624		175.7	2244
165.7	1512		177.4	2431
167.3	1426		179.0	2612
169.0	1379		180.7	2823
170.6	1292		182.3	3465
172.2	1292		184.0	3804
173.9	1361			
175.5	1367			
177.2	1297			
178.8	1471			
180.5	1478			
182.1	1318			
183.7	1373	3217		
185.4	1420	4434		
187.0	1526	3566		
188.7	1458	4557		
190.3	1519	4206		
191.9	1519	4206		
193.6	1478	4971		
195.2	1616	5859		
196.9	1754	6076		
198.5	1665	5859		
200.1	1577	5657		

Depth (feet)	V_s (feet/s)	V_p (feet/s)
201.8	1533	5657
203.4	1555	5657
205.1	1593	5859
206.7	1562	5657
208.3	1519	5657
210.0	1458	5657
211.6	1498	5859
213.3	1616	6076
214.9	1813	6309
216.5	1745	6309
218.2	1649	6562
219.8	1886	6562
221.5	1674	6835
223.1	1600	6835
224.7	1665	6562
226.4	1682	6076
228.0	1356	5468
229.7	1328	5657
231.3	1414	5859
232.9	1505	5859
234.6	1491	5657
236.2	1533	5657
237.9	1624	5859
239.5	1674	5859
241.1	1600	6076
242.8	1505	6076
244.4	1608	6076
246.1	1783	6309
247.7	1773	6562
249.3	1823	6835
251.0	1854	6562
252.6	1674	6309
254.3	1930	6562
255.9	2103	6309
257.6	1907	5859
259.2	1886	5859
260.8	1907	6076
262.5	1930	6076
264.1	2001	6309
265.8	1953	6076
267.4	1854	6076
269.0	1965	6309
270.7	2130	6835
272.3	2327	7132
274.0	2144	6835
275.6	2090	6309
277.2	1745	5859
278.9	1691	5859
280.5	1754	5657
282.2	1854	5859
283.8	1854	5657
285.4	1965	5657
287.1	1813	5468
288.7	1727	5657
290.4	1718	5468
292.0	1709	5657

Fig. 6-3 LADWP Receiving Station East Suspension Logging

7.0 Saturn Street School

Site Description

- Located in Los Angeles, CA off Saturn Street
- Latitude = 34.046, Longitude = -118.356

Work Performed

- P- & S-Wave Velocity Measurements Using Suspension Logging
- Geologic Logging

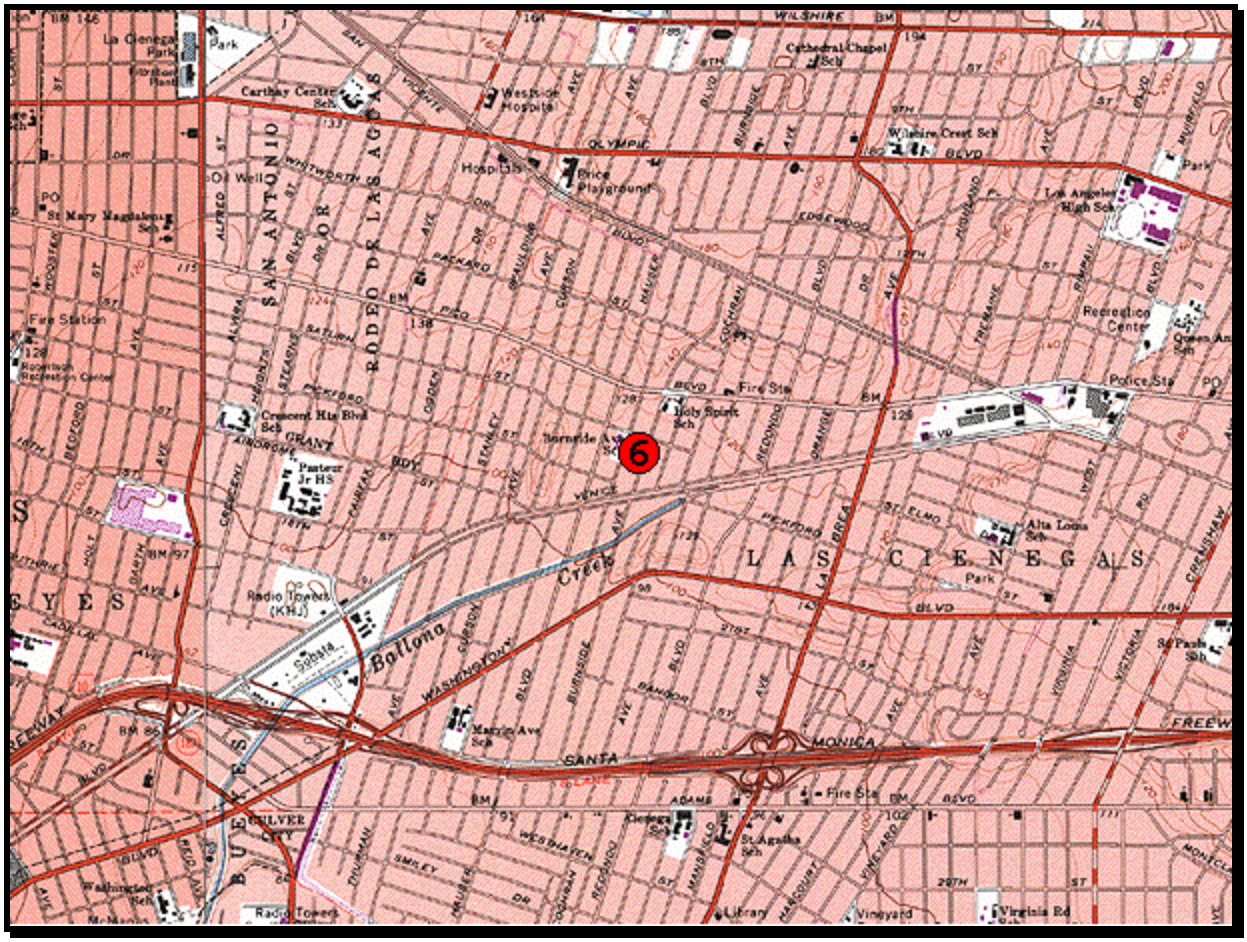

Fig. 7-1 Site Map of Saturn Street School Location

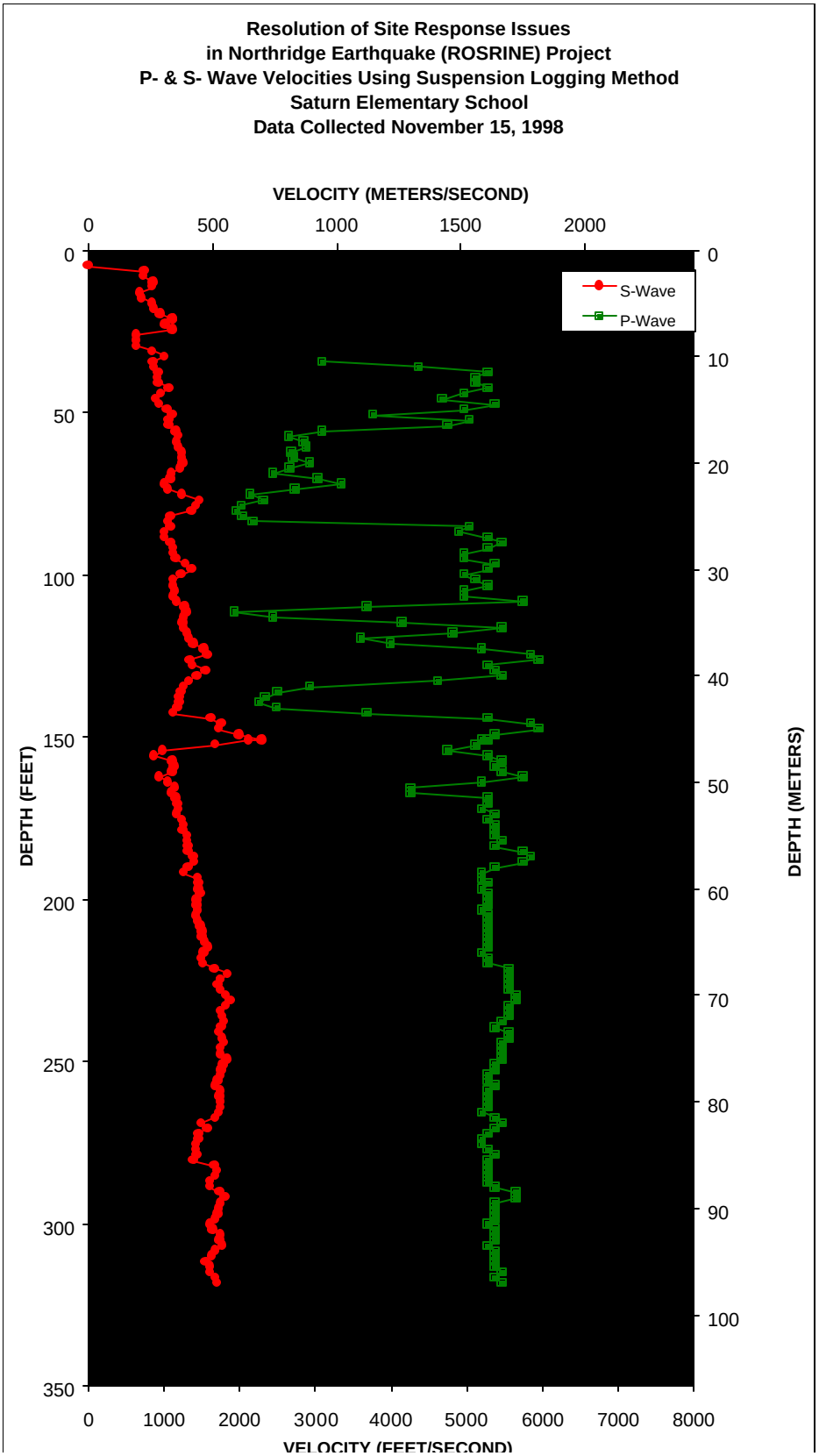

Fig. 7-2 PS Log Chart

Depth (feet)	Vs (feet/s)	Vp (feet/s)
4.9	0	
6.6	743	
8.2	727	
9.8	852	
11.5	846	
13.1	674	
14.8	704	
16.4	848	
18.0	863	
19.7	943	
21.3	1112	
21.3	1120	
23.0	1017	
24.6	1112	
26.3	631	
27.9	629	1131
29.5	630	1101
31.2	848	1793
32.8	1009	1965
34.5	852	3095
36.1	863	4374
37.7	929	5292
39.4	919	5126
41.0	929	5126
42.7	1062	5292
44.3	959	4971
45.9	892	4687
47.6	937	5378
49.2	1042	4971
50.9	1108	3771
52.5	1062	5047
54.1	1069	4755
55.8	1155	3095
57.4	1193	2646
59.1	1163	2853
60.7	1189	2878
62.3	1243	2689
64.0	1238	2711
65.6	1252	2929
67.3	1211	2667
68.9	1097	2448
70.5	1086	3038
72.2	1009	3348
73.8	1058	2734
75.5	1243	2144
77.1	1465	2310
78.7	1420	2025
80.4	1367	1953
82.0	1086	2038
83.7	1058	2173
85.3	1090	5047
86.9	1000	4897
88.6	1003	5292
90.2	1090	5468
91.9	1120	5292
93.5	1124	4971
95.1	1159	4971
96.8	1287	5378
98.4	1361	5292
100.1	1229	4971
101.7	1116	5126
103.4	1120	5292
105.0	1147	4971
106.6	1120	4971
108.3	1163	5756

Depth (feet)	Vs (feet/s)	Vp (feet/s)
109.9	1277	3686
111.6	1297	1930
113.2	1262	2448
114.8	1247	4153
116.5	1262	5468
118.1	1302	4825
119.8	1334	3605
121.4	1390	4001
123.0	1533	5208
124.7	1570	5859
126.3	1345	5965
128.0	1379	5292
129.6	1555	5378
131.2	1439	5468
132.9	1328	4621
134.5	1262	2929
136.2	1229	2504
137.8	1202	2343
139.4	1206	2263
141.1	1176	2485
142.7	1116	3686
144.4	1624	5292
146.0	1764	5859
147.6	1718	5965
149.3	1988	5378
150.9	2294	5208
150.9	2117	5292
152.6	1674	5126
154.2	976	4755
155.8	868	5292
157.5	1105	5468
159.1	1135	5378
160.8	1108	5468
162.4	940	5756
164.0	1052	5208
165.7	1139	4261
167.3	1094	4261
169.0	1159	5292
170.6	1180	5292
172.2	1189	5208
173.9	1172	5378
175.5	1233	5292
177.2	1262	5378
178.8	1252	5378
180.5	1302	5378
182.1	1312	5468
183.7	1318	5378
185.4	1318	5756
187.0	1384	5859
188.7	1402	5756
190.3	1318	5378
191.9	1257	5208
193.6	1445	5208
195.2	1458	5292
196.9	1458	5208
198.5	1478	5292
200.1	1433	5292
201.8	1439	5292
203.4	1452	5208
205.1	1426	5292
206.7	1445	5292
208.3	1485	5292
210.0	1505	5292
211.6	1505	5292
213.3	1540	5292

Depth (feet)	Vs (feet/s)	Vp (feet/s)
214.9	1585	5292
216.5	1533	5208
218.2	1498	5292
219.8	1512	5292
221.5	1665	5561
223.1	1843	5561
224.7	1754	5561
224.7	1754	5561
226.4	1709	5561
228.0	1745	5561
229.7	1823	5657
231.3	1875	5657
232.9	1823	5561
234.6	1745	5561
236.2	1773	5561
237.9	1793	5468
239.5	1764	5378
241.1	1727	5561
242.8	1773	5561
244.4	1793	5468
246.1	1754	5468
247.7	1754	5468
249.3	1833	5468
251.0	1783	5378
252.6	1764	5378
254.3	1745	5292
255.9	1709	5292
257.6	1682	5378
259.2	1745	5292
260.8	1736	5292
262.5	1745	5292
264.1	1745	5292
265.8	1718	5208
267.4	1674	5378
269.0	1498	5468
270.7	1570	5378
272.3	1458	5292
274.0	1458	5208
275.6	1420	5208
277.2	1426	5292
278.9	1433	5378
280.5	1384	5292
282.2	1665	5292
283.8	1700	5292
285.4	1674	5292
287.1	1616	5292
288.7	1608	5378
290.4	1736	5657
292.0	1803	5657
293.6	1745	5378
295.3	1727	5378
296.9	1709	5378
298.6	1674	5378
300.2	1616	5292
301.8	1640	5378
303.5	1745	5378
305.1	1736	5378
306.8	1773	5292
308.4	1682	5378
310.0	1632	5378
311.7	1548	5378
313.3	1608	5378
315.0	1616	5468
316.6	1674	5378
318.2	1700	5468

Fig. 7-3 Saturn Elementary School Suspension Logging

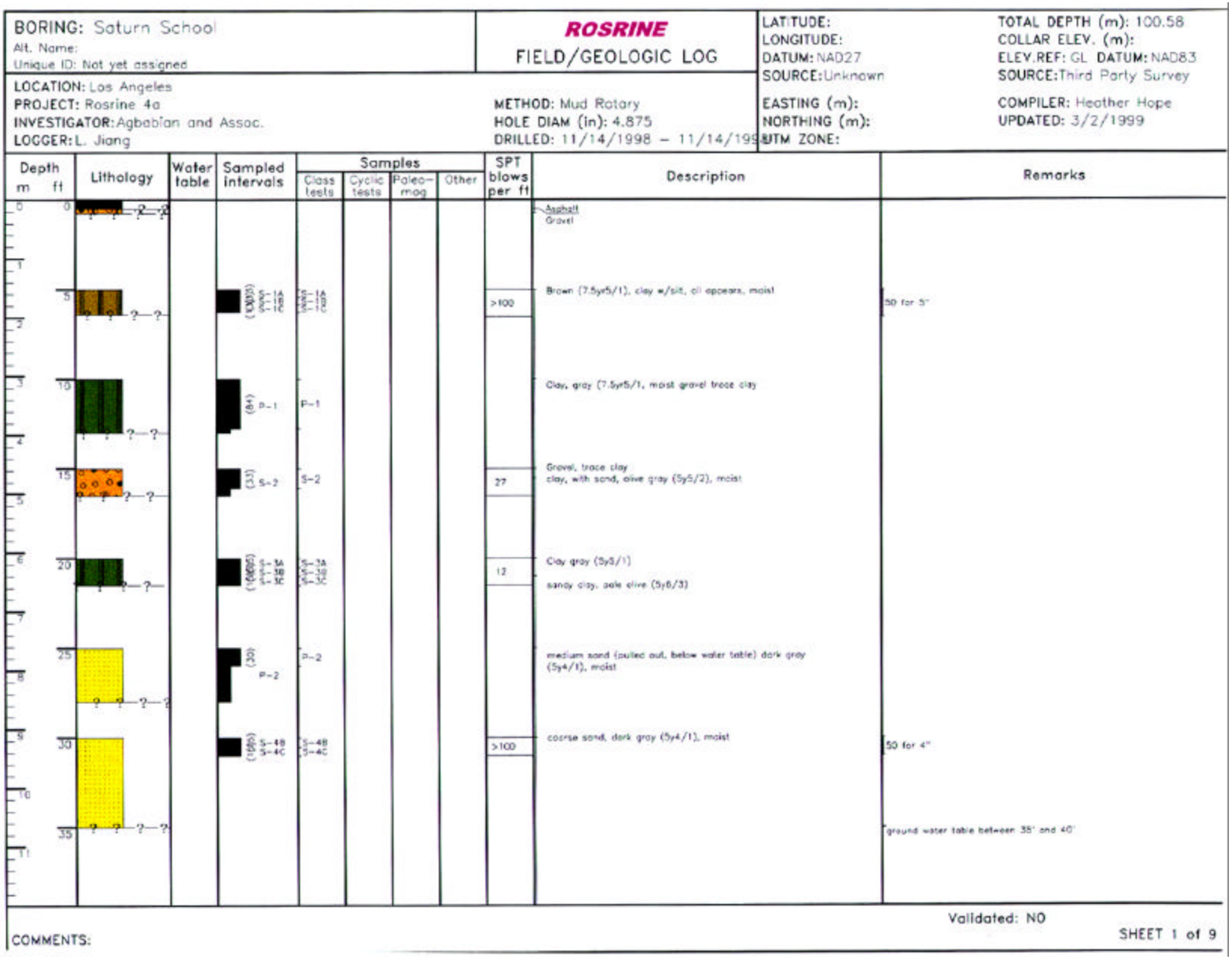

Fig. 7-4 Saturn Elementary School Geologic Logs

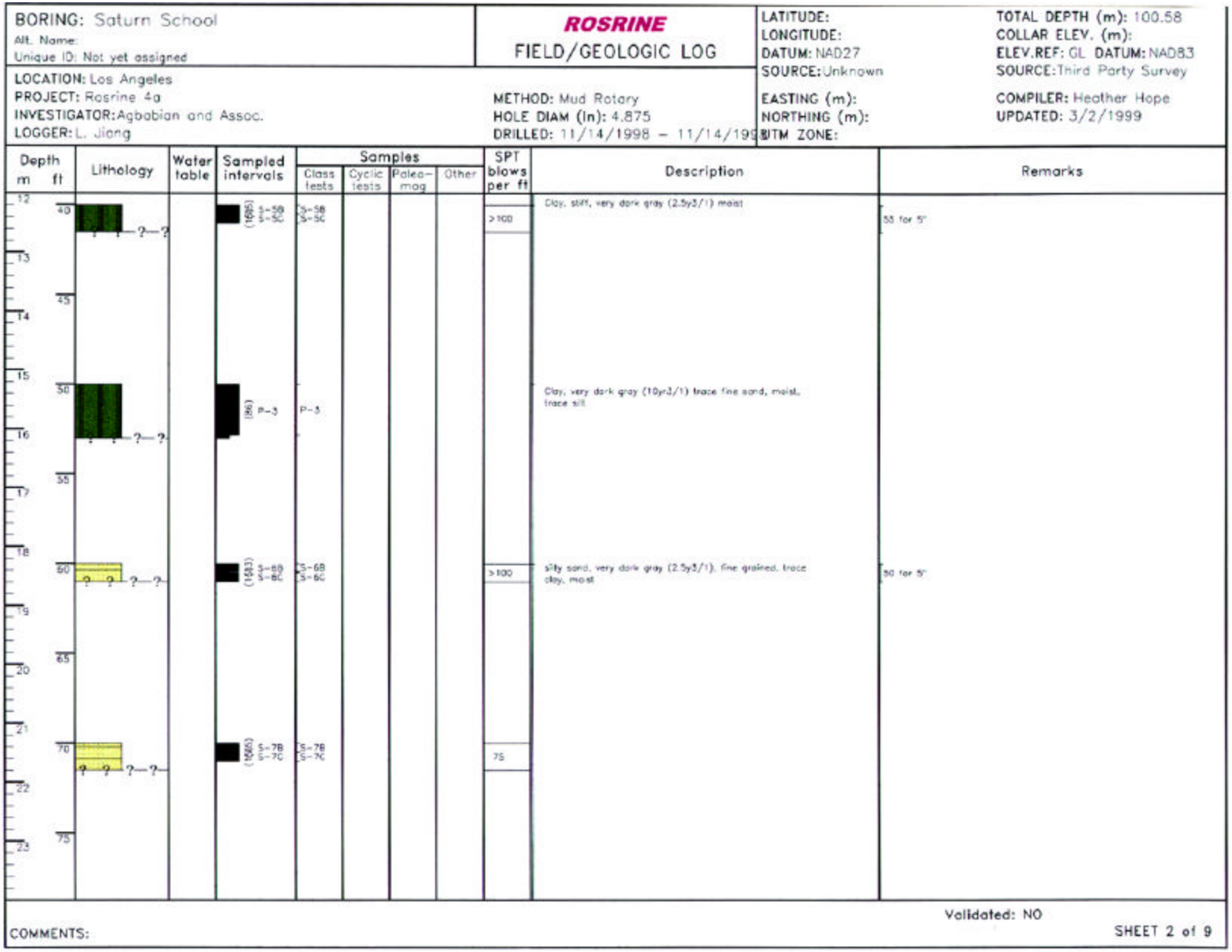

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

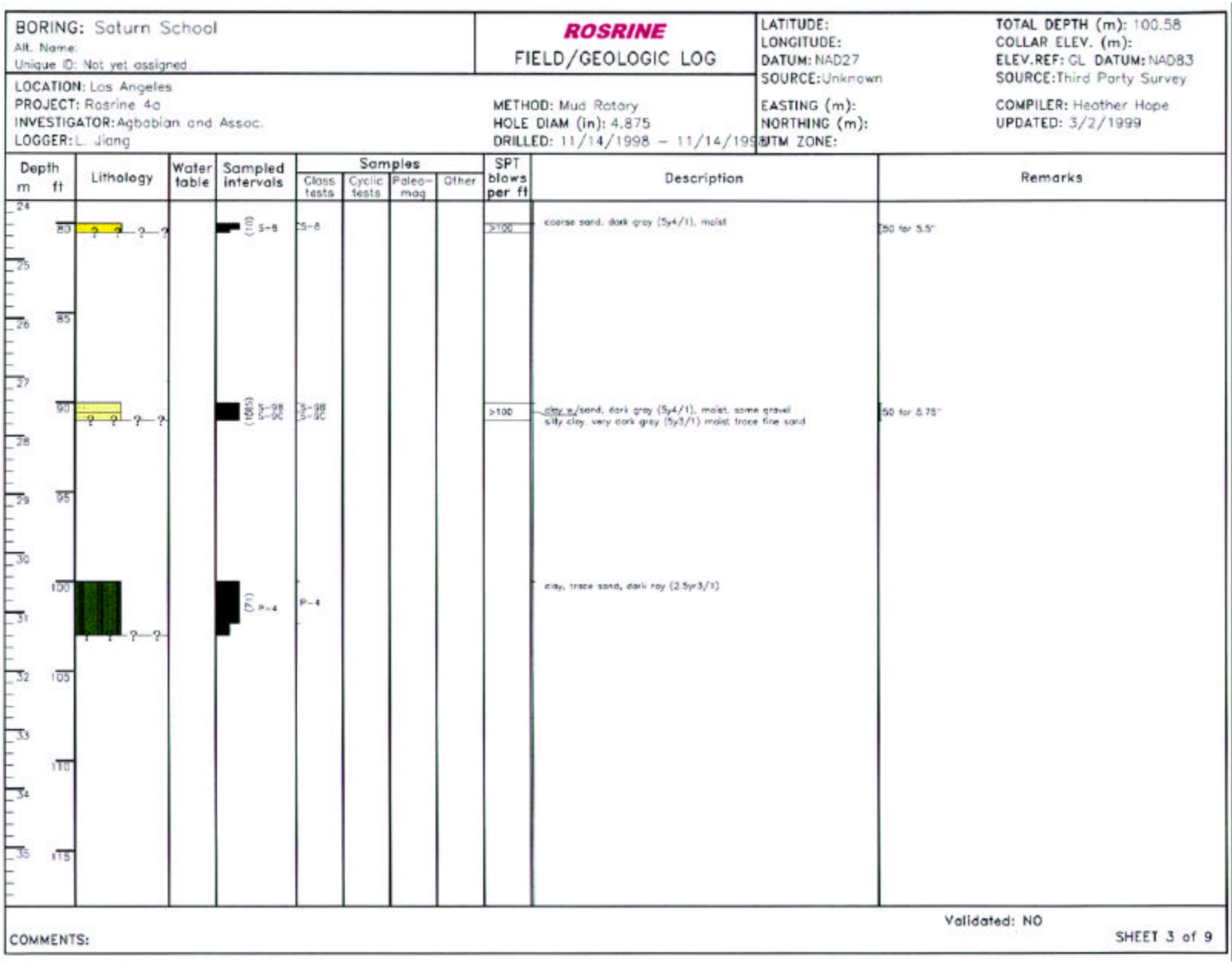

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

BORING: Saturn School Alt. Name: Unique ID: Not yet assigned	**ROSRINE** FIELD/GEOLOGIC LOG	LATITUDE: LONGITUDE: DATUM: NAD27 SOURCE: Unknown	TOTAL DEPTH (m): 100.58 COLLAR ELEV. (m): ELEV.REF: GL DATUM: NAD83 SOURCE: Third Party Survey
LOCATION: Los Angeles PROJECT: Rosrine 4a INVESTIGATOR: Agbabian and Assoc. LOGGER: L. Jiang	METHOD: Mud Rotary HOLE DIAM (in): 4.875 DRILLED: 11/14/1998 – 11/14/1998	EASTING (m): NORTHING (m): UTM ZONE:	COMPILER: Heather Hope UPDATED: 3/2/1999

Depth m	Depth ft	Lithology	Water table	Sampled intervals	Samples: Class tests	Samples: Cyclic tests	Samples: Paleo-mag	Samples: Other	SPT blows per ft	Description	Remarks
36											
	120										driving through boulder, switch to rock bit, 6" – 8" boulders
37											
38	125										
39											
	130										
40											
41	135										
42											
	140	? ? ? ?		⊠ S-10	S-10				>100	silt, gray (7.5yr5/1) moist, trace sand	50 for 2"
43											
44	145										
45											
	150										
46											
47	155										

Validated: NO

COMMENTS:

SHEET 4 of 9

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

BORING: Saturn School
Alt. Name:
Unique ID: Not yet assigned

ROSRINE
FIELD/GEOLOGIC LOG

LATITUDE:
LONGITUDE:
DATUM: NAD27
SOURCE: Unknown

TOTAL DEPTH (m): 100.58
COLLAR ELEV. (m):
ELEV.REF: GL DATUM: NAD83
SOURCE: Third Party Survey

LOCATION: Los Angeles
PROJECT: Rosrine 4a
INVESTIGATOR: Agbabian and Assoc.
LOGGER: L. Jiang

METHOD: Mud Rotary
HOLE DIAM (in): 4.875
DRILLED: 11/14/1998 – 11/14/199

EASTING (m):
NORTHING (m):
UTM ZONE:

COMPILER: Heather Hope
UPDATED: 3/2/1999

Depth m	Depth ft	Lithology	Water table	Sampled intervals	Samples: Class tests	Samples: Cyclic tests	Samples: Paleo-mag	Samples: Other	SPT blows per ft	Description	Remarks
48											
	160										
49											
50											
	165										
51											
	170										
52											
53											
	175										
54											
55	180	? ? ? ?		S-11	S-11				>100	sand (medium) dark gray (5Y4/1)	100 for 5"
56											
	185										
57											
58	190										
59											
	195										

COMMENTS:

Validated: NO

SHEET 5 of 9

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

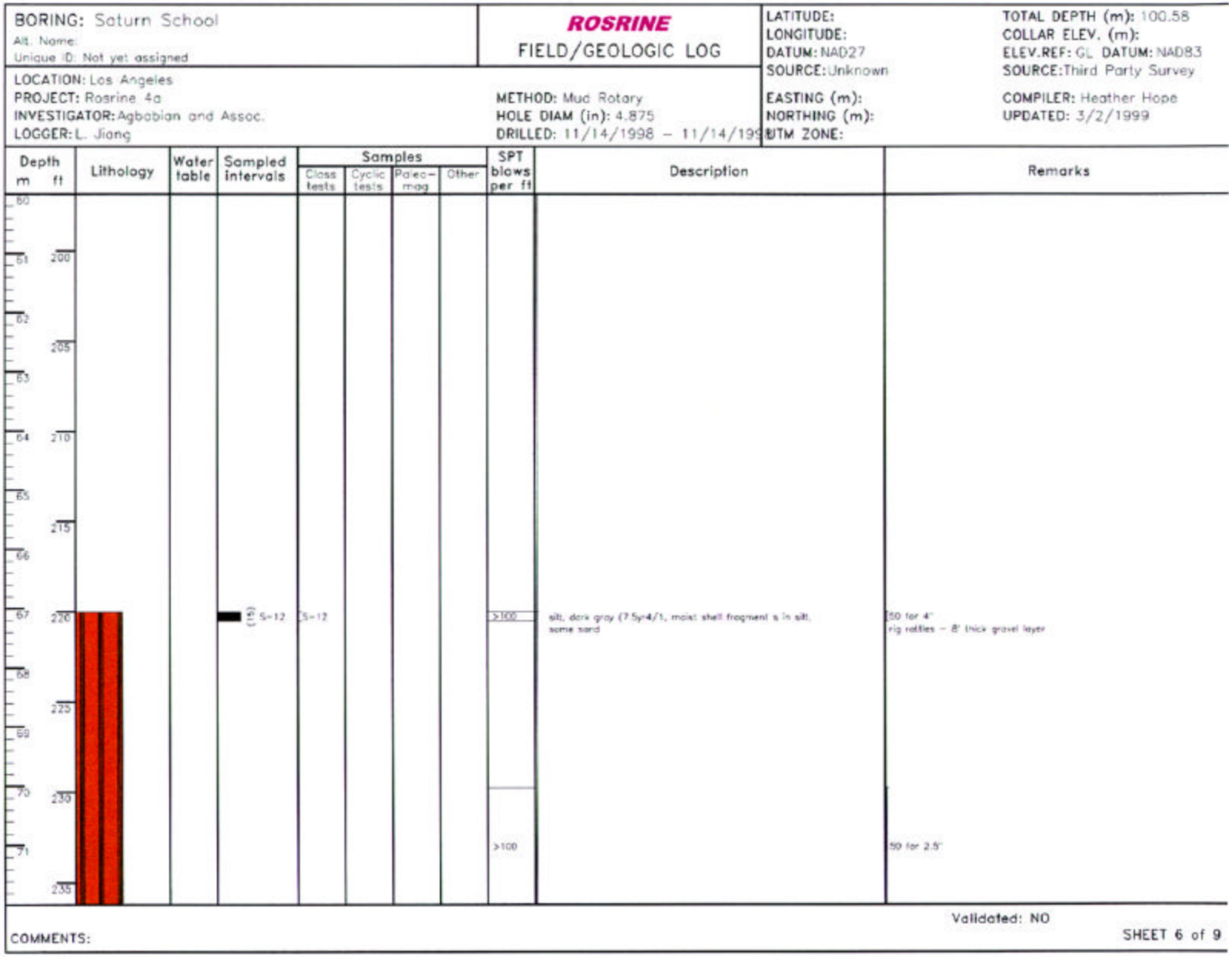

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

BORING: Saturn School
Alt. Name:
Unique ID: Not yet assigned

ROSRINE
FIELD/GEOLOGIC LOG

LATITUDE:
LONGITUDE:
DATUM: NAD27
SOURCE: Unknown
EASTING (m):
NORTHING (m):
UTM ZONE:

TOTAL DEPTH (m): 100.58
COLLAR ELEV. (m):
ELEV.REF: GL DATUM: NAD83
SOURCE: Third Party Survey
COMPILER: Heather Hope
UPDATED: 3/2/1999

LOCATION: Los Angeles
PROJECT: Rosrine 4a
INVESTIGATOR: Agbabian and Assoc.
LOGGER: L. Jiang

METHOD: Mud Rotary
HOLE DIAM (in): 4.875
DRILLED: 11/14/1998 – 11/14/199

Depth m	Depth ft	Lithology	Water table	Sampled intervals	Samples: Class tests	Samples: Cyclic tests	Samples: Palea-mag	Samples: Other	SPT blows per ft	Description	Remarks
72											
73	240										
74	245										
75											
76	250	@									
77											
78	255								>100		50 for 2.5"
79	260										
80											
81	265										
82	270										
83											
	275										

COMMENTS:

Validated: NO

SHEET 7 of 9

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

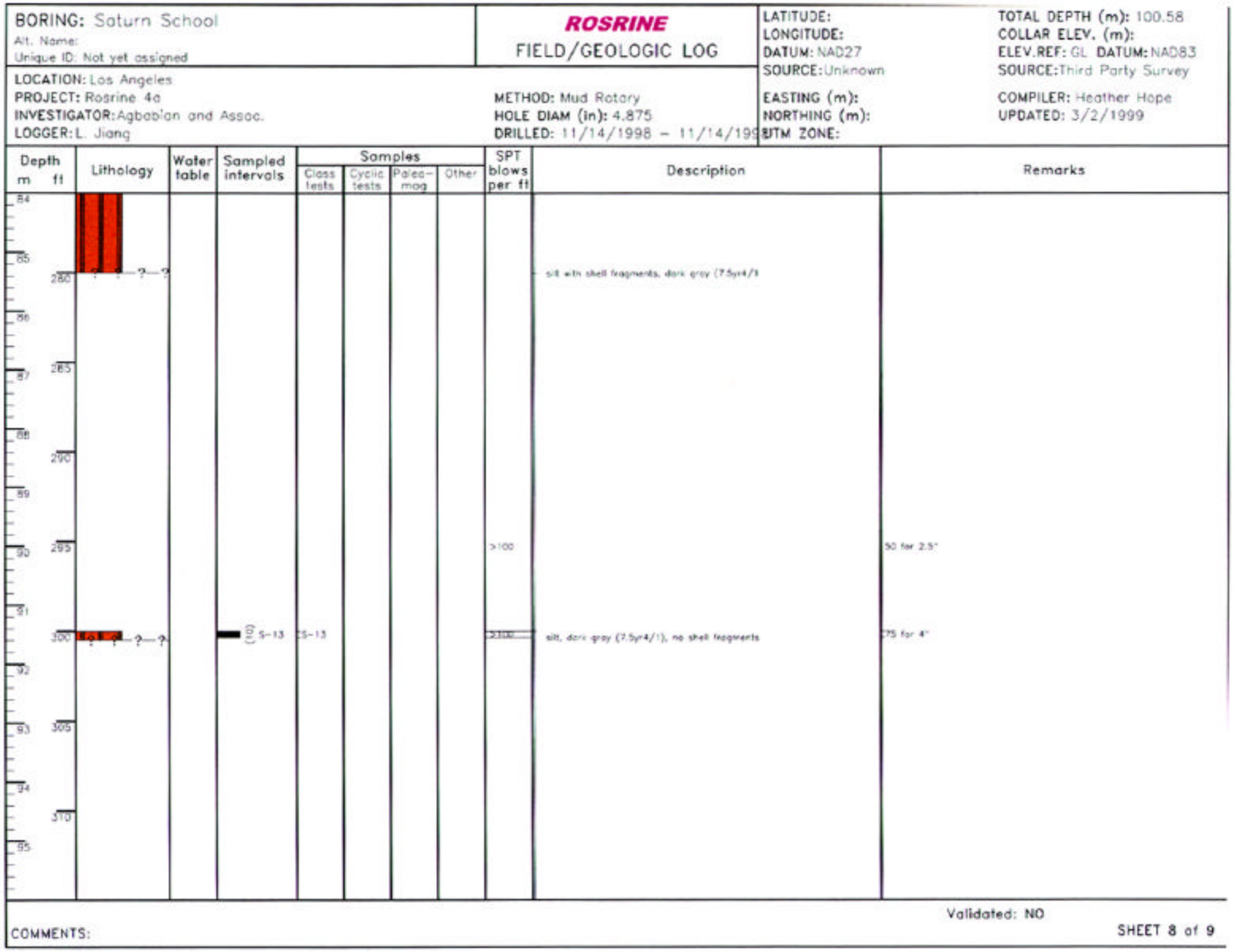

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

BORING: Saturn School
Alt. Name:
Unique ID: Not yet assigned

ROSRINE
FIELD/GEOLOGIC LOG

LATITUDE:
LONGITUDE:
DATUM: NAD27
SOURCE: Unknown
EASTING (m):
NORTHING (m):
UTM ZONE:

TOTAL DEPTH (m): 100.58
COLLAR ELEV. (m):
ELEV.REF: GL DATUM: NAD83
SOURCE: Third Party Survey
COMPILER: Heather Hope
UPDATED: 3/2/1999

LOCATION: Los Angeles
PROJECT: Rosrine 4a
INVESTIGATOR: Agbabian and Assoc.
LOGGER: L. Jiang

METHOD: Mud Rotary
HOLE DIAM (in): 4.875
DRILLED: 11/14/1998 – 11/14/199

Depth m	Depth ft	Lithology	Water table	Sampled intervals	Samples: Class tests	Samples: Cyclic tests	Samples: Paleo-mag	Samples: Other	SPT blows per ft	Description	Remarks
96	315										
97											
	320										
98									>100		50 for 2.5"
99	325										
100											

E.O.H 100.58 m

COMMENTS:

Validated: NO

SHEET 9 of 9

Fig. 7-4 (Continued) Saturn Elementary School Geologic Logs

Acknowledgments

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