STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

A REPORT OF
A SURVEY OF EARTH-BORNE TRAFFIC VIBRATIONS ADJACENT TO A PRIVATE HOME

62-05

May 1962

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State of California
Department of Public Works
Division of Highways
Materials and Research Department

May 1962

Lab. Auth. 100-S-6276
VII-LA-158-LA
Symons vs. State
SCC No. 783540

Mr. George C. Hadley, Asst. Chief Attorney
Division of Contracts and Rights of Way
Legal Section
Rm. 11, 3540 Wilshire Boulevard
Los Angeles 5, California

Attention: Mr. Philip F. Lanzafame

Dear Sir:

Submitted for your consideration is:

A REPORT OF

A SURVEY OF EARTH-BORNE TRAFFIC VIBRATIONS

ADJACENT TO A PRIVATE HOME

Study made by . . . . . Structural Materials Section
Under supervision of . . . . . J. L. Beaton
Report prepared by . . . . . J. E. Barton and W. Chow

Very truly yours,

F. N. Hveem
Materials and Research Engineer

JEB/WC:mw
cc: REReed
PFLanzafame (10)
District VII
LRGillis
FEBaxter
ADMayfield

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I. INTRODUCTION

This survey was initiated by Attorney P. F. Lanzafame, Division of Contracts and Rights of Way, Department of Public Works, Los Angeles, by his letter dated April 19, 1962, to Mr. F. N. Hveem.

The object of the survey was to determine the magnitude of earth-borne traffic vibrations in a private home adjacent to the highway. The private home is located at 15350 Sutton Street, Sherman Oaks, California. Owner of the above home has alleged that since location of the San Diego Freeway adjacent to her home, her home has suffered structural damage.

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II. SUMMARY

Earth-borne vibrations caused by traffic are nearly non-existent on the traveled roadway and nearly immeasurable at the fence line of the highway.

Traffic induced earth-borne vibrations taken at corners of claimant's house were zero.

Vehicle traffic-caused earth-borne vibrations on the temporary connection to Sepulveda Street from southbound San Diego Freeway traffic are of insufficient magnitude to cause structural damage to claimant's house. Bureau of Mines Bulletin #442 indicates that the amplitude (half displacement) of such vibrations should be in excess of 0.05 inches before concern is necessary as to house damage.

Earth-borne vibrations caused by construction equipment were measured during January 1962 adjacent to the equipment doing construction on the Golden State Freeway. The maximum displacement measured during this study was 0.00028. The soil at this site was somewhat similar to that adjacent to the claimant's house.

III. TEST PROCEDURE

The test procedure consisted of recording earth-borne traffic vibrations on the traveled way and at various locations around claimant's house.

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IV. DISCUSSION

An inverse condemnation action has been filed against the State of California by the owner of the property located at 15350 Sutton Street, Sherman Oaks, California. The claimant alleges damages caused by the construction of the San Diego Freeway adjacent to her house. The claim is that the house has suffered damages with respect to cracking of the walls and foundations.

This survey was concerned only with the transmission of earth-borne vibrations due to highway vehicle traffic. The minimum distance between a corner of the claimant's house and the highway edge of pavement is 75 feet. This traveled roadway is on an earth-fill serving as a temporary southbound connection to Sepulveda Boulevard from the San Diego Freeway. This temporary connection funnels from a two lane roadway into one lane traffic on the roadway adjacent to claimant's house. Traffic was moderately heavy during this survey on the morning of May 1, 1962. Average traffic velocity during the survey was approximately 20 mph and came to a complete stop many times during the survey. Heavy truck traffic was in the order of 10% of the total vehicle traffic.

The vibration testers picked up earth-borne vertical vibrations due to vehicle traffic and were recorded on an oscillograph.

Vibration testers were located as shown on Exhibits 1 and 2. Simultaneous vertical vibrations were recorded for Locations A, B, and C, Exhibit 1, each time a heavy truck passed the claimant's house. Similarly, two vibration testers were later moved to Locations D and E, Exhibit 2, and simultaneous vertical vibrations were recorded each time a heavy truck passed the claimant's house.

Location of one vibration tester on the traveled roadway at "A" was to monitor the magnitude of the vibrations close to the source and vibration tester Locations B, C, D, and E measured the attenuated effects of the vibrations in the house vicinity.

Exhibit 3 tabulates the earth-borne vibration records of 18 vehicles passing the claimant's house with the transmitted vibration effect at the right-of-way fence. The exhibit shows that the largest vibration was due to a van line truck, Run #15, with a peak to peak displacement of 0.000060" at a frequency of 25 cps. This vibration was not transmitted to the fence line Location B. The largest vibration at the fence line, Location B, was 0.000030 inches at 28 cps. The earth-borne vibrations are extremely small at the fence line Location B and unmeasurable at Location C with our instruments.

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Exhibit 4 tabulates the vibration testers at Locations A, D, and E. Exhibit 4 shows that earth-borne vibrations from approach zero and were unmeasurable at the claimant's house corners.

Simultaneous recordings of horizontal, transverse and vertical vibrations with respect to the roadway were made at Location E with three vibration testers. No tabulations are shown for these recordings as the vibrations were recorded as zero.

Exhibits 5 and 6 are photographs of the vibration tester locations. Exhibit 7 is an over-all view of the claimant's house from the roadway.

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V. APPENDIX

Exhibit 1. Plan view showing location of vibration testers at Locations A, B, and C.

Exhibit 2. Plan view showing location of vibration testers at Locations A, D, and E.

Exhibit 3. Tabulation of vibration recordings at Locations A, B, and C.

Exhibit 4. Tabulations of vibration recordings at Locations A, D, and E.

Exhibit 5. Photographs of Locations A and C.

Exhibit 6. Photographs of Locations E and D.

Exhibit 7. Over-all view of claimant's house from the roadway.

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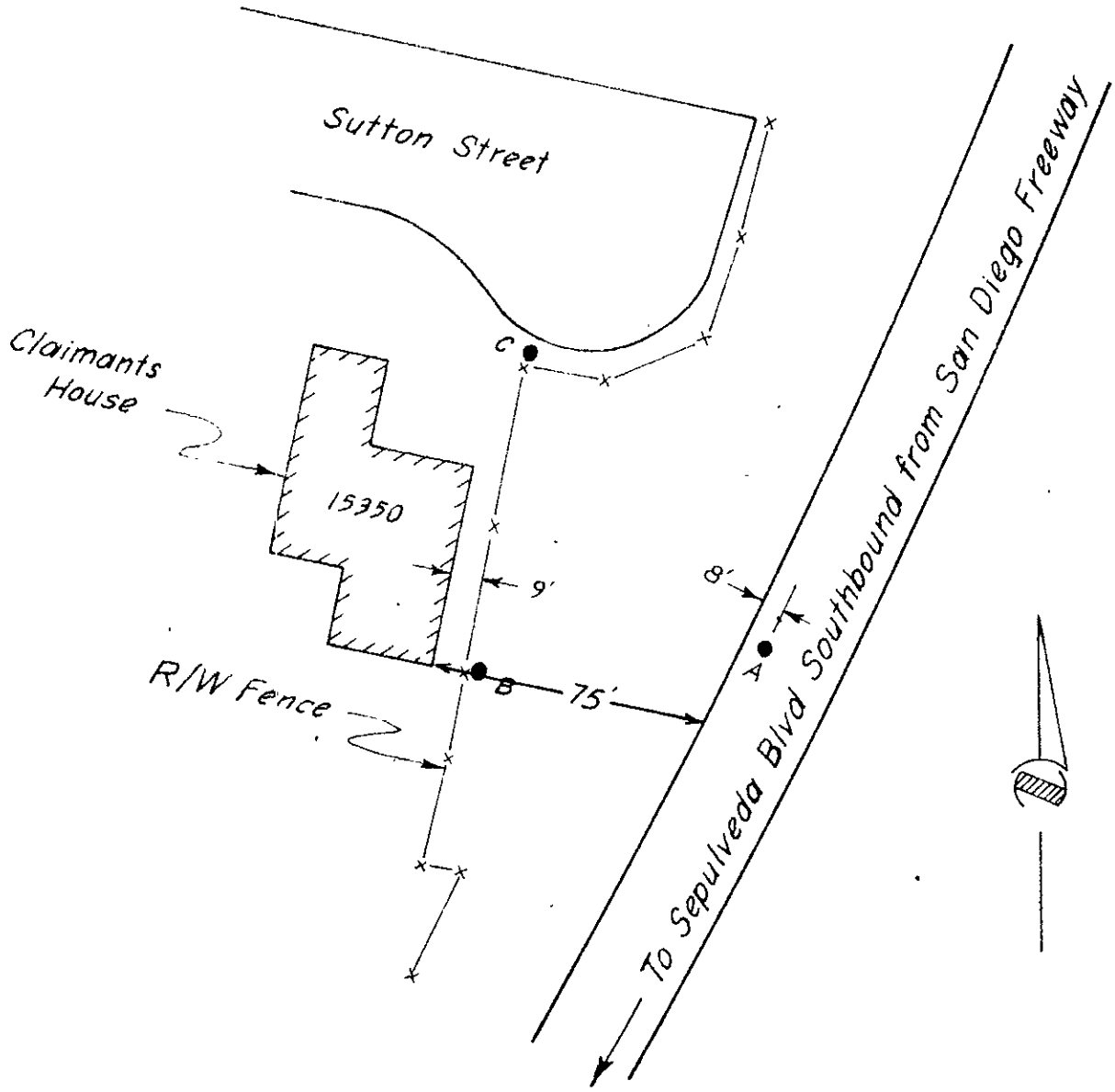
EXHIBIT 1

THREE SIMULTANEOUS VERTICAL VIBRATION MEASUREMENT LOCATIONS AT 15350 SUTTON STREET ROAD VII-LA-158-LA (10)

Scale 1" = 50'



• Vibration Tester Locations
Vibration Testers B & C are 6" from fence line

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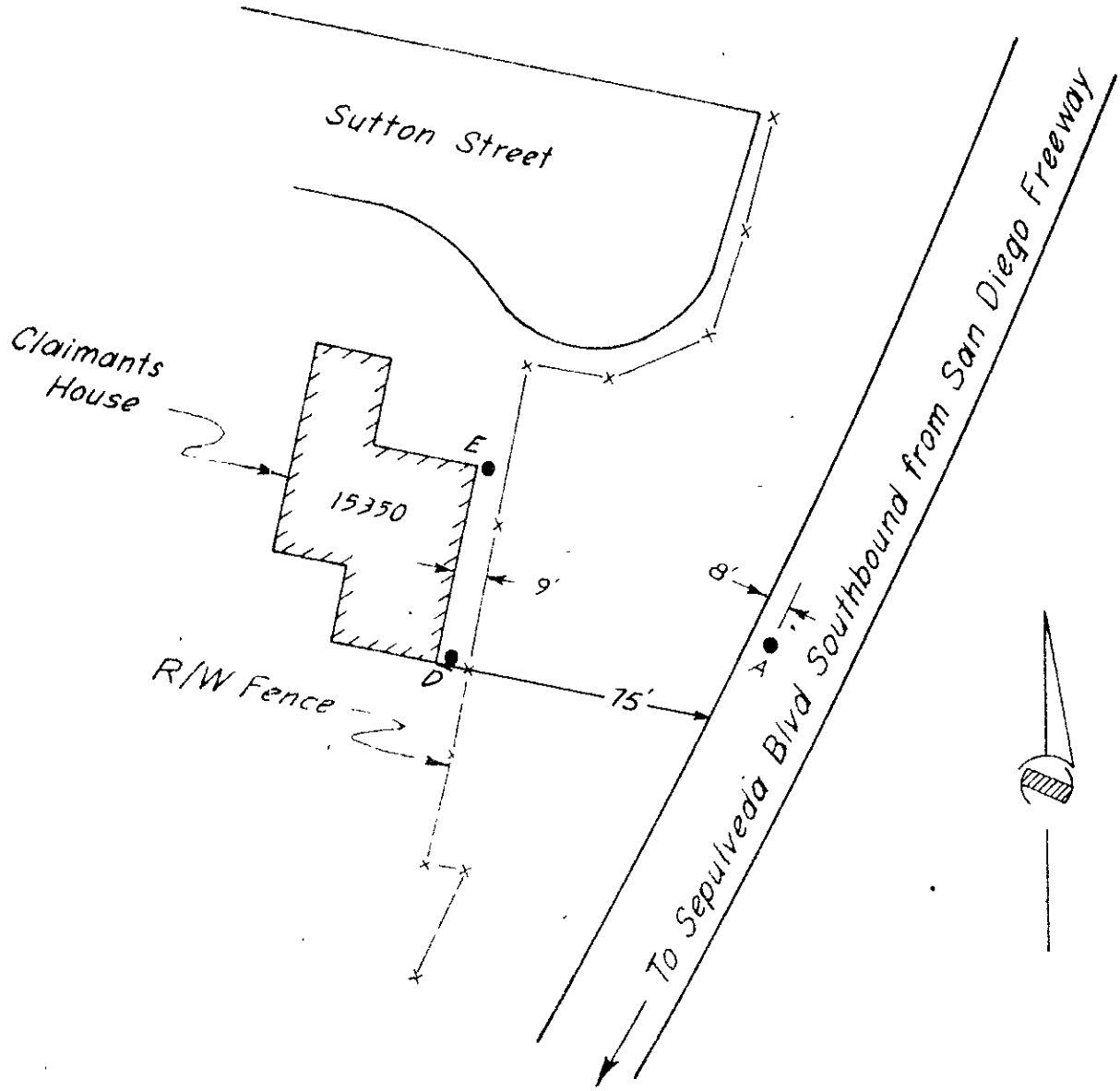
EXHIBIT 2

THREE SIMULTANEOUS VERTICAL VIBRATION MEASUREMENT LOCATIONS AT 15350 SUTTON STREET ROAD VII-LA-158-LA (10)

Scale 1" = 50'



• Vibration Tester Locations

Vibration Testers D & E are 6" from edge of house

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THREE SIMULTANEOUS VERTICAL VIBRATION MEASUREMENTS

AT 15350 SUTTON STREET, SHERMAN OAKS, CALIFORNIA

VII-LA-158-LA

Displacement given in inches peak to peak. Frequency of displacement in cycles/sec (cps). Insignificant displacement indicated by "----". See Exhibit 1 for plan view of tester location.

Run No.	Locations A		B		C		Traffic
	Disp. Inches	cps	Disp. Inches	cps	Disp. Inches	cps	
1	-	-	-	-	-	-	No traffic
2	.000012	33	-		-		5 axle gravel truck
3	.000018	33					5 axle gravel truck
4	.000030	25	-		-		3 axle concrete mixer
5	.000014	33	.000012	33	-		5 axle gravel truck
6	.000012	33	-		-		3 axle concrete mixer
7	.000020	50	.000012	33	-		3 axle bread van truck
8	-		-		-		No traffic
9	-		-		-		5 axle gravel truck
10	-		-		-		5 axle gravel truck
11	.000030	33	.000018	28	-		5 axle gravel truck
12	-		-		-		5 axle gravel truck
13	-		-		-		5 axle gravel truck
14	-		-		-		5 axle gravel truck
15	.000060	25	-		-		United Van line 3 axle truck
16	.000040	33	.000022	33	-		5 axle tanker
17	.000060	25	-		-		School bus
18	-		-		-		5 axle gravel truck
19	.000040	33	.000030	28	-		5 axle truck
20	-		-		-		5 axle gravel truck

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THREE SIMULTANEOUS VERTICAL VIBRATION MEASUREMENTS

AT 15350 SUTTON STREET, SHERMAN OAKS, CALIFORNIA

VII-LA-158-LA

Displacement given in inches peak to peak. Frequency of displacement in cycles/sec (cps). Insignificant displacement indicated by "----". See Exhibit 2 for plan view of tester location.

Run No.	Locations A		D		E		Traffic
	Disp. Inches	cps	Disp. Inches	cps	Disp. Inches	cps	
21	-		-		-		5 axle gravel truck
22	.000035	28	-		-		5 axle gravel truck
23	.000035	28	-		-		5 axle gravel truck
24	-		-		-		5 axle gravel truck
25	-		-		-		Car carrier with 4 cars
26	.000022	33	-		-		3 axle concrete mixer

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EXHIBIT 5

Location A

Location C

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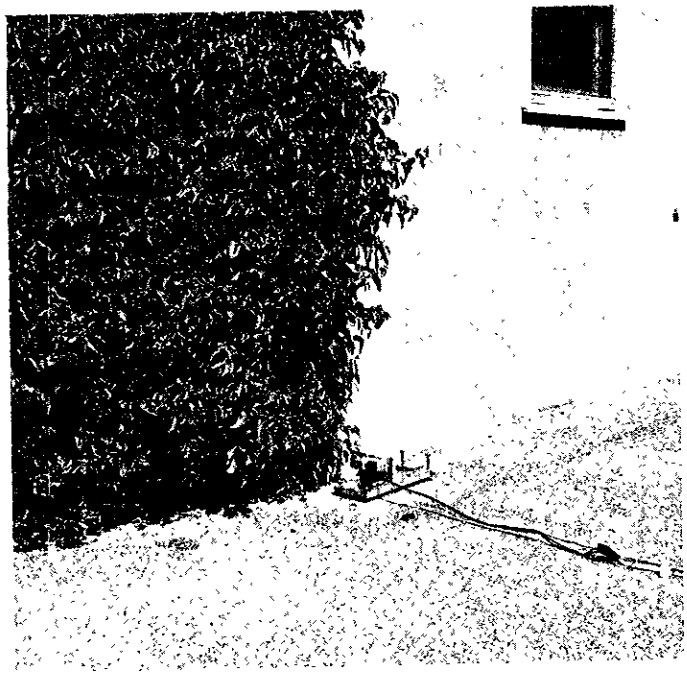
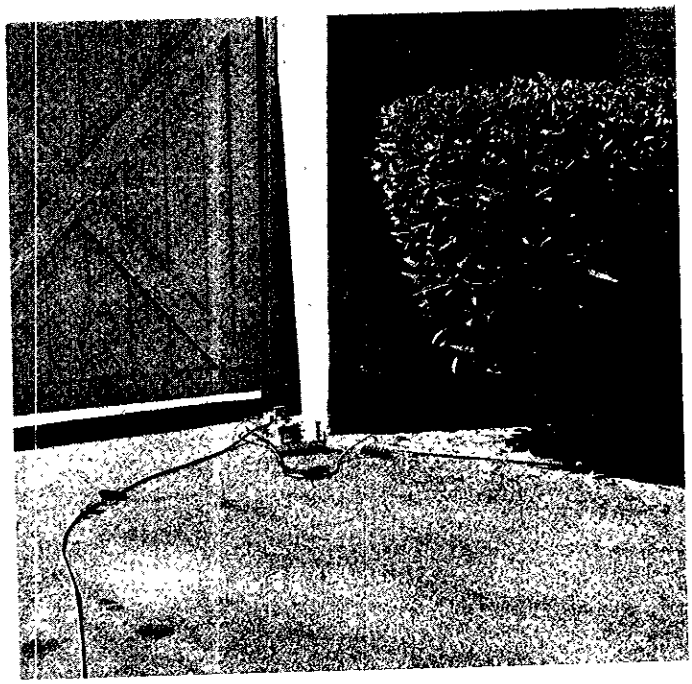
EXHIBIT 6



Location D



Location E

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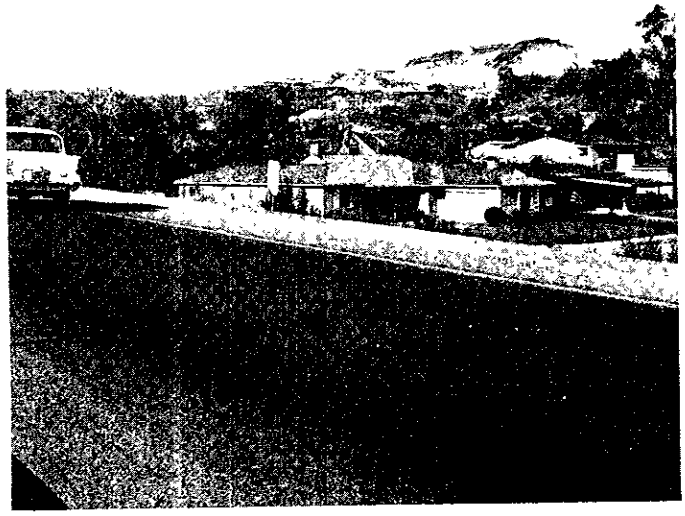
EXHIBIT 7



Over-all view of claimant's
house from the roadway.

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