ENCLOSURE 2

ADDENDUM 1 TO REPORT ON

SOIL BACKFILL CONDITIONS

SAN ONOFRE NUCLEAR GENERATING STATION

UNIT 1

JULY 12, 1983

ADDENDUM 1 TO REPORT ON SOIL BACKFILL CONDITIONS

This addendum provides additional information regarding the insitu backfill soil conditions which was not included in Chapters 1 to 3 and the appendices of the report on this matter. Specifically, this addendum provides (1) additional results of soil density tests and observations of footing conditions made at the site; 2) a discussion of the use of 85 percent relative compaction as a minimum average at the site.

Additional Test Data and Observations

The results of additional tests made in the backfill at the site are given in Table 1. The additional data are in the south extension of the Turbine Building and outside area pipe trench excavations. In addition, the following observations have been made:

a) In reviewing the results of the tests given in Table 1, it was noted that soil backfill exposed in the Footing F excavation in the south extension of the Turbine Building shows several tests in the range of 81 to 87 percent relative compaction. The excavations also revealed the remnant of an old dewatering well (loose soil and gravel pack), the location of which is in general agreement with the construction photographs of the site. Some of the tests are low due to their proximity to the dewatering well backfill. Based on these test results and an inspection of the footing excavation, the soil characterization in this area has been modified locally from Category B to Category D soil fill. This change is reflected in the attached revised Figure 2-22.

b) Review of additional observations made in December 1980 for the foundation for the dog house structure north of the Ventilation Equipment Building showed that the backfill beneath the west wall of the Ventilation Equipment Building is less than what was previously indicated in Section 2 of the report.

It should be noted that the above data are not reflected in the figures in sections 2 and 3 and the appendices of the Soil Backfill Conditions report. However, they are considered in section 4 and 5 of the report and in this addendum.

Discussion of 85 Percent Relative Compaction Charactarization

A density of 85 percent average relative compaction was used to characterize Category D fills as well as deep/narrow portions of Category B and C fills as shown in Figure 2-22. The relative compaction of the fill is an important parameter which is used as basic input to the evaluation of seismically induced settlements. Case histories indicate that the amount of seismically induced settlement for a sandy soil deposit can be calculated using the average density of the deposit.

The selection of the average value in this case was based on inspection of density test results for fill soils. For such fills a mean value of relative compaction for all tests on fills is about 89 percent with a standard

deviation of 5 to 6 percent. These observations represent all categories of fill. Perhaps the most representative area to evaluate the average density of deep narrow fills is the backfill which was tested adjacent to the east side of the Fuel Storage Building. In that area, 11 tests were made in backfill between elevation +5 feet and +13 feet. These tests showed a mean relative compaction of between 85 and 86 percent and a standard deviation of 4 percent. It was not possible to obtain test results below elevation +5 feet in this area due to the congested nature of the excavation below that elevation. To evaluate the effect of elevation on relative compaction, the 175 tests taken on backfill between elevation 0 and 20 were statistically analyzed at 2-foot intervals. These tests were selected from density tests documented in Table B-1 of the soil conditions report and Table 1 of this addendum. It is noted that only those tests representing existing backfill were utilized. The calculated mean and mean minus one standard deviation of the available data are plotted in Figure 1 along with all data points for each interval. Also shown for reference is the mean and mean minus one standard deviation for all tests in the depth range.

As shown by Figure 1, the overall mean and mean minus one standard deviation are about 89 and 83 to 84 percent relative compaction, respectively. The corresponding two-foot interval results and the distribution of data points show no specific trend with elevation. Further, as shown in Figure 1, 85 percent relative compaction corresponds to 50 percent relative density while 80 percent relative compaction corresponds to 30 percent relative density. It is considered unlikely that a soil deposit could remain at 30 percent relative density areally in a location such as the SONGS site where vibrations due to the operation of the power plant equipment or construction equipment have been almost continuous for over 15 years. Based on the aforementioned observation, the results of the 11 tests obtained at the east end of the Fuel Storage Building and on the lack in trend of density with elevation shown in Figure 1, it is concluded that 85 percent relative compaction is the appropriate value for use in settlement calculations.

TABLE 1

WOODWARD-CL[illegible] CONSULTANTS

Job Name: SONGS 1

Field Data Sheet

Sheet No.: 19

SEISMIC MODIFICATIONS SHORT TERM OUTAGE PROJECT

Job Number: 41009K

Date	Test Number	Retest by	Retest of	Grid Number	Location of Test	Elev.	Field Dry Density (pcf)	Moist. %	Method	Max. Lab. (pcf)	Rel. Comp %	Spec Reg. %	Drawing No., Spec.	Quality Class
Jan 24	711			S12+85 W4+99	Fill M-N-8 Turbine Bldg. Ftg. "F"	+14.5'	97	4	S/C	120	81	95	See Plot Plan	2 *2
Jan 24	712			S12+94 W5+01	Fill N-9 Turbine Bldg. Ftg. "F"	+16.5'	100	6	"	"	83	"	"	" *2
Jan 26	713			S12+79 W4+93	Fill M-8 Turbine Bldg. Ftg. "F"	+11'	98	5	"	"	82	"	"	" *2
Feb 3	714			S12+99 W4+93	Fill N-8 Turbine Bldg. Ftg. "F"	+16'	98	3	"	"	81	"	"	" *2
Feb 3	715			S11+71 W5+42	Fill Trench Turbine Bldg. Piping	+17.5'	103	4	"	"	86	"	"	" *2
Feb 3	716			S11+84 W5+42	Fill Trench Turbine Bldg. Piping	+17.5'	104	5	"	"	86	"	"	" *2
Feb 7	717			S11+96 W5+72	Backfill, E. side Piping Trench Overcut	+11.5'	115	9	"	"	96	"	"	" *2
Feb 7	718			S11+72 W5+72	Backfill, N. side Piping Trench Overcut	+12'	115	9	"	"	96	"	"	" *2
Feb 8	719			S12+72 W5+72	Native Waste Oil Line S.G.	+11'	120	5	"	"	100	"	"	" *2
Feb 8	720			S13+36 W5+71	Native Waste Oil Line S.G.	+12'	120	4	"	"	100	"	"	" *2
Feb 9	721	726		S13+40 W5+67	Fill Waste Oil Line S.G.	+12'	100	5	"	"	83	"	"	" *2
Feb 11	722			S12+96 W5+06	Native Turbine Bldg. Ftg. "F"	+16'	120	4	"	"	100	"	"	" *2
Feb 11	723			S12+99 W4+97	Native Turbine Bldg. Ftg. "F"	+14.5'	119	3	"	"	99	"	"	" *2
Feb 11	724			S12+78 W4+94	Fill M-8 Turbine Bldg. Ftg. "F"	+8.5'	99	9	"	"	82	"	"	" *2
Feb 15	725			S13+62 W5+38	Native Waste Oil Line S.G.	+14'	121	4	"	"	101	"	"	" *2

Remarks: *2 Test requested by Bechtel

Class 1 & 2 Reviewed By: _____

Class 3 & 4 Reviewed By: _____

TABLE 1

WOODWARD--CL[illegible] CONSULTANTS

Job Name: SONGS 1
SEISMIC MODIFICATIONS SHORT TERM OUTAGE PROJECT

Field Data Sheet

Sheet No.: 20

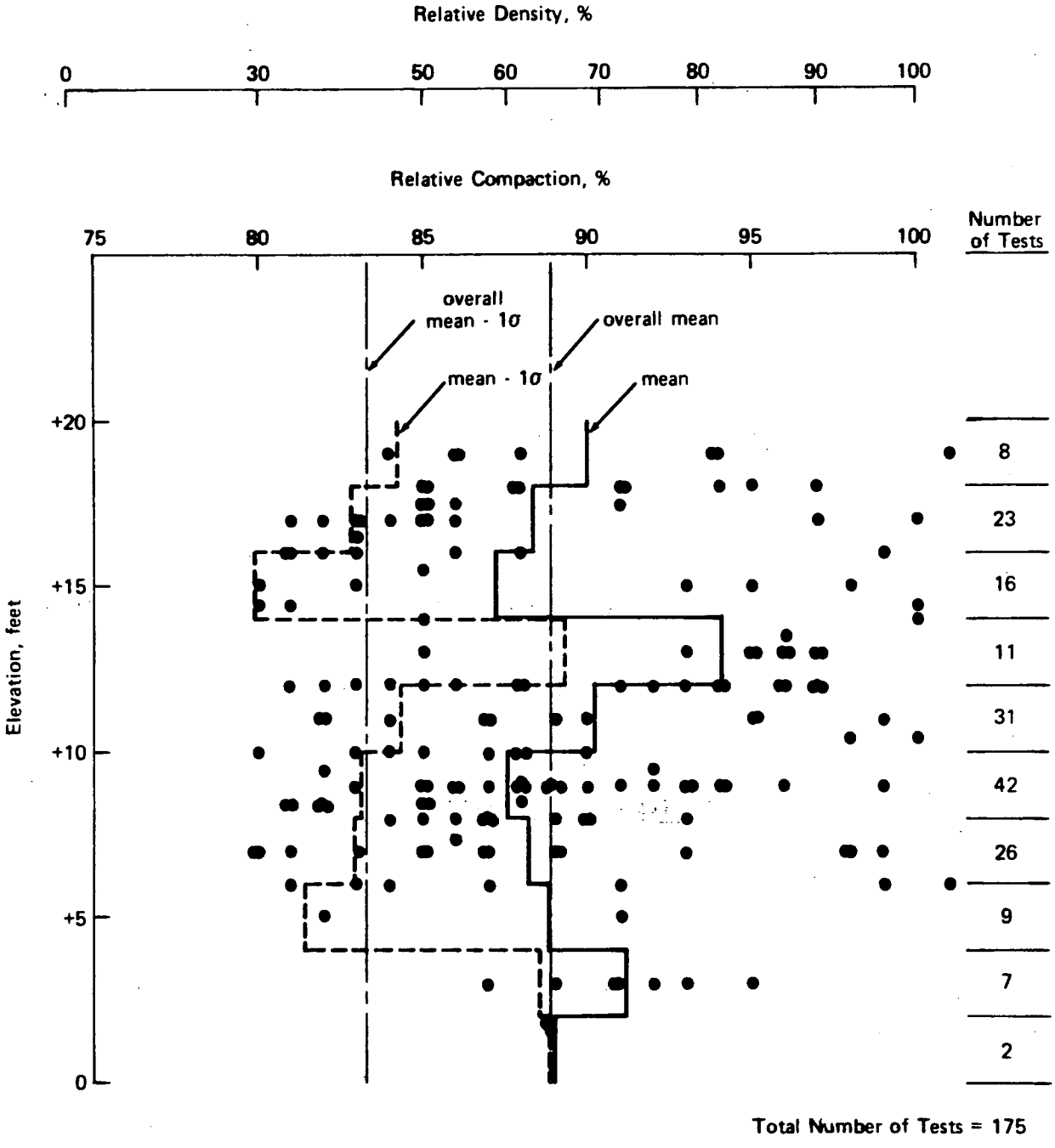
Job Number: 41009K

Date	Test Number	Retest by	Retest of	Grid Number	Location of Test	Elev.	Field Dry Density (pcf)	Moist. %	Method	Max. Lab. (pcf)	Rel. Comp %	Spec Reg. %	Drawing No., Spec.	Quality Class
Feb 24	726		721	S13+39 W5+68	Backfill Waste Oil Line S.G.	+12'	117	5	S/C	120	97	95	See Plot Plan	2 *2
Feb 24	727			S12+77 W5+03	Fill Turbine Bldg. Ftg. "F"	8.5	97	8	"	"	81	"	"	" *2
Feb 26	728			S12+98 W5+02	Native Turbine Bldg. Ftg. "F"	+14.5	120	4	"	"	100	"	"	" *2
Mar 3	729			S12+61 W5+71	Fill 1" Eye Wash Line	+12'	109	7	"	"	91	"	"	" *2
Mar 3	730			S12+52 W5+71	Fill 1" Eye Wash Line	+12'	111	8	"	"	93	"	"	" *2
Mar 3	731			S12+77 W4+90	Fill, Drain Line Turbine Bldg. Ftg. "F"	+17'	100	6	"	"	83	"	"	" *2
Mar 7	732	733		S12+90 W5+72	Backfill Oil Waste Line	+13'	110	6	"	"	92	"	"	" *2
Mar 7	733		732	S12+93 W5+72	Backfill Oil Waste Line	+13'	114	8	"	"	95	"	"	" *2
Mar 8	734			S13+42 W5+55	Backfill Oil Waste Line	+15'	118	10	"	"	98	"	"	" *2
Mar 8	735			S13+37 W5+05	Backfill Level Indicator Line	+19'	117	8	"	"	98	85	"	" *2
Mar 9	736			S13+13 W5+03	Backfill Level Indicator Line	+19'	113	7	"	"	94	"	"	" *2
Mar 11	737	739		S12+87 W3+18	Backfill Sewer Line Lateral	+18'	111	7	"	"	92	95	"	" *2
Mar 11	738			S11+95 W1+78	Backfill Sewer Line Lateral	+22'	116	9	"	"	97	"	"	" *2
Mar 11	739		737	S12+87 W3+18	Backfill Sewer Line Lateral	+18'	115	9	"	"	96	"	"	" *2

Remarks: *2 Test requested by Bechtel

Class 1 & 2 Reviewed By: _____

Class 3 & 4 Reviewed By: _____



Project: SONGS UNIT 1 SEISMIC RE-EVALUATION Project No. 413521	SUMMARY OF PERCENT RELATIVE COMPACTION AS A FUNCTION OF ELEVATION	Fig. 1

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