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and SAN DIEGO GAS & ELECTRIC COMPANY

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of SOUTHERN CALIFORNIA EDISON COMPANY, et al. (San Onofre Nuclear Generating Station, Units 2 and 3).	Docket Nos. 50-361 OL 50-362 OL AFFIDAVIT OF JAY L. SMITH IN SUPPORT OF MOTION FOR SUMMARY DISPOSITION OF INTERVENOR FRIENDS OF THE EARTH, ET AL.'s CONTENTION 1a (DEWATERING WELLS).

STATE OF CALIFORNIA,)
) ss.
COUNTY OF LOS ANGELES.)

JAY L. SMITH, being first duly sworn, deposes and says that if called as a witness herein he can competently testify, as follows:

1. I am currently president of Jay L. Smith Company, Inc., a geologic consulting firm that provides technical services in the earth sciences.

2. I received my Batchelor of Arts Degree in Geology from the University of California at Los Angeles, and have undertaken graduate studies in Geology and related earth sciences at the University of Southern California.

3. I am registered as a Professional Geologist and Engineering Geologist in the States of California, Arizona, and Oregon. I have twenty-two years of professional experience in the field of Engineering Geology: 1 year employed as a Geologic Aide, 3 years employed as a staff Geologist, and 18 years as a Senior Geologist and Project Manager. My knowledge and experience in Engineering Geology has been applied to a broad spectrum of technical objectives including: site selection, design, resource exploration, and damage investigations. I have provided such professional advice on projects to construct power plants, dams, tunnels, defense facilities, mining operations, underground repositories for radioactive waste, and a variety of other major buildings. In my professional capacity as an engineering geologist, I have personally investigated the existence and potential effect of natural and man-induced subsurface cavities involved in projects to

construct nuclear power plants, mines, water tunnels, and residential developments.

4. From 1969 to the present, I have been a consultant to Southern California Edison Company ("SCE") on matters pertaining to the geology of the area on and around the San Onofre Nuclear Generating Station, Units 2 and 3 (hereafter "SONGS 2 and 3"). During the period 1969 through 1971, I was engaged by SCE to supervise the geologic mapping the San Mateo Formation at the SONGS 2 and 3 site (hereafter the "Site") and its environs (approximately 3.5 miles north and west). From 1971 to 1978, I have personally continued to investigate various aspects of the geology of the San Mateo Formation at the Site and other formations in adjacent onshore and offshore regions encompassing hundreds of square miles around the Site.

The San Mateo Formation is the geologic term used to describe the principle geologic stratum directly underlying the Site, as excavated, to a depth of approximately 936 feet. Particularly relevant aspects of the San Mateo Foundation personally investigated or investigated under my supervision include: mapping of the San Mateo Formation where it is well exposed in the seacliffs up and down the coast from the Site; detailed examination and surface mapping of the San Mateo Formation exposed by construction excavations at the Site; subsurface examination of the San

Mateo Formation by personally entering man-size borings drilled below foundation grade to evaluate jointlike features in the San Mateo Formation; and review of a large number of borings drilled at the Site.

From 1978 to the present time, I have also extensively assisted SCE in responding to NRC Staff questions on the geology of the area at and around the Site and I have participated in many field and office reviews of work performed by other geologists. In sum, as a consequence of eleven years of professional experience investigating and reviewing the geology of the Site, I have become very familiar with the physical characteristics and the geologic history of the San Mateo Formation.

5. The question I am here addressing is whether subsurface cavities are naturally occurring phenomena in the San Mateo Formation that underlies the Site. For the reasons more fully described below, it is my professional opinion that subsurface cavities are not naturally occurring phenomena in the San Mateo Formation.

6. Prior to installation and operation of the dewatering wells at the Site, I observed no subsurface cavities in the San Mateo Formation, nor did I see evidence of their surface manifestation. Where the San Mateo Formation is at or within a few feet of the ground surface onshore, (over approximately 1,000 acres within about 5

miles on SONGS), no cavities or evidence of them are seen. Likewise, examination of vertical exposures of the San Mateo Formation a few to several tens of feet high and up to thousands of feet long, provided by gullies, quarry custs, man-sized borings, and the seacliff, disclose the absence of cavities. In those vertical exposures (e.g., the seacliff face) no zones of loose sand were observed, such as might represent cavity infilling.

7. The chief lithologic constituent of the San Mateo Formation is white to light brown, dense, massively-bedded sandstone, composed almost entirely of quartz (65-70%) and feldspar (25-30%) grains. Dense pebble conglomerate lenses and very firm siltstone and claystone clasts are minority constituents. Because of tight packing of the well graded sand grains and the compaction resulting from overburden pressure, the sandstone has fairly high bulk cohesion and strength. However, because of an almost complete absence of cementing minerals or soil matrix to bond the grains together, the sandstone is easily eroded where a free surface exposes it to wind, water, or wave action. Also, it is easily excavated by equipment. Eroded slopes commonly achieve near-verticality several tens of feet high because of the relatively high strength of the undisturbed sandstone.

8. Chemical analyses confirm mineralogical exminations of the San Mateo Formation sandstone, indicating a general absence of soluble carbonates and sulfates (e.g. clcite and gypsum). This is significant because carbonates and sulfates (chiefly calcite and gypsum), when present in abundance, would suggest a potential for dissolution by circulating ground water and the possibility of cavity formation. However, such minerals are rarely present in the San Mateo Formation and they are generally absent at the Site. Thus, subsurface cavity formation at the Site by chemical dissolution is not possible.

Iron oxide is present at the site, but is sparsely distributed as a stain on the sand grains rather than as interstitial fillings that could be easily eroded or dissolved. In some places the iron oxide may provide a slight cementing effect, but mostly it is merely evidence of ground-water circulation. Vertical and horizontal exposures of sandstone display stripes, broad bands and swirls of concentrated ironstains; however, none of these exhibit any apparent difference in density, strength or erodibility compared to that of unstained rock.

9. Irregular-shaped, but generally elongate layers and clasts of dark brown, very firm siltstone and claystone are widely scattered throughout the sandstone, resembling raisins in a pudding in their randomness of

distribution. The clasts commonly display distorted outlines and flow features indicative of plastic deformation during and shortly after deposition. In exposures the clasts stand out from the more friable sandstone and occasionally occur in randomly-arranged clusters or in trains that appear to approximate bedding in the formation. The clasts most likely represent remnants of overbank deposits channel drape or of limited vertical and lateral extent that formed concurrently with sand deposition and were subsequently eroded and redistributed by turbidity currents and other modes of sea-floor sedimentation. There is no apparent difference in the characteristics of the sandstone surrounding the clasts and the sandstone farther away.

10. Structural elements are relatively poorly displayed in the San Mateo Formation. Stratification is chiefly massive and dipping gently west and southwest, with bedding commonly being indistinguishable in hand specimens and in exposures several feet high and wide. Fractures, joints and faults are not abundant; their existence and nature are controlled by stress conditions that are local (in the case of fractures) and regional (in the case of faults and joints). Fracturing is most intense in the San Mateo Formation about one-half mile east of the site where the San Mateo Formation is juxtaposed with the Monterey and San Onofre Formations. Here, more than elsewhere, including

the Site, fracturing is most evident, However, subsurface cavity formation by erosion or solutioning of fractures in the San Mateo Formation in this area has not been observed, although extensively invesstigated. Fractures are even less abundant at the Site. My comprehensive investigation of such fractures indicates that those present at the Site are not accompanied by cavities or zones of loose sand representing cavity infilling.

11. The geologic history of the San Mateo Formation began with deposition of sand in a moderately deep-water marine basin by drainage systems ancestral to San Onofre and San Mateo Creeks during Late Miocene-Pliocene time (5-10 million years ago). Transportation and deposition of the sand by water provided for granular accumulation and tight packing upon consolidation. Subsequent deposition of overlying sediments and later uplift provided additional compaction and cohesion. Regional compression and extension, and movement on the Cristianitos fault (more than 125,000 years ago), produced fractures in the sandstone. During Pleistocene time (1 to 2 million years ago) changes in sea level caused removal of overlying deposits and some of the San Mateo Formation to an elevation above the present plant grade at the Site. This removal was followed during the last 125,000 years by deposition of several tens of feet of sandy and clayey terrace deposits on the wave-cut surface

of the San Mateo Formation. Construction excavation at the Site has exposed the San Mateo Formation across the entire site, and the contact between the sandstone and the overlying terrace deposits is well displayed in the surrounding cut slopes. These relationships are illustrated in a composite cross-section of the Site, which is attached hereto as Exhibit A, entitled "Composite Cross-Section of the San Onofre Site", and incorporated herein by this reference. Although I have observed shallow erosion channels in a few places along this contact, I saw no interruptions that represented the surface manifestation of collapsed and infilled cavities. The extensive geologic observations that lead to my interpretation of the foregoing geologic history provide the basis for my professional opinion that cavity formation was not included in the sequence of natural processes that produced the subsurface environment at the Site.

12. Geologic formations known elsewhere to contain natural subsurface cavities are composed chiefly of limestone, basalt, and bedded or domed salt. Such rock types are completely absent in the Site area and have characteristics greatly different from those of the San Mateo Formation.

13. In conclusion, the San Mateo Formation has neither the physical, chemical, nor structural

characteristics conducive to natural formation of subsurface cavities. The San Mateo Formation's geologic history of deposition, consolidation, deformation, and erosion is such that subsurface cavities are very unlikely to have been created by naturally occurring processes. Indeed, I have observed no evidence of subsurface cavities in the many excellent exposures of the San Mateo Formation, at the ground surface and at depth, during my eleven years of professional geologic investigation at the Site and its environs. In arriving at these conclusions, I have also reviewed prior documentation and data pertinent to the San Mateo Formation at the Site and its environs. Such documentation and data are set forth in Exhibit B, entitled "References", which is attached hereto and incorporated herein by this reference.

14. Based on the foregoing analysis, it is my professional opinion that the subsurface cavities detected on the Site during the investigation and demobilization of the SONGS 2 and 3 construction dewatering well system, as more fully described in the accompanying affidavits of Lucien Hersh, John A. Barneich,

Robert L. McNeill, and Kenneth P. Baskin, were not caused by naturally occurring phenomena in the San Mateo Formation.

DATED: June 2, 1980

JAY L. SMITH

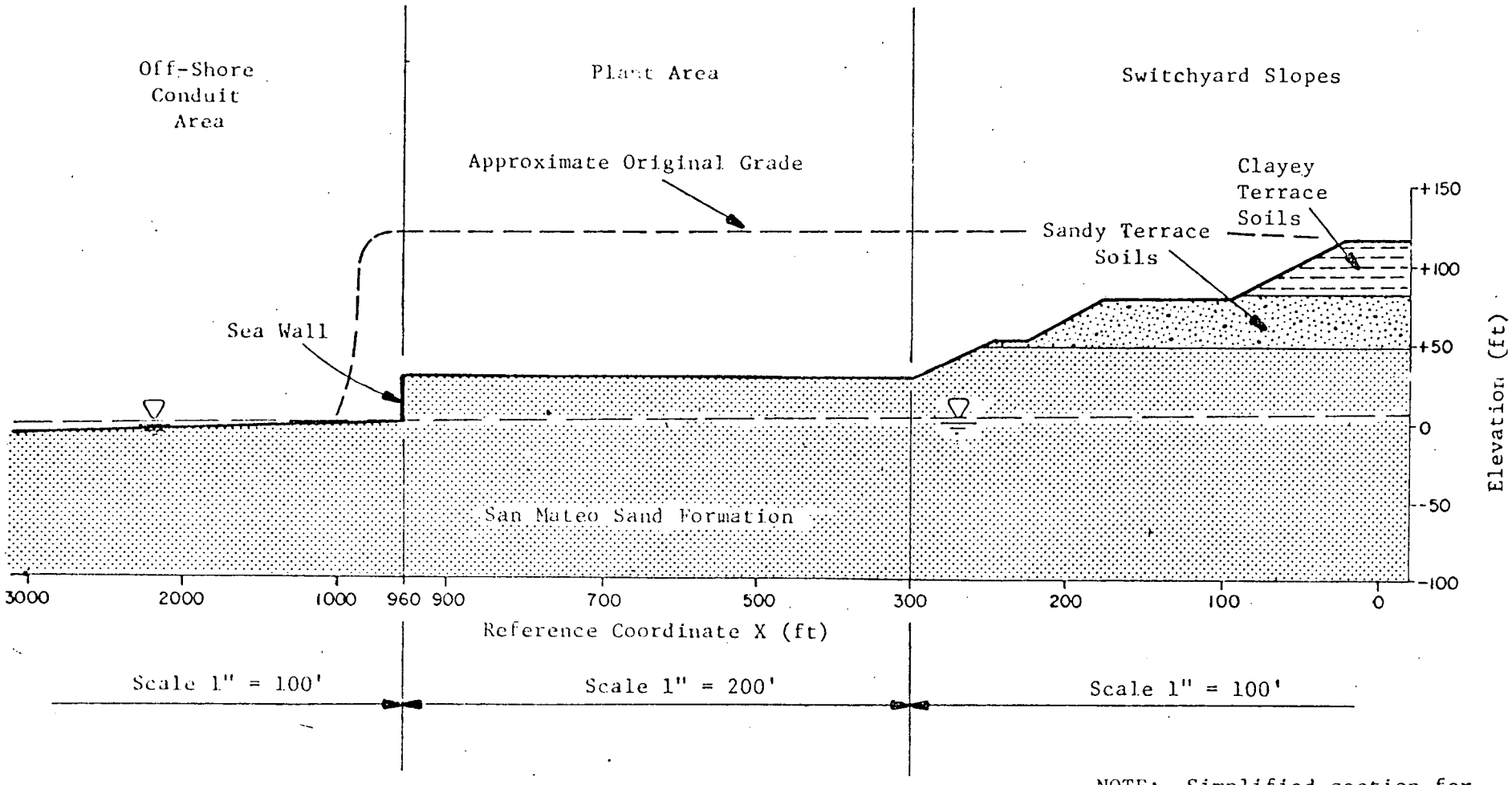
Subscribed and sworn to before me this 2nd day of June, 1980.

Notary Public

for the City and County of Los Angeles, State of California

OFFICIAL SEAL
DONA MARY WILCOMB
NOTARY PUBLIC - CALIFORNIA
PRINCIPAL OFFICE IN
LOS ANGELES COUNTY
My Commission Expires June 18, 1981

COMPOSITE CROSS-SECTION OF THE SAN ONOFRE SITE



NOTE: Simplified section for design analysis only.

Notes: ▽ = Water Table.

EXHIBIT A

REFERENCES

1. Geologic report on the probability of ground displacement on faults in the vicinity of the San Onofre Nuclear Power Plant Site, Units 2 and 3, San Diego County, California, by Converse, Davis and Associates, April 30, 1970; Appendix 2A, Preliminary Safety Analysis Report, SONGS 2 & 3.

2. Analysis of geologic features at the San Onofre Nuclear Generating Station, by Fugro, Inc., July 5, 1974, submitted by letter 7-10-74, J.B. Moore to J.F. O'Leary.

3. Analysis of C and D type features at the San Onofre Nuclear Generating Station, by Fugro, Inc., November 1, 1974, submitted by letter 11-1-74, O.J. Ortega to J.F. O'Leary.

4. Final report on geologic features at the San Onofre Nuclear Generating Station, Units 2 & 3, by Fugro, Inc., August 1976, Final Safety Analysis Report Section 1.8, December 1979 (7-copy information).

5. Generalized subsurface geological and geophysical study, Capistrano area, Orange County, California, by Jack C. West; Enclosure 3 to Recent Geotechnical Studies, Southern Orange County, California, submitted by letter 2-12-76 K.P. Baskin to R.C. DeYoung, Jr., Final Safety Analysis Report Amendment 17, December 1979 (7-copy information).

6. Geologic report on the area adjacent to the San Onofre Nuclear Generating Station, northwestern San Diego County, California, by Perry L. Ehlig, September 31, 1977; Enclosure 3 in Geotechnical Studies, Northern San Diego County, California, Final Safety Analysis Report Amendment 17, December 1979 (7-copy information).

7. Chemical analysis by Associated Laboratories, September 20, 1971; Table B-111 in Elastic and Damping Properties, Laydown Area, San Onofre Nuclear Generating Station, by Woodward-McNeill & Associates, October 14, 1971.