ENCLOSURE I

SAN ONOFRE

NUCLEAR GENERATING STATION

UNIT 1

FINAL ENVIRONMENTAL STATEMENT UPDATE

DOCKET 50-206

JANUARY 1986

SOUTHERN CALIFORNIA EDISON COMPANY

AND THE

SAN DIEGO GAS AND ELECTRIC COMPANY

SONGS 1 FES UPDATE

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SONGS 1 FES UPDATE

Section	Page	Comment
Summary & Conclusions	(i) to (iv)	The summary and conclusions should be read and modified as necessary in the light of the information provided below in this update document.
1.2	1-3	Update Table 1.1 with the following licensing actions*:
Atomic Energy Commission/ Nuclear Regulatory Commission		Provisional Operating License No. DPR-13 of San Onofre Nuclear Generating Station (SONGS) Unit 1 provides a complete listing of all Amendments and Orders to the initial license.
California Regional Water Quality Control Board, San Diego Region	12-17-64	Waste Water Discharge Resolution
	12-09-74	Amendment to Resolution
	06-14-76	NPDES Permit
	11-28-77	Amendment to NPDES Permit
	06-01-81	Extension of NPDES Permit
	07-12-82	New NPDES Permit and Time Schedule Order
	08-29-83	Modification of Time Schedule Order
California Air Pollution Control District, San Diego	02-85	Renewal of permits to operate for various plant equipment/operation (i.e., auxillary boiler, blast machine, paint spray room, blast room and gasoline service site.)

Section	Page	Comment
2.2.1	2-1	Revised information on population distribution in the vicinity of SONGS is available in the January 1984 update of the Final Safety Analysis Report (FSAR) for SONGS Units 2 and 3[1].
		The military complex estimated to contain 1150 housing units in the 1973 Final Environmental Statement (FES) is called San Onofre Heights and contains 600 units. The San Onofre mobile home park, located about 1/2 mile south of San Onofre Heights, contains a total of 140 units[2]. The proposed school, San Onofre Elementary, has been completed.
		The former Western White House was sold in 1983 to an individual who uses it on an irregular basis. A 17 unit subdivision has been approved for lands adjacent to and northeast of the former White House[3].
2.2.1	2-4	The 1980 Census indicates populations of adjacent cities are: San Clemente, 27,325; Mission Viejo, 50,666; Oceanside, 76,698; San Diego, 1,704,352; San Juan Capistrano, 18,959; Camp Pendleton, 26,705 [4].
2.2.1	2-4	Tables 2.1-2 and 2.1-9 of the SONGS Units 2 and 3 FSAR[1] provide actual population distributions out to 50 miles from the plant. These updated tables do not include transient or recreational users, which were included in Table 2.1 of the 1973 FES.
2.2.1	2-4	Table 2.1-8 of the SONGS Unit 2 and 3 FSAR[1] provides 1981 population data for the various base camps inside Camp Pendleton.
		Presently, there are approximately 27,150 permanent residents and 3,640 transient persons residing at Camp Pendleton[2].
2.2.1	2-4	The beaches can accomodate the same number of persons as previously indicated. However, the estimate of a 40 percent use factor as assumed in the FES appears to be high when compared with actual attendance. Table 2.1-16 of the SONGS Units 2 and 3 FSAR[1] provides actual beach attendance within a 10-mile radius of the station during the 1980-1981 season

Section	Page	Comment
2.2.1 (Continued)	2-4	The annual attendance of 3,415,800 persons is equivalent to about 9,358 persons per day.
2.2.1	2-7	From the data presented in Table 2.1-17 of the SONGS Units 2 and 3 FSAR(1), the actual 1980/1981 average daily traffic along Interstate 5 is calculated to be 56,953 automobiles and 6539 trucks which, when combined, is slightly lower than the projected 1980 estimate in the FES of 67,000 automobiles. In addition, the estimated 1980/1981 population in these vehicles per day is 128,990 as taken from Table 2.1-17 of the SONGS Units 2 and 3 FSAR(1).
2.2.2	2-7	Camp Pendleton has developed several residential areas in the last 10 years and is currently building a Landing Craft Air Cushion Complex about 10.5 miles south of the SONGS. The complex will include a work force of about 600 military personnel and 50 to 60 civilians. It is scheduled for completion in 1992(2). Residential development is planned in several locations in Camp Pendleton. In 1986, 300 new homes are planned northeast of Del Mar. In 1987, San Onofre Heights plans to add 300 new housing units and 100 mobile homes nearby(2).
2.2.2	2-7	Agricultural activity within a 50-mile radius of the station includes truck crops, field crops, citrus fruits, nursery stock and livestock. Within this radius most agricultural activity is located in San Bernardino, Riverside and San Diego counties. San Diego County is an important agricultural resource area as it is one of the few remaining areas in the country which can be farmed year round, without the threat of frost. Within the 50-mile radius this county contains about 67,000 acres of field crops, 88,000 acres of fruit and nut crops, 28,000 acres of vegetable crops and over 380 million livestock including: beef and dairy cattle, poultry, hogs and pigs. Some of the agricultural lands along the coast have been developed for residential and other uses in recent years. Areas further inland are being maintained for agricultural uses(5,6,7,8).

Section	Page	Comment
2.2.2	2-8	There are seven schools within a 10-mile radius of SONGS. As of August 1985, the enrollment was about 5,300 pupils[9]. There are three hospitals located within a 10-mile radius of the site. As of August 1985, they had a combined bed capacity of 395[10,11,12]. At present there are few areas (approximately 15 acres) of industrial land use in the City of San Clemente. There are no plans to rezone areas within the city for heavy industrial use [13]. Aside from the Capistrano Rocket Test Facility (5.75 miles from the station), the next largest industrial complex in the area will be the Landing Craft Air Cushion Complex (on Camp Pendleton) previously discussed.
2.4	2-11	Current geological information is provided in the Systematic Evaluation Program (SEP) Topic II-4, Geology and Seismology[14].
2.5.1, 2.5.2	2-11	The updated hydrological information is provided in the SEP Topic II-3.A, Hydrologic Description, II-3.B, Flooding Potential and Protection Requirements, and Topic III-3.A, Effects of High Water Level on Structures[15].
2.5.3.1	2-11	More recent data are available in the "Annual Report to the California Coastal Commission September 1977 - August 1978, Updated Estimated Effects of SONGS Unit 1 on Marine Organisms," Sections 2.2.2 and 2.2.3[16]. This report shows that the upcoast and downcoast speeds at the outer surface range between 0.06 to 0.3 knots with a net speed of about 0.09 knots downcoast, and a range of 0.002 to 0.6 knots with an average of 0.02 knots upcoast, at the outer bottom. The on-offshore current speeds range between 0.02 and 0.2 knots. These current data are in close agreement with those presented in the Unit 1 FES.

Section	Page	Comment
2.5.3.2	2-12	Studies to document the ocean surface temperatures in the vicinity of San Onofre started in 1963 during the preoperational monitoring program for Unit 1 and continue to the present time. Table 3.1 of the Report on 1984 Data, Marine Environmental Analysis and Interpretation[17] summarizes the temperature monitoring programs up to 1984. Based on the most recent monitoring results (1982-1984), the ambient surface temperature varies from a high of 70° to 73°F in August to a low of 57° to 60°F in January. The maximum summer surface temperature varies by 3° to 6°F. The detailed temperature data are available in "Reports on 1982, 1983, 1984 Data - Marine Environmental Analysis and Interpretation" (18,19,17).
2.5.3.3	2-12	More recent information on tide levels and wave action are contained in SONGS Units 2 and 3 FSAR[1] Sections 2.4.5.21 and 2.4.5.3, and the SEP Topic II-3.A, Hydrologic Description and Topic II-3.B, Flooding Potential and Protection Requirements[15].
2.6	2-17	Updated meteorological information is presented in the SEP Topic II-2.A, Severe weather Phenomena, Topic II-2.C, Atmospheric Transport and Diffusion Characteristics for Accident Analysis and Topic III-2, Wind and Tornado Loadings[20]. Additional wind speed and direction have been reported in the Unit 1 Semi-annual Effluent Reports 1980-1985[21-28]. More recent X/Q values have been calculated by the Licensee using the NRC XOQDOQ code and 1979 to 1983 meteorologic data including site-specific terrain recirculation factors developed by Dames and Moore[29,30]. These revised historical atmospheric dispersion factors were incorporated into Revision 2 of the Unit 1 Offsite Dose Calculation Manual as described in the SONGS Unit 1 Semi-annual Effluent Report for January-June 1985[28].
2.7.1	2-17	A one-year background terrestrial survey on the site area was conducted between 1975 and 1976. The study results were summarized in Section 2.5.1 of the FES for Units 2 and 3[31] and the full report was presented in the Environmental Report - Operating License Stage (ER-OL) for Units 2 and 3, Appendix 2A[32].

Section	Page	Comment
2.7.2.1	2-18	Data collection on littoral biota continued from 1973. The latest annual monitoring results are published in the 1984 Marine Environmental Report[17], and a comprehensive review of the littoral sampling results from 1964 to 1984 is also available in references 18, 19 and 33. The major factors causing changes in the intertidal community since 1973 are human activities, such as clamming and exploring tidepools; natural processes of sand and cobble movement; and seasonal variations in biota population. Current data for Table 2.4 are contained in the annual marine environmental reports.
2.7.2.2	2-21	Data collection effort on sublittoral biota has continued since 1973. The San Onofre kelp bed is now well established, occupying a maximum of 100 hectares in 1980; the Barn kelp bed (control site) disappeared in 1980 following major winter storms[34] and showed some growth in 1985. The benthic flora and fauna sampling results are summarized in "1980 Annual Report, Marine Environmental Analysis and Interpretation"[35] and "Thermal Effects Studies, Final Summary Report, SONGS Unit 1"[33], with the latest sampling results presented in "Report on 1984 Data, Marine Environmental Analysis and Interpretation"[17].
2.7.2.3	2-23	Recent plankton data are contained in "1981 Annual Report, Marine Environmental Analysis and Interpretation"[34], and the latest monitoring results are available in "Report on 1984 Data, Marine Environmental Analysis, and Interpretation"[17].
2.7.2.4	2-23	Environmental monitoring on fish has continued since 1973. Summary reports, "1981 Annual Report, Marine Environmental Analysis and Interpretation"[34], "1980 Annual Report, Marine Environmental Analysis and Interpretation"[35], and "Thermal Effects Studies, Final Summary Report, SONGS Unit 1"[33] are available as well as the latest monitoring

Section	Page	Comment
		results, "Report on 1984 Data, Marine Environmental Analysis and Interpretation"(17).
		A strong correlation between temperature change and species abundance and composition was exhibited during the El Nino conditions of 1982-1984. For example, monitoring results show an increase in warm temperature and subtropical fish species.
2.8	2-24	The per capita dose from medical and dental X-rays has been estimated to be 92 millirems/year by the National Academy of Sciences Committee on Biological Effects of Ionizing Radiation (BEIR)(36).

References for Section 2

1. Southern California Edison Company "San Onofre Nuclear Generating Station Units 2 and 3, Final Safety Analysis Report," updated January 1984.

2. Shusto, John, Camp Pendleton Public Works Department, September 1985.

3. Lawrence, William C. Company, Inc., "1983 Land Use Census for San Onofre Nuclear Generating Station 2&3 (SONGS)," August 1983.

4. U.S. Department of the Census, 1980.

5. Foster, Gary, Riverside County Agricultural Commission, September 1985.

6. Knight, Richard, Office of Agricultural Commissioner, County of Los Angeles, September 1985.

7. Escher, Thomas, Agriculture - Weights & Measures, County of San Diego, September 1985.

8. Bracken, Dave, Agriculture - Weights & Measures, County of San Bernardino, 1980.

9. Tanner, Sharon, Capistrano Unified School District, Superintendent's Office, September 1985.

10. Clover, Cate, Mission Community Hospital, Administration, September 1985.

11. San Clemente General Hospital, Hospital Administration, September 1985.

12. Fiochetti, Teresa, South Coast Medical Center, Administration, September 1985.

13. Pechous, Jim, City of San Clemente, Planning Department, September 1985.

14. Southern California Edison Company, "Systematic Evaluation Program Topic II-4, Geology and Seismology."

15. Southern California Edison Company, "Systematic Evaluation Program Topic II-3.A, Hydrologic Description; Topic II-3.B, Flooding Potential and Protection Requirements; Topic III-3.A, Effects of High Water Level on Structures."

16. Connel, J. H., B. J. Mechalas, J. A. Mihursky, "Annual Report to the California Coastal Commission September 1977 - August 1978, Updated Estimated Effects of SONGS Unit 1 on Marine Organisms," Marine Review Committee Document 78-01, August 1978.

References for Section 2 (continued)

17. Southern California Edison Company, "Report on 1984 Data, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 85-RD-37, 1985.

18. Southern California Edison Company, "Report on 1982 Data, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 83-RD-10, 1983.

19. Southern California Edison Company, "Report on 1983 Data, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 84-RD-63, 1984.

20. Southern California Edison Company, "Systematic Evaluation Program, Topic II-2.A, Severe Weather Phenomena; Topic II-2.C, Atmospheric Transport and Diffusion Characteristics for Accident Analysis; Topic III-2, Wind and Tornado Loadings."

21. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1, Semi-annual Effluent Report;" July - December, 1981."

22. Ibid, January - June, 1982

23. Ibid, July - December, 1982

24. Ibid, January - June, 1983

25. Ibid, July - December, 1983

26. Ibid, January - June, 1984

27. Ibid, July - December, 1984

28. Ibid, January - June, 1985

29. Southern California Edison Company, "Report on Site-Specific Terrain Adjustment Factors, San Onofre Nuclear Generating Station," prepared by Dames and Moore, 85-RD-34, April 1985.

30. Southern California Edison Company, "Report on Site-Specific Terrain Adjustment Factors, Unit 1 - Receptor Radii of 1.0-2.5 Miles," prepared by Dames and Moore, 85-RD-35, May 8, 1985.

31. U.S. Nuclear Regulatory Commission, "Final Environmental Statement Related to the Operation of SONGS Units 2 and 3," NUREG 0490, April 1981.

References for Section 2 (continued)

32. Southern California Edison Company, "San Onofre Nuclear Generating Station Units 2 and 3, Environmental Report - Operating License Stage," Docket No. 50-361/362, 1977.

33. Southern California Edison Company, "Thermal Effects Studies, Final Summary Report, San Onofre Nuclear Generating Station Unit 1," August 1973.

34. Southern California Edison Company, "1981 Annual Report, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," Vol. III. 82-RD-51, 1982.

35. Southern California Edison Company, "1980 Annual Report, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," Vol. III. 81-RD-9, 1981.

36. National Academy of Sciences, Committee on Biological Effects of Ionizing Radiation (BEIR), "The Effects on Population of Exposure to Low Levels of Ionizing Radiation," National Academy of Sciences, Washington, D.C., 1980.

Section	Page	Comment
3.1	3-1	As noted in the SONGS Units 2 and 3 ER-OL[1], the overhead transmission system serving Units 1, 2 and 3 is also visible from Interstate Highway 5, with the transmission lines extending overhead. In addition to portions of the turbine generator and storage tanks, the sphere enclosure building is visible from a point on the beach directly in front of the station.
3.2	3-1	Unit 1 refueling outages are scheduled approximately every 15 to 18 months.
3.3	3-4	Per current mode of operation at Unit 1, many changes have been made to the plant water use described by Figure 3.3 of the 1973 ER (1,2,3): o Discontinued use of the flash evaporators (and the associated sulfuric acid addition to maintain proper pH) for saltwater conversion to fresh water. o Fresh water is supplied to the station from the Tri-Cities Municipal Water District. o Deletion of the previous flash evaporator blowdown to the circulating water conduit. o Discontinued use of the biodegradable cellulose sealant for the prevention of leaks in the main condenser. o Deletion of sanitary waste flow diversion to a leach field, now abandoned. o Flow from the two 50,000 gpd sanitary sewage treatment plants located at Unit 1 but serving all three units can range from the minimum design flow of 7,000 gpd (~5 gpm) up to a maximum of about 100,000 gpd (~69 gpm). The sewage treatment plant effluent is pumped to the Unit 1 seawater discharge line.

Section	Page	Comment
3.4	3-4	Total travel time of circulating water from intake port to discharge port is 14.9 minutes per SONGS Unit 1 316(b) Demonstration Report which was prepared per requirement of Section 316 (b) of the Amendments to the Federal Water Pollution Control Act of 1972[4].
3.4.5	3-9	The top of discharge structure is 11.5 feet below mean lower low-water level (MLLW) and the exit velocity from discharge structure is 2.5 feet per second (fps) as described in SONGS Unit 1 Provisional Operating License No. DPR-13[5].
3.4.6	3-9	Under normal conditions, only the intake conduit is heat treated as described in SONGS Unit 1 Technical Specification Appendix A, Section 6.19.1a[5].
3.4.7	3-9	Three additional study reports summarize the measurements of elevated temperature field due to the operation of Unit 1 between 1969 to 1981. These include the Thermal Effect Study[3], 1980 Annual Report - Marine Environmental Analysis and Interpretation[6] and the 1981 Annual Report - Marine Environmental Analysis and Interpretation[7]. The surface area enclosed by the 4°F elevated temperature field averaged about five acres for 1969 through 1972 and 16 acres for 1976 through 1981.
3.4.8	3-19	A minimum initial dilution factor of 10 was approved by the State Water Resources Control Board based on the model study submitted by the Licensee in 1979[8,9]. The minimum dilution factor is defined in the Water Quality Control Plan for Ocean Waters of California - 1978[16]. A State-issued companion document[17] provides guidelines and numerical models for estimating minimum initial dilution. The minimum initial dilution factor of 10 is based on a flux-weighted average dilution approach that uses temperature data recorded at the condenser inlet and outlet, at the water surface above the outfall structure and of the ambient ocean water. This factor methodology has been accepted by the State Water Resources Control Board as meeting the intent of References 16 and 17.

Section	Page	Comment
3.5	3-20	Per Appendix A of SONGS Unit 1 Technical Specification, Section 6.15(5), licensee-initiated major changes to the radioactive waste treatment systems (liquid, gaseous, and solid) shall be reported to the Nuclear Regulatory Commission (NRC) in the Semi-annual Effluent Report for the period in which the evaluation was reviewed. The licensee may choose to submit the information called for in the specification as part of the annual FSAR update.
3.5.1	3-20	As discussed in the Semi-annual Effluent Reports, treated liquid wastes are handled with both "batch" and "continuous" modes of release(10,11).
3.5.1	3-21	As illustrated in current SONGS Unit 1 piping and Instrumentation Drawings(12) (P&IDs), several changes have been made to the liquid waste-discharge system described by Figure 3.11 of the 1973 FES. o Gaseous effluents from the flash tank and gas stripper are routed to the waste gas surge tank of the gaseous radwaste system and from there through the waste gas compressors to the waste gas decay tanks. There is no "waste gas storage tank." o The contents of the auxiliary building sump, the reactor sump and the sphere sump are directed to the decontamination drain tank, and not directly through the radwaste process filter into the monitor tanks. o The contents of the decontamination drain tank are directed through the radwaste process filter to the monitor tanks, and not directly into the radiochemistry lab drain tank.
3.5.1	3-21	The letdown flowrate may be set at either 45 or 90 gal/min(13). The letdown flow is processed through the lithium demineralizer for removal of excess lithium only when and as directed by the Chemistry Group.
3.5.1	3-21	As illustrated in the SONGS Unit 1 P&IDs(12), the shim bleed stream flowpath from the letdown flow stream to the coolant radioactive waste processing system (flash tank) is normally closed.

Section	Page	Comment
3.5.1	3-26	In February 1982, Unit 1 was shut down for seismic modifications. The Unit was brought back into service during November 1984. Measured values of radioactivity released from the plant in liquid effluents from January 1973 through June 1985, as reported in the Semi-annual Effluent Reports, are shown in revised Table 3.5.
3.5.2	3-26	As illustrated in current SONGS Unit 1 P&IDs[12], changes have been made to the radioactive gaseous waste system described by Figure 3.10 of the 1973 FES: o Each unit of the reactor containment air cleanup system also contains a demister and prefilter in addition to the charcoal absorber and high-efficiency filter. o Each of the exhaust paths from the reactor containment and the auxiliary building consists of flow through a building-unique prefilter discharging to a common discharge header. From the header a fan forces the exhaust through a high efficiency filter and to the plant vent stack. o Discharges from the air ejectors and the mechanical vacuum pumps are exhausted directly to the plant vent stack without passing through either a high efficiency filter or a fan. o Radioactive waste gas is no longer processed through the cryogenic waste gas treatment system.

SONGS 1 FES UPDATE

TABLE 3.5 (REVISED)

RADIOACTIVITY RELEASED IN LIQUID EFFLUENT
DURING ACTUAL OPERATION[10,11,14]

Time Period	Curies Excluding Tritium but Including Noble Gases and Iodine[a]	Curies of Tritium
Jan-Jun 1985	1.48 (+1)[c]	1.08 (+3)
Jul-Dec 1984[b]	1.88 (0)	1.37 (+1)
Jan-Jun 1984[b]	1.09 (0)	2.02 (+1)
Jul-Dec 1983[b]	1.62 (-1)	2.08 (+2)
Jan-Jun 1983[b]	1.06 (0)	1.11 (+1)
Jul-Dec 1982[b]	8.67 (-1)	3.45 (+1)
Jan-Jun 1982[b]	1.29 (0)	5.11 (+2)
Jul-Dec 1981	2.13 (-2)	7.17 (+1)
Jan-Jun 1981	2.51 (0)	1.32 (+1)
Jul-Dec 1980	2.65 (0)	1.17 (+1)
Jan-Jun 1980	1.22 (+1)	1.02 (+3)
Jul-Dec 1979	1.86 (+1)	1.29 (+3)
Jan-Jun 1979	1.02 (+1)	1.03 (+3)
Jul-Dec 1978	2.18 (+1)	6.70 (+2)
Jan-Jun 1978	7.86 (-1)	1.82 (+3)
Jul-Dec 1977	6.39 (0)	1.36 (+3)
Jan-Jun 1977	3.45 (0)	3.65 (+2)
Jul-Dec 1976	1.51 (+1)	9.16 (+2)
Jan-Jun 1976	5.30 (0)	2.47 (+3)
Jul-Dec 1975	1.59 (-1)	2.11 (+3)
Jan-Jun 1975	5.80 (0)	1.89 (+3)
Jul-Dec 1974	2.58 (0)	2.38 (+3)
Jan-Jun 1974	5.18 (0)	1.47 (+3)
Jul-Dec 1973	1.11 (+1)	1.21 (+3)
Jan-Jun 1973	5.82 (+1)	2.87 (+3)

(a) For a detailed breakdown, see the references for this table.

(b) SONGS 1 was shut down for seismic modifications from February 1982 through November 1984.

(c) Numbers in parentheses represent powers of ten.

Section	Page	Comment
3.5.2	3-29	The alternative treatment of the gaseous waste that utilized the cryogenic absorption system is no longer used. The system was abandoned following unfavorable operating experience.
3.5.2	3-30	As illustrated in the SONGS Unit 1 P&IDs(12), all vent paths to the plant vent stack do not flow through high efficiency filters.
3.5.2	3-30	As illustrated in the SONGS Unit 1 P&IDs(12), each unit of the reactor containment air cleanup systems also contains a demister and prefilter in addition to the charcoal absorber and high-efficiency filter.
3.5.2	3-30	Measured values of radioactivity released from the plant in gaseous effluents from January 1973 to June 1985, as reported in the Semi-annual Effluent Reports, are shown in revised Table 3.7.
3.5.3	3-33	Spent ion exchange resins are placed within high integrity containers (HICs) and dewatered. The HIC is shipped to a licensed burial site. Spent filters are either placed within HIC's or encapsulated in cement. Very low level filters are placed in drums with an approved absorbent.
3.5.3	3-33	Clothing worn in the plant is no longer decontaminated offsite. Unit 1 laundry is processed onsite at a central decontamination facility along with the contaminated laundry from Units 2 and 3.
3.5.3	3-34	The total volume and radioactivity of the solid waste shipped offsite for disposal are reported to the NRC in the Semi-annual Effluent Reports(10,11,14).
3.6	3-34	Refer to Section 3.4.8 of this update for current minimum initial dilution factor.
3.6.1	3-35	The use of cellulose biodegradable sealant was eliminated in circulating water system as described in the "Thermal Effect Study, Final Summary Report, SONGS Unit 1"(3). Also, sanitary waste is treated by activated sludge process instead of septic tank and leaching field(1).

TABLE 3.7 (REVISED)

RADIOACTIVITY RELEASED IN GASEOUS EFFLUENT
DURING ACTUAL OPERATION(10,11,14)

TIME PERIOD	CURIES OF NOBLE GASES	CURIES OF TRITIUM	CURIES OF IODINES
Jan-Jun 1985	2.48 (+3)(c)	1.51 (+1)	1.16 (-4)
Jul-Dec 1984(b)	8.62 (+1)	LLD(d)	4.29 (-6)(a)
Jan-Jun 1984(b)	LLD	LLD	2.49 (-6)(a)
Jul-Dec 1983(b)	LLD	LLD	7.71 (-7)(a)
Jan-Jun 1983(b)	LLD	3.93	2.15 (-6)(a)
Jul-Dec 1982(b)	1.01 (-3)	6.42	LLD
Jan-Jun 1982(b)	8.61 (+1)	4.99 (+1)	LLD
Jul-Dec 1981	4.11 (+2)	4.47 (0)	1.30 (-3)
Jan-Jun 1981	1.10 (+1)	9.40 (0)	1.90 (-3)
Jul-Dec 1980	2.80 (0)	1.30 (+1)	LLD
Jan-Jun 1980	1.05 (+3)	2.43 (+1)	2.53 (-4)
Jul-Dec 1979	4.50 (+2)	1.40 (+1)	LLD
Jan-Jun 1979	1.60 (+2)	1.50 (+1)	1.22 (-4)
Jul-Dec 1978	8.50 (+2)	2.70 (+1)	1.50 (-4)
Jan-Jun 1978	3.90 (+2)	3.10 (+1)	6.70 (-5)
Jul-Dec 1977	2.40 (+2)	6.00 (+1)	1.81 (-4)
Jan-Jun 1977	3.11 (+1)	1.57 (+1)	LLD
Jul-Dec 1976	7.10 (+1)	1.30 (+1)	1.40 (-4)
Jan-Jun 1976	1.10 (+2)	1.11 (+1)	2.90 (-4)
Jul-Dec 1975	7.15 (+1)	LLD	1.42 (-6)
Jan-Jun 1975	1.07 (+3)	3.43 (+1)	2.46 (-1)
Jul-Dec 1974	1.04 (+3)	1.78 (+1)	2.31 (-4)
Jan-Jun 1974	7.41 (+2)	7.36 (+1)	LLD
Jul-Dec 1973	2.06 (+3)	2.90 (+2)	5.11 (-1)
Jan-Jun 1973	8.50 (+3)	7.99 (+1)	1.40 (-1)

(a) All radioiodine released from Unit 1 during this period, except in the fourth quarter of 1984, was due to processing of Units 2 and 3 radwaste at Unit 1.

(b) SONGS 1 was shut down for seismic modifications from February 1982 through November 1984.

(c) Numbers in parentheses represent powers of ten.

(d) LLD = Lower Limit of Detection.

Section	Page	Comment
3.6.1	3-38	Refer to Section 3.3 of this update for changes made to Tables 3.8 and 3.9 of the 1973 FES. Specifically, chemicals related to the use of the flash evaporators and the main condenser biodegradable cellulose sealant have been deleted. Per the SONGS Units 2 and 3 ER-OL, Section 3.7.1(1), the process rate of the sanitary waste disposal for all three units can range from 7,000 to 100,000 gpd (about 5 to 69 gpm).

Section	Page	Comment
3.7.1	3-40	The current sanitary waste system design information is provided in Section 3.7.1 of the SONGS Units 2 and 3 ER-OL[1]. A permanent sewage treatment plant is located at Unit 1 which serves Units 1, 2 and 3. The plant consists of two 50,000 gpd units, each with aeration tank, blowers, final digesting and settling tanks, and a chlorine contact tank. The minimum design flow during normal operations is 7,000 gpd. The effluent from the treatment plant is pumped to the sea through the Unit 1 discharge line. The effluent produced by the plant indicates biological oxygen demand (BOD) value of 30 parts per million (ppm) with suspended solids less than 10 ppm. Coliform counts have been noted to be 43 most probable number (MPN) per 100 milliliters after chlorine treatment and dilution by circulating water.
3.7.2	3-40	Emergency station auxiliary power is supplied by two diesel electric generators, each rated at 6,000 Kw. The 600 Kw units described in the SONGS Unit 1 FES have been removed and the 3,800 Kw units later planned for this site were never installed. The hourly air pollutant emissions in the exhaust gas from an individual 6,000 Kw diesel generator are estimated to be as follows[15]:

Pollutant	Emissions (lb/hr/generator)
Carbon monoxide	2.13
Hydrocarbons	1.15
Nitrogen oxides (as nitrogen dioxide)	36.50
Sulfur dioxide	19.27
Particulates	3.04

Section	Page	Comment
3.7.2	3-40	Surveillance testing of the diesel generators, as specified in the Technical Specifications, Appendix B, Section 4.4(5), requires engine operation under load at 31 day intervals (monthly) for a minimum of one hour. The diesel generators are typically operated for about two hours at that time. In addition to the monthly surveillance testing, the diesel generators are operated under test for other reasons such as:

- Verification of operability of one diesel when the other diesel is removed from service,
- Diesel generator operation following overhaul or other major maintenance, and
- Surveillance testing at refueling outages

Total test operation of each diesel generator will not normally exceed 50 hours per year. On that basis, the resulting total annual air pollutant emissions from the diesel exhaust are calculated from the hourly emmissions to be as follows:

Pollutant	Emissions (tons/yr/both diesels)
Carbon monoxide	0.11
Hydrocarbons	0.06
Nitrogen oxides (as nitrogen dioxide)	1.82
Sulfur dioxide	0.96
Particulates	0.15

Sustained operation of the diesel generators in an emergency mode is uncommon and the test operation emissions listed above are, therefore, a good representation of the total annual air pollution contribution of the emergency auxiliary power system. This quantity of pollutants, distributed over the year, has a negligible impact on overall air quality.

References for Section 3

1. Southern California Edison Company, "Environmental Report - Operating License Stage, San Onofre Nuclear Generating Station Units 2 and 3," 1977.

2. Southern California Edison Company P&ID No. 5178380-4, "Service and Domestic Water Systems," Sheet 1 of 3.

3. Southern California Edison Company, "Thermal Effect Study, Final Summary Report, San Onofre Nuclear Generating Station Unit 1," Vol. 1, August 1973.

4. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 316 (b) Demonstration," January 1983.

5. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 Provisional Operating License No. DPR-13."

6. Southern California Edison Company, "1980 Annual Report, Environmental Analysis and Interpretation," 1981. Vol. III, 81-RD-9.

7. Southern California Edison Company, "1981 Annual Report, Environmental Analysis and Interpretation," 1982. 82-RD-51.

8. Southern California Edison Company, "Study on Initial Dilution," submitted to the California State Water Resources Control Board, prepared by Koh, R.C.Y. and E. J. List. 1979.

9. NPDES Permit No. CA0001228 for SONGS Unit 1, issued by San Diego Regional Water Quality Control Board, 1982.

10. Southern California Edison Company, "San Onofre Nuclear Generating Station Units 1, 2 and 3 Semi-annual Effluent Report," January - June 1985.

11. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 Semi-annual Effluent Reports," January - June 1981 through July - December 1984.

12. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1, Piping & Instrumentation Diagrams," Series 5178000.

13. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 Station Manual, System Descriptions," October 1965.

14. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 Semi-annual Operating Reports," January - June 1973 through July - December 1980.

15. California Air Pollution Control District, "Fuel Use and Emmissions from Stationary Combustion Processes," July 1976.

16. State of California, "Water Quality Control Plan for Ocean Waters of California - 1978."

17. State of California, "Water Quality Control Plan, Table B Guidelines, Ocean Waters of California," 1978.

Section	Page	Comment
5.2	5-2	Data regarding the measurements of elevated receiving water temperature fields recorded between 1976 and 1981, the last full year of Unit 1 operation, are available in the corresponding annual marine environmental reports and summarized in the 1981 Annual Report - Marine Environmental Analysis and Interpretation[1].
5.3	5-3	The presence of radionuclides in 1981 terrestrial species (i.e., rabbits), representing the last full year of Unit 1 operations prior to the seismic modifications shutdown in February 1982, found no significant variations from the preoperational levels[2]. The evaluation of non-migratory marine species found station-released radionuclides had accumulated to a measurable level greater than that found in a controlled environment. A calculation based on the composite mean activity concentrations reported for 1981 yields an internal dose of approximately 16 mrads/yr for the marine biota[3]. This dose has been calculated with the methods presented in Appendix 5.1 of the Staff's FES related to the proposed Units 2 and 3[4]; the product of $C^b W$ (C^b = bioaccumulation factor for the biota, W = radioactive concentration in water), utilized in Appendix 5.1 was replaced with the marine biota activity concentrations evaluated in the operating report[3].
5.4.1	5-3	Measurements of direct radiation taken near the SONGS in 1981 showed a maximum increment of 1.0 uR/hr to the natural background at 0.1 miles SSW of the site[3], which was relatively lower than the value presented in the 1973 FES of 3.2 uR/hr adjacent to 600-feet long seawall.
5.4.2.1	5-4	The dispersion of gaseous effluents from Unit 1 is addressed in the SONGS Semi-annual Reports [5,6,7]. In these reports, release rates/air doses are presented in terms of percent Technical Specification Limit (TSL). The intent of these Technical Specification Limits is to require compliance with 10CFR20, Appendix B. As shown in the reports, in no case did the percent TSL exceed 100.

Section	Page	Comment
5.4.3	5-6	The Staff's annual radioactive liquid effluent estimates in Table 3.4 of the 1973 FES have proven to be reasonably close for liquid releases excluding tritium and conservative for tritium. Actual Unit 1 liquid releases from 1973 through 1985 are presented in revised Table 3.5 of this update and the data for the period 1973 to 1981 (prior to shutdown for seismic modifications in February 1982) yield an annual average release of 20 Ci/yr excluding tritium and about 2550 Ci/yr of tritium. The Staff's annual radioactive gas release estimates in Table 3.6 of the 1973 FES have proven to be conservative for noble gases and reasonably close for iodines. Actual gaseous activity releases for the 9 years from 1973 through 1981 have averaged about 1920 Ci/yr noble gases and 0.10 Ci/yr iodines as calculated from the data in revised Table 3.7 of this update.
5.4.3.1	5-6	The airborne radiation readings during the period from January 1979 through July 1982 (encompassing the final three years of Unit 1 operation prior to the February 1982 shutdown for seismic modifications) averaged a gross beta activity of 0.019 pci/m^3[2]. This value is much smaller than the values reported for preoperational period of 1964 to 1967[2]. This decrease may be attributable to the cessation of atmospheric nuclear weapons testing, and implies the FES-reported immersion dose of 1.12 man-rems is now conservative. The presence of radionuclides in 1981 soil samples (representing the last full year of Unit 1 operations prior to the seismic modifications shutdown) show detectable levels of Strontium-90, Cesium-137, Radium-226 and Thorium-232, of which only Strontium-90 and Cesium-137 are station-related radionuclides, although Strontonium-90 can also be due to nuclear weapon testing[3]. The 1981 concentrations of these two radionuclides are approximately the same as those reported in 1975[7], thereby implying no trend for the accumulation of these isotopes in the soil environment.
5.4.3.1	5-10	The extent of agricultural activity within a 50-mile radius of the station is addressed in Section 2.2.2 of this update. The concentrations of radionuclides in crop samples in 1981 (representing the last full year of Unit 1 operations prior to the seismic modifications shutdown) show no detectable levels near the site[2,3].

Section	Page	Comment
5.4.3.2	5-11	The concentrations of radionuclides detected in 1981 beach sand samples (representing the last full year of Unit 1 operations prior to the seismic modifications shutdown) show measurable levels of Cesium-137, Radium-226, and the Thorium-232 decay chain, of which only Cesium-137 is a station-generated radionuclide[2]. The activity level of this isotope is commensurate with activity levels at the control location, indicating a negligible effect on the beach sand media[2]. The ocean water radiation readings on gross beta activity during the period of January 1979 through December 1982 (encompassing the final three years of Unit 1 operations prior to the February 1982 shutdown for seismic modifications) show that SONGS Unit 1 has had a detectable, but minimal, effect on this environmental media[2].
5.4.4	5-12	Based upon the actual 1980 population data[8], the aggregate annual exposures received by the population within 50 miles of the station are 631,000 man-rems for natural background radiation exposure assuming 115 mrem/person-year (1973 FES Section 2.8), and 505,000 man-rems for exposure to medical and dental diagnostic x-rays assuming 92 mrem/person-year (Section 2.8 of this update). In contrast, the total anticipated increment of population exposure from Unit 1, as shown in Table 5.2 of the FES is 1.8 man-rems.
5.5.1	5-13	The most recent impact analysis is contained in the SONGS Units 2 and 3 Final Environmental Statement - Operating License Stage (FES-OL)[9], which is in agreement with the previous assessment in Unit 1 FES and Units 2 and 3 Final Environmental Statement - Construction Permit Stage (FES-CP)[4].
5.5.2.1	5-13	The monitoring results of SONGS Unit 1 thermal discharge (1964-1975) on plankton communities were presented in Units 2 and 3 ER-OL Section 5.1.3.4[10]. No measurable changes in species diversity or abundance were found.

Section	Page	Comment
5.5.2.2	5-15	The fish impingement study for Unit 1 began in 1968. The 1975 to 1984 study results were presented in the 1980 to 1984 annual reports on Marine Environmental Analysis and Interpretation[1,11-14]. The total weights of fish killed between 1975 to 1984 ranged from 24 to 316 lbs per normal operational day. The 1980 to 1984 data identified that the total weight of fish killed per heat treatment ranged up to 441 lbs. The total number of species impinged during normal plant operation and heat treatment varied from 33 to 70. The fluctuations can be attributed to the season in which Unit 1 was in operation and seasonal movement and reproductive patterns of seasonally abundant species. The plankton entrainment study for Unit 1 was conducted in 1974 and the results were summarized in Units 2 and 3 ER-OL, Section 5.2.3.4.2[10]. A study on ichthyoplankton was persented in the SONGS 1979 Annual Operating Report[15]. Another special ichthyoplankton entrainment study was conducted from 1979 to 1980 and the results were presented in the 1983 316 (b) demonstration report[16].
5.5.2.3	5-19	Turbidity measurements/studies for SONGS Unit 1 were initiated in 1963 and continued through 1981. The operational monitoring results were presented in annual reports on Marine Environmental Analysis and Interpretation (1968-1981). The study results since 1976 were summarized in 1981 annual report and it was concluded that the influence from Unit 1 was strictly local in scope and produces less than natural variability with space and time in the nearshore coastal environment[1]. The impact, therefore, was considered negligible. The same conclusion was reached during the hearing on SONGS Unit 1 turbidity impacts conducted by California Regional Water Quality Control Board (CRWQCB), San Diego Region in 1983.
5.5.2.5	5-29	No sodium hydroxide or sulphuric acid is presently discharged to the seawater. The remaining chemicals identified on this page (copper, nickel, sodium, calcium, magnesium, phosphates, and hydrazine) are discharged in amounts that are not significantly different from those described in the FES.

Section	Page	Comment
5.5.2.6 Phytoplankton	5-31	The plankton monitoring program concluded in 1982 based on the results of previous studies which indicated no measurable effect of SONGS Unit 1 operation on the plankton resources. Results are presented in the 1980 and 1981 annual reports entitled "Marine Environmental Analysis and Interpretation"(1,11) and the Marine Review Committee report(17). In the 1973 FES, a slight increase in phytoplankton abundance was reported, which was attributed to the thermal discharge from SONGS Unit 1. Subsequent analyses have indicated, however, that phytoplankton species composition and density are similar between the Unit 1 discharge stations and the control stations. The variability in abundance for different sampling periods reflects natural population fluctuations and are not a result of Unit 1 operation. Results of phytoplankton floures-cence studies indicate a healthy phytoplankton population in the SONGS offshore area(11). A comparison of data collected during six years of monitoring studies when Unit 1 was operational, followed by four consecutive plankton surveys when the unit was not operational, showed no difference in composition, distribution or abundance of any plankton species analyzed.
5.5.2.6 Kelp Beds	5-32	Since publication of the 1973 FES for Unit 1, the following changes have been made in the sampling program which has enabled a more accurate assessment of the impact of plant operation on the kelp beds. Aerial photography surveys have documented fluctuations in kelp canopies on a quarterly basis. In addition, hard substrate monitoring and benthic community monitoring was initiated in 1975. Nutrient surveys and the qualitative examination of the health of the kelp plants by divers began in 1977. Results of these monitoring efforts are reported annually in the "Marine Environmental Analysis and Interpretation" reports. The Marine Review Committee has also conducted independent monitoring studies and experimental kelp transplant studies to determine the impact of SONGS Unit 1 operation. Results are reported in the "Updated Estimated Effects of SONGS Unit 1 on Marine Organisms"(17) and the "Predictions of the Effects of SONGS and Recommendations"(18).

Section	Page	Comment
		Since 1973, the San Onofre kelp bed has become well established, occupying an average area of 40 hectares. The Barn kelp bed disappeared in 1980 following major winter storms[1] and it started to show some new growth in 1985. Fluctuations in kelp bed conditions appear to be independent of SONGS Unit 1 operation and are related primarily to high temperature and nutrient deficiencies in the summer, loss of adults in winter storms, and loss of substrate due to sand movement.
5.5.2.6 Zooplankton	5-32	The plankton monitoring program ended in 1982 based on the results of previous studies which showed no impact of SONGS Unit 1 operation on the zooplankton population. Results of the zooplankton studies are reported in the 1980 and 1981 annual reports entitled "Marine Environmental Analysis and Interpretation"[1,11]. In addition, a special 316(b) demonstration study was conducted from 1979 to 1980 to assess the amount of ichthyoplankton entrained during Unit 1 operation. Results are presented in the 1983 316(b) Demonstration Report[16] which was prepared to meet the requirements of Amendments to the Federal Water Pollution Control Act of 1972. Previous studies reported in the 1973 FES indicated an increase in abundance of zooplankton species during periods of Unit 1 operation. Subsequent sampling indicated, however, that the variability in abundance was due to natural fluctuations and not a result of plant operation. The collected data show a change in the dominant species of copepods since the 1973 FES. This is attributed to changes in sampling design and the addition of stations that are further offshore. The most common copepod species collected from 1975 to 1980 are *Acartia* and *Paracalanus* species. A review of over ten years of data, including periods of operation and shutdown of Unit 1 and independent Marine Review Committee studies have shown that operation of SONGS Unit 1 has not significantly affected plankton resources in the San Onofre area[11,17,18].

Section	Page	Comment
5.5.2.6 Benthos	5-34	The benthic monitoring program has become more quantitative in scope since 1973 as sampling methods improved[14]. The current program to satisfy National Pollution Discharge Elimination System (NPDES) permit requirements include an assessment of substrate cover (percent sand and rock) as well as the abundance of dominant kelp and grazer species in the San Onofre and San Mateo Kelp beds. The sandy intertidal sampling program ended in 1980 with the completion of construction of Units 2 and 3. No adverse effects of operation or construction on the sandy beach intertidal community were found. Changes in the intertidal cobble community were attributed to human activities such as clamming and exploring tidepools, natural processes of sand and cobble movement, and seasonal variations in population. There was no evidence of changes in the intertidal cobble biota due to the operation of SONGS Unit 1. The infaunal sediment sampling program continued until 1980 and thereafter was reduced in scope. The stations immediately adjacent to Unit 1 showed an elevation in the number of species and individuals which is attributed to an elevation in the sediment organics. The hard benthos sampling program is currently limited to the kelp bed areas. An analysis of the data collected to date indicates no long term ecological effects associated with the operation of Unit 1 at the inshore and offshore cobble stations and the kelp stations.
5.5.2.7	5-35	Fish sampling has been conducted since 1963 although more quantitative sampling techniques have been employed since 1973. Results are presented in the annual "Marine Environmental Analysis and Interpretation" reports. Examples of these reports are given in References 1 and 11 through 14. There is substantial spatial variability in fish populations in the San Onofre area that is related to depth and stability of substrate. The collected data indicate no unique fish

Section	Page	Comment
		groups near SONGS Unit 1 and no numerical domination of a given species near the discharge site. A comparison of data collected when Unit 1 was in operation and when Unit 1 was shut down indicates no significant differences in the fish community. All of the data collected to date indicate that the variability inherent in the fish community and governing physical factors exceed any differences that can be attributed to thermal discharge from Unit 1. Impingement studies began in 1968 and were changed to include more quantitative analyses in 1974. Data collection is continuing as part of the NPDES permit requirements and results are reported annually in the "Marine Environmental Analysis and Interpretation" reports, typically References 1 and 11 through 14, and the SONGS Unit 1 316 (b) Demonstration Report[16]. The impingement studies between 1975 to 1984, presented in the 1980 through 1984 annual reports[1,11-14], are discussed earlier in Section 5.5.2.2 of this update. In no case was the probability of a species being impinged or entrained greater than 3.2 percent of the species population in the immediate vicinity of the plant and in most cases, the probability was less that 1 percent. Therefore, it was concluded that the operation of Unit 1 has an insignificant impact on the nearshore fish population in the San Onofre area.
5.6	5-38	The applicant conducted surveys in March 1976 to determine the residential location of SONGS Unit 1 workers and to evaluate the proposed development of SONGS Units 2 and 3. The results of these surveys, and the economic impact on the communities identified by them, are presented in the SONGS Units 2 and 3 ER-OL, Appendix 8A[10].
5.7	5-39	Unit 1 refueling outages are scheduled to occur every 15 to 18 months as compared with the previous estimate of once a year in 1973 FES.

Section	Page	Comment
5.7.1	5-39	The November 1985 refueling outage required five shipments of new fuel. Each shipment averaged five NRC and Department of Transportation (DOT) approved containers, with two fuel elements per container.
5.7.2	5-39	The transport of irradiated fuel to the General Electric Processing Center in Morris, Illinois has been suspended, and the irradiated fuel is currently being stored in the spent fuel pool. When the shipments are resumed, they will comply with the applicable transportation requirements of the NRC and the DOT[19].
5.7.3	5-40	Details on Unit 1 shipments of solid radioactive waste to approved waste disposal sites are reported to the NRC in the Semi-annual Effluent Reports[5,6,7]. The tabulation on the following page (5-10) summarizes the information in these reports for waste shipped during the time period from January 1973 through June 1985.

ANNUAL SOLID RADIOACTIVE WASTE SHIPMENTS(5,6,7)

Time Period	Volume(m^3)	Radioactivity (Ci)	Total Number of Shipments and Destination
1985	450.0	586.0	23 to Richland, Wa
1984	291.2	15.3	29 to Richland, WA
1983	332.0	226.8	20 to Richland, WA
1982	927.0	76.0	43 to Richland, WA
1981	1,618.4	78.2	82 to Richland, WA
1980	711.9	383.0	1 to Beatty, NV 36 to Richland, WA
1979	83.5	92.4	6 to Beatty, NV 1 to Richland, WA
1978	182.4	8.8	4 to Beatty, NV 19 spent fuel assemblies to Morris, IL
1977	368.4	60.2	14 to Beatty, NV 27 spent fuel assemblies to Morris, IL
1976	144.4	697.6	9 to Beatty, NV 55 spent fuel assemblies to Morris, IL
1975	79.6	26.0	6 to Beatty, NV 21 spent fuel assemblies to Morris, IL
1974	68.2	230.4	11 to Beatty, NV 12 spent fuel assemblies to Morris, IL
1973	112.7	381.0	13 to Beatty, NV 9 spent fuel assemblies to Morris, IL

Section	Page	Comment
5.7.4	5-40	The transportation of radioactive material is regulated by the DOT and NRC.
5.7.5	5-40, 5-41	Potential exposure during normal new fuel transport is evaluated in the Commission's "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," WASH-1238[20]. The environmental impacts of transportation of new fuel, irradiated fuel, and solid radioactive waste, with respect to both normal and accident conditions of transport, are set forth in Table 5.4 in 10 CFR Part 51.52[21]. Transportation accidents involving radioactive materials are addressed in Section 7.2.
5.7.6	5-42	The total number of shipment miles per year to the plant has changed because of 1) a new fuel shipment frequency to support refueling at 15 to 18-month intervals (2,400 miles each trip) instead of refueling at 12-month intervals assumed by the staff in the 1973 FES, 2) the implementation of a new solid waste disposal site (1,200 miles each trip) since 1979, and 3) the cessation of irradiated fuel shipments after 1978. As a result, a total of less than 0.1 million truck miles for each year of plant operation would be expected, if all trucks must be returned to their points of origin.

References for Section 5

1. Southern California Edison Company, "1981 Annual Report, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," Vol. III. 82-RD-51, 1982.

2. Southern California Edison Company, "San Onofre Nuclear Generating Station Units 1, 2 and 3 Annual Radiological Environmental Operating Report for 1984," Docket Nos. 50-206, 50-361 and 50-362; License Nos. DPR-13, NPF-10 and NPF-15, April 30, 1985.

3. Southern California Edison Company, "Annual Operating Report of SONGS Unit 1 for 1981, Corrective Maintenance, and Radiological Environmental Monitoring," Docket No. 50-206, License No. DPR-13, 1982.

4. Nuclear Regulatory Commission, "Final Environmental Statement related to the proposed San Onofre Nuclear Generating Station Units 2 and 3," Docket Nos. 50-361/362, March 1973.

5. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 Semi-annual Report," January-June 1981 through July-December 1984.

6. Southern California Edison Company, "San Onofre Nuclear Generating Station Semi-annual Effluent Report," January-June 1985.

7. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 Semi-annual Operating Reports," January-June 1973 through July-December 1980.

8. Southern California Edison Company, "San Onofre Nuclear Generating Station Units 2 and 3 Final Safety Analysis Report" updated January 1984. Tables 2.1-2 and 2.1-9.

9. U.S. Nuclear Regulatory Commission, "Final Environmental Statement Related to the Operation of San Onofre Nuclear Generating Station Units 2 and 3," NUREG 0490, April 1981.

10. Southern California Edison Company, "Environmental Report - Operating License Stage, San Onofre Nuclear Generating Station Units 2 and 3," 1977.

11. Southern California Edison Company, "1980 Annual Report, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," Volume III. 81-RD-9, 1981.

12. Southern California Edison Company, "Report on 1982 Data, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 83-RD-10, 1983.

References for Section 5 (Continued)

13. Southern California Edison Company, "Report on 1983 Data, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 84-RD-63, 1984.

14. Southern California Edison Company, "Report on 1984 Data, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 85-RD-37, 1985.

15. Southern California Edison Company, "1979 San Onofre Nuclear Generating Station Annual Operating Report," Vol. V, 80-RD-100, Chapter 6A. 1980.

16. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 316 (b) Demonstration," prepared for California Regional Water Quality Control Board, San Diego Region, 82-RD-95, 1983.

17. Marine Review Committee, "Annual Report to the California Coastal Commission, September 1977 - August 1978, Updated Estimated Effects of San Onofre Nuclear Generating Station Unit 1 on Marine Organisms," 1978.

18. Marine Review Committee, "Report to the Marine Review Committee to the California Coastal Commission Predictions of the Effects of San Onofre Nuclear Station and Recommendations," Part I: Recommendations, Predictions, and Rationale. MRC Doc. 80-04 (I), 1980.

19. Title 49 Code of Federal Regulations Part 173 Subpart I, "Radioactive Materials."

20. U.S. Atomic Energy Commission, "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," Report WASH-1238, December 1972.

21. Title 10 Code of Federal Regulations Part 51, Section 52, "Environmental Effects of Transportation of Fuel and Waste."

Section	Page	Comment
6	6-1	The environmental monitoring programs have changed over the years to (1) reflect the effect of construction and operation of SONGS Units 2 and 3 and (2) meet the new monitoring requirements imposed by the NRC and CRWQCB[1,2].
6.1	6-1	The previous environmental monitoring program for SONGS Unit 1 was completed in 1974 and subsequently modified to expand the operational monitoring program for SONGS Unit 1 and serve as the pre-operational monitoring program for Units 2 and 3. Details are provided in Section 6.2 of this update.
6.2, 6.2.1	6-1	The current biological environmental monitoring programs are described in detail in the latest Annual Radiological Environmental Operating Report[3] and Section 6 of the FES for Units 2 and 3[4]. The original aquatic monitoring program for SONGS 1 has been expanded to determine the environmental impact of construction and operation of Units 1, 2 and 3 and to meet the NPDES permit monitoring requirements for these units. A summary of the major marine ecological programs at SONGS is presented in Table 2-2 of the latest Annual Marine Environmental Report[1]. Marine studies which were proposed in the FES for Unit 1 (1973) have since been completed and the data analyzed. Results are included in the annual reports entitled "Marine Environmental Analysis and Interpretation." A one-year terrestrial monitoring program was undertaken as part of SONGS Units 2 and 3 construction permit requirements[4]. No endangered plant or animal species were discovered and no operational monitoring program is required. However, in accordance with the California Coastal Commission requirement, an erosion control program to protect the bluffs south of the plant is active[5].

Section	Page	Comment
6.2.2	6-2	The present radiological environmental monitoring program and the monitoring sample locations are described in detail in the SONGS Unit 1 Technical Specifications, Section 3.18, and the 1984 Radiological Environmental Operating Report for Units 1, 2 and 3[6,3]. Appropriate pages from these references are included as Attachment 1. The current program represents an expansion of that presented in the FES (1973) in terms of the number of monitoring stations and the inclusion of ocean water samples. Results are published annually in the Annual Radiological Environmental Operating Report for SONGS 1, 2 and 3. The latest report[3] indicates that the radiological impact of operating SONGS Units 1, 2 and 3 through 1984 has been minimal, and that 10CFR50, Appendix I and 40CFR190 criteria for radiological dose exposure to the public have been met.
6.3	6-3	The CRWQCB requirements for monitoring fish entrainment and receiving water quality are specified in the NPDES permit[2]. The current operational program includes temperature and aerial turbidity monitoring as well as trawling, fish impingement studies and kelp bed measurements in response to these requirements. The onsite meteorological tower provides data in accordance with Regulatory Guide 1.23 and the SONGS Units 2 and 3 Technical Specifications. The program was modified in 1975, 1981 and 1982 by extending the tower height, adding dewpoint and precipitation sensors, and installing a backup meteorological tower. Details are provided in the SONGS Units 2 and 3 FSAR[7]. The meteorological tower data are printed out on a strip chart recorder in the control room and are available on a computer display at the Technical Support Center. Other related studies include (1) the heat treatment optimization study to support the 316(a) exemption of the Amendments to the Federal Water Pollution Control Act of 1972 for SONGS Units 2 and 3; and (2) the Marine Review Committee of the California Coastal Commission study to independently evaluate the impact of plant operation on the marine environment. These studies are described in detail in the SONGS Unit 2 and 3 FES[4].

Section	Page	Comment
6.3 (continued)	6-3	Additional studies are (3) the onshore tracer studies to determine the validity of meteorological tower data[8], (4) the construction marine monitoring program for Units 2 and 3[9], and (5) the fish return system evaluation and study on the effects of El Nino on the marine environment[1].

References for Section 6

1. Southern California Edison Company, "Report on 1984 Data, Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 85-RD-37, 1985.

2. California Regional Water Quality Control Board, San Diego Region, NPDES Permit, Monitoring and Reporting Program No. 82-14 for the Southern California Edison Company, San Onofre Nuclear Generating Station, Unit 1, San Diego County, July 12, 1982.

3. Southern California Edison Company, "San Onofre Nuclear Generating Station Units 1, 2 and 3 Annual Radiological Environmental Operating Report for 1984," Docket Nos. 50-206, 50-361 and 50-362; License Nos. DPR-13, NPF-10 and NPF-15, April 30, 1985.

4. Nuclear Regulatory Commission, "Final Environmental Statement related to the Operation of San Onofre Nuclear Generating Station Units 2 and 3," Docket Nos. 50-361/362, NUREG-0490, April 1981.

5. Southern California Edison Company, "San Onofre Nuclear Generating Station Units 2 and 3, Environmental Report-Operating License Stage," Docket Nos. 50-361/362, 1977.

6. Southern California Edison Company, "San Onofre Nuclear Generating Station Unit 1 Provisional Operating License No. DPR-13."

7. Southern Californis Edison Company, "San Onofre Nuclear Generating Station Units 2 and 3, Final Safety Analysis Report," Docket Nos. 50-361/362, updated January 1984.

8. Septoff, M., A. E. Mitchell and L. H. Teuscher, "Final Report of Onshore Tracer Tests Conducted from December 1976 through March 1977 at San Onofre Nuclear Generating Station," Report NUS-1927, NUS Corporation, Rockville, Maryland, 1977.

9. Marine Biological Consultants, Inc., "Construction Monitoring Program for San Onofre Nuclear Generating Station Units 2 and 3, December 1976 - December 1977," 78-RD-21, 1978.

Section	Page	Comment
7.1	7-2	The 1980 population distribution assumed by the Staff (FES, Table 2.1) for evaluating radiological effects of accidents as reported in Table 7.2 continues to be conservative when compared with actual 1980 population data provided in the SONGS Units 2 and 3 updated FSAR(1). Within the five-mile radius, the Staff assumptions for 1980 conservatively exceed the Licensee projections out through the year 2020(1).
7.1	7-5	In conjunction with licensing proceedings related to the construction of SONGS Units 2 and 3, the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) were reduced for SONGS. To maintain calculated post-accident radiation doses at the smaller EAB and LPZ distances within 10CFR100 limits, certain modifications were made to SONGS Unit 1 as described in References 2, 3 and 4. These modifications, which were implemented during 1976, include: o The addition of a reinforced concrete enclosure building around the steel containment sphere to attenuate post-accident direct radiation dose rates at the EAB; o Modification of fluid systems penetrating containment and changes to the containment leak rate testing program to ensure isolatability and leak tightness of the containment sphere in order to mitigate post-accident indirect dose rates at the EAB and LPZ; and o Modifications to the containment spray system to mitigate both direct and indirect post-accident dose rates at the EAB and LPZ. Additional information on exclusion area is also available in the SEP Topic II-1.A, Exclusion Area Authority and Control(5).
7.2	7-6	Based on the current transportation activities described in section 5.7.6 of this update, the total maximum shipment-miles estimated by the staff in the Unit 1 FES was conservative.

References for Section 7

1. Southern California Edison Company, "San Onofre Units 2 and 3, Final Safety Analysis Report," Docket Nos. 50-361/362, updated January 1984.

2. Amendment 52 to the Final Safety Analysis, San Onofre Nuclear Generating Station Unit 1, Sphere Enclosure Project Report, December 3, 1975.

3. Letter, Southern California Edison Company to R. A. Purple, NRC, Supplement to the Sphere Enclosure Project Report, March 1, 1976.

4. Letter, Southern California Edison Company to K. R. Goller, NRC, Second Supplement to the Sphere Enclosure Project Report, March 25, 1976.

5. Southern California Edison Company, "Systematic Evaluation Program Topic II-1.A, Exclusion Area Authority and Control."

Section	Page	Comment
8.1	8-1	Chapter 2 of the 1985 California Electricity Report prepared by the California Energy Commission (CEC) contains current statewide and applicants' service areas energy forecasts[1]. Table 2-2 of Reference 1 provides for peak load and electricity demand forecasts. Tables 2.2-19 and 2.2-36 of Reference 1 Appendices, Vol. 1 provide a comparison of peak demand forecasts between applicant utilities (SCE and SDG&E) and the CEC[1]. The SCE and SDG&E area peak demands in 1984 were 15,169 MW and 2,342 MW, respectively on September 5[2,3]. When compared to Table 2.2-19 of Reference 1 Appendices, Vol. 1, it shows that the 1984 SCE peak demand has already exceeded the CEC forecast for 1989. Plans for the Kaiparowits Coal Generation Project and the Piru Creek Pumped Storage Project are no longer active.
8.4.3	8-10	As discussed in the update to Sections 5.5.2.2 and 5.5.2.7, recent entrainment studies support the original conclusion in the SONGS Unit 1 FES that fish loss due to entrainment and heat treatment does not constitute a threat to the local population of species involved.
8.4.4	8-10	The recent turbidity study results and conclusions were contained in the SCE annual reports on Marine Environmental Analysis and Interpretation and are described in Section 5.5.2.3 Update.
8.5	8-10	As noted in the SONGS Units 2 and 3 FSAR, the SONGS site is comprised of 84 acres of which 16 acres are occupied by Unit 1. Units 2 and 3 occupy 52.8 acres of the site[4].
8.5	8-11	The Staff's assessment of the alternative procedures that may be used in the decomissioning of reactors has been updated, and is presented in NUREG-0586[5]. The SONGS Units 2 and 3 FES-OL details these alternative procedures[6].

References for Section 8

1. California Energy Commission, "The 1985 California Electricity Report - Affordable Electricity in an Uncertain World," May 1985.

2. Southern California Edison Company, "Annual Report, 1984."

3. San Diego Gas and Electric Company, "Annual Report, 1984."

4. Southern California Edison Company, "San Onofre Nuclear Generating Station Units 2 and 3, Final Safety Analysis Report," Docket Nos. 50-361/362, updated January 1984.

5. U.S. Nuclear Regulatory Commission, "Draft Generic Environmental Impact Statement on Decomissioning of Nuclear Facilities," USNRC Report NUREG-0586, January 1981.

6. U.S. Nuclear Regulatory Commission, "Final Environmental Statement Related to the Operation of SONGS Units 2 and 3," NUREG-0490, April 1981.

Section	Page	Comment
9.2.2.3	9-13 through 9-14	The septic tank was removed and disposed of in late 1982. The leach fields have been abandoned in place. A more sophisticated secondary sewage treatment system installed at Unit 1 presently serves Units 1, 2 and 3. It consists of two 50,000 gpd units, each with an aeration tank, blowers, final digesting and settling tanks, and a chlorine contact tank. The effluent from this plant is discharged through the Unit 1 circulating water system(1).
9.2.3	9-16	Test results on the effects of changing cooling water flow direction(2) indicates that: 1) Flow reversal of the cooling water system to control biofouling of intake/discharge structure may have changed the composition of the benthic communities near the structure due to changes in the thermal plume; 2) Potential effects of increased turbidity would have a negligible effect due to the naturally high turbidity levels in the area; 3) If changes in flow direction affect the texture of the sediment bottom, the biotic community would be expected to respond by alterations of species composition; 4) The inlet and outlet would experience a shift in community structure during flow reversal. The area, however, would still remain productive; 5) Increased fish loss is expected to occur during flow reversal because the discharge structure does not have a velocity cap. Velocity caps, such as the one on the intake structure have been proven to reduce fish loss by 90 percent. To date, Unit 1 does not plan to use flow reversal as an alternative to heat treatment.

References for Section 9

1. Southern California Edison Company, "Environmental Report - Operating License Stage for San Onofre Nuclear Generating Station Units 2 and 3," Vol. 2, 1977, Section 3.7.

2. Southern California Edison Company, "Turbidity at San Onofre Unit 1," in Doc. 78-RD-58, 1978.

3. Southern California Edison Company, "Report on 1984 Data, Marine Environmental Analysis and Interpretation," 85-RD-37, 1985.

Appendix A - Meteorology

Tables of frequencies of wind speed and direction for various stability categories and X/Q values have been presented in the San Onofre Units 2 and 3 FSAR and ER-OL Section 2.3. Joint wind speed and direction frequency distributions by atmospheric stability class, also appear in the San Onofre Nuclear Generating Station 1981 to 1985 Semi-annual Effluent Reports. None of this more recent data has indicated any significant change in site meteorology compared with that presented in Appendix A of the FES.

TABLE 3.18.1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
1. AIRBORNE Radioiodine and Particulates	Samples from at least 5 locations 3 samples from offsite locations (in different sectors) of the highest calculated annual average ground level D/Q. 1 sample from the vicinity of a community having the highest calculated annual average ground level D/Q. 1 sample from a control location 15-30 km (10-20 miles) distant and in the least prevalent wind direction.[c]	Continuous operation of sampler with sample collection as required by dust loading but at least once per 7 days.[d]	Radioiodine cartridge. Analysis at least once per 7 days for I-131. Particulate sampler. Analyze for gross beta radioactivity $\geq$ 24 hours following filter change. Perform gamma isotopic[b] analysis on each sample when gross beta activity is $\geq$ 10 time the yearly mean of control samples. Perform gamma isotopic analysis on composite (by location) sample at least once per 92 days.
2. DIRECT RADIATION[e]	At least 30 locations including an inner ring of stations in the general area of the SITE BOUNDARY and an outer ring approximately in the 4 to 5 mile range from the site with a station in each sector of each ring. The balance of the stations are in special interest areas such as population centers, nearby residences, schools, and in 2 or 3 areas to serve as control stations.	At least once per 92 days.	Gamma dose. At least once per 92 days.

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Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
3. WATERBORNE			
a. Ocean	4 Locations	At least once per month and composited quarterly	Gamma isotopic analysis of each monthly sample. Tritium analysis of composite sample at least once per 92 days.
b. Drinking	2 Locations	Monthly at each location.	Gamma isotopic and tritium analyses of each sample.
c. Sediment from Shoreline	4 Locations	At least once per 184 days.	Gamma isotopic analysis of each sample.
d. Ocean Bottom Sediments	5 Locations	At least once per 184 days.	Gamma isotopic analysis of each sample.
4. INGESTION			
a. Nonmigratory Marine Animals	3 Locations	One sample from each group (listed below) will be collected in season, or at least once per 184 days if not seasonal. Groups to be sampled: 1. Fish-2 adult species such as flatfish, bass, perch or sheepshead. 2. Crustaceae-such as crab or lobster. 3. Molluska-such as limpets, clams or seahares.	Gamma isotopic analysis on edible portions.

ATTACHMENT 1
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Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
b. Local Crops	2 Locations	Representative vegetables, normally 1 leafy and 1 fleshy collected at harvest time. At least 2 vegetables collected semiannually from each location.	Gamma isotopic analysis on edible portions semi-annually an I-131 analysis for leafy crops.

TABLE NOTATION

a. Sample locations are indicated in the ODCM.

b. Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

c. The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites which provide valid background data may be substituted.

d. Canisters for the collection of radioiodine in air are subject to channeling. These devices should be carefully checked before operation in the field or several should be mounted in series to prevent loss of iodine.

e. Regulatory Guide 4.13 provides minimum acceptable performance criteria for thermoluminescence dosimetry (TLD) systems used for environmental monitoring. One or more instruments, such as a pressurized chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purpose of this table, a thermoluminescent dosimeter may be considered to be one phosphor and two or more phosphors in a packet may be considered as two or more dosimeters. Film badges should not be used for measuring direct radiation.

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

Sample Type and Sampling Location

	Direct Radiation	Distance	Direction
1	City of San Clemente (SDG&E Offices)	5.6	NW
2	Camp San Mateo	3.5	N
3	Camp San Onofre	2.6	NE
4	Camp Horno	4.5	E
5	Camp Las Pulgas	8.5	ESE
6	Old Route 101 -ESE	3.0	ESE
7	Old Route 101 -ESE	0.5	ESE
8	Non-commissioned Officers Beach Club	1.2	NW
9	Basilone Road/ I-5 Freeway Offramp	2.0	NW
10	Bluff	0.8	NW
11	Visitor's Center	0.2	NNE
12	South Edge of the Switchyard	0.2	NE
13	Site Boundary	0.13	SE
14	Huntington Beach Generating Station	37.0	NW
15	ESE Site Boundary	0.2	ESE
16	East Site Boundary	0.5	E
17	Transit Dose	-	-
18	Transit Dose	-	-
19	San Clemente Highlands	5.0	NNW
20	San Clemente Pier	5.0	NW
21	Concordia Elementary School	3.5	NW
22	Coast Guard Station- San Mateo Point	2.7	WNW
23	San Clemente General Hospital	8.2	NW
24	San Clemente High School	6.0	NW
25	Convalescent Home- San Clemente	8.0	NW
26	Dana Hills High School	11.0	NW
27	U.S. Post Office- Dana Point	10.5	NW
28	Doheny Fire Station- Capistrano Beach	9.5	NW
29	San Juan Capistrano Fire Station	10.8	NW
30	Laguna Beach Fire Station	17.5	NW
31	Aurora Park- Mission Viejo	18.6	NNW
32	Santa Ana Police Department	32.0	NW
33	Camp Talega	5.7	N
34	San Onofre School	1.7	NW
35	Range 312 (Marine Corps Base, Camp Pendleton)	4.7	NNE
36	Range 208C (Marine Corps Base, Camp Pendleton)	4.0	NE
37	Laguna Niguel Fire Station	13.5	NW
38	San Onofre State Beach Park	3.6	SE
39	Basilone Road Trailer Park	1.4	NNW
40	SCE Training Center- Japanese Mesa	0.8	NW
41	Old Route 101- E	0.3	E
42	Horno Canyon	4.6	E

Distance (miles) and direction (sectors) are measured relative to the midpoint between Units 2 and 3.

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

Sample Type and Sampling Location	Distance	Direction
Direct Radiation (Con't)		
43 Edson Range (Marine Corps Base, Camp Pendleton)	10.6	SE
44 Fallbrook Fire Station	18.0	E
45 Interstate 5 Weigh Station	2.0	ESE
46 San Onofre Beach Park	1.4	SE
47 Camp Las Flores	8.6	SE
48 Mainside (Marine Corps Base, Camp Pendleton)	15.0	ESE
49 Camp Chappo	12.8	ESE
50 Oceanside Fire Station	15.5	SE
51 Carlsbad Fire Station	18.6	SE
52 Vista Fire Station	21.0	ESE
53 San Diego County Operations Center	45.0	SE
54 Escondido Fire Station	32.0	ESE
55 San Onofre State Beach (Unit 1)	0.2	W
56 San Onofre State Beach (Unit 1)	0.1	W
57 San Onofre State Beach (Unit 2)	0.1	SSW
58 San Onofre State Beach (Unit 3)	0.1	S
59 SONGS Meteorological Tower	0.3	NW
Airborne		
1 City of San Clemente (SDG&E Offices)	5.5	NW
2 Camp San Onofre (Camp Pendleton)	1.8	NE
3 Huntington Beach Generating Station	37.0	NW
4 Northeast Site Boundary	0.2	NNE
5 Units 2 and 3 Switchyard	0.13	ESE
6 SONGS Meteorlogical Tower	0.3	NW
9 State Beach Park	0.4	ESE
10 Bluff	0.5	WNW
11 Mesa E.O.F.	0.5	NNW
Soil Samples		
1 Camp San Onofre	2.5	NE
2 Old Route 101- SE	3.0	SE
3 Basilone/ I-5 Freeway Offramp	2.0	NW
4 Huntington Beach Generating Station	37.0	NW
5 East Site Boundary	0.2	NNW
Ocean Water		
A Station Discharge Outfall- Unit 1	0.5	SW
B Station Discharge Outfall- Unit 2	0.7	SW
C Station Discharge Outfall- Unit 3	0.7	SW
D Newport Beach	30.0	NW

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

Sample Type and Sampling Location		Distance	Direction
Drinking Water			
1	Tri-Cities Municipal Water District Reservoir	8.7	NW
2	San Clemente Golf Course Well	3.5	NNW
3	Huntington Beach	37.0	NW
Shoreline Sediment			
1	San Onofre State Beach	0.6	SE
2	San Onofre Surfing Beach	0.9	NW
3	San Onofre State Beach	3.5	SE
4	Newport Beach (North end)	30.0	NW
Local Crops			
1	San Mateo Canyon	2.6	NW
2	SE of Oceanside	22.0	SE
Non-migratory Marine Animals			
A	Unit 1 Outfall	0.6	WSW
B	Units 2 and 3 Outfall	0.7	SSW
C	Newport Beach	30.0	NW
Kelp			
A	San Onofre Kelp Bed	1.5	S
B	San Mateo Kelp Bed	3.5	WNW
C	Barn Kelp Bed **	6.6	SSE
D	Newport Beach	30.0	NW
Ocean Bottom Sediments			
A	Unit 1 Outfall	0.5	SW
B	Unit 1 Outfall	0.6	SW
C	Unit 2 Outfall	1.3	SW
D	Unit 3 Outfall	0.9	SSW
E	Newport Beach	30.0	NW
Rabbit Sampling			
1	Adult Rabbit	0.5	E

** Samples were not obtained from the Barn Kelp Bed because it is in a non-harvestable condition.