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A. Edward Scherer
Manager of
Nuclear Regulatory Affairs

May 11, 2007

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: **Docket Nos. 50-206, 50-361, 50-362 and 72-41**
2006 Annual Radiological Environmental Operating Report
San Onofre Nuclear Generating Station Units 1, 2 and 3 and Independent Spent Fuel Storage Facility

Dear Sir or Madam:

As required by Technical Specification (TS) Section D6.9.1.3 of San Onofre Nuclear Generating Station (SONGS) Unit 1 Facility Operating License DPR-13, and TS Section 5.7.1.2 of Facility Operating Licenses NPF-10 and NPF-15 for SONGS Units 2 and 3, respectively, this letter transmits the 2006 Annual Radiological Environmental Operating Report (AREOR) for SONGS Unit 1 and SONGS Units 2 and 3.

The AREOR covers the operation of SONGS Unit 1 and SONGS Units 2 and 3 during the calendar year 2006 and includes summaries, interpretations, and analyses of trends of the results of the Radiological Environmental Monitoring Program.

In addition, the AREOR includes the results for direct radiation monitoring near the Independent Spent Fuel Storage Installation.

If you require any additional information, please contact Mr. E.S. Medling at (949) 368-7492.

Sincerely,

Enclosure

cc: B. S. Mallett, Regional Administrator, NRC Region IV
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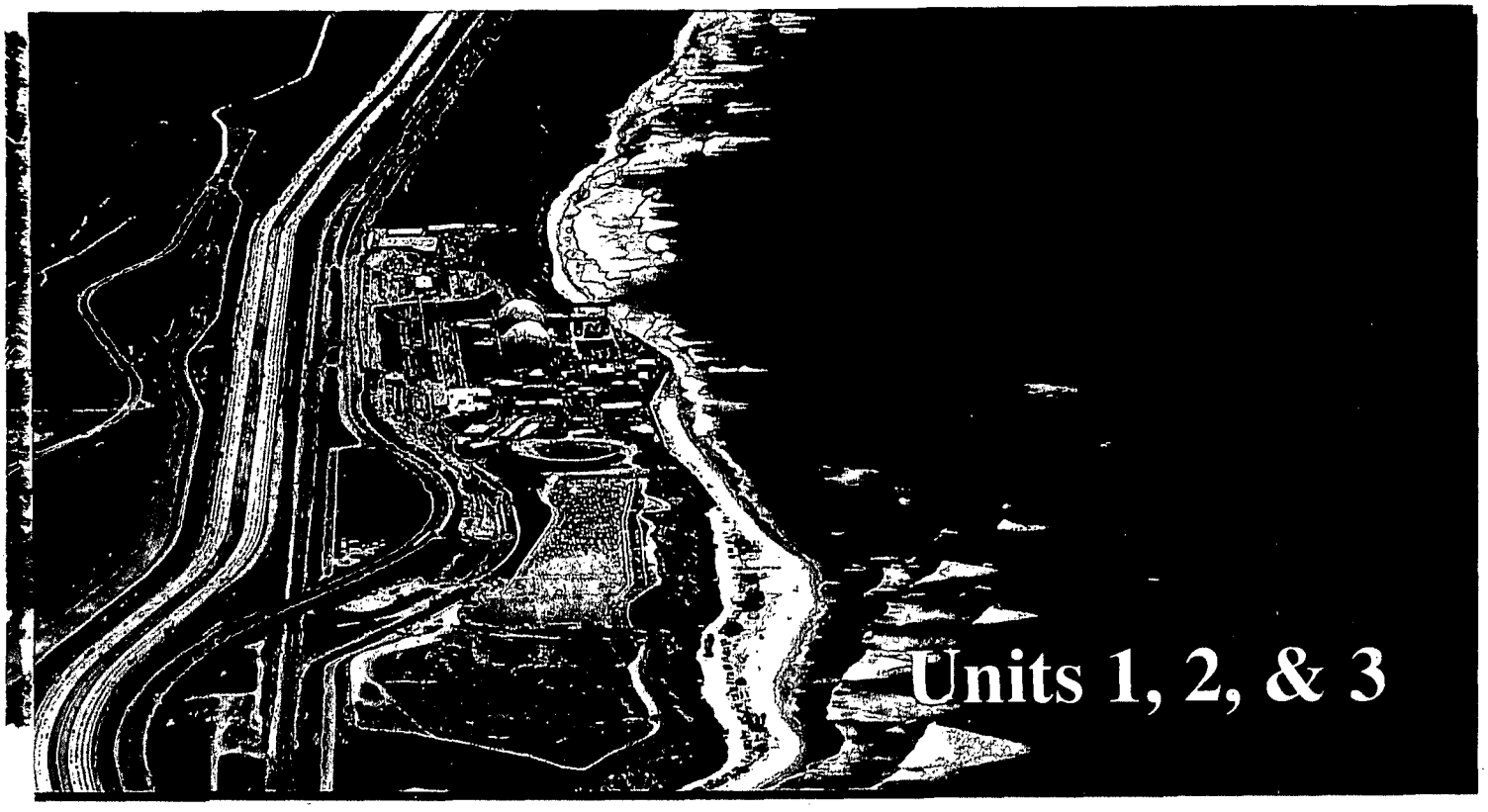
2006
Radiological Environmental Operating Report
San Onofre Nuclear Generating Station



Southern California Edison
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Docket Nos. 50-206, 50-361, 50-362
License Nos. DPR-13, NPF-10, NPF-15

April 2007

SOUTHERN CALIFORNIA EDISON
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2006 ANNUAL

RADIOLOGICAL ENVIRONMENTAL

OPERATING REPORT

San Onofre Nuclear Generating Station

UNITS 1, 2, & 3

Southern California Edison

An *Edison International* Company

Prepared by: N. A. Hansen 5/2/07

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MAY 2007

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Executive Summary

The data from the San Onofre Nuclear Generating Station (SONGS) Radiological Environmental Monitoring Program (REMP) clearly indicate that SONGS had no measurable radiological environmental impact during 2006.

Preparation of the 2006 Annual Radiological Environmental Operating Report (AREOR) used the data reduction protocol described in NUREG/CR-4007. A meaningful analysis of data at, near, or below the detection limit must necessarily involve a consideration of the degrees of uncertainty associated with the data. Excluding naturally occurring radionuclides, approximately 5% of the 2006 SONGS REMP data set was above the critical level (1.64 sigma), which is characteristic of a database of values statistically equal to zero. The data have been summarized in the Statistical Summary of REMP Data found in Appendix B. The plant related radionuclides (Cs-137 in soil and sediment, as well as I-131 in kelp) detected above the *a posteriori* minimum detectable concentration (MDC) may be attributable to fallout from nuclear weapons testing (Cs-137) and medical administrations of radionuclides (I-131). These isotopes have been detected at indicator as well as control locations in past years. The naturally occurring radionuclides (Be-7, K-40, and Th-228) detected were observed in both control and indicator locations at substantially similar concentrations and are not related to the operation of SONGS. The balance of 2006 SONGS REMP database displays behavior statistically equal to a null set. Refer to Appendix B for a more detailed discussion.

INTRODUCTION

SONGS consists of two pressurized water nuclear reactors housed in separate containment buildings. Unit 1 attained initial criticality June 1967 and was permanently retired from service in November 1992. Units 2/3 attained initial criticality in July 1982 and August 1983, respectively, and have been in operation to date.

The purpose of the REMP is to quantify ambient radiation levels in the environs of SONGS, and to identify and quantify concentrations of radioactivity in various environmental media in the vicinity of SONGS which have a potential radiation exposure pathway to man. Thermoluminescent dosimeters (TLDs) were used to measure direct radiation levels. Sampled environmental media include soil, shoreline sediment (beach sand), air (particulate & iodine), local crops, non-migratory marine species, kelp, drinking water, ocean water, and ocean bottom sediments. Each of the samples was analyzed for both naturally-occurring and SONGS-related radionuclides.

The REMP is conducted in accordance with Section 5.0 of the SONGS Unit 1 and Units 2/3 Offsite Dose Calculation Manuals (ODCM).

To conform with 10CFR Part 50, Appendix I, Section IV-B.2, measured radioactivity concentrations in the environmental samples have been compared against predicted (calculated) ones to evaluate the relationship between quantities of radioactive material released in effluents and resultant radiation doses to individuals from principal pathways of exposure.

Refer to Appendix B for a correlation of effluent to environmental concentrations.

A land use census was performed in 2006 to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the monitoring program are made if required by the results of this census. Appendix F of the report identifies changes to the census and the resultant dose increase, if any, to individuals from principal pathways of exposures in conformance with 10CFR Part 50, Appendix I, Section IV. B.3.

OBJECTIVES

1. To fulfill the radiological environmental monitoring requirements of the ODCM and the Technical Specifications.

2. To detect any significant increase in the concentration of radionuclides in critical pathways.

3. To detect any significant change in ambient gamma radiation levels.

4. To verify that the operation of SONGS Units 1, 2 and 3 have no measurable (detrimental) effects on the health and safety of the public or the environment.

SAMPLE COLLECTION

Samples of various environmental media were obtained to meet the stated objectives. The selection of sample types was based on established critical pathways for the transfer of radionuclides through the environment to individuals, and the evaluation of data during the operational phase. Sampling locations were determined with consideration given to site meteorology, local demography, and land uses. Refer to Appendix A for a complete list of REMP sample locations as described in Table 5-4 of the ODCM.

Sampling locations were divided into two classes, indicator and control. Control stations were at locations considered to be unaffected by SONGS operations. All others are considered indicator locations and may be potentially affected by SONGS operations.

SOURCES OF RADIOACTIVITY

Plant-specific radionuclides are produced in the normal operation of a nuclear power plant. Most of the fission products are retained within the fuel and its cladding. A small fraction of fission products such as cesium-137 (Cs-137) and iodine-131 (I-131), and activation products such as cobalt-60 (Co-60), are present in the primary reactor cooling system. Noble gases are also produced during the fission process.

Radioactive liquid and gaseous waste releases to the ocean and the atmosphere may contain very minute concentrations of plant-produced radionuclides. The airborne radioactive noble gases released are mostly xenon and krypton, which are inert (non-reactive). They do not concentrate in the body, but they may contribute to human radiation exposure as an immersion source for whole body exposure. Xenon-133 and argon-41 are the major radioactive noble gases released to the atmosphere, and their calculated offsite beta and gamma air doses are no greater than 0.1 mrad per year.

The releases of iodines and particulates in the gaseous and liquid effluents are small. The major radionuclides of interest are I-131, Cs-134, Cs-137, Co-58, and Co-60. The total releases for these radionuclides were well below applicable regulatory limits.

Tritium (H-3), the radioactive isotope of hydrogen, is the predominant radionuclide in the liquid effluents and is also present in gaseous effluents. Tritium is produced in the reactor water (coolant) as a result of boron activation and other nuclear reactions.

EXPOSURE PATHWAY

Figure 1 illustrates various exposure pathways resulting in radiation dose to the surrounding population from operation of a nuclear facility. Only a few pathways will have real dose potential and require detailed calculations.

a. External Exposure

External exposure to people during normal operations will include radioactive gases in gaseous effluent plumes, radionuclides deposited on soil, and vegetation, or shoreline sediments. Direct exposure from radionuclides in water during recreation or commercial fishing activity is insignificant. Accumulation in sediments has the greater potential as a source of exposure. Gamma dosimeters (TLDs) are the usual means of measuring direct radiation exposure since significant dose contributors are gamma-emitters.

b. Internal Exposure

The release of radioactivity in liquid effluents involves pathways such as fish consumption and direct exposure from the ocean water by swimming and the shoreline activities. Consumption of fish or crops from the area receiving liquid effluents and breathing noble gases from the gaseous effluents releases are the most probable sources of internal exposure.

REGULATORY LIMITS, GUIDANCE, AND REQUIREMENTS

* 10CFR50

The Code of Federal Regulations Title 10, Part 50, Appendix I.

* 40CFR190

The Environmental Protection Agency (EPA) has established environmental radiation protection standards for nuclear power plants in 40CFR190. The standards for normal operation recommended that the dose from all discharges of radioactivity should not exceed 25 mrem/yr. These limits are applicable to the sum of both liquid and gaseous effluents and direct radiation. The environmental doses calculated at SONGS are a small fraction of the dose limits established by the EPA.

* 10CFR20

10CFR20, Appendix B, Table II, "Effluent Concentrations" and Appendix C, "Concentration for Release to Sewerage"

Guidance:

* Regulatory Guide 4.1

Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants, 1975

* Regulatory Guide 4.2

Preparation of Environmental Reports for Nuclear Power Stations, 1976

* Regulatory Guide 4.8

Environmental Technical Specifications for Nuclear Power Plants, 1975

* Regulatory Guide 4.13

Performance, Testing, and Procedural Specification for Thermoluminescent Dosimetry: Environmental Applications, 1977

* NUREG-0133

Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants

* Regulatory Guide 1.109

Calculation of Annual Doses to Man from Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, 1977

* NUREG-1301

Offsite Dose Calculations Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors, Generic Letter 89-01, Supplement No. 1, 1991

* ANSI N545 (TLD's)

American National Standard Performance, Testing, And Procedural Specifications for Thermoluminesence Dosimetry (Environmental Application), 1975

* Regulatory Guide 4.15

Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment, 1979

* NUREG/CR-4007 Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements, 1984

DATA MANAGEMENT

The tabulated means, ranges and standard deviations presented in Appendix B were calculated following the standard format specified in Regulatory Guide 4.8, the Radiological Assessment Branch Technical Position, Revision 1, 1979, and in accordance with the protocol outlined in NUREG/CR-4007. A custom data management software package was used to perform the statistical analysis and tabulation of the data.

The REMP data are reviewed for accuracy and comparison against NRC reporting levels, and then entered into the REMP database. One of the REMP menus flags measurements exceeding the administrative levels (10% of the NRC reporting levels) established by Southern California Edison (SCE). The *a posteriori* MDC is compared to the maximum value for the *a priori* Lower Limit of Detection (LLD) specified in the ODCM. This ensures that regulatory limits for the maximum LLD are met.

The impact of SONGS on the surrounding environment was assessed through a series of analyses. These analyses included: data reduction, comparisons of indicator to control locations, and summary (Appendix B); comparison of operational to preoperational environmental data (Appendix D); summary of deviations from sampling requirements and corrective actions taken (Appendix E); and the results of the 2006 Land Use Census (Appendix F).

All Radiological Environmental Monitoring activities for San Onofre are assessed in accordance with Quality Assurance requirements as defined in Regulatory Guide 4.15. The Contracted Environmental Analysis Laboratory (CEAL) participated in an interlaboratory comparison program in partial fulfillment of the quality assurance requirements for environmental monitoring. The CEAL participated in cross check programs which meet the intent of Reg. Guide 4.15. Refer to Appendix C.

DETECTION LIMIT TERMINOLOGY

This report utilizes three distinct terms to describe the concept of "lower limit of detection" at various detection confidence levels. The terms are briefly defined below. For a more thorough discussion, the reader should refer to NUREG/CR-4007.

Critical level - Defined as 1.64 sigma. For a sufficiently large database of [isotopically analyzed] sample results, with the "true" activity being equal to zero, approximately 5% of the results should be above the critical level.

Lower Limit of Detection (LLD) - The LLD is the *a priori* (before the fact) lower limit of detection. This value is calculated for each isotope and every matrix based on typical or expected values of decay time, sample size, counter efficiency, etc. These values are listed in the ODCM and represent the maximum permissible value for the "lower limit of detection" for specified sample media.

Minimum Detectable Concentration (MDC) - The MDC is the *a posteriori* (after the fact) lower limit of detection based on actual decay time, measured sample size, counter efficiency as determined by recent calibration, etc. The MDC is compared to the LLD to verify that the measurement met the ODCM requirements for the maximum value of the LLD for the listed analytes. Values above the MDC are presumed to represent "detected" activity at the 95% detection confidence level.

The 2006 SONGS REMP data required by the ODCM have been summarized in the Statistical Summary of REMP Data found in Appendix B.

CONCLUSION

Levels of radioactivity in environmental media are a function of several factors including: site release rates; meteorology; number, location, size and date of nuclear weapons tests; seasonal variability of fallout; soil conditions; local terrain and variability in the natural environment.

Radiological environmental data collected throughout 2006 have been evaluated to determine the impact, if any, of San Onofre operations on the surrounding environment. To accomplish this, several methods of evaluation were employed, namely:

1. Compilation and verification of all data, as well as a determination of those data considered to be significantly greater than background levels.

2. Correlation of effluent concentrations to concentrations in the environment. Refer to Appendix B.

3. Examination of time-dependent variations of pertinent radioisotopes in selected environmental media throughout the year at both indicator and control locations.

4. Comparison of radioactivity in various media in 2006 against the levels observed in pre-operational years.

5. Historical trending of radionuclides in various media during operational years.

In comparing these findings to the conservatively-defined limits of the facility operating licenses, it is concluded that the radiological environmental impact of the operation of SONGS through 2006 has been negligible, and the resulting dose to man is negligible.

REFERENCES

1. 10CFR20, 10CFR50

2. Land Use Census for SONGS Units l, 2 and 3 Radiological Environmental Monitoring Program, October 2006.

3. ODCM (Offsite Dose Calculation Manual) for SONGS Unit 1 and Units 2/3, Section 5.0, 2006.

4. SONGS Radiological Monitoring (RM) Procedures: SO123-RM-1 (SO123-IX-1.10).

5. L. Currie. 1968 "Limits for the Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Analytical Chemistry, vol. 40 pp. 586-593

APPENDIX A

SAMPLE TYPE AND SAMPLING LOCATION

TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION (Out of sequence sample numbers are due to program modifications)	DISTANCE* (miles)	DIRECTION* (Sector)
Direct Radiation			
1	City of San Clemente (Former SDG&E Offices)	5.7	NW
2	Camp San Mateo – MCB	3.5	N
3	Camp San Onofre – MCB	2.6	NE
4	Camp Horno – MCB	4.5	E
6	Old Route 101 (East-Southeast)	3.0	ESE
8	Noncommissioned Officers' Beach Club	1.4	NW
10	Bluff (Adjacent to PIC #1)	0.7	WNW
11	Former Visitors' Center	0.4 **	NW
12	South Edge of Switchyard	0.2 **	E
13	Southeast Site Boundary (Bluff)	0.4 **	ESE
15	Southeast Site Boundary (Office Building)	0.1 **	SSE
16	East Southeast Site Boundary	0.4 **	ESE
19	San Clemente Highlands	5.0	NNW
22	Former US Coast Guard Station - San Mateo Point	2.7	WNW
23	SDG&E Service Center Yard	8.1	NW
31	Aurora Park - Mission Viejo (Control)	18.6	NNW
33	Camp Talega – MCB	5.7	N
34	San Onofre School – MCB	1.9	NW
35	Range 312 – MCB	4.7	NNE
36	Range 208C – MCB	4.2	NE
38	San Onofre State Beach Park	3.3	SE
40	SCE Training Center - Mesa (Adjacent to PIC #3)	0.7	NNW
41	Old Route 101 – East	0.3 **	E
44	Fallbrook Fire Station	17.7	E

* Distance (miles) and Direction (sector) are measured relative to Units 2/3 midpoint. Direction determined from degrees true north.
** Distances are within the Units 2/3 CAB/EAB (Controlled Area Boundary/Exclusion Area Boundary)
*** Soil samples are not required by Technical Specifications.
**** Kelp samples are not required by Technical Specifications.
MCB Marine Corp Base Camp Pendleton
PIC Pressurized Ion Chamber

TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION (Out of sequence sample numbers are due to program modifications)	DISTANCE* (miles)	DIRECTION* (Sector)
Direct Radiation (Continued)			
46	San Onofre State Beach Park	0.9	SE
47	Camp Las Flores – MCB	8.6	SE
49	Camp Chappo – MCB	12.8	ESE
50	Oceanside Fire Station (Control)	15.6	SE
53	San Diego County Operations Center	44.3	SE
54	Escondido Fire Station	31.8	ESE
55	San Onofre State Beach (U1 West)	0.2 **	W
56	San Onofre State Beach (U1 West)	0.2 **	W
57	San Onofre State Beach (Unit 2)	0.1 **	WSW
58	San Onofre State Beach (Unit 3)	0.1 **	S
59	SONGS Meteorological Tower	0.3 **	WNW
61	Mesa - East Boundary (Adjacent to PIC #4)	0.7	N
62	MCB - Camp Pendleton (Adjacent to PIC #5)	0.6	NNE
63	MCB - Camp Pendleton (Adjacent to PIC #6)	0.6	NE
64	MCB - Camp Pendleton (Adjacent to PIC #7)	0.6	ENE
65	MCB - Camp Pendleton (Adjacent to PIC #8)	0.7	E
66	San Onofre State Beach (Adjacent to PIC #9)	0.6	ESE
67	Former SONGS Evaporation Pond (Adjacent to PIC #2)	0.6	NW
68	Range 210C – MCB	4.3	ENE
73	South Yard Facility	0.4 **	ESE
74	Oceanside City Hall (Backup Control)	15.6	SE
75	Gate 25 MCB	4.6	SE
76	El Camino Real Mobil Station	4.6	NW
77	Area 62 Heavy Lift Pad	4.3	N
78	Sheep Valley	4.4	ESE

* Distance (miles) and Direction (sector) are measured relative to Units 2/3 midpoint. Direction determined from degrees true north.

** Distances are within the Units 2/3 CAB/EAB (Controlled Area Boundary/Exclusion Area Boundary)

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PIC Pressurized Ion Chamber

TABLE A-1

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	TYPE OF SAMPLE AND SAMPLING LOCATION (Out of sequence sample numbers are due to program modifications)	DISTANCE* (miles)	DIRECTION* (Sector)
Airborne			
1	City of San Clemente (City Hall)	5.1	NW
7	AWS Roof	0.18 **	NW
9	State Beach Park	0.6	ESE
10	Bluff	0.7	WNW
11	Mesa EOF	0.7	NNW
12	Former SONGS Evaporation Pond	0.6	NW
13	Marine Corp Base (Camp Pendleton East)	0.7	E
14	Mesa Medical Facility	0.7	NNW
15	Oceanside City Hall (Control)	15.6	SE
Soil Samples ***			
1	Camp San Onofre	2.6	NE
2	Old Route 101 - East Southeast	3.0	ESE
3	Basilone Road / I-5 Freeway Off ramp	2.0	NW
5	Former Visitor's Center	0.4 **	NW
6	Oceanside (Control)	16.0	SE

* Distance (miles) and Direction (sector) are measured relative to Units 2/3 midpoint. Direction determined from degrees true north.

** Distances are within the Units 2/3 CAB/EAB (Controlled Area Boundary/Exclusion Area Boundary)

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TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION (Out of sequence sample numbers are due to program modifications)	DISTANCE* (miles)	DIRECTION* (Sector)
Ocean Water			
A	Station Discharge Outfall - Unit 1	0.6	SW
B	Outfall - Unit 2	1.5	SW
C	Outfall - Unit 3	1.2	SSW
D	Newport Beach (Control)	30.0	NW
51	Unit 2 Conduit	0.1	SW
52	Unit 3 Conduit	0.1	SSW
Drinking Water			
4	Camp Pendleton Drinking Water Reservoir	2.2	NNW
5	Oceanside City Hall (Control)	15.6	SE
Shoreline Sediment (Beach Sand)			
1	San Onofre State Beach (SE)	0.6	SE
2	San Onofre Surfing Beach	0.8	WNW
3	San Onofre State Beach (SE)	3.5	SE
4	Newport Beach North End (Control)	29.2	NW
Local Crops			
1	San Clemente Ranch (San Mateo Canyon)	2.6	NW
2	Oceanside (Control)	15-25	SE to ESE
4	San Clemente Residence (Ola Vista) with Garden	4.4	NW
6	SONGS Garden	0.4	NNW
Non-Migratory Marine Animals			
A	Unit 1 Outfall	0.9	WSW
B	Units 2/3 Outfall	1.5	SSW
C	Laguna Beach (Control)	18.2	NW

* Distance (miles) and Direction (sector) are measured relative to Units 2/3 midpoint. Direction determined from degrees true north.

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**** Kelp samples are not required by Technical Specifications.

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TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION (Out of sequence sample numbers are due to program modifications)	DISTANCE* (miles)	DIRECTION* (Sector)
Kelp ****			
A	San Onofre Kelp Bed	1.5	S
B	San Mateo Kelp Bed	3.8	WNW
C	Barn Kelp Bed	6.3	SSE
E	Salt Creek (Control)	11 to 13	WNW to NW
Ocean Bottom Sediments			
B	Unit 1 Outfall (0.6 mile West)	0.8	SSW
C	Unit 2 Outfall	1.6	SW
D	Unit 3 Outfall	1.2	SSW
E	Laguna Beach (Control)	18.2	NW
F	SONGS Upcoast	0.9	WSW
51	Unit 2 Conduit	0.1	SW
52	Unit 3 Conduit	0.1	SSW

* Distance (miles) and Direction (sector) are measured relative to Units 2/3 midpoint. Direction determined from degrees true north.

*** Soil samples are not required by Technical Specifications.

**** Kelp samples are not required by Technical Specifications.

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TABLE A-2

SECTOR AND DIRECTION DESIGNATION FOR REMP SAMPLE LOCATION MAP

DEGREES TRUE NORTH FROM SONGS 2 AND 3 MIDPOINT			NOMENCLATURE	
Sector Limit	Center Line	Sector Limit	22.5° Sector	Direction
348.75	0 & 360	11.25	A	N
11.25	22.5	33.75	B	NNE
33.75	45.0	56.25	C	NE
56.25	67.5	78.75	D	ENE
78.75	90.0	101.25	E	E
101.25	112.0	123.75	F	ESE
123.75	135.0	146.25	G	SE
146.25	157.0	168.75	H	SSE
168.75	180.0	191.25	J	S
191.25	202.5	213.75	K	SSW
213.75	225.0	236.25	L	SW
236.25	247.5	258.75	M	WSW
258.75	270.0	281.25	N	W
281.25	292.5	303.75	P	WNW
303.75	315.0	326.25	Q	NW
326.25	337.5	348.75	R	NNW

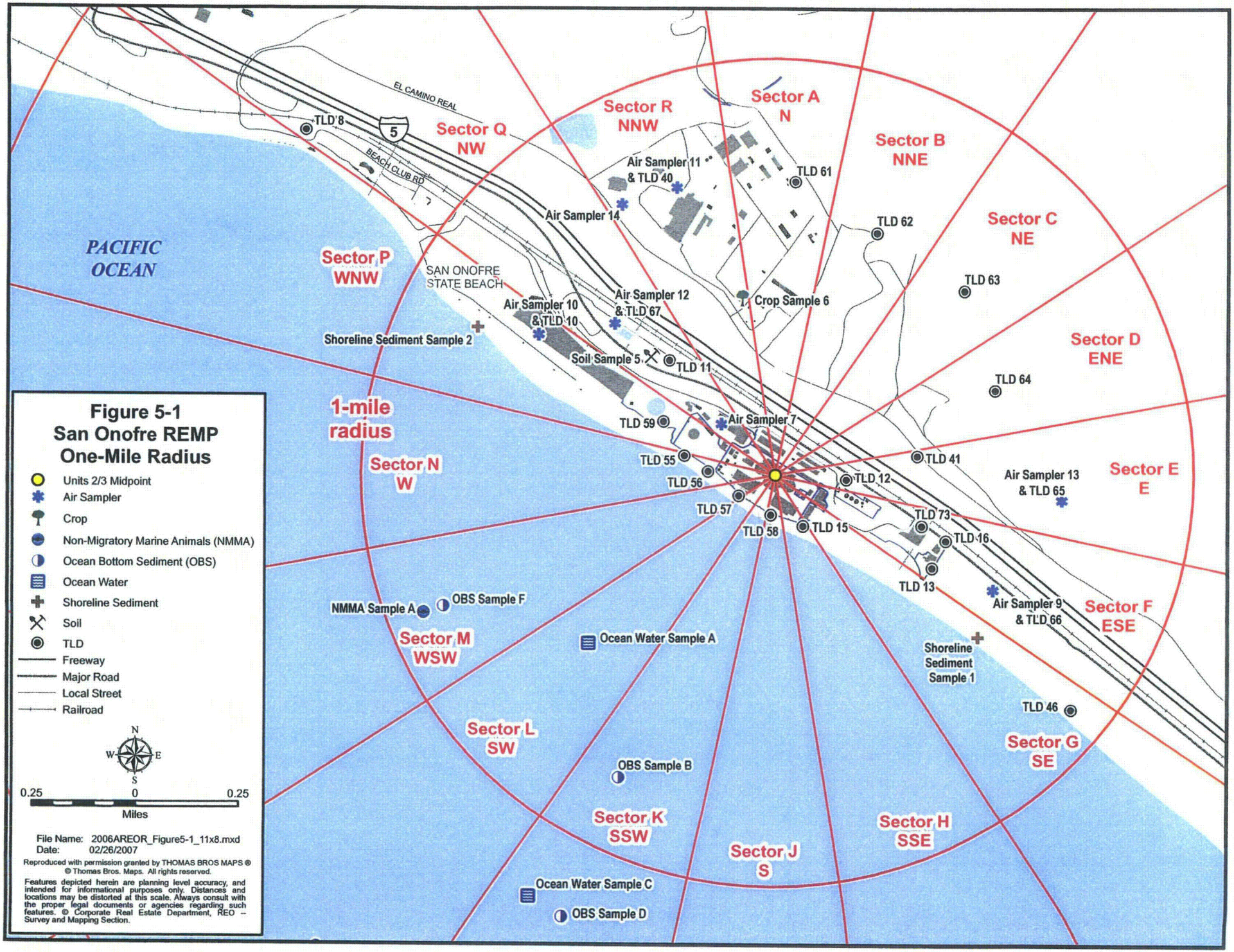
Figure 5-1
San Onofre REMP
One-Mile Radius
Units 2/3 Midpoint
Air Sampler
Crop
Non-Migratory Marine Animals (NMMA)
Ocean Bottom Sediment (OBS)
Ocean Water
Shoreline Sediment
Soil
TLD
Freeway
Major Road
Local Street
Railroad
N
W
E
S
0.25
0
0.25
Miles
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Date: 02/26/2007
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PACIFIC OCEAN
SAN ONOFRE STATE BEACH
EL CAMINO REAL
BEACH CLUB RD
5
1-mile radius
Sector A N
Sector B NNE
Sector C NE
Sector D ENE
Sector E E
Sector F ESE
Sector G SE
Sector H SSE
Sector J S
Sector K SSW
Sector L SW
Sector M WSW
Sector N W
Sector P WNW
Sector Q NW
Sector R NNW
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TLD 41
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TLD 13
TLD 46
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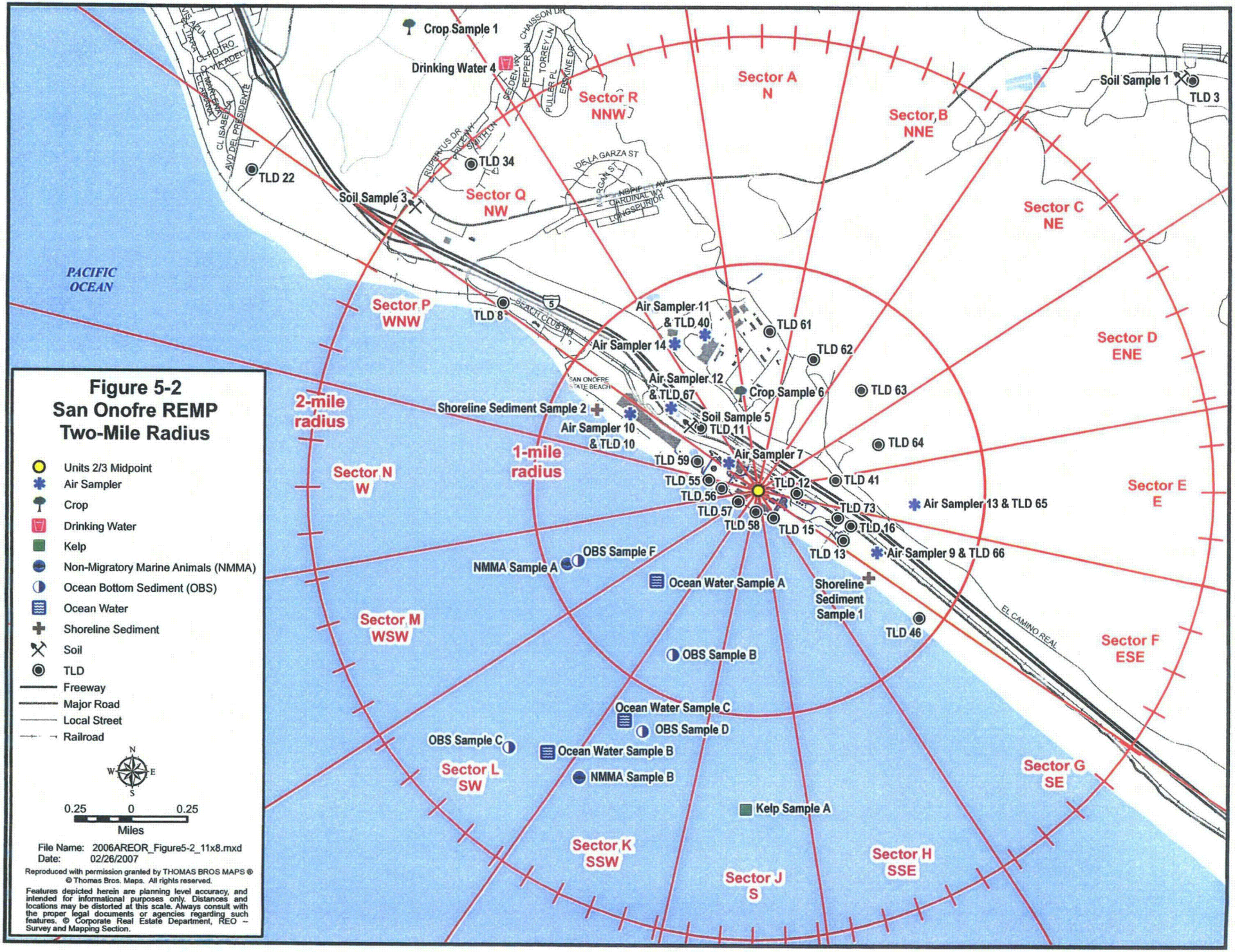
Air Sampler 14
Air Sampler 10 & TLD 10
Air Sampler 12 & TLD 67
Air Sampler 7
Air Sampler 13 & TLD 65
Air Sampler 9 & TLD 66
Crop Sample 6
Shoreline Sediment Sample 2
Soil Sample 5
TLD 11
NMMA Sample A
OBS Sample F
Ocean Water Sample A
Shoreline Sediment Sample 1
OBS Sample B
Ocean Water Sample C
OBS Sample D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Soil Sample 1
TLD 3
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Soil Sample 3
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Sector Q
NW
Sector C
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PACIFIC
OCEAN
Sector P
WNW
TLD 8
Air Sampler 11
& TLD 40
TLD 61
Air Sampler 14
TLD 62
Sector D
ENE
Air Sampler 12
& TLD 67
Crop Sample 6
TLD 63
2-mile
radius
Shoreline Sediment Sample 2
Air Sampler 10
& TLD 10
Soil Sample 5
TLD 11
TLD 64
1-mile
radius
Air Sampler 7
TLD 59
Sector N
W
TLD 55
TLD 12
TLD 41
Sector E
E
TLD 56
TLD 73
Air Sampler 13 & TLD 65
TLD 57
TLD 58
TLD 15
TLD 16
TLD 13
Air Sampler 9 & TLD 66
OBS Sample F
NMMA Sample A
Ocean Water Sample A
Shoreline
Sediment
Sample 1
Sector M
WSW
TLD 46
EL CAMINO REAL
Sector F
ESE
OBS Sample B
Ocean Water Sample C
OBS Sample D
OBS Sample C
Ocean Water Sample B
Sector L
SW
NMMA Sample B
Sector G
SE
Kelp Sample A
Sector K
SSW
Sector H
SSE
Sector J
S
Figure 5-2
San Onofre REMP
Two-Mile Radius
Units 2/3 Midpoint
Air Sampler
Crop
Drinking Water
Kelp
Non-Migratory Marine Animals (NMMA)
Ocean Bottom Sediment (OBS)
Ocean Water
Shoreline Sediment
Soil
TLD
Freeway
Major Road
Local Street
Railroad
N
W
E
S
0.25 0 0.25
Miles
File Name: 2006AREOR_Figure5-2_11x8.mxd
Date: 02/26/2007
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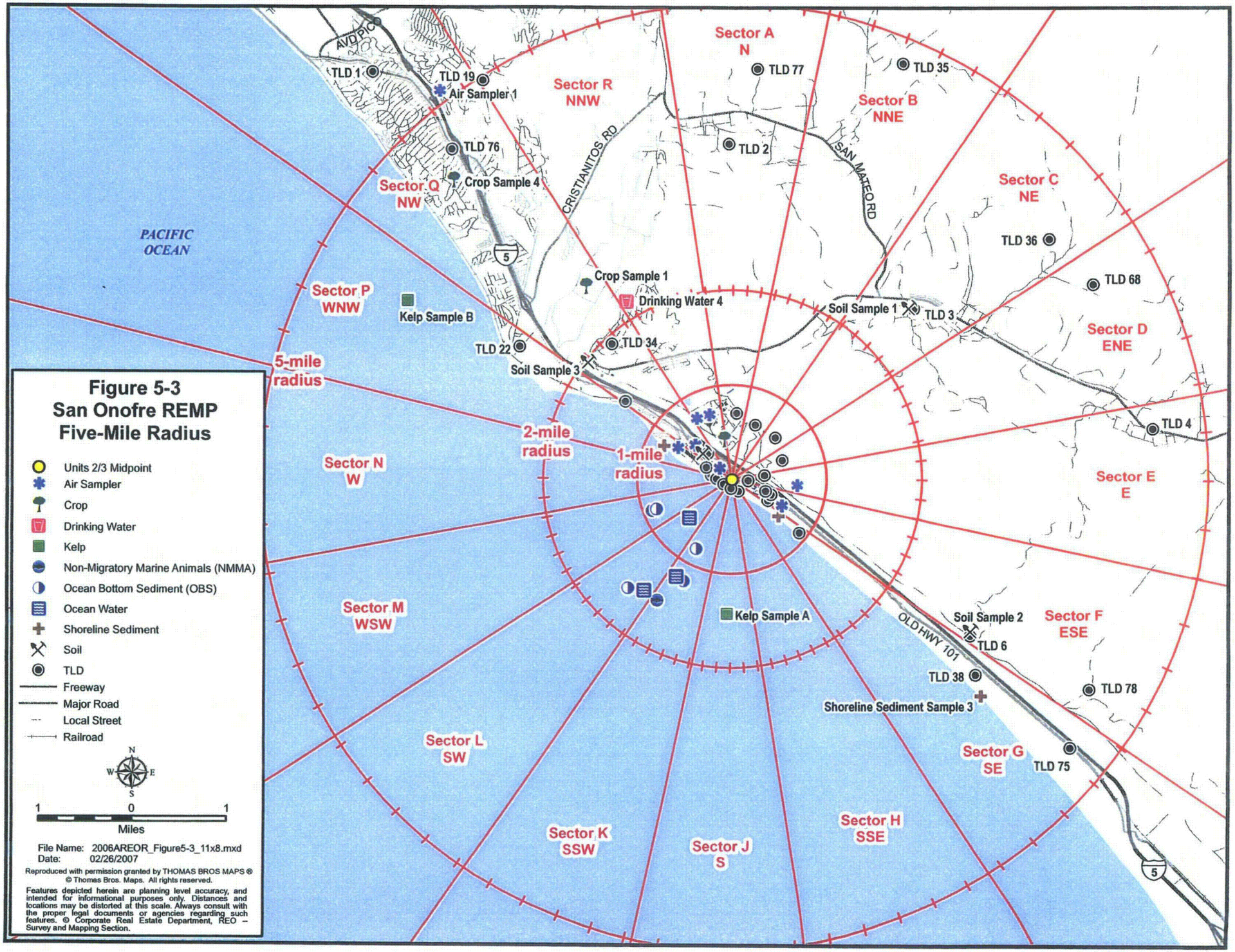
Figure 5-3
San Onofre REMP
Five-Mile Radius
Units 2/3 Midpoint
Air Sampler
Crop
Drinking Water
Kelp
Non-Migratory Marine Animals (NMMA)
Ocean Bottom Sediment (OBS)
Ocean Water
Shoreline Sediment
Soil
TLD
Freeway
Major Road
Local Street
Railroad
N
W
E
S
1
0
1
Miles
File Name: 2006AREOR_Figure5-3_11x8.mxd
Date: 02/26/2007
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PACIFIC OCEAN
AVD PIC
TLD 1
TLD 19
Air Sampler 1
TLD 76
Crop Sample 4
Sector Q
NW
Sector R
NNW
Sector A
N
TLD 77
TLD 35
Sector B
NNE
TLD 2
CRISTIANITOS RD
SAN MATEO RD
Sector C
NE
TLD 36
TLD 68
Sector D
ENE
TLD 3
Soil Sample 1
Crop Sample 1
Drinking Water 4
Sector P
WNW
Kelp Sample B
TLD 22
TLD 34
Soil Sample 3
5-mile
radius
2-mile
radius
1-mile
radius
Sector N
W
TLD 4
Sector E
E
Kelp Sample A
Sector M
WSW
Soil Sample 2
Sector F
ESE
OLD HWY 101
TLD 6
TLD 38
TLD 78
Shoreline Sediment Sample 3
Sector L
SW
Sector G
SE
TLD 75
Sector K
SSW
Sector J
S
Sector H
SSE
5

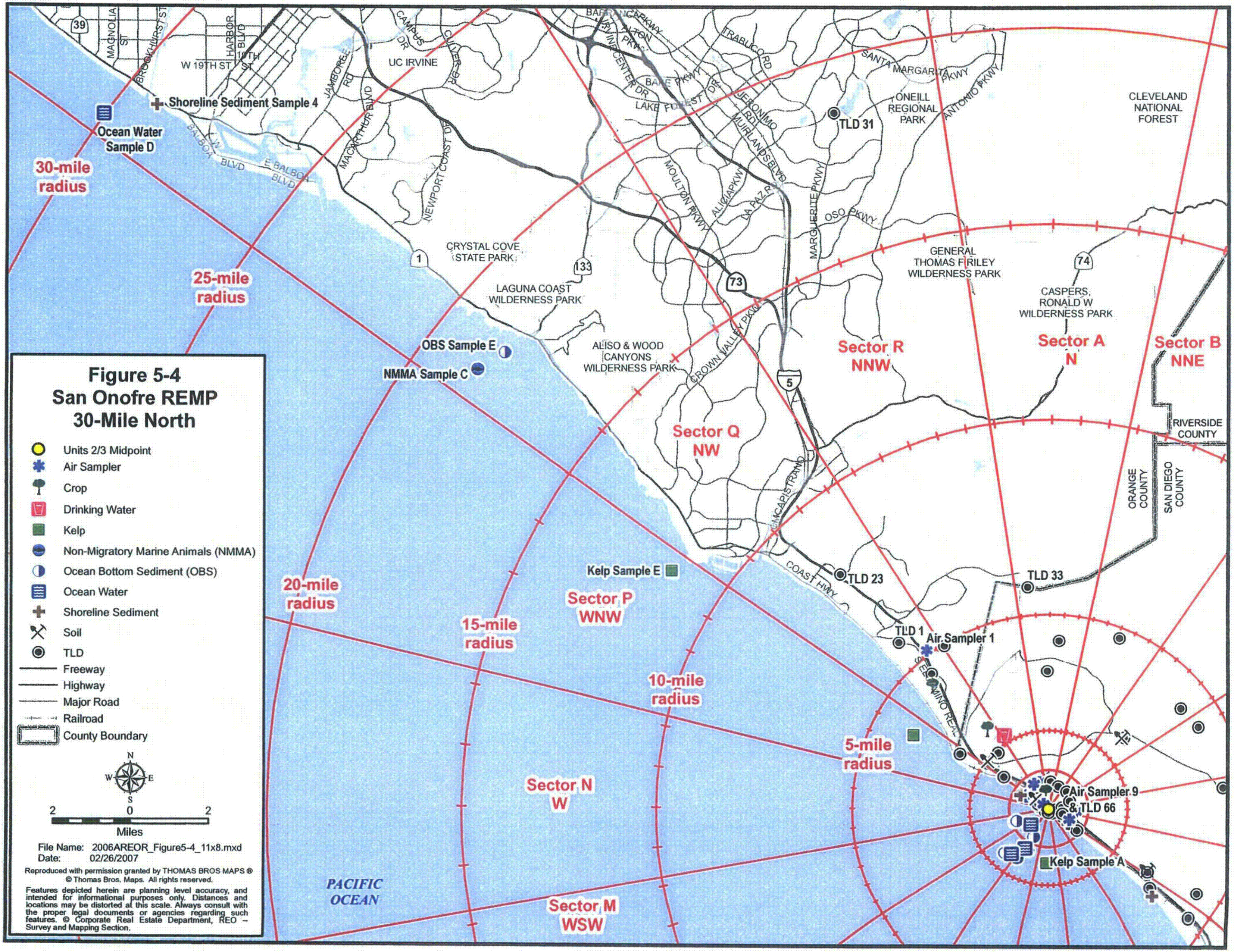
Figure 5-4
San Onofre REMP
30-Mile North
Units 2/3 Midpoint
Air Sampler
Crop
Drinking Water
Kelp
Non-Migratory Marine Animals (NMMA)
Ocean Bottom Sediment (OBS)
Ocean Water
Shoreline Sediment
Soil
TLD
Freeway
Highway
Major Road
Railroad
County Boundary
N
W
E
S
2
0
2
Miles
File Name: 2006AREOR_Figure5-4_11x8.mxd
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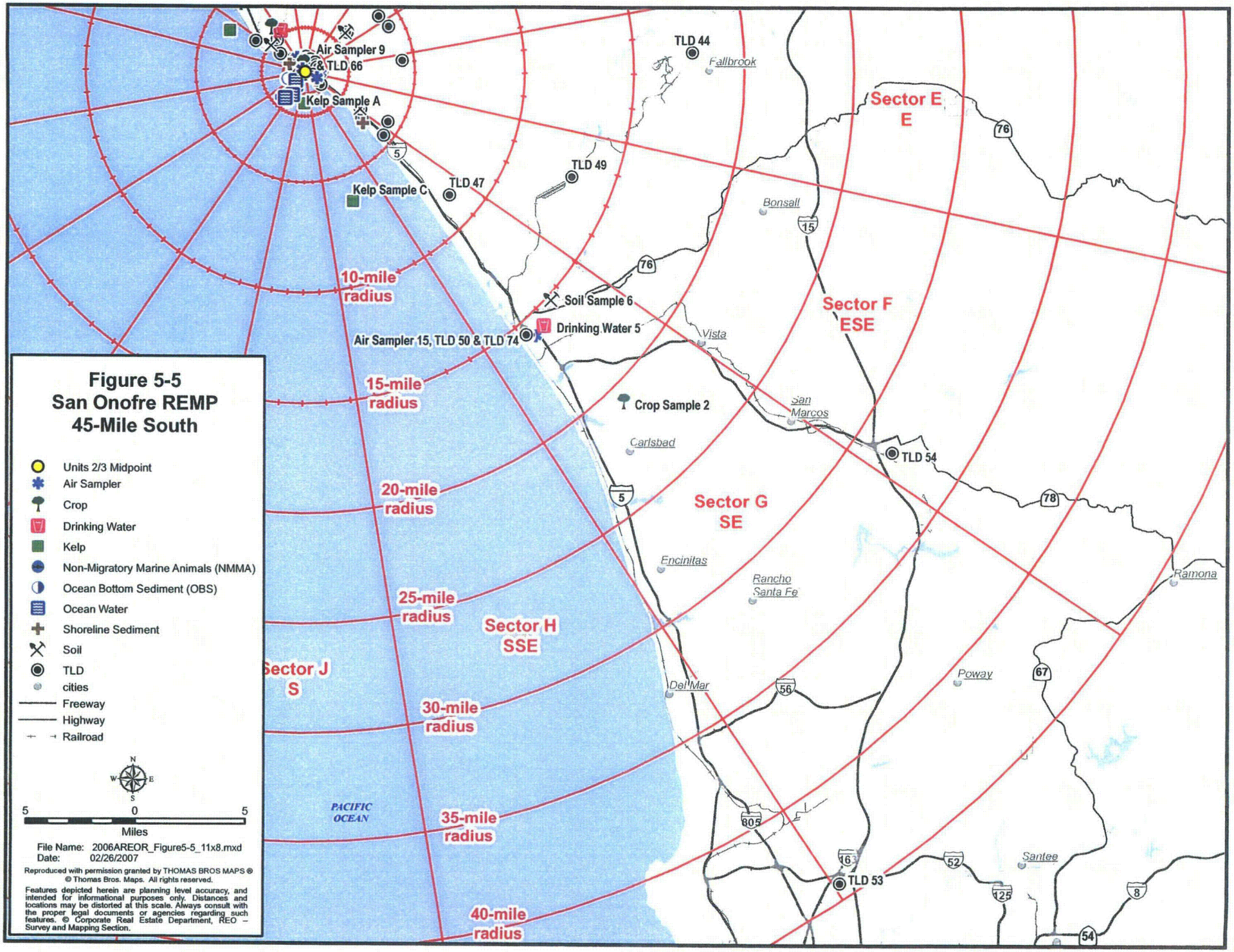
Shoreline Sediment Sample 4
Ocean Water Sample D
30-mile radius
25-mile radius
20-mile radius
15-mile radius
10-mile radius
5-mile radius
OBS Sample E
NMMA Sample C
Kelp Sample E
Kelp Sample A
Air Sampler 1
Air Sampler 9 & TLD 66
TLD 1
TLD 23
TLD 31
TLD 33
Sector A N
Sector B NNE
Sector R NNW
Sector Q NW
Sector P WNW
Sector N W
Sector M WSW
UC IRVINE
CRYSTAL COVE STATE PARK
LAGUNA COAST WILDERNESS PARK
ALISO & WOOD CANYONS WILDERNESS PARK
GENERAL THOMAS F RILEY WILDERNESS PARK
CASPERS, RONALD W WILDERNESS PARK
ONEILL REGIONAL PARK
CLEVELAND NATIONAL FOREST
RIVERSIDE COUNTY
ORANGE COUNTY
SAN DIEGO COUNTY
PACIFIC OCEAN
W 19TH ST
BALBOA BLVD
E BALBOA BLVD
MACARTHUR BLVD
NEWPORT COAST DR
COAST HWY
CAMINO REAL
OSO PKWY
SANTA MARGARITA PKWY
ANTONIO PKWY
TRABUCO RD
MARGUERITE PKWY
MOULTON PKWY
CROWN VALLEY PKWY
LAKE FOREST DR
1
5
39
73
74
133


Air Sampler 9
TLD 66
Kelp Sample A
Kelp Sample C
TLD 47
TLD 49
TLD 44
Fallbrook
Bonsall
Soil Sample 6
Drinking Water 5
Air Sampler 15, TLD 50 & TLD 74
Vista
Crop Sample 2
San Marcos
Carlsbad
TLD 54
Encinitas
Rancho Santa Fe
Ramona
Del Mar
Poway
Santee
TLD 53
PACIFIC OCEAN
10-mile radius
15-mile radius
20-mile radius
25-mile radius
30-mile radius
35-mile radius
40-mile radius
Sector E
E
Sector F
ESE
Sector G
SE
Sector H
SSE
Sector J
S
Figure 5-5
San Onofre REMP
45-Mile South
Units 2/3 Midpoint
Air Sampler
Crop
Drinking Water
Kelp
Non-Migratory Marine Animals (NMMA)
Ocean Bottom Sediment (OBS)
Ocean Water
Shoreline Sediment
Soil
TLD
cities
Freeway
Highway
Railroad
N
W
E
S
5
0
5
Miles
File Name: 2006AREOR_Figure5-5_11x8.mxd
Date: 02/26/2007
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APPENDIX B

SUMMARY, RESULTS, AND DISCUSSIONS

OF 2006 ENVIRONMENTAL DATA

SUMMARY

To assess the changes or trends in the radioactivity level in the environment over the past year, the data from January 2006 to December 2006 were evaluated. The 2006 REMP data were evaluated according to the criteria described in NUREG/CR-4007 and with the methodology described by Currie (1968).* The REMP data above the critical level (1.64 times one sigma) for selected radionuclides, were reduced and tabulated in the Statistical Summary of REMP Data in accordance with the format specified in Reg. Guide 4.8. It should be noted that in an ideal database with the "true" value of each data point equal to zero, five (5)% of the values should be expected to be above the critical level. Excluding natural radionuclides (Be-7, K-40 and Th-228), approximately 5% of the data listed in the Statistical Summary of REMP Data are above the critical level. Thus the 2006 SONGS REMP database, when examined in accordance with the Currie data reduction protocol, leads to the conclusion that SONGS had no statistically significant radiological environmental impact. A summary of the type and number of REMP samples obtained in 2006 appears in Table B-2.

As noted above, the SONGS REMP data base behaves substantially similar to a data base with values statistically indistinguishable from zero for station related isotopes. The exceptions, summarized in Table B-1, include five (5) isotopically analyzed samples with station related activity reported above the *a posteriori* MDC. All sample values were significantly less than the NRC reporting levels. I-131 was detected in kelp and Cs-137 was detected in soil. These radionuclides have been detected in control as well as indicator locations in previous years. Cs-137 is commonly detected in environmental sediment samples because of fallout from weapons testing. Cs-137 has been intermittently detected in the indicator and in the control soil samples in past years and no correlation between Cs-137 level in soil and proximity to the plant has been observed. The data strongly suggest that the low level Cs-137 in certain soil samples is due to fallout from nuclear weapons testing and from Chernobyl. We conclude that the low level Cs-137 in soil is not due to the operation of SONGS. I-131 is a medically administered radionuclide which is often detected in sewage plant outfalls, including those routed to the Pacific Ocean. I-131 has been detected in control and indicator kelp samples, suggesting that the source of the I-131 is external to SONGS. See Table B-1 for data. We conclude that SONGS had a negligible radiological environmental impact during 2006.

Historical trending of data near and below the detection limits is necessarily limited. The concentration of radionuclides in the environs of SONGS has trended downward since the early to mid 1980s. In the past decade only a few REMP analysis results have been above the detection limit. These isotopes are detected in control as well as indicator locations and there are known sources for these radionuclides external to SONGS. The overall trend of the REMP data at SONGS is *de minimis* levels of anthropogenic radioactivity with occasional samples showing radioactivity above the *a posteriori* MDC.

* L. Currie. 1968 "Limits for the Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Analytical Chemistry, vol. 40 pp. 586-593

RESULTS AND DISCUSSIONS OF 2006 ENVIRONMENTAL DATA

A. Direct Radiation

The purpose of this program element was to measure the quarterly environmental gamma radiation in the vicinity of SONGS. To accomplish this task, calcium sulfate ($CaSO_4$) thermoluminescent dosimeters (TLDs) were placed at 38 indicator and 11 control locations. They were collected and analyzed quarterly in accordance with ANSI-N545 standards. TLDs within five miles of SONGS were considered indicator locations. TLDs located greater than five miles from SONGS were considered control locations. The indicator locations are selected as inner and outer rings for all three Units as required by Unit 1 and Units 2/3 Offsite Dose Calculation Manuals (ODCMs). Additional TLDs are placed at locations of interest such as schools and hospitals.

Six laboratory control TLDs were analyzed quarterly. TLD numbers 17, 18, and 60 are used for background dose normalization. TLDs #A and #B are used to compensate for transit dose. A fader TLD is used to compensate for the time and temperature dependent "fade" associated with this type of dosimeter.

After the samples were analyzed, the measured doses were corrected for pre and post field exposure times. The average routine indicator location dose was 17.03 mR with a range of 10.42 to 34.84 mR. The average control location dose was 15.70 mR with a range of 11.99 to 21.08 mR. The routine 2006 REMP TLD data has been grouped into four categories based on distance from SONGS for the purposes of trending any correlation between distance from SONGS and total annual dose.

2006 REMP TLD data (Average Dose vs. Distance from SONGS)

	Average Quarterly Dose in mR
TLDs ≤ 0.5 miles from SONGS	19.75
TLDs > 0.5 miles AND ≤ 1.0 mile from SONGS	14.87
TLDs > 1.0 mile AND ≤ 5.0 miles from SONGS	16.34
TLDs > 5 miles from SONGS (Control TLDs)	15.70

These data indicate no correlation between total dose and distance from SONGS. The variations in the average dose is approximately equal to the median two sigma variation of measurement (1.8 mR per quarter). Statistically, the control and indicator doses are the same value. The routine indicator location at the Units 2/3 midpoint) had the highest TLD average in 2006. The operation of SONGS had no impact on the environment as measured by this sample medium.

Figure 2A compares environmental radiation levels of indicator and control locations for the operational year 2006 and for previous years. This figure show the close correlation between the control and indicator location TLD dose data.

Quality Control Duplicate Direct Radiation Samples
Duplicate QC TLDs were installed adjacent to TLD #66 and TLD #67. Refer to Appendix C for results. These TLDs were not required by the ODCM and are not included in the Statistical Summary of REMP Data.

ISFSI Direct Radiation Samples
ISFSI (Independent Spent Fuel Storage Installation) TLDs were deployed in the vicinity of the ISFSI. Data from these TLDs have not been included in the statistical summary of REMP data since these TLDs are not required by the ODCM. The ISFSI data are listed and discussed in Appendix J.

B. Airborne Particulate, Iodine, and Composite Isotopic Analyses

Air particulate samples were collected on a weekly basis from eight indicator locations and from one control location. The samples were analyzed for gross beta activity, I-131, and composited quarterly for gamma isotopic analysis. Sample locations were selected according to the requirements of the Unit 1 and Units 2/3 Offsite Dose Calculation Manuals.

Gross beta analysis is a measure of total radioactivity of beta-emitting radionuclides in a sample. Beta radiation is emitted by many radionuclides, but beta decay gives a continuous energy spectrum rather than the discrete lines or peaks associated with gamma radiation. Gross beta measurements only indicate whether the sample contains normal or abnormal concentrations of beta-emitting radionuclides and does not identify specific radionuclides. Gross beta measurement data serves as a screening tool to determine if further analysis is required.

Nearly all gross beta activity analysis results were above the *a posteriori* MDC. The concentration of gross beta activity in the samples collected from the indicator locations ranged from 0.0031 to 0.0517 pCi/m^3, averaging 0.0241 pCi/m^3 of air. The concentrations of gross beta activity in the samples from the control location ranged from 0.0029 to 0.0515 pCi/m^3, averaging 0.0235 pCi/m^3 of air. Figure 3D shows the variation in gross beta activity level in 2006 at different locations. These graphs show a close correlation between the indicator and control location data.

Per the requirements of Unit 1 and Units 2/3 ODCM, Section 5, Table 5.1, an assessment was performed to determine whether the gross beta activity of the indicators exceeded 10 times the background (control location #15). The results showed that indicator locations maximum gross beta activity in air in 2006 was 0.0517 pCi/m^3 and the 2005 control location average was 0.0231 pCi/m^3. No action was taken since no indicator location value exceeded ten times the annual average gross beta activity of the control location data from the previous year.

All samples analyzed for I-131 were less than the *a posteriori* MDC and all I-131 samples were less that the *a priori* lower limit of detection (LLD). The airborne indicator and control I-131 REMP samples taken in 2006 at SONGS were statistically indistinguishable from zero.

No samples yielded station related isotopic results confirmed above the *a posteriori* MDC. Quarterly composite gamma spectral analysis analyses yielded only naturally occurring beryllium-7 (Be-7) above the *a posteriori* MDC.

We conclude that the operation of SONGS had no impact on the environment as measured by this sample medium.

C. Ocean Water

Monthly ocean water samples were collected from indicator locations in the vicinity of each station discharge and from the control location at Newport Beach. The samples were analyzed for naturally-occurring and SONGS-related gamma-emitting radionuclides. Quarterly composite ocean water samples were analyzed for tritium according to ODCM requirements.

Four non-ODCM ocean water samples were obtained from two locations, Unit 2 outfall conduit and Unit 3 outfall conduit. The conduit samples were collected to measure the radiological environmental effect potentially resulting from the minor conduit leakage. The conduit sample results are included in the statistical summary.

Throughout 2006, only naturally occurring K-40 was detected in the monthly gamma spectral analyses of ocean water. No station related radionuclides were detected above the *a posteriori* MDC in this sample type during 2006.

Naturally occurring potassium-40 (K-40) was detected in all ocean water samples obtained in 2006. No SONGS related radionuclides were detected in this sample medium during 2006. Excluding K-40, the ocean water gamma isotopic database is statistically indistinguishable from a database with zero activity.

The data indicate that the operation of SONGS had no impact on the environment as measured by this sample medium.

D. Drinking Water

In 2006, drinking water samples were collected on a monthly basis from one indicator location and from the Oceanside control location. Samples were analyzed for tritium, gross beta, and 26 naturally-occurring and SONGS-related gamma emitting radionuclides. There is no drinking water pathway for liquid effluent at SONGS.

No station related radionuclides were detected in drinking water during 2006. The gross beta activity is due to naturally occurring radionuclides. The drinking water gamma isotopic database is statistically indistinguishable from a database with zero activity. The operation of SONGS had no impact on this sample medium.

E. Shoreline Sediment (Beach Sand)

Beach sand was collected semiannually in 2006 from three indicator locations and from a control location situated in Newport Beach. After collection, the samples were analyzed for 26 different plant-related and naturally-occurring radionuclides. Only naturally occurring K-40 and thorium-228 (Th-228) were detected. No plant related radionuclides were reported above the *a posteriori* MDC. The operation of SONGS had no impact on the environment as measured by this sample medium.

F. Ocean Bottom Sediments

Ocean bottom sediments were collected in the vicinity of each of the three SONGS discharge locations and at the Newport Beach control location. The samples were analyzed by gamma-spectral analysis for 26 naturally-occurring and station-related radionuclides. K-40 and Th-228 were detected in all ocean bottom sediment samples collected during 2006.

Four non-ODCM ocean bottom sediment samples were obtained from two locations, Unit 2 outfall conduit and Unit 3 outfall conduit. The conduit samples were collected to measure the radiological environmental effect potentially resulting from the minor conduit leakage. During 2006, all the conduit sample analysis results were below the MDC for station related radionuclides.

We conclude that the operation of SONGS had no significant impact on the environment as measured by this sample medium.

G. Non-Migratory Marine Species (Flesh)

Species of adult fish, crustacea and mollusks, were collected on a semi annual basis at the SONGS Unit 1 outfall, the SONGS Units 2/3 outfall and from Laguna Beach control location. The flesh portion of each sample type was analyzed for 26 gamma-emitting station-related and naturally occurring radionuclides. The results were subsequently reported to Edison in terms of wet sample weights. Because results based on a wet sample weight are most useful for calculating doses, the results of sample analyses are summarized in terms of "as received" wet weights.

No plant related radionuclides were confirmed above the *a posteriori* MDC.

Naturally-occurring K-40 was detected in most marine species samples collected during 2006. No plant related isotopes were reported above the *a posteriori* MDC. The operation of SONGS had no impact on the environment as measured by this sample medium. The potential dose to members of the public from consumption of marine species near SONGS is negligible.

H. Local Crops

Fleshy and leafy crops were collected semiannually in 2006 from the SONGS garden and from the control location 21 miles from SONGS Units 2/3 midpoint in sector F. The crop samples were analyzed quantitatively for 26 gamma-emitting radionuclides, both natural and plant related. Only naturally occurring radionuclides were detected. SONGS had no measurable impact on this sample medium.

I. Soil

To determine if there is evidence of a build-up of radionuclides in the land near SONGS, indicator soil samples were collected from the East Site Boundary (Former Visitor's center), Old Route 101, Basilone Road, and Camp San Onofre. A control sample was obtained from Oceanside. Surface soil was collected from all indicator and control locations at the depth of

3 inches. The sampling protocol is consistent with the procedure described in HASL-300. Soil sampling is not required by ODCMs.

Soil samples were analyzed for 26 naturally-occurring and SONGS-related gamma-emitting radionuclides using gamma spectral analysis. All 2006 soil samples yielded naturally occurring K-40 and Th-228. Cs-137, above the *a posteriori* MDC, was detected in two indicator samples, as well as the control sample. Cs-137 is often detected in environmental sediment samples and the presence of Cs-137 is most likely related to nuclear weapons testing fallout.

Cs-137 and strontium-90 (Sr-90) were detected in soil profile analyses conducted in previous years. These radionuclides are mostly due to the nuclear weapons testing fallout depositing on soil and retention of these radionuclides due to their long half lives. The presence of Cs-137 in the indicator and the control locations in previous years supports the conclusion that the major source of this radionuclide is fallout deposition. The Cs-137 activity can be attributed to atmospheric nuclear weapons tests and not SONGS operations. During 2006, the operation of SONGS had no impact on the environment as measured by this sample medium.

J. Kelp Sampling

Kelp was collected during April and October 2006 from the San Onofre kelp beds, San Mateo kelp beds, Barn kelp beds, and from the Salt Creek control location. Upon collection, the samples were analyzed by gamma-spectral analysis for 26 different naturally-occurring and Station-related radionuclides. The radionuclides detected in 2006 were Be-7, K-40 and I-131. K-40 and Be-7 are naturally occurring and not related to the operation of SONGS. I-131 was detected in one control sample and one indicator sample. I-131 is often detected in Sewage Plant outfalls, including those routed to the Pacific Ocean.

I-131 has been detected at indicator and control locations in previous years. The northern control location is too far away and in the predominantly upstream current direction for the I-131 activity to be attributable to SONGS. The presence of low levels of I-131 in both the indicator and the control locations suggest a source which is external to SONGS. The I-131 activity in kelp data, graphically presented in Figure 4, shows a relatively close correlation between indicator and control locations over a 25 year period - further supporting the assessment that the likely source for this radionuclide is external to SONGS.

K. Correlation of Effluent Concentrations to Concentrations in the Environment

In accordance with 10 CFR 50 Appendix I, a correlation study was generated to estimate the environmental concentration of selected radionuclides using the methodology outlines in Reg. Guide 1.109 and basing the projected environmental concentrations on actual SONGS effluent data. The predicted environmental concentrations of the radionuclides listed in the ODCM Table 5-3 for all ODCM identified environmental media are much less than the associated environmental *a priori* LLD and the lower, count specific, *a posteriori* MDC. With two exceptions, the measured concentrations of these radionuclides are also less than the *a posteriori* MDC. The exceptions are Cs-137 in soil and I-131 in Kelp.

The REMP soil Cs-137 levels in the control and indicator samples are about equal which leads to the conclusion that Cs-137 in soil is attributable to residual fallout from external anthropogenic factors such as nuclear weapons testing and Chernobyl. The predicted concentration for Cs-137 in soil (based on effluent data) is about 2 to 3 orders of magnitude lower than the measured concentration of Cs-137 in soil. The effluent based correlation calculation indicates that even if there were no Cs-137 in soil from sources external to SONGS, the Cs-137 concentration in soil attributable to the operation of SONGS would be undetectable.

The SONGS REMP indicator and control kelp samples have historically contained equal concentrations of I-131. The I-131 concentration in the control kelp sample location, approximately twelve (12) miles from SONGS in the predominantly upstream direction, has historically been slightly higher than the indicator locations. Kelp has a very large biomagnification factor and can concentrate very low concentrations of I-131 in ocean water to detectable I-131 levels in kelp. The SONGS I-131 liquid effluent release data are too low to account for the I-131 in Kelp at the indicator and control locations. We conclude that the I-131 in Kelp is probably attributable to sewage treatment plant discharges in the predominantly upstream direction, near the kelp control location.

TABLE B-1

Summary of SONGS related Gamma Isotopic Analyses confirmed above MDC

Sample Media & location	Radionuclide	Sample Value	MDC (*a posteriori*)
Aquatic Kelp San Onofre Kelp Bed Station A 18APR06	I-131	(14 ± 7) E-3 pCi/g	11 E-3 pCi/g
Aquatic Kelp Salt Creek (Control) Station E 06JUNE06	I-131	(36 ± 20) E-3 pCi/g	29 E-3 pCi/g
Soil Camp San Onofre Location # 1 20SEP06	Cs-137	(133 ± 32) E-3 pCi/g	40 E-3 pCi/g
Soil Old El Camino Real Location #2 20SEP06	Cs-137	(329 ± 48) E-3 pCi/g	42 E-3 pCi/g
Soil Oceanside Control Location #6 20SEP06	Cs-137	(245 ± 27) E-3 pCi/g	17 E-3 pCi/g

TABLE B-2

REMP SAMPLE ANALYSIS SUMMARY FOR 2006

Medium	Analysis Type	Sampling Frequency	# of Locations	Total # of Analyses in 2006
Direct Radiation	Dosimetry	Quarterly	49	196
Airborne Particulates	Gross Beta	Weekly	9	468
Charcoal Cartridge	I-131	Weekly	9	468
Airborne Particulates	Ge (Li) Scan	Quarterly	9	36
Ocean Water	Ge (Li) Scan	Monthly	4	48
Ocean Water	H-3	Quarterly	4	16
Ocean Water Conduit	Ge (Li) Scan	Semi-Annually	2	4
Drinking Water, Unfiltered	Ge (Li) Scan H-3 Gross Beta	Monthly	3 3 3	27 27 27
Shoreline Sediment	Ge (Li) Scan	Semi-Annually	4	8
Ocean Bottom Sediment	Ge (Li) Scan	Semi-Annually	7	14
Marine Species, Flesh	Ge (Li) Scan	Semi-Annually	3	30
Crops	Ge (Li) Scan	Semi-Annually	2	8
Kelp	Ge (Li) Scan	Semi-Annually	4	5
Soil	Ge (Li) Scan	Annually	5	5

STATISTICAL SUMMARY OF REMP DATA FOR 2006

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)	Location with Highest Annual Mean		Control Locations Mean (Range)	Number of Nonroutine Reported Measurements
				Name, Distance and Direction	Mean (Range)		
Quarterly Gamma Exposure – Table 1A (mR/std quarter)							
	Gamma 196	5	17.03 (152/152) (10.42 – 34.84)	South Yard Facility, 0-4, ESE	29.62 (4/4) (23.52 – 34.84)	15.70 (44/44) (11.99 – 21.08)	

(1) Indicator location TLDs include all REMP TLDs 5.0 miles or closer to SONGS 2/3 midpoint.
(2) Control location TLDs include all REMP TLDs more than 5.0 miles from SONGS 2/3 midpoint.
(3) Indicator location TLD data excludes QC TLDs, transit dose TLDs, and ISFSI TLDs.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)	Location with Highest Annual Mean		Control Locations Mean (Range)	Number of Nonroutine Reported Measurements
				Name, Distance and Direction	Mean (Range)		
Weekly Airborne Particulates Gross Beta Activity – Table 2 (pCi/cu.m)							
	Gross Beta 468	0.01	0.0241 (415/416) (0.0031 – 0.0517)	Mesa EOF 0.7 Miles NNW	0.0252 (52/52) (0.0056 – 0.0490)	0.0235 (52/52) (0.0029 – 0.0515)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)	Location with Highest Annual Mean		Control Locations Mean (Range)	Number of Nonroutine Reported Measurements
				Name, Distance and Direction	Mean (Range)		
Weekly Radioiodine I-131 Activity – Table 3 (pCi/cu.m)							
	I-131 468	0.07	0.0197 (23/416) (0.0130 – 0.0330)	Mesa EOF 0.7 Mi. NNW	0.0235 (2/52) (0.0140 – 0.0330)	0.0145 (2/52) (0.0130 – 0.0160)	0

This table summarizes the weekly air iodine 131 cartridge data above the critical level (1.64 x One Sigma). Note that in an ideal gamma isotopic database, consisting entirely of sample values with no detectable radioactivity, approximately 5% of the data will be greater than the critical level. In 2006, all weekly iodine 131 cartridge analysis results were less than the *a posteriori* MDC (Minimum Detectable Concentration).

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Quarterly Comp. Airborne Particulates Gamma – Table 4A (pCi/cu.m)							
	Be-7 36	0.04	0.13 (32/32) (0.0820 – 0.017)	Mesa Medical Facility 0.7 Mi. NNW	0.14 (4/4) (0.11 – 0.17)	0.13 (4/4) (0.11 – 0.14)	0
	Cs-134 36	0.05	6.58E-4 (5/32) (2.80E-4 – 8.30E-4)	Mesa Medical Facility 0.7 Mi. NNW	8.30E-4 (1/4) (8.30E-4 – 8.30E-4)	4.10E-4 (1/4) (4.10E-4 – 4.10E-4)	0
	Cs-137 36	0.06	8.00E-4 (5/32) (7.10E-4 – 9.00E-4)	Bluff 0.7 Mi. WNW	8.80E-4 (2/4) (8.60E-4 – 9.00E-4)	<LLD (0/4) (-)	0

Be-7 (Beryllium 7) is a naturally occurring radioactive isotope produced by cosmic radiation. Be-7 was confirmed above the detection limit in all the SONGS air particulate quarterly composite samples analyzed in 2006. All other air particulate quarterly composite analysis results were less than the detection limit.

The term "< LLD," as used above, means that all results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular sample result should be considered other than background. The numerical values for Cs-134 (Cesium-134) and Cs-137 (Cesium-137) listed in this table are those values above the critical level and do not indicate that these radionuclides were detected in any samples.

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Monthly Ocean Water Gamma Spectral Analysis – Table 5 (pCi/l)											
	Ba-140	52	15	3.30 (3.30 – 3.30)	(1/40)	(B) Outfall – Unit 2 1.5 Mi SW	3.30 (3.30 – 3.30)	(1/12)	< LLD (-)	(0/12)	0
	Co-58	52	15	< LLD (-)	(0/40)	(D) Newport Beach 30 Mi NW	2.90 (2.30 – 3.50)	(2/12)	2.90 (2.30 – 3.50)	(2/12)	0
	Co-60	52	15	3.25 (2.30 – 4.60)	(4/40)	Unit 2 Conduit 0.1 Mi SW	3.70 (3.70 – 3.70)	(1/2)	3.10 (3.10 – 3.10)	(1/12)	0
	Cs-134	52	15	3.05 (1.90 – 4.00)	(6/40)	(A) Station Discharge Outfall – Unit 1 0.6 Mi SW	4.00 (4.00 – 4.00)	(1/12)	< LLD (-)	(0/12)	0
	Cs-137	52	18	< LLD (-)	(0/40)		---- (-)	(0/2)	< LLD (-)	(0/12)	0
	Fe-59	52	30	< LLD (-)	(0/40)		---- (-)	(0/2)	< LLD (-)	(0/12)	0
	I-131	52	15	5.40 (5.40 – 5.40)	(1/40)	(D) Newport Beach 30 Mi NW	5.60 (5.60 – 5.60)	(1/12)	5.60 (5.60 – 5.60)	(1/12)	0
	K-40	52	150	314.77 (247.00 – 405.00)	(40/40)	(C) Outfall – Unit 3 1.2 Mi SSW	324.08 (288.00 -384.00)	(12/12)	308.58 (251.00 – 376.00)	(12/12)	0

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Monthly Ocean Water Gamma Spectral Analysis – Table 5 (pCi/l)											
	La-140	52	15	3.80 (3.80 – 3.80)	(1/40)	(B) Outfall - Unit 2 1.5 Mi SW	3.80 (3.80 – 3.80)	(1/12)	< LLD (-)	(0/12)	0
	Mn-54	52	15	2.20 (1.60 – 2.80)	(2/40)	Unit 2 Conduit 0.1 Mi SW	2.80 (2.80 – 2.80)	(1/2)	< LLD (-)	(0/12)	0
	Nb-95	52	15	3.15 (2.10 – 4.20)	(2/40)	Unit 2 Conduit 0.1 Mi SW	4.20 (4.20 – 4.20)	(1/2)	< LLD (-)	(0/12)	0
	Zr-95	52	15	6.10 (5.50 – 6.70)	(2/40)	(B) Outfall - Unit 2 1.5 Mi SW	6.70 (6.70 – 6.70)	(1/12)	< LLD (-)	(0/12)	0

The naturally occurring radioactive isotope K-40 (Potassium 40) was detected in all SONGS Ocean water samples analyzed in 2006. The analysis results for all other radionuclides were less than the detection limit.

The term "< LLD," as used above, means that all results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular sample result should be considered other than background. The numerical values listed in this table are those values above the critical level and do not indicate that these radionuclides were detected in any samples.

This table is a statistical summary of the radionuclides detected in 2006 (K-40) and the radionuclides listed in the ODCM (Offsite Dose Calculation Manual).

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Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean			Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
						Name, Distance and Direction	Mean (Range)				
Quarterly Composite Ocean Water Tritium Activity – Table 7 (pCi/l)											
	H-3	16	2000	< LLD (-)	(0/12)	--- (-)		(0/4)	< LLD (-)	(0/4)	0

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Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Monthly Drinking Water Analysis – Table 9A (pCi/l)										
	Co-58	27	15	2.40 (2.40 – 2.40)	(1/15)	Camp Pendleton 2.2 Mi NNW	2.40 (2.40 – 2.40)	(1/12)	< LLD (-)	(0/12)	0
	Co-60	27	15	3.57 (3.00 – 4.60)	(3/15)	Camp Pendleton 2.2 Mi NNW	3.57 (3.00 – 4.60)	(3/12)	2.75 (2.60 – 2.90)	(2/12)	0
	Cs-134	27	15	< LLD (-)	(0/15)		---- (-)	(0/3)	< LLD (-)	(0/12)	0
	Cs-137	27	18	< LLD (-)	(0/15)	Oceanside (Control) 15.6 Mi SE	2.90 (2.90 – 2.90)	(1/12)	2.90 (2.90 – 2.90)	(1/12)	0
	Fe-59	27	30	3.80 (3.80 – 3.80)	(1/15)	Camp Pendleton 2.2 Mi NNW	3.80 (3.80 – 3.80)	(1/12)	< LLD (-)	(0/12)	0
	Gross Beta	27	4	4.64 (2.70 – 7.70)	(14/15)	Oceanside (Control) 15.6 Mi SE	7.65 (4.70 – 18.50)	(12/12)	7.65 (4.70 – 18.50)	(12/12)	0
	H-3	27	2000	< LLD (-)	(0/15)		---- (-)	(0/12)	< LLD (-)	(0/12)	0
	I-131	27	15	4.00 (4.00 – 4.00)	(1/15)	Camp Pendleton 2.2 Mi NNW	4.00 (4.00 – 4.00)	(1/12)	< LLD (-)	(0/12)	0

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Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Monthly Drinking Water Analysis – Table 9A (pCi/l)										
	K-40	27	150	< LLD (-)	(0/15)	Oceanside (Control) 15.6 Mi SE	47.50 (45.00 – 50.00)	(2/12)	47.50 (45.00 – 50.00)	(2/12)	0
	La-140	27	15	5.20 (5.20 – 5.20)	(1/15)	Camp Pendleton 2.2 Mi NNW	5.20 (5.20 – 5.20)	(1/12)	< LLD (-)	(0/12)	0
	Mn-54	27	15	< LLD (-)	(0/15)		---- (-)	(0/12)	< LLD (-)	(0/12)	0
	Nb-95	27	15	< LLD (-)	(0/15)		---- (-)	(0/12)	< LLD (-)	(0/12)	0
	Th-228	27	30	11.10 (10.80 – 11.50)	(3/15)	Oceanside (Control) 15.6 Mi SE	14.00 (14.00 – 14.00)	(1/12)	14.00 (14.00 – 14.00)	(1/12)	0
	Zn-65	27	30	12.00 (12.00 – 12.00)	(2/15)	Camp Pendleton 2.2 Mi NNW	12.00 (12.00 – 12.00)	(1/12)	5.80 (5.80 – 5.80)	(1/12)	0

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Monthly Drinking Water Analysis – Table 9A (pCi/l)										
	Zr-95 27	15	3.90 (3.90 – 3.90)	(2/15)	Camp Pendleton 2.2 Mi NNW	3.90 (3.90 – 3.90)	(1/12)	< LLD (-)	(0/12)	0

During 2006 gross beta was confirmed above the *a posteriori* MDC in most drinking water samples. Gross beta is attributable to naturally occurring radionuclides. One analysis result from San Clemente well # 6 had naturally occurring Th-228 (Thorium 228) confirmed above the *a posteriori* MDC. All the other analysis results were less than detectable.

The term "< LLD," as used above, means that all results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular sample result should be considered other than background. The numerical values listed in this table are those values above the critical level and do not indicate that these radionuclides were detected in any samples.

This table is a statistical summary of the analysis results confirmed above the *a posteriori* MDC in 2006 (Gross Beta and Th-228) as well as those radionuclides listed in the ODCM (Offsite Dose Calculation Manual).

Starting in October 2006 San Clemente Well # 6 was sampled and analyzed as a courtesy to the City of San Clemente. This table includes the City of San Clemente drinking water analysis results.

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Semi-annual Shoreline Sediment Gamma Spectral Analysis – Table 10 (pCi/g)							
	Cs-134 8	0.15	<LLD (0/6) (-)		--- (0/2) (-)	<LLD (0/2) (-)	0
	Cs-137 8	0.18	0.0160 (2/6) (0.0150 – 0.0170)	San Onofre Surfing Beach 0.8 Mi. WNW	0.0170 (1/2) (0.0170 – 0.0170)	<LLD (0/2) (-)	0
	K-40 8	1.5	12.45 (6/6) (8.88 - 14.80)	Newport Beach North End 29.2 Mi. NW	18.71 (2/2) (18.13 – 19.29)	18.71 (2/2) (18.13 – 19.29)	0
	Th-228 8	0.4	0.30 (6/6) (0.12 – 0.51)	Newport Beach North End 29.2 Mi. NW	0.89 (2/2) (0.36 – 1.42)	0.89 (2/2) (0.36 – 1.42)	0

During 2006 naturally occurring Th-228 (thorium 228) and K-40 (potassium 40) were confirmed above the *a posteriori* MDC in most shoreline sediment samples.

The term "< LLD," used above, indicates that all analysis results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular sample result should be considered other than background. The numerical values listed in this table for Cs-137 are those values above the critical level and do not indicate that Cs-137 was detected in any samples.

This table is a statistical summary of the analysis results confirmed above the *a posteriori* MDC in 2006 (K-40 and Th-228) as well as those radionuclides listed in the ODCM (Offsite Dose Calculation Manual).

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Semi-Annual Ocean Bottom Sediment Gamma Spectral Analysis – Table 11 (pCi/g)										
	Cs-134	14	0.15	< LLD (-)	(0/12)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
	Cs-137	14	0.18	0.0200 (0.0099 – 0.0260))	(3/12)	Unit 2 Conduit 0.1 Mi SW	0.0260 (0.0260 – 0.0260)	(1/2)	< LLD (-)	(0/2)	0
	K-40	14	1.5	16.53 (14.00 – 20.30)	(12/12)	(B) Unit 1 Outfall 0.8 Mi SSW	19.65 (19.00 – 20.30)	(2/2)	9.43 (6.05 – 12.80)	(2/2)	0
	Th-228	14	0.4	0.56 (0.13 – 2.27)	(12/12)	Unit 2 Conduit 0.1 Mi SW	1.28 (0.28 – 2.27)	(2/2)	0.14 (0.14 – 0.14)	(1/2)	0

During 2006, naturally occurring Th-228 (thorium 228) and K-40 (potassium 40) were confirmed above the *a posteriori* MDC in most ocean bottom sediment samples.

The term "< LLD," used above, indicates that all analysis results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular sample result should be considered other than background. The numerical values listed in this table for Cs-137 are those values above the critical level and do not indicate that Cs-137 was detected in any samples.

This table is a statistical summary of the analysis results confirmed above the *a posteriori* MDC in 2006 (K-40 and Th-228) as well as those radionuclides listed in the ODCM (Offsite Dose Calculation Manual).

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Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
Bay Mussel	Co-58	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Bay Mussel	Co-60	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Bay Mussel	Cs-134	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Bay Mussel	Cs-137	3	0.15	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Bay Mussel	Fe-59	3	0.26	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Bay Mussel	K-40	3	1.4	2.13 (1.90 – 2.35)	(2/2)	(A) Unit 1 Outfall 0.9 Mi WSW	2.35 (2.35 – 2.35)	(1/1)	1.84 (1.84 – 1.84)	(1/1)	0
Bay Mussel	Mn-54	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Bay Mussel	Zn-65	3	0.26	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0

<LLD results are less than the critical level 1.64 sigma.

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Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
Blacksmith	Co-58	3	0.13	< LLD (-)	(0/1)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Blacksmith	Co-60	3	0.13	< LLD (-)	(0/1)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Blacksmith	Cs-134	3	0.13	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/2)	0
Blacksmith	Cs-137	3	0.15	0.0110 (0.0110 – 0.0110)	(1/1)	(B) Units 2 & 3 Outfall 1.5 Mi SSW	0.0110 (0.0110 – 0.0110)	(1/1)	< LLD (-)	(0/2)	0
Blacksmith	Fe-59	3	0.26	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/2)	0
Blacksmith	K-40	3	1.4	3.47 (3.47 – 3.47)	(1/1)	(C) Laguna Beach 18.2 Mi NW	3.75 (3.61 – 3.89)	(2/2)	3.75 (3.61 – 3.89)	(2/2)	0
Blacksmith	Mn-54	3	0.13	< LLD (-)	(0/1)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Blacksmith	Zn-65	3	0.26	< LLD (-)	(0/1)		---- (-)	(0/2)	< LLD (-)	(0/2)	0

<LLD results are less than the critical level 1.64 sigma.

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Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
California Mussel	Co-58	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
California Mussel	Co-60	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
California Mussel	Cs-134	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
California Mussel	Cs-137	3	0.15	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
California Mussel	Fe-59	3	0.26	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
California Mussel	K-40	3	1.4	1.97 (1.95 – 1.99)	(2/2)	(C) Laguna Beach 18.2 Mi NW	2.04 (2.04 – 2.04)	(1/1)	2.04 (2.04 – 2.04)	(1/1)	0
California Mussel	Mn-54	3	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
California Mussel	Nb-95	3		< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
California Mussel	Zn-65	3	0.26	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/1)	0

<LLD results are less than the critical level 1.64 sigma.

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Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
Black Perch	Co-58	2	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Black Perch	Co-60	2	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Black Perch	Cs-134	2	0.13	0.0250 (0.0250 – 0.0250)	(1/2)	(A) Unit 1 Outfall 0.9 Mi WSW	0.0250 (0.0250 – 0.0250)	(1/2)	< LLD (-)	(0/0)	0
Black Perch	Cs-137	2	0.15	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Black Perch	Fe-59	2	0.26	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Black Perch	K-40	2	1.4	2.81 (2.70 – 2.92)	(2/2)	(A) Unit 1 Outfall 0.9 Mi WSW	2.81 (2.70 – 2.92)	(2/2)	< LLD (-)	(0/0)	0
Black Perch	Mn-54	2	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Black Perch	Zn-65	2	0.26	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0

<LLD results are less than the critical level 1.64 sigma.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
Half Moon	Co-58	1	0.13	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Half Moon	Co-60	1	0.13	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Half Moon	Cs-134	1	0.13	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Half Moon	Cs-137	1	0.15	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Half Moon	Fe-59	1	0.26	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Half Moon	K-40	1	1.4	3.75 (3.75 – 3.75)	(1/1)	(A) Unit 1 Outfall 0.9 Mi WSW	3.75 (3.75 – 3.75)	(1/1)	< LLD (-)	(0/0)	0
Half Moon	Mn-54	1	0.13	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Half Moon	Zn-65	1	0.26	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0

<LLD results are less than the critical level 1.64 sigma.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
Kelp Bass	Co-58	2	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Kelp Bass	Co-60	2	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Kelp Bass	Cs-134	2	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Kelp Bass	Cs-137	2	0.15	0.0112 (0.0112 – 0.0112)	(0/2)	(B) Units 2 & 3 Outfall 1.5 MI SSW	0.0112 (0.0112 – 0.0112)	(1/2)	< LLD (-)	(0/0)	0
Kelp Bass	Fe-59	2	0.26	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Kelp Bass	K-40	2	1.4	3.37 (3.30 – 3.43)	(2/2)	(B) Units 2 & 3 Outfall 1.5 MI SSW	3.37 (3.30 – 3.43)	(2/2)	< LLD (-)	(0/0)	0
Kelp Bass	Mn-54	2	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Kelp Bass	Zn-65	2	0.26	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0

<LLD results are less than the critical level 1.64 sigma.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
Sheephead	Co-58	4	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/2)	0
Sheephead	Co-60	4	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/2)	0
Sheephead	Cs-134	4	0.13	< LLD (-)	(0/2)		---- (-)	(0/1)	< LLD (-)	(0/2)	0
Sheephead	Cs-137	4	0.15	0.0180 (0.0180 – 0.0180)	(1/2)	(B) Units 2 & 3 Outfall 1.5 Mi SSW	0.0180 (0.0180 – 0.0180)	(1/1)	< LLD (-)	(0/2)	0
Sheephead	Fe-59	4	0.26	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Sheephead	Mn-54	4	0.13	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Sheephead	Zn-65	4	0.26	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/2)	0

<LLD results are less than the critical level 1.64 sigma.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Non-Migratory Marine Animals (Flesh) Analysis – Table 12A (pCi/g)											
Spiny Lobster	Co-58	6	0.13	< LLD (-)	(0/4)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Spiny Lobster	Co-60	6	0.13	< LLD (-)	(0/4)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Spiny Lobster	Cs-134	6	0.13	< LLD (-)	(0/4)	(C) Laguna Beach 18.2 Mi NW	0.0190 (0.0190 – 0.0190)	(1/2)	0.0190 (0.0190 – 0.0190)	(1/2)	0
Spiny Lobster	Cs-137	6	0.15	< LLD (-)	(0/4)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Spiny Lobster	Fe-59	6	0.26	< LLD (-)	(0/4)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Spiny Lobster	K-40	6	1.4	3.38 (2.86 – 3.90)	(4/4)	(B) Units 2 & 3 Outfall 1.5 Mi SSW	3.59 (3.28 – 3.90)	(2/2)	3.47 (3.30-3.64)	(2/2)	0
Spiny Lobster	Mn-54	6	0.13	0.0230 (0.0230 – 0.0230)	(1/4)	(B) Units 2 & 3 Outfall 1.5 Mi SSW	0.0230 (0.0230 – 0.0230)	(1/2)	< LLD (-)	(0/2)	0
Spiny Lobster	Zn-65	6	0.26	< LLD (-)	(0/4)		---- (-)	(0/2)	< LLD (-)	(0/2)	0

<LLD results are less than the critical level 1.64 sigma.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Local Crops Gamma Spectral Analysis – Table 13A (pCi/g)											
Artichoke	Cs-134	1	0.06	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Artichoke	Cs-137	1	0.08	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Artichoke	I-131	1	0.06	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/0)	0
Artichoke	K-40	1	1	2.80 (2.80 – 2.80)	(1/1)	SONGS Garden 0.4 Mi NNW	2.80 (2.80 – 2.80)	(1/1)	< LLD (-)	(0/0)	0
Cilantro	Cs-134	1	0.06	< LLD (-)	(0/0)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Cilantro	Cs-137	1	0.08	< LLD (-)	(0/0)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Cilantro	I-131	1	0.06	< LLD (-)	(0/0)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Cilantro	K-40	1	1	< LLD (-)	(0/0)	Southeast of Oceanside 22 Mi SE	5.46 (5.46 – 5.46)	(1/1)	5.46 (5.46 – 5.46)	(1/1)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Local Crops Gamma Spectral Analysis – Table 13A (pCi/g)											
Lettuce	Cs-134	1	0.06	< LLD (-)	(0/0)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Lettuce	Cs-137	1	0.08	< LLD (-)	(0/0)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Lettuce	I-131	1	0.06	< LLD (-)	(0/0)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Lettuce	K-40	1	1	< LLD (-)	(0/0)	Southeast of Oceanside 22 Mi SE	2.02 (2.02 – 2.02)	(1/1)	2.02 (2.02 – 2.02)	(1/1)	0
Sorrel	Cs-134	2	0.06	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Sorrel	Cs-137	2	0.08	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Sorrel	I-131	2	0.06	< LLD (-)	(0/2)		---- (-)	(0/2)	< LLD (-)	(0/0)	0
Sorrel	K-40	2	1	3.33 (2.95 – 3.70)	(2/2)	SONGS Garden 0.4 Mi NNW	3.33 (2.95 – 3.70)	(2/2)	< LLD (-)	(0/0)	0

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Local Crops Gamma Spectral Analysis – Table 13A (pCi/g)											
Tomato	Cs-134	3	0.06	< LLD (-)	(0/1)		---- (-)	(0/2)	< LLD (-)	(0/2)	0
Tomato	Cs-137	3	0.08	< LLD (-)	(0/1)	Southeast of Oceanside 22 Mi SE	0.0110 (0.0110 – 0.0110)	(1/2)	0.0110 (0.0110 – 0.0110)	(1/2)	0
Tomato	I-131	3	0.06	< LLD (-)	(0/1)		---- (-)	(0/1)	< LLD (-)	(0/2)	0
Tomato	K-40	3	1	1.64 (1.64 – 1.64)	(1/1)	Southeast of Oceanside 22 Mi SE	1.72 (1.29 – 2.14)	(2/2)	1.72 (1.29 – 2.14)	(2/2)	0

During 2006, naturally occurring K-40 (potassium 40) was confirmed above the *a posteriori* MDC in all local crop samples.

The term "< LLD," used above, indicates that all analysis results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular analysis result should be considered as other than background. The numerical values listed in this table for Cs-137 are those values above the critical level and do not indicate that Cs-137 was detected in any samples.

This table is a statistical summary of the analysis results confirmed above the *a posteriori* MDC in 2006 (K-40) as well as those radionuclides listed in the ODCM (Offsite Dose Calculation Manual).

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Annual Soil Analysis – Depth 3 " – Table 14 (pCi/g)										
	Cs-134	5	0.15	< LLD (-)	(0/4)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
	Cs-137	5	0.18	0.23 (0.13 – 0.33)	(2/4)	Old Route 101 – East Southeast 3 Mi ESE	0.33 (0.33 – 0.33)	(1/1)	0.25 (0.25 – 0.25)	(1/1)	0
	K-40	5	1.5	15.01 (8.56 – 19.50)	(4/4)	Basilone Road/I-5 Freeway Offramp 2 Mi NW	19.50 (19.50 – 19.50)	(1/1)	3.43 (3.43 – 3.43)	(1/1)	0
	Th-228	5	0.4	0.62 (0.42 – 0.94)	(4/4)	Basilone Road/I-5 Freeway Offramp 2 Mi NW	0.94 (0.94 – 0.94)	(1/1)	0.20 (0.20 – 0.20)	(1/1)	0

During 2006, naturally occurring Th-228 (thorium 228) and K-40 (potassium 40) were confirmed above the *a posteriori* MDC in all soil samples. Cs-137 (Cesium 137) was detected in three samples are roughly the same level or concentration and is attributable to fallout from nuclear weapons testing and from Chernobyl.

The term "< LLD," used above, indicates that all analysis results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular sample result should be considered other than background.

This table is a statistical summary of the analysis results confirmed above the *a posteriori* MDC in 2006 (K-40 and Th-228) as well as those radionuclides listed in the ODCM (Offsite Dose Calculation Manual) for sediment samples.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

SAN ONOFRE NUCLEAR GENERATING STATION

DOCKET NOS. 50-206, 50-361, 50-362
SAN DIEGO COUNTY, CALIFORNIA

Reporting Period: 1/1/2006 to 12/31/2006

Medium or Pathway sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Range)		Location with Highest Annual Mean Name, Distance and Direction	Mean (Range)		Control Locations Mean (Range)		Number of Nonroutine Reported Measurements
Semi-Annual Kelp Analysis – Table 15 (pCi/g)											
Macrocystis p.	Cs-134	5	0.06	< LLD (-)	(0/4)		---- (-)	(0/1)	< LLD (-)	(0/1)	0
Macrocystis p.	Cs-137	5	0.08	0.0150 (0.0150 – 0.0150)	(1/4)	(B) San Mateo Kelp Bed 3.8 Mi WNW	0.0150 (0.0150 – 0.0150)	(1/1)	< LLD (-)	(0/1)	0
Macrocystis p.	I-131	5	0.06	0.0161 (0.0140 – 0.0200)	(3/4)	(E) Salt Creek (Control) 11 Mi NNW	0.0360 (0.0360 – 0.0360)	(1/1)	0.0360 (0.0360 – 0.0360)	(1/1)	0
Macrocystis p.	K-40	5	1	8.46 (5.82 – 9.90)	(4/4)	(E) Salt Creek (Control) 11 Mi NNW	10.71 (10.71 – 10.71)	(1/1)	10.71 (10.71 – 10.71)	(1/1)	0

During 2006, naturally occurring K-40 (potassium 40) were confirmed above the *a posteriori* MDC in all kelp samples. I-131 (iodine 131) was also confirmed above the *a posteriori* MDC in two samples. I-131 is known to be a constituent of sewage plant discharges due to medically administered I-131. Since the concentration of I-131 in the control sample (Salt Creek - about 11 miles up coast from SONGS) has is historically been higher than the I-131 concentration in kelp closer to SONGS, we conclude that the I-131 in kelp is most likely attributable to sewage plant effluents.

The term "< LLD," used above, indicates that all analysis results were less than the critical level (1.64 x One Sigma). The critical level is used to determine if a bias exists in the database and is not used to determine if a particular sample result should be considered other than background. The numerical values listed in this table for Cs-137 are those values above the critical level and do not indicate that Cs-137 was detected in any samples.

APPENDIX C

SUMMARY OF 2006 QUALITY CONTROL PROGRAMS

All REMP samples are collected, shipped, and analyzed in accordance with NRC Regulatory Guide 4.15. Marine radiological environmental samples are collected by a vendor, MBC Environmental, per the vendor's Quality Assurance manual. REMP sample analysis is performed by the Contracted Environmental Analysis Laboratory (CEAL) in accordance with the Laboratory Quality Assurance Plan. During 2006 the CEAL was Areva NP Environmental Laboratory.

INTERLABORATORY CROSS-CHECK PROGRAM:

The CEAL participates in a number of independent cross check programs, including the National Institute of Standards and Technology (NIST) and Analytics cross-check programs. A summary of the Analytics cross check data is included in Table C-1. The CEAL's performance meets the criteria described in Reg. Guide 4.15. Discrepancies and non-agreement results are resolved through a formal Condition Report evaluation process.

QUARTERLY DUPLICATE TLDs

SONGS deployed a duplicate TLD package in the same location and canister as TLD 66. The quarterly dose measured by these separate TLD packages is nearly identical.

DUPLICATE TLD DATA COMPARISON

	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
TLD 66	12.82 ±0.65	16.36 ±0.70	13.16 ±0.85	15.11 ±0.78
TLD 200	13.03 ±0.80	15.13 ±0.80	13.34 ±0.64	14.19 ±0.61

ANNUAL DUPLICATE TLDs

An annual duplicate TLD package is collocated with TLD 67.

TLD 67 average dose in mR per standard quarter (July 2005 to July 2006)	TLD 201 (annual duplicate) dose in mR per standard quarter (July 2005 to July 2006)
17.52	16.90

CALIBRATION OF AIR SAMPLER VOLUME METERS

The Shop Services and Instrumentation Division of SCE performs an annual calibration procedure using standards referenced to NIST on all REMP air sampler gas meters. When the gas meters are removed from service, the meter is calibrated and the calibration reports are reviewed for bias. This is an *a posteriori* review of the gas meter performance to evaluate method bias and to identify possible outlier analysis results. In 2006, two (2) gas meters failed to meet this criterion at all calibrated flow rates and one gas meter was inoperable. A review of the affected gross beta data has revealed no meaningful anomalies. Thus no discernable impact to the REMP database or conclusions resulted from use of the out of tolerance gas meters. Replacement of the gas meters was completed in 2006.

TABLE C-1

ANALYTICS CROSS-CHECK PROGRAM SUMMARY

Sample Number	Quarter / Year	Sample Media	Analyte / Nuclide	Units	Reported Value	Known Value	Ratio E-LAB/ Analytics	Evaluation
E4836-162	4th / 2005	Water	H-3	pCi/L	13700	13200	1.04	Agreement
E4837-162	4th / 2005	Water	Sr-89	pCi/L	80.3	91.4	0.88	Agreement
E4837-162	4th / 2005	Water	Sr-90	pCi/L	7.18	7.4	0.97	Agreement
E4838-162	4th / 2005	Filter	Gross Alpha	pCi	22.3	25.0	0.89	Agreement
E4838-162	4th / 2005	Filter	Gross Beta	pCi	146	136	1.07	Agreement
E4839-162	4th / 2005	Filter	Ce-141	pCi	122	131	0.93	Agreement
E4839-162	4th / 2005	Filter	Cr-51	pCi	113	113	1.00	Agreement
E4839-162	4th / 2005	Filter	Cs-134	pCi	48.0	51.0	0.94	Agreement
E4839-162	4th / 2005	Filter	Cs-137	pCi	111	111	1.00	Agreement
E4839-162	4th / 2005	Filter	Co-58	pCi	44.2	45.2	0.98	Agreement
E4839-162	4th / 2005	Filter	Mn-54	pCi	93.5	88.9	1.05	Agreement
E4839-162	4th / 2005	Filter	Fe-59	pCi	44.6	48.1	0.93	Agreement
E4839-162	4th / 2005	Filter	Zn-65	pCi	95.8	89.9	1.07	Agreement
E4839-162	4th / 2005	Filter	Co-60	pCi	59.1	64.6	0.91	Agreement
E4840-162	4th / 2005	Filter	Sr-89	pCi	103	121	0.85	Agreement
E4840-162	4th / 2005	Filter	Sr-90	pCi	9.05	9.70	0.93	Agreement
E4841-162	4th / 2005	Milk	I-131LL	pCi/L	72.4	74.6	0.97	Agreement
E4841-162	4th / 2005	Milk	I-131	pCi/L	74.1	74.6	0.99	Agreement
E4841-162	4th / 2005	Milk	Ce-141	pCi/L	217	224	0.97	Agreement
E4841-162	4th / 2005	Milk	Cr-51	pCi/L	190	193	0.98	Agreement
E4841-162	4th / 2005	Milk	Cs-134	pCi/L	86.4	87.3	0.99	Agreement
E4841-162	4th / 2005	Milk	Cs-137	pCi/L	187	189	0.99	Agreement
E4841-162	4th / 2005	Milk	Co-58	pCi/L	78.7	77.5	1.02	Agreement
E4841-162	4th / 2005	Milk	Mn-54	pCi/L	153	152	1.01	Agreement
E4841-162	4th / 2005	Milk	Fe-59	pCi/L	87.8	82.4	1.07	Agreement
E4841-162	4th / 2005	Milk	Zn-65	pCi/L	148	154	0.96	Agreement

TABLE C-1

ANALYTICS CROSS-CHECK PROGRAM SUMMARY

Sample Number	Quarter / Year	Sample Media	Analyte / Nuclide	Units	Reported Value	Known Value	Ratio E-LAB/ Analytics	Evaluation
E4841-162	4th / 2005	Milk	Co-60	pCi/L	106	111	0.95	Agreement
E4879-162	4th / 2005	Charcoal	I-131	pCi	68.4	72.0	0.95	Agreement
E4884-162	1st / 2006	Water	Gross Alpha	pCi/L	38.7	38.1	1.02	Agreement
E4884-162	1st / 2006	Water	Gross Beta	pCi/L	265	262	1.01	Agreement
E4885-162	1st / 2006	Water	I-131LL	pCi/L	65.8	67.4	0.98	Agreement
E4885-162	1st / 2006	Water	I-131	pCi/L	66.3	67.4	0.98	Agreement
E4885-162	1st / 2006	Water	Ce-141	pCi/L	83.0	86.8	0.96	Agreement
E4885-162	1st / 2006	Water	Cr-51	pCi/L	217	234	0.93	Agreement
E4885-162	1st / 2006	Water	Cs-134	pCi/L	91.9	101	0.91	Agreement
E4885-162	1st / 2006	Water	Cs-137	pCi/L	73.3	74.3	0.99	Agreement
E4885-162	1st / 2006	Water	Co-58	pCi/L	84.7	87.5	0.97	Agreement
E4885-162	1st / 2006	Water	Mn-54	pCi/L	74.7	78.1	0.96	Agreement
E4885-162	1st / 2006	Water	Fe-59	pCi/L	73.2	72.4	1.01	Agreement
E4885-162	1st / 2006	Water	Zn-65	pCi/L	146.7	148	0.99	Agreement
E4885-162	1st / 2006	Water	Co-60	pCi/L	102.5	107	0.96	Agreement
E4886-162	1st / 2006	Water	Sr-89	pCi/L	82.0	99.4	0.82	Agreement
E4886-162	1st / 2006	Water	Sr-90	pCi/L	10.2	10.8	0.94	Agreement
E4887-162	1st / 2006	Charcoal	I-131	pCi	84.3	84.8	0.99	Agreement
E4888-162	1st / 2006	Filter	Gross Alpha	pCi	13.5	14.2	0.95	Agreement
E4888-162	1st / 2006	Filter	Gross Beta	pCi	104.5	97.3	1.07	Agreement
E4889-162	1st / 2006	Milk	I-131LL	pCi/L	81.8	78.0	1.05	Agreement
E4889-162	1st / 2006	Milk	I-131	pCi/L	77.4	78.8	0.98	Agreement
E4889-162	1st / 2006	Milk	Ce-141	pCi/L	101	104	0.97	Agreement
E4889-162	1st / 2006	Milk	Cr-51	pCi/L	277	280	0.99	Agreement
E4889-162	1st / 2006	Milk	Cs-134	pCi/L	113.8	121	0.94	Agreement
E4889-162	1st / 2006	Milk	Cs-137	pCi/L	86.7	88.8	0.98	Agreement

TABLE C-1

ANALYTICS CROSS-CHECK PROGRAM SUMMARY

Sample Number	Quarter / Year	Sample Media	Analyte / Nuclide	Units	Reported Value	Known Value	Ratio E-LAB/ Analytics	Evaluation
E4889-162	1st / 2006	Milk	Co-58	pCi/L	100	105	0.95	Agreement
E4889-162	1st / 2006	Milk	Mn-54	pCi/L	94.6	93.3	1.01	Agreement
E4889-162	1st / 2006	Milk	Fe-59	pCi/L	90.7	86.6	1.05	Agreement
E4889-162	1st / 2006	Milk	Zn-65	pCi/L	172.2	176	0.98	Agreement
E4886-162	1st / 2006	Milk	Co-60	pCi/L	125.0	128	0.98	Agreement
E4890-162	1st / 2006	Milk	Sr-89	pCi/L	79.7	99.2	0.80	Agreement
E4890-162	1st / 2006	Milk	Sr-90	pCi/L	10.6	10.8	0.98	Agreement
E5013-162	2nd / 2006	Water	H-3	pCi/L	5830	6000	0.97	Agreement
E5014-162	2nd / 2006	Filter	Gross Alpha	pCi	31.8	36.6	0.87	Agreement
E5014-162	2nd / 2006	Filter	Gross Beta	pCi	103.8	96.8	1.07	Agreement
E5015-162	2nd / 2006	Filter	Ce-141	pCi/L	91.6	92.8	0.99	Agreement
E5015-162	2nd / 2006	Filter	Cr-51	pCi/L	131.7	131	1.01	Agreement
E5015-162	2nd / 2006	Filter	Cs-134	pCi/L	60.5	63.9	0.95	Agreement
E5015-162	2nd / 2006	Filter	Cs-137	pCi/L	62.9	59.3	1.06	Agreement
E5015-162	2nd / 2006	Filter	Co-58	pCi/L	52.0	50.6	1.03	Agreement
E5015-162	2nd / 2006	Filter	Mn-54	pCi/L	74.5	73.9	1.01	Agreement
E5015-162	2nd / 2006	Filter	Fe-59	pCi/L	46.4	47.3	0.98	Agreement
E5015-162	2nd / 2006	Filter	Zn-65	pCi/L	93.4	93.6	1.00	Agreement
E5015-162	2nd / 2006	Filter	Co-60	pCi/L	63.0	65.0	0.97	Agreement
E5016-162	2nd / 2006	Filter	Sr-89	pCi/L	146.6	163	0.90	Agreement
E5016-162(1)	2nd / 2006	Filter	Sr-90	pCi/L	7.01	12.3	0.57	Non-Agreement
E5017-162	2nd / 2006	Milk	I-131LL	pCi/L	67.0	63.2	1.06	Agreement
E5017-162	2nd / 2006	Milk	I-131	pCi/L	62.0	63.2	0.98	Agreement
E5017-162	2nd / 2006	Milk	Ce-141	pCi/L	180.8	184	0.98	Agreement

(1) Non-Agreement evaluated in accordance with the CEAL's corrective action program.

TABLE C-1

ANALYTICS CROSS-CHECK PROGRAM SUMMARY

Sample Number	Quarter / Year	Sample Media	Analyte / Nuclide	Units	Reported Value	Known Value	Ratio E-LAB/ Analytics	Evaluation
E5017-162	2nd / 2006	Milk	Cr-51	pCi/L	248.0	259	0.96	Agreement
E5017-162	2nd / 2006	Milk	Cs-134	pCi/L	120.1	127	0.95	Agreement
E5017-162	2nd / 2006	Milk	Cs-137	pCi/L	117.3	117	1.00	Agreement
E5017-162	2nd / 2006	Milk	Co-58	pCi/L	97.3	100	0.97	Agreement
E5017-162	2nd / 2006	Milk	Mn-54	pCi/L	150.5	146	1.03	Agreement
E5017-162	2nd / 2006	Milk	Fe-59	pCi/L	95.4	93.6	1.02	Agreement
E5017-162	2nd / 2006	Milk	Zn-65	pCi/L	183.9	185	0.99	Agreement
E5017-162	2nd / 2006	Milk	Co-60	pCi/L	126.2	129	0.98	Agreement
E5090-162	3rd / 2006	Water	Gross Alpha	pCi/L	71.5	69.4	1.03	Agreement
E5090-162	3rd / 2006	Water	Gross Beta	pCi/L	253	273	0.93	Agreement
E5091-162	3rd / 2006	Water	I-131LL	pCi/L	84.4	79.9	1.06	Agreement
E5091-162	3rd / 2006	Water	I-131	pCi/L	77.3	79.9	0.97	Agreement
E5091-162	3rd / 2006	Water	Ce-141	pCi/L	84.5	88.0	0.96	Agreement
E5091-162	3rd / 2006	Water	Cr-51	pCi/L	287	288	1.00	Agreement
E5091-162	3rd / 2006	Water	Cs-134	pCi/L	85.6	87.0	0.98	Agreement
E5091-162	3rd / 2006	Water	Cs-137	pCi/L	174	179	0.97	Agreement
E5091-162	3rd / 2006	Water	Co-58	pCi/L	108	112	0.96	Agreement
E5091-162	3rd / 2006	Water	Mn-54	pCi/L	116	115	1.01	Agreement
E5091-162	3rd / 2006	Water	Fe-59	pCi/L	47.0	44.7	1.05	Agreement
E5091-162	3rd / 2006	Water	Zn-65	pCi/L	146	148	0.99	Agreement
E5091-162	3rd / 2006	Water	Co-60	pCi/L	130	137	0.95	Agreement
E5092-162	3rd / 2006	Charcoal	I-131	pCi	88.3	91.1	0.97	Agreement
E5093-162	3rd / 2006	Filter	Gross Alpha	pCi	36.9	37.3	0.99	Agreement
E5093-162	3rd / 2006	Filter	Gross Beta	pCi	142	147	0.97	Agreement
E5094-162	3rd / 2006	Milk	I-131LL	pCi/L	79.9	73.8	1.08	Agreement
E5094-162	3rd / 2006	Milk	I-131	pCi/L	72.5	73.8	0.98	Agreement

TABLE C-1

ANALYTICS CROSS-CHECK PROGRAM SUMMARY

Sample Number	Quarter / Year	Sample Media	Analyte / Nuclide	Units	Reported Value	Known Value	Ratio E-LAB/ Analytics	Evaluation
E5094-162	3rd / 2006	Milk	Ce-141	pCi/L	85.5	86.0	0.99	Agreement
E5094-162	3rd / 2006	Milk	Cr-51	pCi/L	288	282	1.02	Agreement
E5094-162	3rd / 2006	Milk	Cs-134	pCi/L	84.8	85.0	1.00	Agreement
E5094-162	3rd / 2006	Milk	Cs-137	pCi/L	171	175	0.98	Agreement
E5094-162	3rd / 2006	Milk	Co-58	pCi/L	106	109	0.97	Agreement
E5094-162	3rd / 2006	Milk	Mn-54	pCi/L	112	113	0.99	Agreement
E5094-162	3rd / 2006	Milk	Fe-59	pCi/L	45.3	43.7	1.04	Agreement
E5094-162	3rd / 2006	Milk	Zn-65	pCi/L	146	145	1.01	Agreement
E5094-162	3rd / 2006	Milk	Co-60	pCi/L	129	134	0.96	Agreement

APPENDIX D

COMPARISON OF OPERATIONAL TO PREOPERATIONAL DATA AND ANALYSIS OF TRENDS

Comparison of Operational to Preoperational Data and Analysis of Trends

Unit 1 achieved criticality on June 14, 1967 and was permanently retired from service on November 30, 1992. Unit 2 attained initial criticality on July 26, 1982 and Unit 3 on August 29, 1983.

A variety of environmental samples were analyzed and the analytical results (January 1, 1979 to July 31, 1982) were compared with the 2006 operational data obtained for SONGS Units 2/3, which is the subject post-operational period for SONGS Unit 1.

The following media were evaluated and compared with the operational data of SONGS Units 1, 2 and 3:

A.	External Radiation	F.	Ocean Bottom Sediments
B.	Air Particulates	G.	Marine Species
C.	Radioiodine	H.	Local Crops
D.	Ocean Water	I.	Soil
E.	Shoreline Sediment (sand)	J.	Kelp
		K.	Drinking Water

All of the measurements obtained from the SONGS Unit 1 operational Radiological Environmental Monitoring Program (REMP) during the period from January 1979 to July 1982 are used as the preoperational baseline for SONGS Units 2/3. This is in accordance with San Onofre Units 2/3, Environmental Report, Operating License Stage, Appendix 6A, Pre-operational Radiological Environmental Monitoring, May 31, 1978. Comparisons of preoperational data to 2006 operational data are possible for each of the exposure pathways to man, namely: (1) direct radiation, (2) air particulates (inhalation), and (3) ocean water (waterborne). Comparisons can also be made between preoperational and operational data for ocean bottom sediment data to ascertain if there has been any significant increase in radioactivity in ocean bottom sediments in the vicinity of the SONGS Units 2/3 outfalls.

Overall, the preoperational data are much higher than the operational data. The decrease in radioactivity is due primarily to the cessation of nuclear weapons testing and to the decay of fallout radionuclides. There is a close correlation between indicator and control data over several decades. See Figures 2A, 3A, 3B, 3C and 4. There are no adverse trends.

A. Direct Radiation

SONGS Unit 1:

No direct radiation data were obtained in the preoperational period of 1964 to 1967 to compare with the operational data.

SONGS Units 2/3:

Direct radiation measurements for the SONGS REMP were made quarterly at 38 indicator locations and 11 control locations in 2006. (See Appendix I for ISFSI TLD data). Direct radiation samples (TLDs) were collected at a number of inner and outer ring locations as

specified by the ODCM. During the preoperational period from January 1979 to July 31, 1982, the indicator stations ranged from 16.1 to 46.6 millirem.

The preoperational indicator average was 25.3. The preoperational control range was 19.3 to 30.1 and the control mean was 23.1. During the 2006 operational year for Units 2/3, the routine indicator TLD locations ranged from 10.42 to 34.84 millirem, averaging 17.03 millirem while the control locations ranged from 11.99 to 21.08 millirem with an average of 15.70 millirem.

Factors such as meteorology, geographic location, the fallout from atmospheric nuclear weapons testing, and seasonal fluctuations account for the variability in the data seen during the preoperational period for each location. The decrease in radiation levels at all TLD sample locations is attributable to the curtailment of the atmospheric nuclear weapons testing, and the continued decay of fission products from previous nuclear weapons tests.

The average direct radiation doses were larger at both indicator and control locations during the preoperational period than during the 2006 operational period for SONGS Units 2/3. The larger average observed during the preoperational time span may be attributable to Chinese atmospheric nuclear weapons tests on March 14, 1978 and on October 15, 1980. The large average of annual direct radiation levels seen at most TLD sample locations during 1986 and 1987 is attributable to the Chernobyl Nuclear Power Plant accident that occurred April 26, 1986.

Figure 2A compares the environmental radiation levels of selected indicator and control locations. Simultaneous variation in the radiation levels at both the control and indicator locations show that the variations are due to factors external to SONGS. The operation of SONGS had no impact on the environment as measured by this sample medium.

B. Air Particulates

SONGS Unit 1:

Before SONGS Unit 1 attained initial criticality, samples of air particulate gross beta activity were collected from indicator and control locations. During the preoperational period of 1964-1967, detectable gross beta activity at the indicator locations ranged from 0.030 to 3.810 pCi/m^3, averaging 0.253 pCi/m^3. The control location of Huntington Beach (HBGS) had an average gross beta activity of 0.306 ranging from 0.04 to 2.77 pCi/m^3. During 2006, the gross beta activity at the indicator locations ranged from 0.003 to 0.0517 pCi/m^3, and averaging 0.0241 pCi/m^3. The Oceanside control location gross beta activity ranged from 0.0029 to 0.0515 pCi/m^3 with an average of 0.0235 pCi/m^3. The decrease in activity levels between 1965 and 2006 is ascribed to the curtailment of atmospheric nuclear weapons testing and the resultant decrease in fallout. Refer to figures 3A, 3B and 3C. There was a close correlation between indicator and control locations in 2006. The operation of SONGS had no impact on the environment as measured by this sample medium.

Valid comparisons of preoperational data to the 2006 postoperational data are difficult to make because the preoperational background levels are elevated by a factor of about ten due to the atmospheric nuclear weapons testing fallout.

SONGS Units 2/3:

From January 1979 through July 1982 (considered to be the preoperational period for SONGS Units 2/3), there is a period of noticeably higher gross beta activity in air at all sample locations. This period extends from the fourth quarter of 1980 through the fourth quarter of 1981. These higher activity levels are attributable to the Chinese atmospheric nuclear weapons test conducted on October 15, 1980.

Figures 3A, 3B, and 3C compare the monthly average gross beta particulate in air activity levels of selected indicator locations with the control location over a period of 29 years (January 1976 to December 2006). The data clearly show a close correlation between the indicator and control locations for the entire time period covered. The various spike increases in gross beta activity at all sample locations are closely grouped and timed to coincide with known events external to SONGS with worldwide radiological impact. These events include: Chinese atmospheric nuclear weapons testing on September 17, 1977; March 14, 1978; October 15, 1980; and the April 1986 Chernobyl accident. The graphs (Figures 3A, 3B and 3C) show that the environmental levels of gross beta remained substantially similar at both the indicator and the control locations over an extended period of time, with both control and indicator locations showing simultaneous variations of equal magnitude. The fluctuations in gross beta activity are not attributable to SONGS and are the result of other environmental phenomena and seasonal variations.

C. Radioiodine

SONGS Unit 1:

No preoperational data are available. All 2006 data were below both the *a priori* LLD (0.07 pCi/m^3) and the lower, count specific, *a posteriori* MDC.

SONGS Units 2/3:

Most of the preoperational and all of the 2006 operational data for I-131 level were below the detection limit.

D. Ocean Water

SONGS Unit 1:

No samples were obtained for the preoperational period of SONGS Unit 1.

SONGS Units 2/3:

Ocean water samples were collected on a monthly basis in the vicinity of each of the Station discharge outfalls, which served as indicator locations, and from the Newport Beach control location. The ocean water samples are analyzed for naturally-occurring and station-related gamma-emitting radionuclides. They are composited quarterly and analyzed for tritium.

During the preoperational period, naturally-occurring potassium-40 was detected in each of the samples collected from both indicator and control locations. Other gamma-emitting radionuclides were detected in only one ocean water sample. In May 1980, Co-58, Co-60,

Cs-134, and Cs-137 were detected in an ocean water sample collected from the SONGS Unit 1 outfall. Concentrations of the radionuclides in this sample were 11, 6, 380, and 430 pCi/l, respectively. Tritium was also detected in two of the ocean water samples collected in May 1980 from the SONGS Unit 2 outfall and from the Newport Beach control location. Reduction in effluent activity through programmatic changes at Unit 1 may have reduced activity levels in ocean water.

For tritium and all SONGS related radionuclides, the data collected at all locations during the 2006 operational period were below both the *a priori* LLD and the lower *a posteriori* MDC. We conclude that the operation of SONGS had no impact on the environment as measured by this sample medium.

E. Shoreline Sediments (Sand)

SONGS Unit 1:

Shoreline sediment samples were not collected during the preoperational period for SONGS 1.

SONGS Units 2/3:

Beach sand is collected semiannually from three indicator locations and from a control location situated at Newport Beach. The samples are analyzed for 26 naturally-occurring and plant-related radionuclides.

To assess the impact of SONGS operations on this environmental medium, preoperational data were compared to 2006 operational data. The radionuclide detected in shoreline sediment in the preoperational time frame was Cs-137 with a range of 0.012 to 0.022 pCi/g, averaging 0.019 in 5 sediment samples. One control sample with a Cs-137 activity of 0.032 pCi/g was observed in July 1979. The presence of Cs-137 in both control and indicator locations during the preoperational period leads to the conclusion that the root cause is external to SONGS and is most likely attributable to atmospheric nuclear weapons testing. No SONGS-related radionuclides were detected in shoreline sediment during the 2006 operational period. Thus the impact of SONGS on the environment as measured by the sample medium is considered to be negligible.

F. Ocean Bottom Sediments

SONGS Unit 1:

Ocean bottom sediment samples were not collected during the preoperational phase of Unit 1, and, therefore, no comparison can be made. However, operational data for SONGS 1 did not reveal the presence of any significant radioactivity in the sediment samples.

SONGS Units 2/3:

During the preoperational and operational periods, representative samples of ocean bottom sediments were collected semiannually from each of the Station discharge outfalls and from a control station in Laguna Beach. The samples were analyzed for naturally occurring and SONGS related radionuclides. The results of the analyses are listed in Table D-1B.

SONGS-related radionuclides were also detected in samples collected during preoperational period. Manganese-54 (Mn-54) was detected in 5 of the 28 samples. The concentrations of Mn-54 in these samples ranged from 0.015 to 0.49 pCi/g, averaging 0.13 pCi/g. Cobalt-58 (Co-58) was detected in nine samples. The concentration of Co-58 in the samples ranged from 0.013 to 1.16 pCi/g, averaging 0.20 pCi/g. Cobalt-60 (Co-60) was measured in 15 of the 28 samples. The concentration of Co-60 in the sample ranged from 0.014 to 8.1 pCi/g, averaging 0.79 pCi/g. Cs-137 was also detected in 16 of the 28 samples. The concentrations of Cs-137 in the samples ranged from 0.014 to 0.090 pCi/g, averaging 0.039 pCi/g. Cerium-144 (Ce-144) was found in two samples. The concentration of Ce-144 in the samples was 0.06 and 0.26 pCi/g, respectively.

The results indicate that there has not been a build-up of radionuclides with time in ocean bottom sediments near SONGS. The results also indicate notable decrease in the concentrations of plant-related radionuclides in the ocean bottom sediment. Although Co-58, Co-60, and Cs-137 are normally associated with nuclear power operations, preoperational study reveals no accumulation trend for these radionuclides, and no increase in levels for these radionuclides was detected during the operational period.

The concentration of station-related radionuclides in all ocean bottom sediment samples analyzed in 2006 was below the *a posteriori* MDC. We conclude that operation of SONGS Units 2/3 has had a negligible impact upon this environmental medium.

TABLE D-1A

SHORELINE SEDIMENTS CONCENTRATION (pCi/g, wet weight)
PREOPERATIONAL AND OPERATIONAL DATA*
SONGS UNITS 2/3

		INDICATOR		CONTROL	
Radionuclide**	**Period**	**Range**	**Average**	**Range**	**Average**
Cs-137	PreOp	0.012-0.022	0.019	<LLD-0.032	<LLD
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

TABLE D-1B

OCEAN BOTTOM SEDIMENTS CONCENTRATION (pCi/g, wet weight)
PREOPERATIONAL AND OPERATIONAL DATA*
SONGS UNITS 2/3

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Mn-54	PreOp	0.0150-0.49	0.129	<LLD	<LLD
Co-58	PreOp	0.013-1.160	0.199	<LLD	<LLD
Co-60	PreOp	0.014-8.100	0.788	<LLD	<LLD
Ag-110m	PreOp	<LLD-0.020	<LLD	<LLD	<LLD
Cs-137	PreOp	0.014-0.090	0.039	<LLD-0.043	<LLD
Cs-137	Operational	<LLD	<LLD	<LLD	<LLD
Ce-144	PreOp	0.060-0.260	0.160	<LLD	<LLD
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

* PreOp = January 1979 to July 1982; Operational - January to December 2006
** During January to December 2006 all station related Radionuclides from all sample locations were < LLD
LLD Lower limits of detection for operational data are listed in Appendix B.

G. Marine Species (Flesh)

SONGS Unit 1:

Marine species were not collected during the preoperational period for SONGS Unit 1. No comparison with operational data is possible.

SONGS Units 2/3:

Non-migratory marine species were collected semi-annually near SONGS to determine the amount of radioactivity that could be consumed by man or that was present in the food chain to man. Marine species caught by the SONGS outfalls and from Laguna Beach include two species of adult fish, crustacea and mollusks. Upon collection, the flesh portion is analyzed for gamma-emitting, radionuclides as specified in the ODCM. The results are subsequently reported as pCi/gram wet weight.

Results for several marine species for both the preoperational and 2006 operational periods for Units 2/3 are summarized in Table D-2. The marine species used for purposes of comparison include: sheephead (a fish), black perch (a fish), bay mussel (a mollusk), spiny lobster (a crustacea), and keyhole limpet (a mollusk). Radionuclides analyzed but not included in Table D-2 were below the lower limits of detection for both the preoperational and operational periods.

During the 2006 operational period, no SONGS related radionuclides were detected at either the *a priori* LLD or the lower *a posteriori* MDC. The data indicate no accumulation trends. The operation of SONGS Units 2/3 in 2006 had no impact on the environment as measured by this sample medium.

TABLE D-2

MARINE SPECIES CONCENTRATIONS (pCi/g, wet weight) PREOPERATIONAL AND 2006 OPERATIONAL DATA (SONGS UNITS 2/3)*

Sheephead Flesh**

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Co-58	PreOp	0.016-0.030	0.023	<LLD	<LLD
Co-60	PreOp	0.005-0.044	0.017	<LLD	<LLD
Ag-110m	PreOp	<LLD-0.004	<LLD	<LLD	<LLD
Cs-137	PreOp	0.004-0.018	0.007	0.005-0.012	0.007
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

Black Perch Flesh**

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Co-58	PreOp	0.009-0.011	0.010	<LLD	<LLD
Co-60	PreOp	0.004-0.045	0.017	<LLD	<LLD
Ag-110m	PreOp	0.002-0.009	0.006	<LLD	<LLD
Cs-137	PreOp	0.003-0.015	0.008	0.004-0.014	0.009
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

* **PreOp = January 1979 to July 1982; Operational = January to December 2006**

** **During January to December 2006 all station related Radionuclides from all sample locations were < LLD**

LLD **Lower limits of detection for operational data are listed in Appendix B.**

TABLE D-2

MARINE SPECIES CONCENTRATIONS (pCi/g, wet weight) PREOPERATIONAL AND 2006 OPERATIONAL DATA (SONGS UNITS 2/3)*

Bay Mussel Flesh**

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Mn-54	PreOp	0.009-0.025	0.017	<LLD	<LLD
Co-58	PreOp	0.008-0.080	0.028	--	--
Co-60	PreOp	0.005-0.40	0.077	<LLD	<LLD
Cs-137	PreOp	0.003-0.006	0.004	<LLD	<LLD
Ru-103	PreOp	<LLD-0.045	<LLD	<LLD	<LLD
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

Spiny Lobster Flesh**

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Co-58	PreOp	0.007-0.270	0.086	<LLD	<LLD
Co-60	PreOp	0.014-0.210	0.060	<LLD	<LLD
Cs-137	PreOp	0.005-0.011	0.008	0.040-0.015	0.008
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

* **PreOp = January 1979 to July 1982; Operational = January to December 2006**

** **During January to December 2006 all station related Radionuclides from all sample locations were < LLD**

LLD **Lower limits of detection for operational data are listed in Appendix B.**

TABLE D-2

MARINE SPECIES CONCENTRATIONS (pCi/g, wet weight) PREOPERATIONAL AND 2006 OPERATIONAL DATA (SONGS UNITS 2/3)*

Sea Hare Flesh**

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Co-57	PreOp	0.006-0.017	0.009	<LLD	<LLD
Co-58	PreOp	0.006-12.4	1.233	<LLD	<LLD
Co-60	PreOp	0.016-2.000	0.448	0.003-0.027	0.013
Zn-65	PreOp	<LLD-0.10	<LLD	<LLD	<LLD
Ag-110m	PreOp	0.018-0.50	0.138	0.020-0.039	0.030
Cs-137	PreOp	<LLD-0.004	<LLD	<LLD-0.005	<LLD
All other measured	PreOp	< LLD	< LLD	< LLD	< LLD
SONGS related radionuclides	Operational	---	---	---	---

Keyhole Limpet (Flesh)**

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Co-58	PreOp	0.007-0.101	0.054	<LLD-0.190	<LLD
Co-60	PreOp	0.021-0.040	0.033	<LLD-0.022	0.022
Ag-110m	PreOp	0.033-0.101	0.054	0.005-0.042	0.022
Cs-137	PreOp	<LLD	<LLD	<LLD-0.005	<LLD
All other measured	PreOp	< LLD	< LLD	< LLD	< LLD
SONGS related Radionuclides	Operational	---	---	---	---

* **PreOp = January 1979 to July 1982; Operational = January to December 2006**

** **Sea Hare and Keyhole Limpet samples were not collected in 2006**

LLD **Lower limits of detection for operational data are listed in Appendix B.**

H. Local Crops

SONGS Unit 1:

During the preoperational phase of Unit 1, local crops were collected semiannually from both indicator and control locations, and subsequently analyzed for Sr-90. The range was 0.008 to 0.030 pCi/g wet weight. The average Sr-90 value was 0.022 pCi/g wet weight. Sr-90 is a common fission product likely due to atmospheric weapons tests.

During 2006, only naturally occurring radionuclides were detected in the crop samples.

SONGS Units 2/3:

In the preoperational period of January 1979 through July 1982, Sr-90 was detected in the control samples of kale, parsley, and squash. Naturally occurring K-40 was detected in cucumber, kale, and tomato samples from the indicator and control locations. Ce-144 and Zr-95 were detected in one sample of parsley at the control location at concentrations of 0.12 and 0.09 pCi/g, wet weight respectively.

In the 2006 operational period, only naturally occurring radionuclides were detected in the crop samples. The data indicate that the concentration of SONGS related radionuclides have decreased over time in this sample medium. This decrease is attributable to the termination of atmospheric nuclear weapons testing. The operation of SONGS had no impact on the environment as measured by this sample medium.

I. Soil

SONGS Unit 1:

No soil data were available for Unit 1 preoperational phase so a comparison cannot be made. However, gamma isotopic analysis of soil does not show any significant level of radioactivity. No accumulation pattern of plant-related radionuclides in the soil has been observed in the last 20 years.

SONGS Units 2/3:

A comparison of operational and preoperational data does not reveal any accumulation pattern of SONGS related isotopes in soil. The intermittent detection of Cs-137 in both indicator and control locations is due to residual fallout from atmospheric nuclear weapons testing.

J. Kelp

SONGS Unit 1:

Samples of kelp were not collected and analyzed during the preoperational period for SONGS Unit 1. No comparison with operational data is possible.

SONGS Units 2/3:

Kelp is collected semiannually from three indicator locations and from a control location situated in Laguna Beach. After collection, the samples are analyzed by gamma-spectral analysis for naturally-occurring and SONGS-related radionuclides.

To assess the impact of SONGS operations on kelp, preoperational data were compared to 2006 operational data in Table D-4. Radionuclides detected during the preoperational period for SONGS Units 2/3 include Mn-54, Co-60, Zr-95, I-131, and Cs-137.

During the 2006 operational period, I-131 was detected in two (2) samples obtained. No other station related isotopes were detected in kelp samples during the 2006 operational period. Figure 4 (I-131 in Kelp) shows a close correlation between indicator and control sample locations over an extended period of time.

Although I-131 activity has been randomly detected in kelp since 1977, there is no evidence that the concentration of I-131 or other station related radionuclides in kelp is increasing near SONGS. I-131 in kelp is most likely due to the sewer release of medical administrations, since it has been detected consistently in control as well as indicator locations. Since 1988 the concentration of I-131, when detected, has typically been highest at the control location. These data support the conclusion that during the Units 2/3 operational period, the detection of I-131 in kelp is primarily due to factors external to SONGS.

K. Drinking Water

No plant related radionuclides were detected during the 2006 operational period. Gross beta activity was detected during both the operational and preoperational periods at both the indicator and the control locations. No trends have been noted. There is no drinking water pathway for SONGS. The operation of SONGS had no impact on the environment as measured by this sample medium.

TABLE D-3
SOIL PREOPERATIONAL AND OPERATIONAL DATA* (pCi/g, dry weight)
SONGS UNITS 2/3

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Sr-90	PreOp	0.02-0.08	0.044	<LLD-0.03	<LLD
Cs-137	PreOp	0.02-0.20	0.096	<LLD-0.06	<LLD
Cs-137	Operational	< LLD-0.329	0.23	0.245	0.245
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

TABLE D-4
KELP PREOPERATIONAL AND OPERATIONAL DATA* (pCi/g, wet weight)
SONGS UNITS 2/3

		INDICATOR		CONTROL	
Radionuclide	**Period**	**Range**	**Average**	**Range**	**Average**
Mn-54	PreOp	<LLD-0.005	<LLD	<LLD	<LLD
Co-60	PreOp	0.006-0.009	0.008	<LLD	<LLD
Zr(Nb)-95	PreOp	0.014-0.090	0.046	0.018-0.053	0.036
I-131	PreOp	0.006-0.024	0.013	0.008-0.030	0.014
I-131	Operational	<LLD-0.014	<LLD	<LLD-0.036	0.036
Cs-137	PreOp	0.004-0.009	0.006	<LLD	<LLD
All other measured SONGS related radionuclides	PreOp	< LLD	< LLD	< LLD	< LLD
	Operational	< LLD	< LLD	< LLD	< LLD

* **PreOp = January 1979 to July 1982; Operational = January to December 2006**
LLD Lower Limit of Detection for operational data are listed in Appendix B.
During 2006, kelp was not available for Autumn sampling due to the El Nino weather system. Only one control kelp sample was collected in 2006.

APPENDIX E

DEVIATIONS FROM ODCM SAMPLING REQUIREMENTS

IN 2006

DEVIATIONS FROM THE ODCM SAMPLING REQUIREMENTS

Deviations from the Offsite Dose Calculation Manual (ODCM) sampling requirements are identified below in accordance with section 5.0 of the ODCM. The performance standard for environmental data collection of 95% was met for all sample types. During 2006, the ODCM specified *a priori* LLD was achieved for all REMP samples obtained. Deviations from the ODCM were associated with external factors not within the control of REMP personnel such as limited availability of marine samples at the locations specified in the ODCM. These minor unavoidable deviations from the ODCM had no meaningful impact on the REMP database and did not compromise the validity of the reported conclusions.

PART I TERRESTRIAL SAMPLING

A. WEEKLY AIR SAMPLING

Downtime for each air sampler in 2006 due to weekly sample collection, annual preventive maintenance (PM), and the annual gas meter change out was approximately 46 minutes for each sampler.

Weekly Change out:	Approximately 0.5 minutes x 52 = 26 minutes
Annual PM:	Approximately 15 minutes
Annual Gas Meter change out:	Approximately 5 minutes

Down times in excess of 1 hour are described below for each air sample. Air sampler availability remains well above 95%.

Air Sampler 1 (City of San Clemente): No deviations were observed.

Air Sampler 9 (State Beach Park): No deviations were observed.

Air Sampler 10 (Bluff): No deviations were observed.

Air Sampler 11 (EOF): Out of service for 27.2 hours during 2006 due to station electrical work.

Air Sampler 12 (Former SONGS Evaporation Pond): No deviations were observed.

Air Sampler 13 (Camp Pendleton East): No deviations were observed.

Air Sampler 14 (Mesa Medical Facility): No deviations were observed.

Air Sampler 15 (Oceanside Control): No deviations were observed.

Summary of Air Sampler Corrective Actions

The useful life of the vacuum pump motor assemblies is estimated to be five years based on the recommendation of the manufacturer and upon experience. If the internal components (motor and control valve) are replaced the useful life may be extended. During 2006 the REMP air samplers experienced no down time attributable to motor or vacuum pump assembly failure.

B. DIRECT RADIATION

No deviations were observed.

C. LOCAL CROPS

No deviations were observed.

D. SHORELINE SEDIMENTS

No deviations were observed.

E. DRINKING WATER

No deviations were observed.

F. SOIL

The ODCM listed location for the control soil sample is 16.0 miles SE. Due to recent development, an undisturbed sample was not available at that location. A control sample location in an undisturbed area was located approximately 15 miles SE from SONGS at the Prince of Peace Abbey.

PART II MARINE SAMPLING

A. NON-MIGRATORY MARINE ANIMALS

Samples were collected from the specified ODCM sample location when samples were available at that location. When the specified sample type was not available at the ODCM listed location, alternate locations were selected based on sample availability and proximity to the specified sample location. All indicator samples were obtained within two miles of the associated outfall. In some cases the indicator species is not the same as the control species due to limited availability at the indicator location. Most non-migratory marine species samples were not available at the locations specified in the ODCM. All indicator marine animal samples were collected within 2 miles of the Units 2 & 3 discharge diffusers. Adverse diving conditions prevented some of the spring samples from being collected in April 2006; those samples were collected in May 2006.

B. OCEAN WATER SAMPLING

No deviations were observed.

C. OCEAN BOTTOM SEDIMENTS

No deviations were observed in 2006.

D. KELP

Kelp is intermittently available at the various local kelp forests. Sea urchin population, El Nino and La Nina weather phenomena and other macro-environmental factors determine kelp sample availability. Samples were obtained from the kelp canopy closest to the ODCM specified location.

Kelp was not available in October 2006 due to external factors not related to the operation of SONGS.

APPENDIX F

LAND USE CENSUS

INTRODUCTION

Southern California Edison conducted the annual 2006 Land Use Census (LUC) in accordance with section 5.2 of the Offsite Dose Calculation Manual (ODCM). The purpose of the LUC is to identify important radiological exposure pathways to humans. The LUC identifies the nearest residences, milk animals, meat animals, gardens of at least 500 square feet that produce fleshy or leafy vegetables, and other specified uses (campgrounds, employment, etc.) in each of the meteorological landward sectors within five miles of SONGS. Results are summarized in Table F-1 and F-2 at the end of this appendix.

THE STUDY AREA

The study area includes half of the city of San Clemente (population estimated at 66,280 as of January 1, 2006), the San Clemente State Park, U.S. Marine Corps Base Camp Pendleton (MCB), San Onofre State Beach and Park, the San Clemente Ranch (now known as Seaview Farm), the former U. S. Coast Guard Station at San Mateo Point, and SONGS.

METHODOLOGY

A review of the 2005 LUC and documentation notebook was conducted. Verification and revision of the 2005 data was accomplished by inquiry to the cognizant agency, organization, or individual possessing direct knowledge of the item being verified.

The garden census was performed by examining aerial photographs taken. The photographic image areas which appeared to correspond to likely garden locations were converted to street addresses. The corresponding residences were observed from the nearest public road to determine if a garden was present. If the entire property was not visible from the street then a garden was assumed to be present.

The closest residence was established in each sector by correspondence with cognizant authorities (City of San Clemente Planning Department and USMC Camp Pendleton). The meat and milk animal survey was performed by contacting the natural resources office on Camp Pendleton, the Orange County Agricultural Commissioner, and the County of San Diego Department of Agriculture. Information on other uses was obtained by contacting the appropriate organizations.

DEFINITIONS

Residence is defined as any structure (single-family house, apartment, mobile home, barracks or similar unit) occupied by individual(s) for three months (2,000 hours) or longer per year. Other Specified Use is defined as a location occupied by members of the general population as other than their primary residence. The use is divided into two categories: employment and non-employment related.

Employment use is defined as a location occupied by members of the general population engaged in normal work activities regardless of the length of time spent at the location, and regardless of its permanence, including concession stands, restaurants, markets and guard shacks.

Non-employment-related use is defined as a location occupied by members of the general population who are not engaged in normal work activities, including campgrounds, temporary housing, time-share condominiums, motels, hotels, schools and beaches.

Milk animals include, but are not limited to cows, goats and sheep, whose milk is used in dairy products for human consumption.

Meat animals include, but are not limited to deer, other game animals, cattle, goats and sheep, whose meat is used for human consumption.

Leafy vegetables include, but are not limited to lettuce, cabbage, collard greens, Bok choi, sorrel, and spinach.

Fleshy vegetables include, but are not limited to tomatoes, cucumbers, cauliflower, squash, beans, zucchini, and sweet corn.

SUMMARY OF CHANGES

1. Changes from the 2005 LUC include the miscellaneous residential occupancy changes highlighted in Tables 4-1 through F-3.

2. Sunrise Growers (formerly San Clemente Ranch) ceased operation on December 31, 2005.

TABLE F-1
2006 SONGS Units 2/3 LUC Five-Mile Radius Summary Sheet

Units 2/3 Sector	LUC #	Residence	Miles From Unit 1	Unit 1 Sector	Miles From U2/3	Estimated Hours of Maximum Occupancy
A	R-A1	Camp San Mateo	3.5	A	3.6	FTR
	R-A2	SONGS Camp Mesa	0.3	B	0.4	**FTR**
B						
C	R-C2	Camp San Onofre Fire Station	2.4	C	2.4	**3,744**
	R-C1	Camp San Onofre Barracks 524101	**2.9**	C	**2.8**	FTR
D	R-D1	Camp San Onofre Barracks	3.0	D	3.0	FTR
E	R-E1	Camp Horno Barracks	4.2	E	4.1	FTR
F						
G						
H						
J						
K						
L						
M						
N						
P	R-P3	San Onofre Rec Beach (SORB)	0.8	Q	1.0	FTR
	R-P4	SORB Resident	1.3	Q	1.5	FTR
	R-P2	San Mateo Point Housing	2.5	P	2.7	FTR
	R-P1	Cotton Point Estates	**2.5**	P	**2.7**	FTR
Q	R-Q5	SORB Resident Employee	0.9	Q	1.1	FTR
	R-Q4	SORB Resident Employee	0.9	Q	1.1	FTR
	R-Q2	San Onofre Mobile Homes	1.2	Q	1.4	FTR
	R-Q3	San Mateo Point Housing	2.5	Q	2.7	FTR
R	R-R2	SONGS Camp Mesa	**0.3**	A	0.4	**FTR**
	R-R3	SONGS Dry Camping PL12	0.6	Q/R	0.7	**2920**
	R-R1	San Onofre Mobile Homes	1.2	R	1.3	FTR
	20	**Sea Ridge Estates**	**4.4**	**R**	**4.5**	**FTR**

FTR – Full Time Residence **Bolt Text** indicates changes from 2005 LUC

TABLE F-2
2006 SONGS Units 2/3 LUC Five-Mile Radius Summary Sheet

Units 2/3 Sector	LUC #	Gardens	Miles From Unit 1	Unit 1 Sector	Miles From U2/3
A					
B					
C					
D					
E					
F					
G					
H					
J					
K					
L					
M					
N					
P	G-3	Cotton Point Estate	2.6	P	2.8
Q	**G-2**	**Sunrise Growers (not in use)**	**NA**	**NA**	**NA**
	G-8	2240 Av. Salvado	3.9	Q	4.1
	G-5	1706 S Ola Vista	4.2	Q	4.4
	G-6	1315 S Ola Vista	4.4	Q	4.6
	14	Inactive -	4.1	Q	4.3
		3 W Ave San Antonio			
	16	Inactive -	3.9	Q	4.1
		147 W Junipero			
R	G-10	SONGS Garden	0.3	B	0.4
	G-1	**Sunrise Growers (not in use)**	**NA**	**NA**	**NA**

FTR – Full Time Residence **Bolt Text** indicates changes from 2005 LUC

TABLE F-3
2006 SONGS Units 2/3 LUC Five-Mile Radius Summary Sheet

Units 2/3 Sector	LUC #	Other Specified Uses	Miles From Unit 1	Unit 1 Sector	Miles From U2/3	Estimated Hours of Maximum Occupancy
A	O-8	Camp San Mateo Motor Pool	3.5	A	3.6	1,920
	24	Cristianitos Fire Station	4.8	A	5.0	**3,744**
	22	SCE Land Uses	0.3	B	0.4	---
B	O-9	USMC CP Sanitary Land Fill	2.1	B	2.1	**400**
	27	USMC CP Ammunition Dump	4.6	B	4.6	**NA**
C	O-10	Camp San Onofre (STP #11)	2.3	C	2.2	**1,776**
D	O-4	Camp Horno (STP #10)	3.8	D	3.7	**NA**
E	O-5	Camp Horno Motor Pool	4.2	E	4.0	1,920
	29	Camp Horno Truck Company			4.7	NA
F	O-1	San Onofre State Beach Guard Shack	1.0	F	0.8	1,500
	O-2	**San Onofre Beach Campground**	**1.1**	**F**	**0.9**	**NA**
	31A	Border Patrol Checkpoint (NB)	2.2	F	**1.9**	**2,256**
	31B	Hwy Patrol Weigh Sta (NB)	2.3	F	2.1	2,112
G	O-2	San Onofre Beach Campground	**2.0**	G	**1.8**	720
	32	Hwy Patrol Weigh Sta (SB)	2.3	G	2.1	2,112
	O-2A	**San Onofre State Beach Surf Camp**	**3.0**	**G**	**2.8**	**1,680**
H						
J						
K						
L						
M						
N						
P	O-6	Surf Beach (Lifeguard)	**0.3**	P	0.5	800
	1A	**SORB Campground Checkin**	**1.2**	**Q**	**1.4**	**NA**
	1B	Mini-Exchange (SORB)	1.2	Q	1.4	**NA**
	2	SORB Guard Shack	1.4	Q	1.6	**NA**
	3	Trestles Beach Lookout Tower	1.6	P	1.8	500
Q	O-3	State Park Office Trailer	**0.4**	Q	0.6	2,000
	5	Surf Beach Guard Shack	0.5	Q	0.7	1,500
	33	Military Beach Campground & Cottages	0.9	Q	1.1	FTR
	7	SORB Clubhouse	1.0	Q	1.2	**30**
	18	SORB Lifeguard Tower	**1.0**	Q	**1.2**	2,000
	8	USMC Exchange & Commissary	1.5	Q	1.7	2,000
	9	Basilone Road USMC Entry Gate	1.8	Q	**2.0**	1,248
	O-11	**Sunrise Growers Field Workers**	**2.0**	**Q**	**2.2**	**NA**
	10	**Sunrise Growers Administrative Offices**	**2.4**	**Q**	**2.6**	**NA**
	12	San Mateo Campground	2.7	Q	2.9	4,380
	11	State park Main Offices	3.3	Q	3.5	FTR
	13	Beach Concession	3.7	Q	3.9	2,000
	17	Beach Concession	4.7	Q	4.5	500
	1A	**SORB Campground Checkin**	**1.1**	**Q**	**1.3**	**2000**
R	**O-7**	**Sunrise Growers Packing & Shipping**	**2.4**	**R**	**2.6**	**NA**
	O-12	**Sunrise Growers Field Workers**		**R**	**2.3**	**NA**
	19	Camp San Mateo (STP #12)	3.5	A	3.7	**1,776**
	21	Cristainitos USMC Entry Gate	**4.0**	**A**	**4.1**	1,248
	23	Cristianitos USMC Gas Station	**4.0**	A	4.1	2,000

FTR – Full Time Residence **Bolt Text** indicates changes from 2005 LUC

APPENDIX G

FIGURES FOR 2006

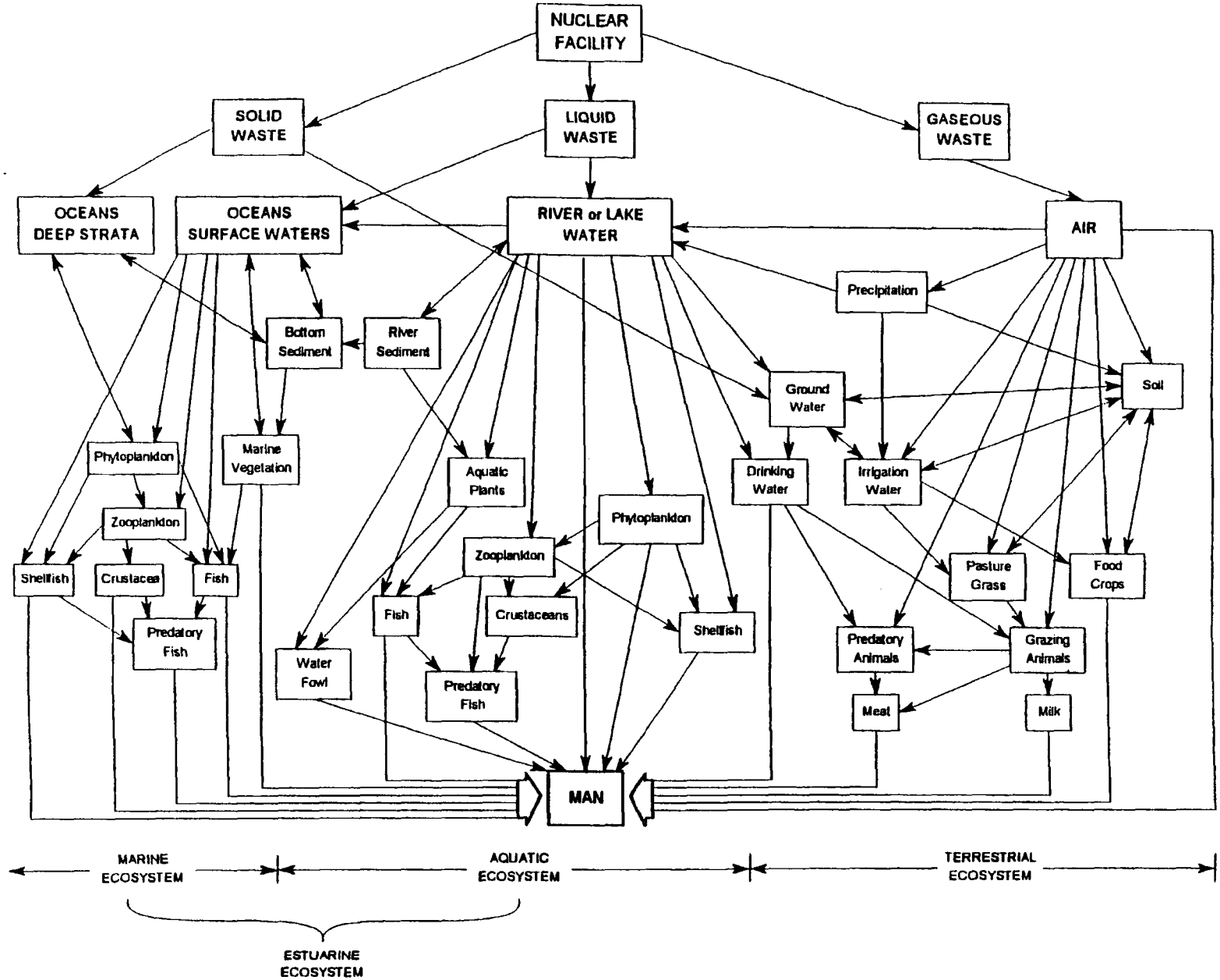


Figure 1. Potential Radiation Exposure Pathways Leading to Man

Direct Radiation Monitoring
Quarterly Environmental TLD dose measurements in mR
Selected TLDs located very close to SONGS vs. Selected CONTROL TLDs

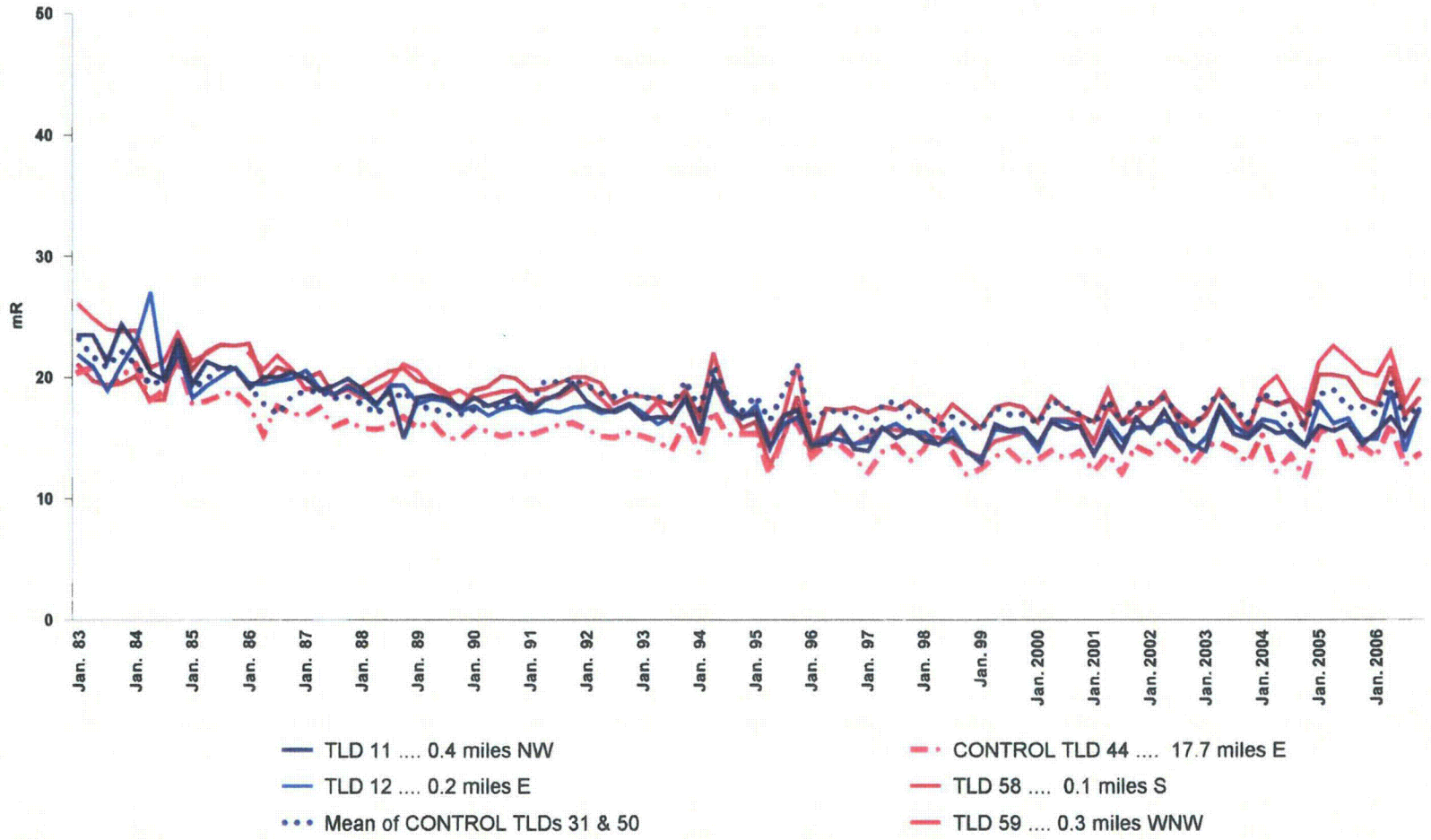


Figure 2A

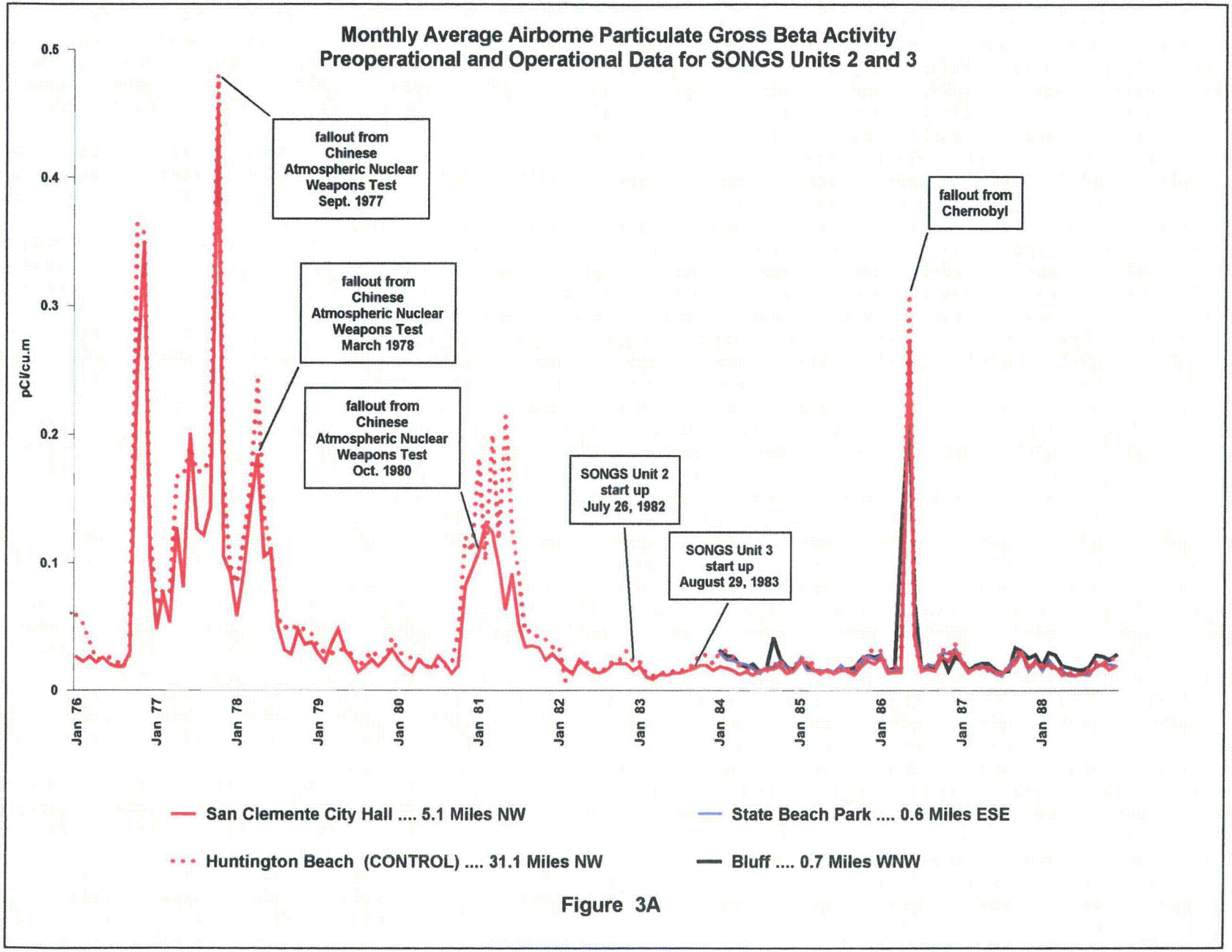

Monthly Average Airborne Particulate Gross Beta Activity
Preoperational and Operational Data for SONGS Units 2 and 3
pCi/cu.m
0.5
0.4
0.3
0.2
0.1
0
fallout from Chinese Atmospheric Nuclear Weapons Test Sept. 1977
fallout from Chinese Atmospheric Nuclear Weapons Test March 1978
fallout from Chinese Atmospheric Nuclear Weapons Test Oct. 1980
SONGS Unit 2 start up July 26, 1982
SONGS Unit 3 start up August 29, 1983
fallout from Chernobyl
Jan 76
Jan 77
Jan 78
Jan 79
Jan 80
Jan 81
Jan 82
Jan 83
Jan 84
Jan 85
Jan 86
Jan 87
Jan 88
San Clemente City Hall .... 5.1 Miles NW
State Beach Park .... 0.6 Miles ESE
Huntington Beach (CONTROL) .... 31.1 Miles NW
Bluff .... 0.7 Miles WNW

Figure 3A

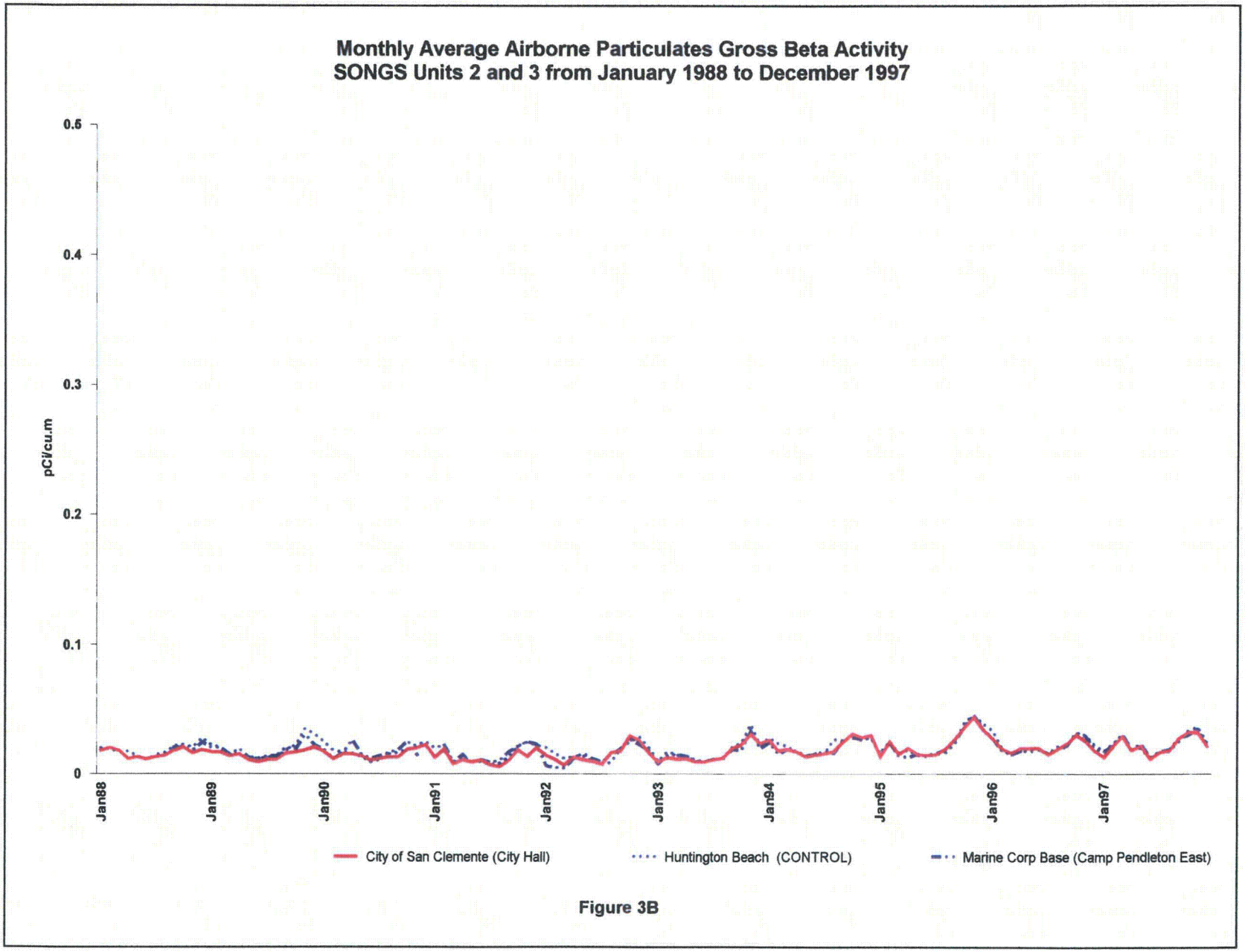

Monthly Average Airborne Particulates Gross Beta Activity
SONGS Units 2 and 3 from January 1988 to December 1997
0.5
0.4
0.3
0.2
0.1
0
pCi/cu.m
Jan88
Jan89
Jan90
Jan91
Jan92
Jan93
Jan94
Jan95
Jan96
Jan97
City of San Clemente (City Hall)
Huntington Beach (CONTROL)
Marine Corp Base (Camp Pendleton East)

Figure 3B

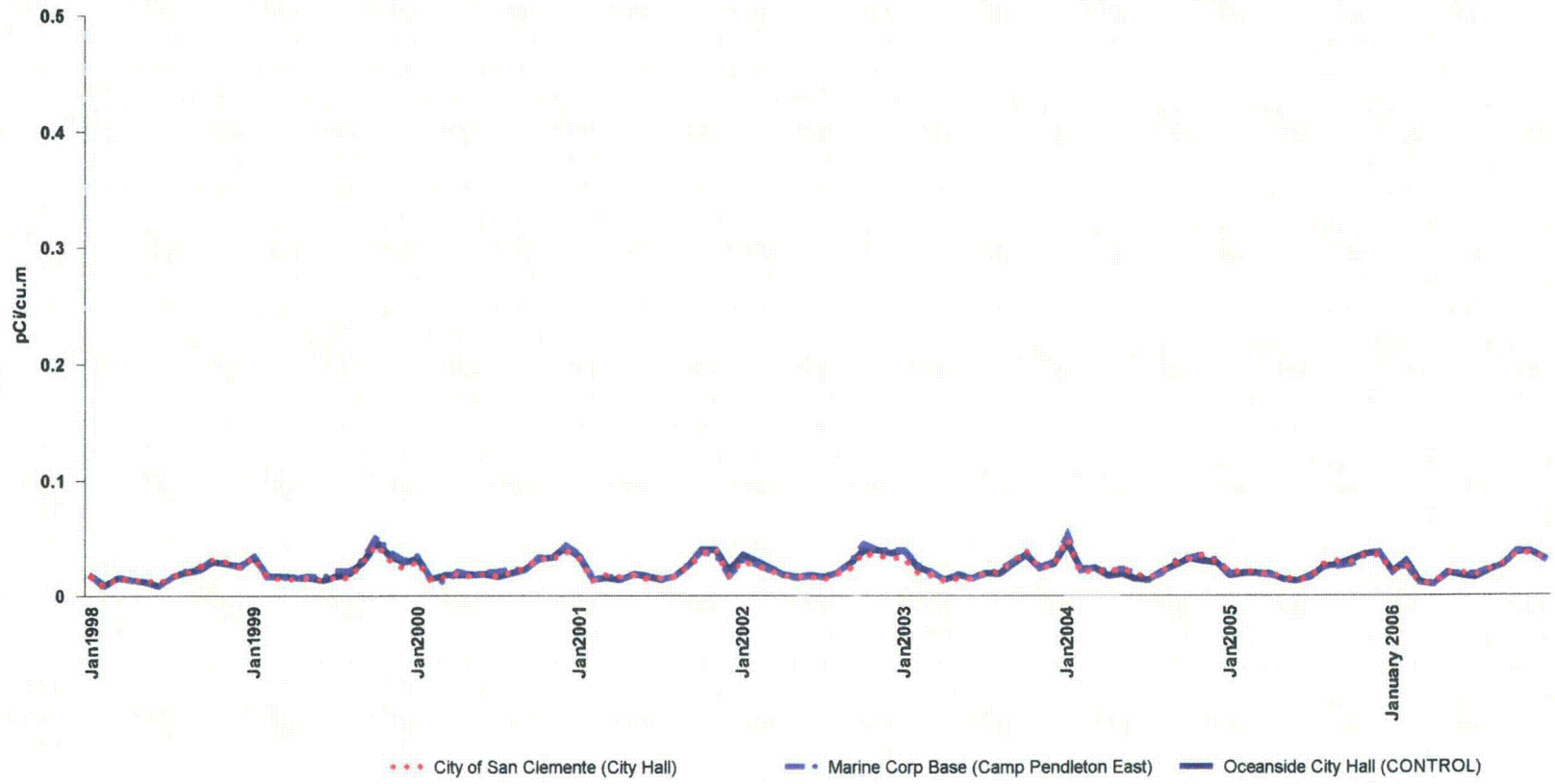

Monthly Average Airborne Particulates Gross Beta Activity SONGS Units 2 and 3
January 1998 to December 2006
0.5
0.4
0.3
0.2
0.1
0
pCi/cu.m
Jan1998
Jan1999
Jan2000
Jan2001
Jan2002
Jan2003
Jan2004
Jan2005
January 2006
City of San Clemente (City Hall)
Marine Corp Base (Camp Pendleton East)
Oceanside City Hall (CONTROL)

Figure 3C

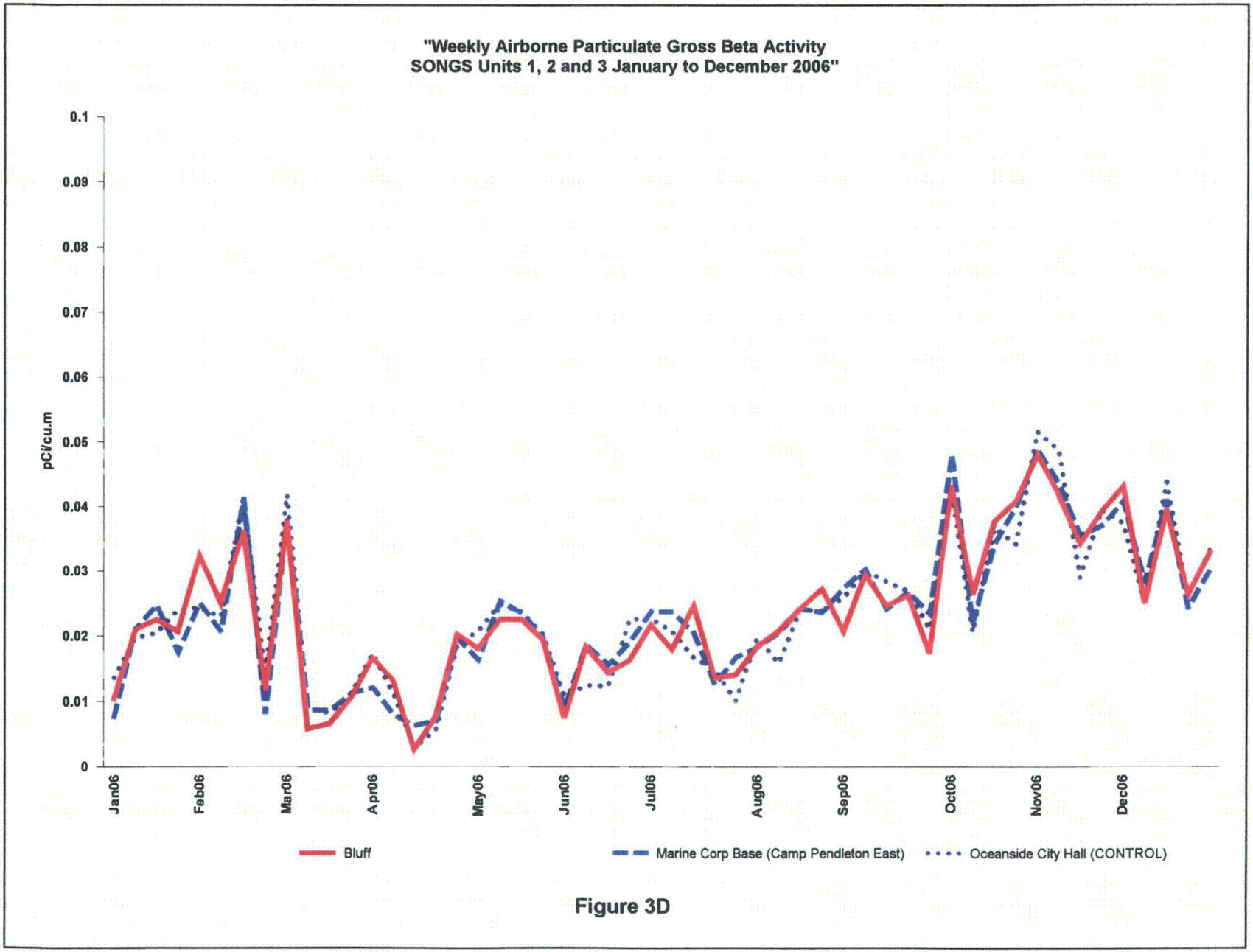

"Weekly Airborne Particulate Gross Beta Activity
SONGS Units 1, 2 and 3 January to December 2006"
pCi/cu.m
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan06
Feb06
Mar06
Apr06
May06
Jun06
Jul06
Aug06
Sep06
Oct06
Nov06
Dec06
Bluff
Marine Corp Base (Camp Pendleton East)
Oceanside City Hall (CONTROL)

Figure 3D

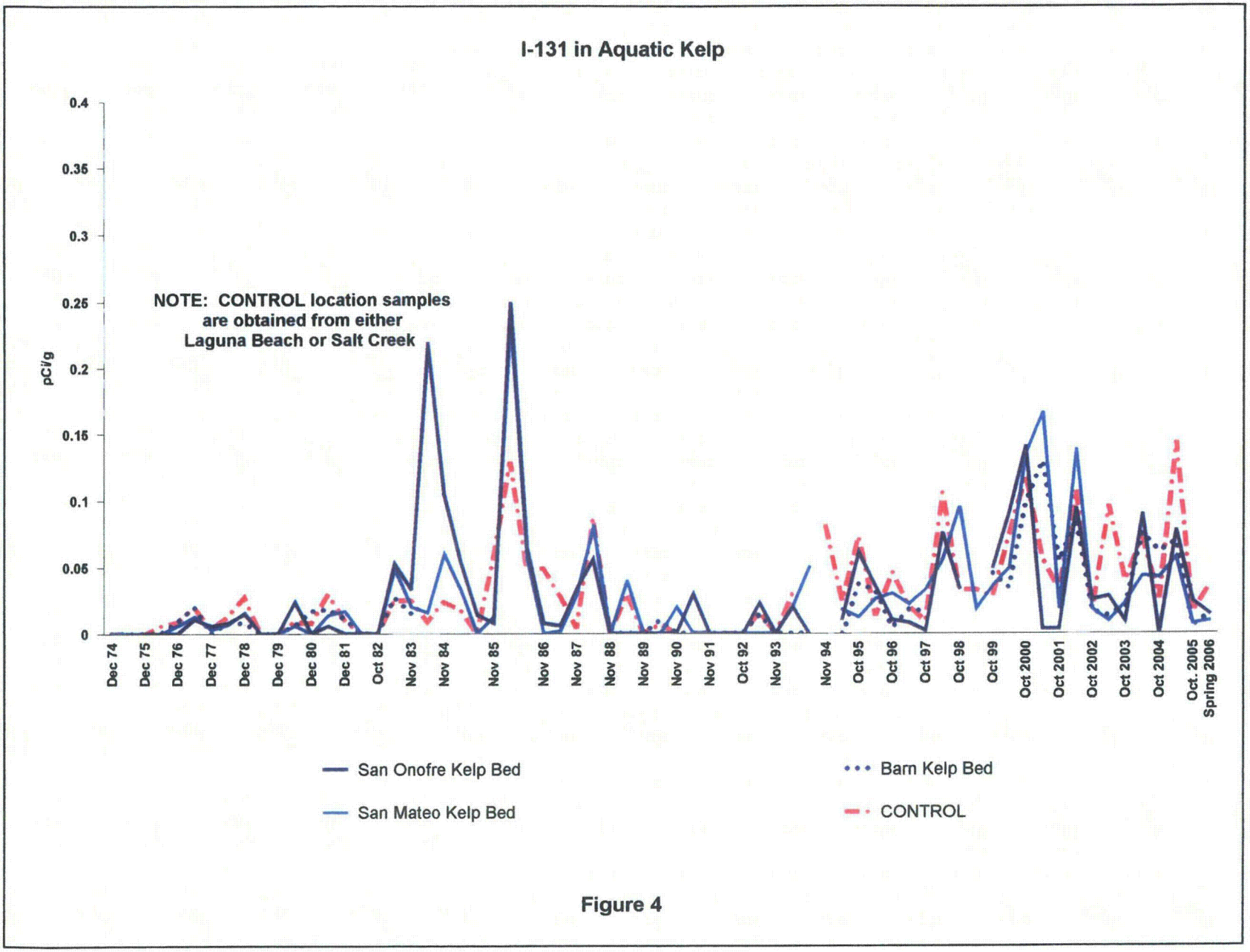

I-131 in Aquatic Kelp
pCi/g
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
NOTE: CONTROL location samples are obtained from either Laguna Beach or Salt Creek
Dec 74
Dec 75
Dec 76
Dec 77
Dec 78
Dec 79
Dec 80
Dec 81
Oct 82
Nov 83
Nov 84
Nov 85
Nov 86
Nov 87
Nov 88
Nov 89
Nov 90
Nov 91
Oct 92
Nov 93
Nov 94
Oct 95
Oct 96
Oct 97
Oct 98
Oct 99
Oct 2000
Oct 2001
Oct 2002
Oct 2003
Oct 2004
Oct. 2005 Spring 2006
San Onofre Kelp Bed
San Mateo Kelp Bed
Barn Kelp Bed
CONTROL

Figure 4

APPENDIX H

ERRATA TO THE 2005 AREOR

All data required by the ODCM in 2005 was reported in the 2005 AREOR. There are no errata to be appended to the 2005 AREOR.

APPENDIX I

REMP TLDs CO-LOCATED WITH DHS TLDs DURING 2006

APPENDIX I

REMP TLDs CO-LOCATED WITH DHS TLDs DURING 2006

Requirements in the standard Technical Specifications adopted under the Technical Specifications Improvement Program include reporting results of those thermoluminescent dosimeters (TLDs) that are co-located with NRC dosimeters. The NRC no longer deploys TLDs in the environs of SONGS. Some SCE TLDs are located adjacent to the former NRC TLD locations and these SCE TLDs are listed below.

The DHS (Department of Health Services) also maintains a TLD program in the environs of SONGS. The DHS direct radiation monitoring program uses Landauer TLDs.

The below listed quarterly TLD data is from the SCE & DHS TLD programs. The NRC location numbers refer to the locations in the old NRC program.

2006 Data from SCE TLDs

Location Number	Location Name	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
SCE -1 , NRC -7, DHS #2	San Clemente	16.16	19.59	16.44	16.02
SCE -2, NRC -23, DHS #8	Camp San Mateo	17.74	20.58	17.5	19.55
SCE -3, NRC -19, DHS #9	Camp San Onofre	14.91	17.7	15.4	16.52
SCE -6, DHS #10	Old Route 101 (East-Southeast)	10.69	12.71	10.9	11.78
SCE 10, NRC -12, DHS #6	San Onofre Surfing Beach	14.83	19.46	14.1	18.07
SCE 16, DHS #7*	ESE Site boundary	15.78	20.39	19.88	20.84
SCE 22, NRC 11, DHS #4	Coast Guard Station	16.68	20.22	17.57	17.56
SCE -34, NRC -14, DHS #5	San Onofre Elementary School	15.24	18.42	15.29	15.07
SCE 41, NRC 25, DHS #11**	Old Route 101 (Unit 3)	14.76	17.71	14.95	15.84
SCE 50, NRC 32, DHS #13	Oceanside Fire Station	16.39	17.89	15.53	16.59

* SCE 16 is approximately 15 meters from DHS 7. DHS 7 is across Basilone Rd.

** SCE 41 is approximately 120 meters from DHS 11. Results included per DHS request.

Appendix J

ISFSI (Independent Spent Fuel Storage Installation) TLD Data

ISFSI (Independent Spent Fuel Storage Installation) TLD Data

Per 10 CFR 72.126, SONGS implemented an environmental TLD program in the vicinity of the ISFSI. In the fourth quarter of 2001, 21 pre-operational TLDs were deployed in the area around the ISFSI foundation then under construction. The pre-operational TLDs data are compared to the data obtained after the commencement of spent fuel storage in the ISFSI for the purposes of estimating the additional dose potentially attributable to the operation of the ISFSI.

Environmental dose rates are variable. The REMP TLD data show a seasonal variability that does not appear to be related to any activities at SONGS. Data from the REMP indicator and control TLDs increase and decrease in a synchronous manner. The data support the conclusion that macro-environmental factors are the causative agents for the variations. Refer to Figure 2a and 2b. The ISFSI TLD data gathered to date appears to follow a similar seasonal variability. Refer to Figures 6-1, 6-2, and 7a. In addition to environmental factors some non-ISFSI work activities at Unit 1 have elevated the pre-operational measured ISFSI TLD dose. The storage and transport of radioactive materials and waste near the location of the ISFSI foundation area in 2001 and 2002 appears to have elevated the dose rates of TLDs 306 to 315. In addition, the removal of the Unit 1 reactor vessel in October 2002 caused a noticeable increase in the measured dose for TLDs 301 to 315. Refer to Tables J-1 and J-2 which list all the REMP and ISFSI TLD data within the 10 CFR 72 Controlled Area Boundary and the 10 CFR 50 EAB (Exclusion Area Boundary).

The TLDs close to the ISFSI foundation (TLDs 306 to 315) all showed a decrease in measured dose after the commencement of spent fuel storage in the ISFSI. Refer to Table J-1. This decrease in measured dose may be attributable to the aforementioned seasonal variability of environmental dose rates or it may be attributable to the decrease in non-ISFSI radioactive material work activity in the Unit 1 area.

In the first quarter 2004, 3 TLDs were placed on the perimeter fence 15 meters SW of the ISFSI module. These TLDs (336, 337, and 338) showed the highest measured dose in 2006. The closest publicly accessible location SW of the ISFSI is the San Onofre Beach access road. The TLDs located along the access road measured a dose indistinguishable from background in 2006.

We conclude that dose attributable to the storage of spent fuel in the ISFSI is not measurable beyond the immediate area of the ISFSI and is well below regulatory limits. We further conclude that dose to a member of the general public attributable to all SONGS related radiological activities at the EAB is below 10 CFR 72.104 limits.

TABLE J-1
ISFSI TLD DATA

ISFSI TLD Number Location	2001	2002				2003				2004			
	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr (1)	1st Qtr	2nd Qtr	3rd Qtr (2)	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
TLD 301 (3)	17.3	18.42	17.91	18.51	24.56	17.23	18.47	17.09	17.39	18.86	18.0	17.7	15.49
TLD 302 (3)	20.28	20.67	19.59	19.46	125.78	20.32	20.77	19.3	21.97	23.57	26.37	20.02	19.11
TLD 303 (3)	18.96	18.82	18.26	18.11	156.89	20.45	25.74	26.56	27.06	28.54	29.98	24.59	24.72
TLD 304 (3)	18.06	19.1	18.28	17.95	64.53	19.57	28.34	33.25	31.8	34.72	33.22	29.74	28.44
TLD 305 (3)	18.99	20.49	19.68	19.82	147.33								
TLD 306 (3)	17.23	18.56	16.91	17.07	29.6	19.03	19.75	17.3	17.27	18.85	17.31	15.7	16.08
TLD 307 (3)	17.34	19.61	17.68	17.36	23.35	24.07	20.3	16.24	16.82	18.07	17.62	15.53	15.11
TLD 308 (3)	18.75	20.11	18.9	18.68	27.22	21.82	21.31	18.35	18.73	20.55	21.72	18.11	15.82
TLD 309 (3)	18.74	23.09	23.43	24.43	30.53	21.78	20.49	18.44	16.85	20.15	21.44	18.72	17.34
TLD 310 (3)	19.79	25.82	23.47	21.49	25.8	20.74	19.05	18.96	17.59	21.17	21.28	18.19	17.15
TLD 311 (3)	21.29	29.93	25.33	26.43	26.61	25.24	23.59	21.8	19.99	19.06	20.43	18.04	17.52
TLD 312 (3)	21.86	34.08	28.45	30.07	26.45	28.46	27.71	19.88	16.15	15.5	13.87	15.23	13.35
TLD 313 (3)	24.95	36.84	28.78	26.49	25.44	25.78	26.34	25.6	23.4	22.87	21.14	20.68	20.0
TLD 314 (3)	20.67	22.28	20.15	19.58	18.8	19.74	20.23	19.3	19.85	18.84	19.06	17.68	15.83
TLD 315 (3)	23.37	25.7	22.77	22.58	20.82	24.06	23.18	22.77	21.49	20.89	21.36	19.26	18.13
TLD 316 (4)	16.96	18.81	17.83	16.29	18.01	16.72	17.76	16.01	14.97	16.68	19.06	15.15	14.45
TLD 317 (4)	18.07	19.87	20.62	17.95	18.43	16.86	18.82	17.12	16.02	17.41	17.51	16.96	14.94
TLD 318 (4)	17.86	18.91	19.59	18.4	18.3	17.62	19.01	17.72	16.95	18.15	18.31	16.34	16.37
TLD 319 (4)	17.78	19.76	20.01	19.02	18.35	19.14	19.54	18.57	15.88	17.22	19.19	16.48	16.54
TLD 320 (4)	17.83	19.39	19.11	18.34	18.25	17.78	19.41	17.8	16.94	16.36	19.18	16.34	15.93
TLD 321 (4)	18.52	19.84	20.45	18.67	19.41	19.83	21.1	18.46	17.82	18.89	20.8	16.92	15.5
TLD 336										39.12	31.35	30.77	24.63
TLD 337										36.03	49.65	65.77	47.51
TLD 338										45.83	38.84	36.06	30.27

(1) Large Component Removal and start of the long term storage of the Unit 1 Reactor Vessel.
(2) Fuel loaded into the ISFSI pad September 2003.
(3) These TLDs are in an area where radiological materials have been stored or transported.
(4) These TLDs are not in the proximity of radiological activities.

TABLE J-1
ISFSI TLD DATA

ISFSI TLD Number Location	2005				2006			
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr (1)	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
TLD 301 (3)	22.05	33.23	31.2	27.44	31.54	26.99	20.41	18.96
TLD 302 (3)	31.04	45.99	41	40.43	40.3	35.93	28.72	20.75
TLD 303 (3)	33.14	49.45	41.54	38.53	39.16	34.51	29.14	25.08
TLD 304 (3)	34.63	42.62	41.1	37.05	36.66	37.95	29.07	29.71
TLD 306 (3)	19.92	20.4	20.44	19.24	19.68	24.01	17.65	18.5
TLD 307 (3)	20.26	24.94	22.08	20.98	21.48	23.22	16.98	16.66
TLD 308 (3)	21.81	25.3	23.88	23.1	23.42	23.89	18.01	17.82
TLD 309 (3)	22.1	20.61	19.53	18.14	18.95	22.54	17.08	19.25
TLD 310 (3)	20.66	20.91	21.08	20.26	20.27	24.21	17.92	19.01
TLD 311 (3)	21.85	20.94	20.61	19.35	19.48	23.91	17.82	19.49
TLD 312 (3)	16.88	15.67	15.57	13.81	14.99	19.36	16.18	16.08
TLD 313 (3)	26.97	26.36	26.45	25.93	26.33	33.12	36.28	25.34
TLD 314 (3)	21.79	20.26	20.83	20.05	20.67	28.09	45.96	24.18
TLD 315 (3)	22.84	20.28	20.61	19.65	20.61	28.62	36.53	22.32
TLD 316 (4)	19.02	18.62	19.7	19.5	19.34	21.3	14.77	16.59
TLD 317 (4)	20.04	21.48	21.19	19.89	21.21	23.92	17.57	16.77
TLD 318 (4)	21.56	19.82	19.23	18.44	19.22	23.38	16.96	17.93
TLD 319 (4)	20.94	19.42	19.02	18.13	18.23	21.76	15.88	16.45
TLD 320 (4)	21.89	19.91	20.42	19.54	20.39	23.05	17.29	17.1
TLD 321 (4)	21.34	20.15	20.83	20.12	20.75	23.67	17.9	18.03
TLD 336	39.5	63.71	67.54	73.3	78.47	51.74	61.25	34.02
TLD 337	54.46	64.07	59.43	68.36	62.62	92.87	116.8	44.67
TLD 338	40.18	44.51	42.75	46.49	42.78	45.02	51.58	36.63

(1) Large Component Removal and start of the long term storage of the Unit 1 Reactor Vessel.
(2) Fuel loaded into the ISFSI pad September 2003.
(3) These TLDs are in an area where radiological materials have been stored or transported.
(4) These TLDs are not in the proximity of radiological activities.

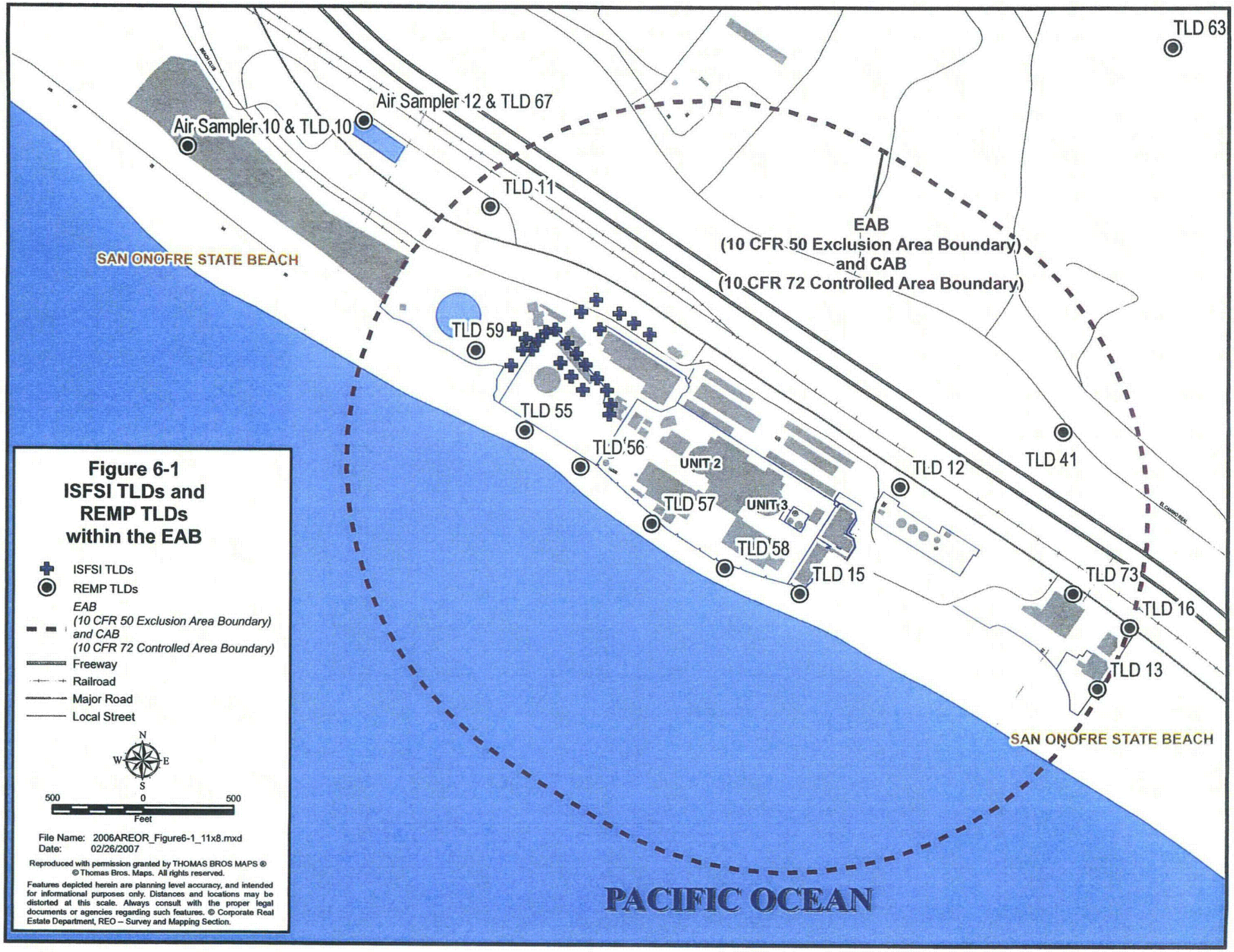
TABLE J-2
REMP TLDs WITHIN THE EAB

REMP TLD Number Location	2001				2002				2003				2004			
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr (1)	1st Qtr	2nd Qtr	3rd Qtr (2)	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
11	13.61	15.63	13.89	16.57	15.39	17.2	15.17	14.38	13.89	17.43	15.29	14.93	16.02	15.35	15.52	14.26
12	13.59	16.28	14.81	15.79	15.75	16.4	16.01	13.93	14.96	17.64	16.04	15.19	16.49	16.25	15.01	14.22
13	28.13	33.16	38.84	31.06	31.03	37.64	38.2	22.62	27.26	28.38	33.11	21.08	21.67	20.34	22.45	22.84
15	15.63	18.37	16.07	17.76	17.32	20.82	16.79	15.63	16.52	19.11	15.44	16.36	17.37	16.23	19.52	16.95
16	17.46	18.16	19.61	17.66	17.14	18.25	17.91	13.61	15.04	18.48	17.77	15.53	19.27	17.62	16.31	15.37
41	13.51	16.47	14.3	14.63	15.24	17.41	15.13	13.32	15.98	16.41	14.32	15.03	16.26	14.45	14.85	13.85
55	17.11	19.37	15.93	18.98	20.11	19.89	17.67	17.84	18.08	19.86	18.04	18.2	20.06	16.67	18.67	16.72
56	16.39	19.17	15.57	18.77	18.11	20.12	17.31	17.05	17.84	19.71	17.11	17.26	19.12	17.63	17.63	16.69
57	15.88	18.51	16.29	19.19	17.96	19.09	16.03	15.8	16.18	17.44	16.69	15.85	17.8	16.64	15.56	16.69
58	16.29	18.97	16.22	17.45	17.4	18.65	16.39	15.88	16.75	18.94	17.39	(3)	18.17	17.66	18.08	15.88
59	14.65	17.56	16.14	16.54	17.45	18.31	17.12	16.11	16.88	18.79	17.23	15.51	19.0	20.07	18.18	17.08
73	22.97	25.29	22.41	22.71	22.94	23.48	24.9	21.47	22.1	23.91	22.53	22.47	23.02	22.02	23.64	20.67

(1) Large Component Removal and the start of the long term storage of the Unit 1 Reactor Vessel.
(2) Spent Fuel Storage started at the ISFSI
(3) TLD damaged; no data available.

TABLE J-2
REMP TLDs WITHIN THE EAB

REMP TLD Number Location	2005				2006			
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
11	15.96	15.49	16.04	14.38	15.44	16.62	15.06	17.08
12	17.79	16.14	16.59	14.81	14.87	18.82	13.82	17.3
13	24.28	29.32	25.68	17.95	23.52	31.94	34.84	28.16
15	20.94	19.06	19.29	17.7	18.84	20.97	18.69	20.14
16	22.12	18.18	17.2	16.16	15.78	20.39	19.88	20.84
41	16.66	17.04	15.45	14.47	14.76	17.71	14.95	15.84
55	21.64	21.73	19.07	20.51	20.95	21.69	18.44	16.78
56	20.66	21.39	19.59	18.75	20.7	22.99	18.84	17.76
57	21.4	21.79	19.86	19.1	18.73	21.63	17.7	18.41
58	20.19	20.15	19.93	18.2	17.71	20.78	16.78	18.16
59	21.18	22.58	21.52	20.35	20.07	22.08	17.89	19.74
73	26.83	24.81	23.35	22.34	21.12	23.52	24.27	25.2


TLD 63
Air Sampler 12 & TLD 67
Air Sampler 10 & TLD 10
TLD 11
EAB
(10 CFR 50 Exclusion Area Boundary)
and CAB
(10 CFR 72 Controlled Area Boundary)
SAN ONOFRE STATE BEACH
TLD 59
TLD 55
TLD 56
UNIT 2
TLD 57
UNIT 3
TLD 58
TLD 15
TLD 12
TLD 41
TLD 73
TLD 16
TLD 13
SAN ONOFRE STATE BEACH
PACIFIC OCEAN
Figure 6-1
ISFSI TLDs and
REMP TLDs
within the EAB
ISFSI TLDs
REMP TLDs
EAB
(10 CFR 50 Exclusion Area Boundary)
and CAB
(10 CFR 72 Controlled Area Boundary)
Freeway
Railroad
Major Road
Local Street
N
W
E
S
500
0
500
Feet
File Name: 2006AREOR_Figure6-1_11x8.mxd
Date: 02/26/2007
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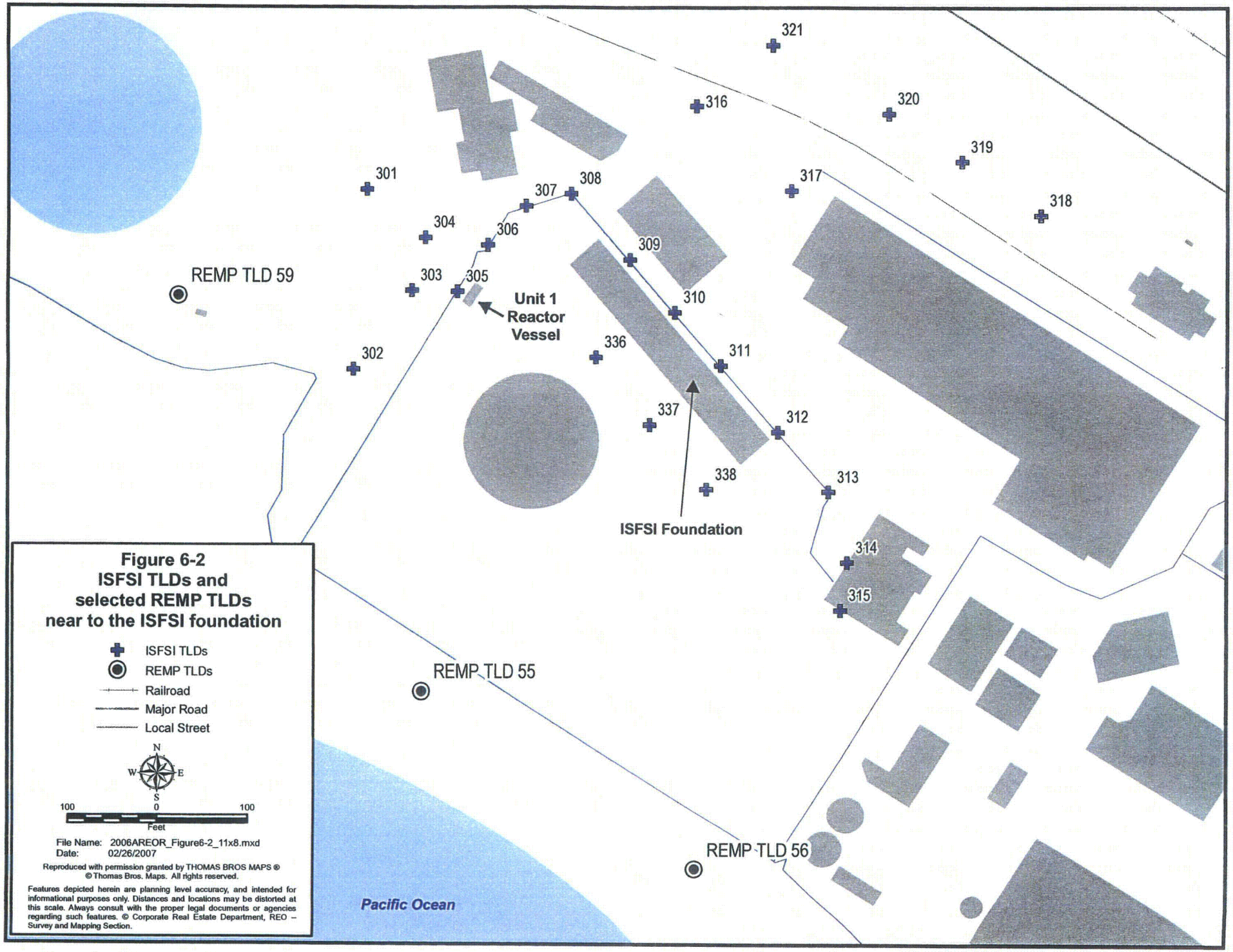
321
316
320
319
317
318
301
307
308
304
306
309
REMP TLD 59
303
305
310
Unit 1
Reactor
Vessel
336
311
302
337
312
338
313
ISFSI Foundation
314
315
REMP TLD 55
REMP TLD 56
Pacific Ocean
Figure 6-2
ISFSI TLDs and
selected REMP TLDs
near to the ISFSI foundation
ISFSI TLDs
REMP TLDs
Railroad
Major Road
Local Street
N
W
E
S
100
0
100
Feet
File Name: 2006AREOR_Figure6-2_11x8.mxd
Date: 02/26/2007
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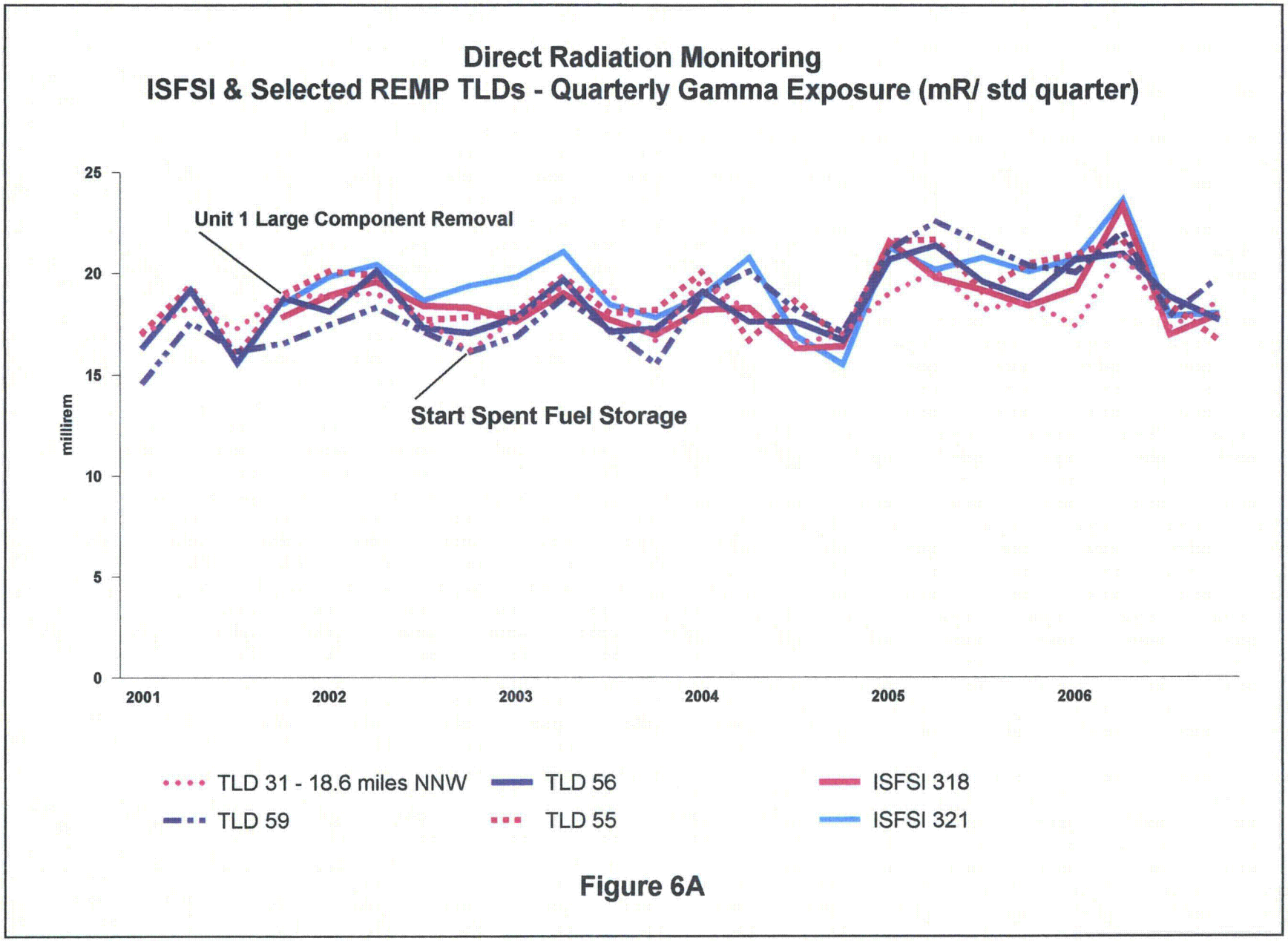
Direct Radiation Monitoring
ISFSI & Selected REMP TLDs - Quarterly Gamma Exposure (mR/ std quarter)
millirem
25
20
15
10
5
0
2001
2002
2003
2004
2005
2006
Unit 1 Large Component Removal
Start Spent Fuel Storage
TLD 31 - 18.6 miles NNW
TLD 56
ISFSI 318
TLD 59
TLD 55
ISFSI 321

Figure 6A