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Power
Authority

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Richard M. Kessel
Chairman

December 29, 1990

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

Attention: Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Re: Decommissioning Plan of the Long Island Power Authority for the Shoreham Nuclear Power Station (Docket No. 50-322)

Gentlemen:

As you know, on June 28, 1990, the Long Island Power Authority ("LIPA") and the Long Island Lighting Company ("LILCO") jointly applied for an amendment to the Nuclear Regulatory Commission ("NRC") license for the Shoreham Nuclear Power Station ("Shoreham") to allow transfer of the facility and the license (in a non-operating status) to LIPA. As explained in that application, LIPA will not operate Shoreham as a nuclear facility. Instead, LIPA initially will maintain Shoreham in a defueled, non-operating condition and then will decommission Shoreham pursuant to an NRC-approved decommissioning plan.

By this letter, LIPA, as the prospective Shoreham licensee responsible for Shoreham decommissioning, transmits to the NRC five copies of the following documents for NRC review and approval:

: LIPA's Shoreham Decommissioning Plan, as contemplated by 10 CFR § 50.82(a); and

: LIPA's Supplement to Environmental Report (Decommissioning) ("Environmental Supplement"), as contemplated by 10 CFR § 51.53(b).

An additional 45 copies of these documents will be transmitted separately to the NRC.

LIPA is authorized to state that LILCO has reviewed the Decommissioning Plan and Environmental Supplement and consents to their submission on the docket.

The Decommissioning Plan and Environmental Supplement have been prepared by LIPA with the assistance of the New York Power Authority ("NYPA"), Bechtel Power Corporation and Bechtel Associates Professional Corporation (collectively "Bechtel"), and other contractors identified in the Decommissioning Plan. NYPA serves as LIPA's principal contractor for the decommissioning of Shoreham. Bechtel is providing conceptual and detailed engineering services for decommissioning. In addition, LIPA has consulted extensively with LILCO concerning the Decommissioning Plan.

As detailed in the Decommissioning Plan and the Environmental Supplement, LIPA intends to decommission Shoreham by means of the DECON alternative. Decommissioning by the DECON alternative will be safe and cost effective and is particularly appropriate in light of the limited operating history and low levels of radiological contamination at Shoreham. The Environmental Supplement demonstrates that decommissioning Shoreham using the DECON alternative will have no significant environmental impacts and, in fact, will confer an environmental benefit by achieving release of the Shoreham site for unrestricted use in the near future.

LIPA respectfully requests that the NRC proceed expeditiously in its review and approval of the Decommissioning Plan. In view of the limited operation and low level of radioactivity at Shoreham, the NRC should be able to review and approve the Decommissioning Plan in substantially less time than required for a plant that has operated at full power for an extended period of time. Moreover, given the very substantial costs involved in maintaining Shoreham pending initiation of actual decommissioning, it is critical that the NRC give prompt review and approval not only to the Decommissioning Plan, but also to LILCO's January 5, 1990 request to amend Shoreham's NRC license to a possession-only license (POL) or other defueled license and to LIPA's and LILCO's joint License Transfer application filed on June 28, 1990. LILCO presently is expending approximately $150 million per year to own and maintain Shoreham consistent with expressed NRC policies, an amount that ultimately is borne by Long Island ratepayers. Such expenditures for a plant that will never operate strongly counsel expeditious NRC action on the POL application, the License Transfer application and the Decommissioning Plan.

In this regard, while the Decommissioning Plan assumes that the NRC will approve the License Transfer application on July 1, 1991 and the Decommissioning Plan on October 1, 1991, LIPA would be prepared to receive the Shoreham license and to commence decommissioning in advance of those dates.

LIPA, together with NYPA, Bechtel, LILCO, and other contractors, is prepared to work cooperatively with the NRC Staff to facilitate consideration of the Decommissioning Plan, the Environmental Supplement and the License Transfer application. LIPA would be pleased to meet at the NRC's convenience at a technical or management level to discuss these matters.

Very truly yours,

Richard M. Kessel

cc: William Catacosinos

Enclosures

LONG ISLAND POWER AUTHORITY

SHOREHAM NUCLEAR POWER STATION

NRC Docket No. 50 - 322

DECOMMISSIONING PLAN

DECEMBER 1990

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LIST OF ACRONYMS AND DEFINITIONS

A/E - Architect/Engineer

AIF - Atomic Industrial Form

ARC - ALARA Review Committee

Bechtel - Bechtel Power Corporation and Bechtel Associates Professional Corporation

BWR - Boiling Water Reactor

CRD - Control Rod Drives

DAW - Dry Active Waves

DCS - Drive Cutting Station

DOT - United States Department of Transportation

DP - Decommissioning Plan

DSAR - Defueled Safety Analysis Report

DTS - Defueled Technical Specifications

EAB - Exclusion Area Boundary

EPA - United States Environmental Protection Agency

EPP - Environmental Protection Plan

GET - General Employee Training

GM - Geiger Mueller

HEPA - High Energy Particulant Air

HP - Health Physics

HPCI - High Pressure Coolant Injection

HPP - Health Physics Program

IRP - Independent Review Panel

LIST OF ACRONYMS AND DEFINITIONS

LILCO	-	Long Island Lighting Company
LIPA	-	Long Island Power Authority
LLRW	-	Low Level Radioactive Waste
LPG	-	Liquid Propane Gas
LSA	-	Low Specific Activity
MWe	-	Megawatts Electric
NDE	-	Non-Destructive Examination
NESP	-	National Environmental Studies Project
NQA	-	Nuclear Quality Assurance
NRC	-	United States Nuclear Regulatory Commission
NSSS	-	Nuclear Steam Supply System
NYPA	-	New York Power Authority
NYPSC	-	New York Public Service Commission
OJT	-	On the Job Training
PAG	-	Protective Action Guide
PCI	-	Power Cutting, Inc.
POL	-	Possession-only License
QA	-	Quality Assurance
QAM	-	Quality Assurance Manual
QC	-	Quality Control
QS	-	Quality Systems

LIST OF ACRONYMS AND DEFINITIONS

RBCLCW	-	Reactor Building Closed Loop Cooling Water
RCIC	-	Reactor Core Isolation Cooling
REMP	-	Radiological Environmental Monitoring Program
RPV	-	Reactor Pressure Vessel
RWCU	-	Reactor Water CleanUP
RWP	-	Radiation Work Permit
SCPFR	-	Shoreham Characterization Program Final Report
Shoreham	-	Shoreham Nuclear Power Station
SRC	-	Site Review Committee
SRV	-	Scram Reactor Volume
TLG	-	TLG Engineering
UCF	-	Units Cost Factor
USAR	-	Updated Safety Analysis Report
WBS	-	Work Breakdown Structure
WCS	-	Wet Cutting Station

1.0 SUMMARY OF PLAN

1.1 Background Information and Decommissioning Plan Organization

1.1.1 Background Information

On February 23, 1989, Governor Cuomo, representating the State of New York, and the Long Island Lighting Company (LILCO) entered into a Settlement Agreement (Ref. 1-1) under which LILCO agreed not to operate the Shoreham Nuclear Power Station (Shoreham) as a Nuclear facility and to transfer the plant and certain areas and buildings on the Shoreham site to the Long Island Power Authority (LIPA). LIPA is a corporate municipal instrumentality and a political subdivision of the State of New York. LIPA was created by a New York State statute, the LIPA Act (Ref. 1-2). LIPA is empowered to assess the needs for gas and electric power on Long Island and to acquire, construct, maintain and operate such generating and transmission facilities as it deems desirable in order to maintain an adequate electric and gas supply on Long Island. LIPA is also specifically authorized by the LIPA Act to acquire the Shoreham plant; upon such acquisition, LIPA is required to close and decommission the plant as a nuclear facility and to investigate and develop non-nuclear alternative uses, if any, for the plant.

On April 14, 1989, LILCO and LIPA entered into an Asset Transfer Agreement (Ref. 1-3) under which LILCO reiterated its agreement never to operate the Shoreham plant and to transfer it to LIPA. The Settlement Agreement and the Asset Transfer Agreement (collectively, the "Settlement") have been approved by the Board of Directors and shareholders of LILCO, the Board of Trustees of LIPA and the State of New York Public Service Commission (NYPSC). The Settlement became effective on June 28, 1989, when LILCO's shareholders voted to approve it.

Promptly after June 28, 1989, LILCO notified the Nuclear Regulatory Commission (NRC) of its intentions never to operate the Shoreham plant as a nuclear facility. On June 28, 1990, LILCO and LIPA jointly submitted a license amendment request (Ref. 1-4) to the NRC requesting that LILCO's Shoreham license be transferred to LIPA. Upon the NRC's approval of the license transfer amendment request, LIPA will be responsible for carrying out the safe and orderly maintenance and decommissioning of the Shoreham plant, acting then as the plant owner and licensee.

This Decommissioning Plan (DP) is submitted by LIPA, as the prospective licensee with ultimate responsibility for Shoreham's decommissioning, with the consent of LILCO, the current licensee. The DP was prepared in accordance with the requirements of 10 CFR 50.82. Draft Regulatory Guide DG-1005, "Standard Format and Content for Decommissioning Plans for Nuclear Reactors" (Ref. 1-5) was used as guidance in preparing the DP. LIPA was assisted in preparation of the DP by the New York Power Authority (NYPA), by LIPA's decommissioning architect/engineer (A/E), the Bechtel Power Corporation and Bechtel Associates Professional Corporation (collectively, "Bechtel"), and by other contractors. In addition, LILCO has also cooperated in the preparation of this DP, including the provision of data and analysis for the DP and reviewing the DP.

This DP is accompanied by a "Supplement to Environmental Report (Decommissioning)" which has been prepared in accordance with 10 CFR 51.53(b). The Supplement reflects earlier environmental analyses prepared by LIPA. On November 1, 1990, LIPA issued a Final Generic Environmental Impact Statement (Ref. 1-6), regarding the selection and implementation of the DECON decommissioning alternative at Shoreham in compliance with the requirements of the New York State Environmental Quality Review Act.

In accordance with 10 CFR 50.82(a), LIPA will subsequently submit to the NRC a request for license termination which will reference this DP.

1.1.2 Organization of the Decommissioning Plan

Section 1.0 discusses the background leading up to LIPA's submission of the DP. It also provides a summary of the decommissioning alternative selected (DECON) and major DP topics (i.e., estimated costs, site history, available funds, quality assurance (QA) controls and audit activities, site physical description, major decommissioning activities, milestone schedule, and the final radiation survey plan).

Section 2.0 provides a description of LIPA's selection of the DECON decommissioning alternative and the related activities and tasks. It also describes LIPA's project organization, scope of training and intentions related to the use of contractor assistance.

Section 3.0 describes the radiological status of the facility and discusses the radioactive waste management program for decommissioning. Radiation protection, accident analysis and occupational safety are also discussed.

Section 4.0 discusses the residual radioactive contamination release criteria and the final radiation survey plan.

Section 5.0 contains a description of the cost estimating methodology and provides a summary of the decommissioning cost estimate and funding plan.

Section 6.0 summarizes the technical and environmental specifications and other administrative controls that will be in place during decommissioning.

Section 7.0 summarizes the quality assurance provisions and administrative controls that will be in place during decommissioning.

Section 8.0 provides a description of and a schedule for the contemplated changes to the security plan.

1.2 Site Description

1.2.1 Physical Description

The Shoreham site is located on the north shore of Long Island in the Town of Brookhaven, Suffolk County, New York, as shown on the General Location Map (Figure 1.2-1). The site is approximately 50 miles east of the LaGuardia Airport.

The Shoreham site comprises approximately 500 acres. The developed portion of the Shoreham plant site, which includes the Shoreham plant structures, occupies approximately 80 acres and is located in the northern sector of the property. This area is bounded on the north by Long Island Sound, on the south by North Country Road, on the east by the Wading River marshlands and on the west by a parcel of approximately 420 acres known as the Shoreham West property. Figure 1.2-2 shows the Shoreham site plan and the location of the Reactor Building and other major facilities on the developed portion of the site. The area of the Shoreham site to be transferred to LIPA is shown in Figure 1.2-3. It also shows the overall site layout, including the location and identification of individual buildings and facilities.

The property which will be utilized by LIPA in the decommissioning of the Shoreham plant is defined as the "Project Area" and is in general shown on Figure 1.2-3. The Project Area is approximately 18 acres, of which 11 acres will be transferred to LIPA by LILCO. LILCO has agreed that LIPA will have access to other facilities and property of LILCO should the need arise in connection with the Shoreham plant's maintenance and decommissioning. The Asset Transfer

Agreement and a subsequent agreement between LILCO and LIPA -- the Site Cooperation and Reimbursement Agreement (Site Agreement) (Ref. 1-7) -- provide the specific details on these arrangements. The Project Area is covered primarily by structures, asphalt or gravel. The facilities outside the LIPA property that may be used for decommissioning activities include existing parking lots, laydown areas, warehousing and other ancillary structures.

The site terrain is generally hilly, varying from beach level at Long Island Sound to an elevation of 200 feet midway between North Country Road and the southern border of the site. Except for the developed portions, the site is mostly wooded, with wetlands along the east and west boundaries extending as much as 1,300 feet from the shore.

The nearest location accessible to the general public (approximately 600 feet NE of the Reactor Building) is along Wading River Creek east of the east plant access road (New Beach Road). This area is within the site property, but is accessible from the Riverhead Town beach. The nearest accessible location on property not controlled by LILCO is a nature conservation area which adjoins the Shoreham site to the east, about 1100 feet from the Reactor Building. The nearest residence is located on the beach about 1500 feet NE of the Reactor Building.

The Shoreham site topography, hydrology, climatology, meteorology and seismology are extensively described in LILCO's Updated Safety Analysis Report (USAR) (Ref. 1-8). The Shoreham site is characterized as a low seismicity area. There have been no earthquake epicenters detected in the immediate vicinity of the site.

As described in the Shoreham USAR, the plant is comprised of a boiling water reactor (BWR) nuclear steam supply system (NSSS), and a turbine generator, both furnished by the General Electric Company. The reactor core thermal power rating is 2346 megawatts thermal. The balance of the plant was designed to provide a gross electrical output of 849 megawatts electric (MWe).

The principal buildings and structures at the Shoreham site are as shown on Figure 1.2-3 and include the following:

o Reactor Building

The Reactor Building houses the NSSS which includes the reactor pressure vessel (RPV) and its associated auxiliary and safety systems. A conceptual diagram of the Reactor Building is provided in Figure 1.2-4; the RPV is shown in Figure 1.2-5.

Major pertinent structural components include the primary containment (suppression pool and dry well), spent fuel storage pool, dryer/separator pool, polar crane and building sumps. In addition to the reactor and its recirculation system, major auxiliary and safety systems include the residual heat removal system (comprised of several subsystems), reactor core isolation cooling, high pressure coolant injection, core spray, standby liquid control, reactor water cleanup, fuel pool cooling and cleanup, and primary containment atmospheric control systems. Large fans and ductwork are installed for normal and emergency ventilation. The Reactor Building contains virtually all of the contaminated systems and structures to be decontaminated and/or removed during decommissioning as described in Section 3.1. These include the RPV, piping systems, floor drains and sumps.

- Turbine Building

The Turbine Building houses the turbine generator and other balance of plant systems and equipment. These include the main condenser, condensate system, feedwater system, extraction heaters and part of the off-gas radwaste system. The Turbine Building contains only one structure, a drain sump, that is known to be contaminated.

- Radwaste Building

The Radwaste Building includes a number of plant support systems, such as the condensate demineralizers, the liquid radwaste system, the solid radwaste storage area, the crane and truck bay, the makeup water treatment plant, chemical support systems and a portion of the off-gas radwaste system (i.e., sacrificial decay beds and charcoal decay tanks). The Radwaste Building contains some slightly contaminated structures and systems, such as floor drain sumps and radwaste tanks. The processing of waste generated during decommissioning will be handled by portable radwaste equipment to minimize further contamination of these structures and systems and to avoid contamination of systems that are presently clean.

- Control Building

The Control Building houses three Trans-America DeLaval emergency diesel-generator units and associated support equipment on the ground floor. The Control Room is on the top floor. The building also houses station air conditioning equipment, and electrical relay and switchgear equipment. The Control Building will be needed to operate various systems and equipment in support of plant decommissioning. The emergency diesel-generators will supply emergency backup power during fuel handling operations.

- Intake and Discharge Structures

The Intake and Discharge Structures include the intake canal, screenwell and the circulating water diffuser.

- Security Building

The Security Building houses plant security operations and administrative offices. The Security Building will be used throughout decommissioning to provide access control for personnel and vehicles in support of decommissioning activities.

- Administration Building

The Administration Building consists of two connected buildings: the Offices and Services Building that houses offices and a maintenance shop; and the Office Building Annex that houses offices and emergency technical support facilities.

1.2.2 Plant Status

The Shoreham plant was tested by LILCO only briefly at low (under 5 percent) power. Due to this limited operating history, the extent of radioactive contamination at Shoreham is quite limited. Aside from the nuclear fuel which presently is stored in the spent fuel pool, LIPA estimates that the total radioactive inventory at Shoreham is about 602 curies, almost all of which is located in the RPV and its internals. Outside of the RPV and its internals, the radioactive inventory of the remaining structures and systems is about 3 millicuries. This relatively small and localized amount of radioactive material should facilitate expeditious and safe decommissioning of the plant, as described hereafter.

At the present time, the Shoreham plant still holds a full-power operating license, although, by Confirmatory Order dated March 29, 1990, the license was modified such that LILCO may not load fuel into the vessel without the NRC's prior approval (Ref. 1-9). LILCO has requested the NRC to amend Shoreham's license further to a defueled operating license (DOL) or possession-only license (POL) (Ref. 1-10) and it is such a DOL or POL which LIPA expects to be transferred to LIPA pursuant to its pending license transfer amendment request (Ref. 1-4).

LILCO is working cooperatively with LIPA to facilitate the prompt and orderly transfer of Shoreham plant ownership from LILCO to LIPA. In addition, the LILCO plant staff has undertaken three (3) major work efforts related to LIPA's preparations for Shoreham's decommissioning.

First, working closely with members of LIPA's project team, LILCO was responsible for planning and implementing a program to radiologically characterize the Shoreham plant. By June, 1990, LILCO's comprehensive site characterization study was largely complete (Ref. 1-11). The data acquired by LILCO through this undertaking have been used extensively by LIPA in the development of the DP. LILCO remains cooperative and supportive in acquiring additional radiological data as needs have been identified.

Second, LILCO is pursuing the removal and disposal of several reactor components which are either normally removed and replaced during the course of plant operation, or can be readily removed without permanent, irreversible damage to the reactor. The start-up neutron source, in addition to start-up incore instrumentation, have already been removed from the reactor, packaged and shipped to off-site licensees.

Lastly, LILCO has evaluated and is planning to implement a chemical decontamination program to decontaminate five of the nine contaminated plant systems identified in Section 2.2.1.1. LILCO has selected a technique that has been used at operating nuclear plants, and has determined that this process can be used without causing irreversible damage or degradation to the plant equipment. In addition, LILCO is using the existing Shoreham plant staff to manually decontaminate various areas of the plant, including the suppression pool and reactor cavity. It is anticipated that there will be several benefits to LIPA resulting from LILCO's decontamination program, including the possible reduction in the overall scope of decommissioning and dismantlement (i.e., under the assumption that levels of contamination in plant systems and structures are reduced below acceptable release criteria). Such decontamination efforts are being closely monitored by LIPA and will be factored into LIPA's detailed engineering and planning activities for decommissioning. As noted hereafter, however, for purposes of this DP, LIPA generally has assumed that LILCO's decontamination activities will not reduce contamination levels to below acceptable release criteria and that, accordingly, this DP will need to address all presently contaminated systems.

1.3 Overview of Decommissioning Plan

1.3.1 Selected Decommissioning Alternative

LIPA has selected the DECON alternative for the decommissioning of the Shoreham plant. The DECON alternative, which is reflected as LIPA's selected alternative throughout this DP, is defined by the NRC in Reference 1-12 as follows:

> "DECON is the alternative in which the equipment, structures, and portions of the facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."

1.3.2 Major Decommissioning Activities

The major decommissioning activities have been divided into the following work categories:

(1) System and Structure Decontamination and Dismantlement.

(2) Segmentation of the Reactor Pressure Vessel and Internals.

(3) Radwaste Management.

(4) Area Cleanup and Decontamination.

(5) Final Radiation Survey.

System and Structure Decontamination and Dismantlement

As described more completely in Section 2.2, LIPA intends to decontaminate and dismantle Shoreham's plant systems and structures to the extent necessary to assure the removal of the Shoreham plant irrevocably from service as a nuclear generating facility and to permit release of the facility for unrestricted use. LIPA is contemplating the use of a wide range of decontamination and dismantlement techniques to achieve this objective.

Decontamination techniques to be employed by LIPA are consistent with those used routinely throughout the nuclear industry. In-situ chemical decontamination, ultra-high pressure water lancing, abrasive grit blasting and a variety of manual techniques are all expected to be used by LIPA during the course of Shoreham's decommissioning. In addition, LIPA is closely evaluating the off-site decontamination services discussed in Section 3.3.

LIPA similarly will apply industry-accepted and field-proven processes for the dismantlement of certain plant systems and structures. Such techniques will range from simple, manually operated power bandsaws used to sever small bore piping through more sophisticated techniques such as diamond wire saw cutting which may be used to sever the large bore piping connections to the RPV. The selected options, as well as LIPA's continued evaluation of available technology, will reflect careful consideration of the radiological conditions associated with their intended application.

<u>Segmentation of the Reactor Pressure Vessel and Internals</u>

Radiological characterization of the Shoreham site has revealed that the majority of radioactive material resulting from the plant's limited period of operation is contained within the reactor internals. The RPV and internals will be decontaminated to the extent practicable, and to the extent necessary will be segmented, packaged and shipped for off-site disposal as described in Sections 2.2 and 3.3.

Segmentation of the more highly activated reactor internals will be performed using underwater, semi-automatic plasma arc and metal disintegration machining equipment. The RPV will be severed into ring sections using the diamond wire saw. The ring sections will then be cut into pieces appropriately sized to permit their safe and efficient handling, packaging and shipping using either the diamond wire saw or a thermal cutting technique.

<u>Radwaste Management</u>

LIPA has estimated that approximately 79,000 cubic feet of low level radioactive waste (LLRW) will be generated as a result of Shoreham's decommissioning. Section 3.3 describes LIPA's plans for processing, packaging, shipping and disposing of Shoreham's radwaste in accordance with applicable federal and state regulations. As described in Section 7.0, radwaste-related activities will be subject to LIPA's QA program.

Volume reduction is a key aspect of LIPA's plan for managing Shoreham's radwaste. Through an aggressive campaign of decontamination, waste segregation and other industry-proven waste processing techniques, LIPA anticipates that Shoreham's radwaste can be consolidated so that only a small fraction of the 79,000 cubic foot estimate will require disposal at a licensed radwaste burial facility.

Area Cleanup and Decontamination

Precautions will be taken to preclude the spread of contamination to the vast majority of plant areas which are presently clean. However, various areas throughout the plant which are affected by the decontamination and dismantlement activities will be surveyed and decontaminated, as required, following the completion of decommissioning activities.

Final Radiation Survey

A final radiation survey will be conducted on all suspected and known contaminated structures, systems, components, equipment, on-site grounds and adjacent environs upon completion of the decontamination and dismantlement activities. The final survey will demonstrate that any residual contamination is within the criteria for unrestricted release. The final plan is based largely on the statistical and sampling methodology developed in NUREG/CR-2082 (Ref. 1-13). This methodology will provide a basis for determining that a decommissioned site meets the criteria for unrestricted release.

The survey will involve a full evaluation of the site, and the development of a sampling program and the controls to be used over virtually all aspects of the survey to assure valid results. The site will be divided into survey blocks and characterized as described in Section 4.1. Specific media to be sampled will be determined, and the methods of sampling will be evaluated. Instrumentation appropriate to detecting gamma or beta/gamma radiation in and on various media will be used. Limitations of processes and instruments will be evaluated. Laboratory analysis will incorporate statistical methods in evaluations, and all data will be taken, collected, processed, analyzed, stored, retrieved and interpreted under LIPA's QA program which is described in Section 7.0.

1.3.3 Schedule

LIPA has prepared a schedule of its planned decommissioning activities under the selected DECON alternative. As indicated by the scheduled milestones provided in Figure 1.3-1, the Shoreham decommissioning project is planned to commence with physical decommissioning in October 1991 and be complete by the end of 1993, with actual termination of Shoreham's NRC license occurring upon completion of NRC review. A more detailed project schedule, and discussion of the many assumptions which were made in its development, is included in Section 2.2.

1.3.4 Cost Estimate and Funding

The estimated cost to decommission Shoreham is $186 million, in 1991 dollars. LIPA's cost estimate was prepared in a manner that is consistent with industry decommissioning studies that were used by the NRC in development of the Decommissioning Rule (Ref. 1-14) and reflects LIPA's Shoreham-specific plan for plant decommissioning. The estimate is discussed in greater detail in Section 5.1, along with the underlying assumptions which were used in its development. It is to be noted that the elements of work (i.e., work breakdown structure (WBS)) comprising LIPA's cost estimate in Section 5.1 are consistent with the activities and tasks included in LIPA's schedule (see Section 2.2).

As specified in the Settlement Agreement (Ref. 1-1), the Asset Transfer Agreement (Ref. 1-3), and the Site Agreement (Ref. 1-7), LILCO is responsible for providing all of the funds required for the Shoreham decommissioning. The details of such LILCO funding have been set forth in the Site Agreement. This agreement sets forth the precise mechanism for payment by LILCO of Shoreham related costs incurred by LIPA. The NYPSC approved the Site Agreement in an order dated June 7, 1990 (Ref. 1-15). This approval ensures that LIPA will have sufficient funds, ultimately through NYPSC ratemaking, to pay for Shoreham decommissioning. This funding arrangement is described more fully in Section 5.2, where, in addition, the appropriate references are drawn to a pending LILCO licensing submission (Ref. 1-16) regarding the funding plan for Shoreham's decommissioning.

1.3.5 Quality Assurance

The activities related to decommissioning of the Shoreham plant that are subject to QA controls are defined in Section 7.0 of the DP. All structures, systems, and components which are considered "safety related" for the safekeeping and storage of nuclear fuel in the spent fuel storage pool will be governed by the QA program described in Section 17.2 of the Defueled Safety Analysis Report (DSAR) (Ref. 1-17), "Quality Assurance During the Operations Phase," until the removal of nuclear fuel from the facility.

Section 7.0 also describes LIPA's QA program that will be in place to assure that decommissioning and other related specified activities described in this DP are accomplished in accordance with the license, applicable codes and standards, and regulatory requirements, and in a manner that will protect the health and safety of the general public and personnel working at the Shoreham plant. While LIPA will retain ultimate responsibility for the QA program, contractors and suppliers providing services or equipment for decommissioning or related activities will be required to implement a QA program approved by LIPA, or to work under LIPA's QA program.

1.4 REFERENCES

1-1. Settlement Agreement - LILCO Issues, dated February 28, 1989.

1-2. Long Island Power Authority Act, New York Public Authorities Law Section 1020 et seq. (McKinney Supp. 1990).

1-3. Amended and Restated Asset Transfer Agreement between LILCO and LIPA dated as of June 16, 1988, as Amended and Restated as of April, 14, 1989.

1-4. Joint Application of LILCO and LIPA for License Amendment to Authorize Transfer of Shoreham, Docket No. 50-322, License No. NPF-82, dated June 28, 1990.

1-5. Draft Regulatory Guide DG-1005, "Standard Format and Content for Decommissioning Plans for Nuclear Reactors," September 1989.

1-6. Long Island Power Authority, "Final Generic Environmental Impact Statement for the Decommissioning of the Shoreham Nuclear Power Station," November 1990.

1-7. Site Cooperation and Reimbursement Agreement by and between LILCO and LIPA, dated as of January 24, 1990.

1-8. Long Island Lighting Company, "Updated Safety Analysis Report-Shoreham Nuclear Power Station," Docket No. 50-322, Revision 3, June 1990.

1-9. Confirmatory Order Modifying License (Effective Immediately), Docket No. 50-322, License No. NPF-82, March 29, 1990, 55 Fed. Reg. 12258 (April 5, 1990).

1-10. Long Island Lighting Company, "Application for an Amendment to Facility Operating License NPF-82," Docket No. 50-322, transmitted via SNRC-1664 from W.E. Steiger to U.S. Nuclear Regulatory Commission, January 5, 1990.

1-11. Long Island Lighting Company, "Shoreham Nuclear Power Station Site Characterization Program Final Report, "May 1990; Addendum 1, June 1990; Addendum 2, August 1990.

1-12. U. S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988.

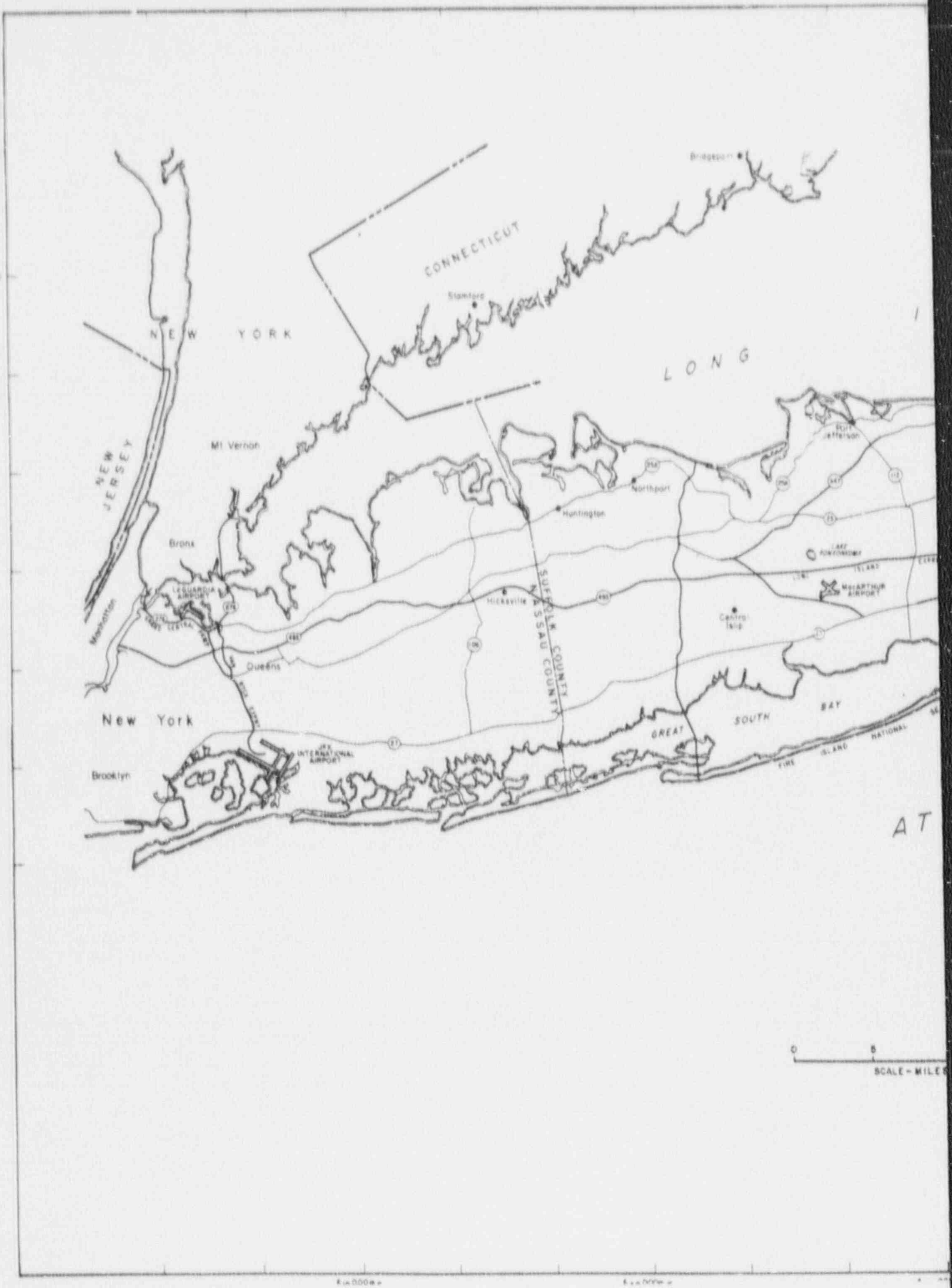
1-13. U.S. Nuclear Regulatory Commission, "Monitoring for Compliance with Decommissioning Termination Survey Criteria," NUREG/CR-2082, June 1981.

1-14 Final Rule, "General Requirements for Decommissioning Nuclear Facilities," 53 Fed. Reg. 24018 (1988).

1-15. NYPSC Approval of Site Agreement, dated June 7, 1990.

1-16. Long Island Lighting Company Letter from V. A. Staffieri to U. S. Nuclear Regulatory Commission, June 11, 1990.

1-17. Long Island Lighting Company, "The Shoreham Nuclear Power Station Defueled Safety Analysis Report," Attachment 3 to SNRC-1664 from W. E. Steiger to U. S. Nuclear Regulatory Commission, January 5, 1990.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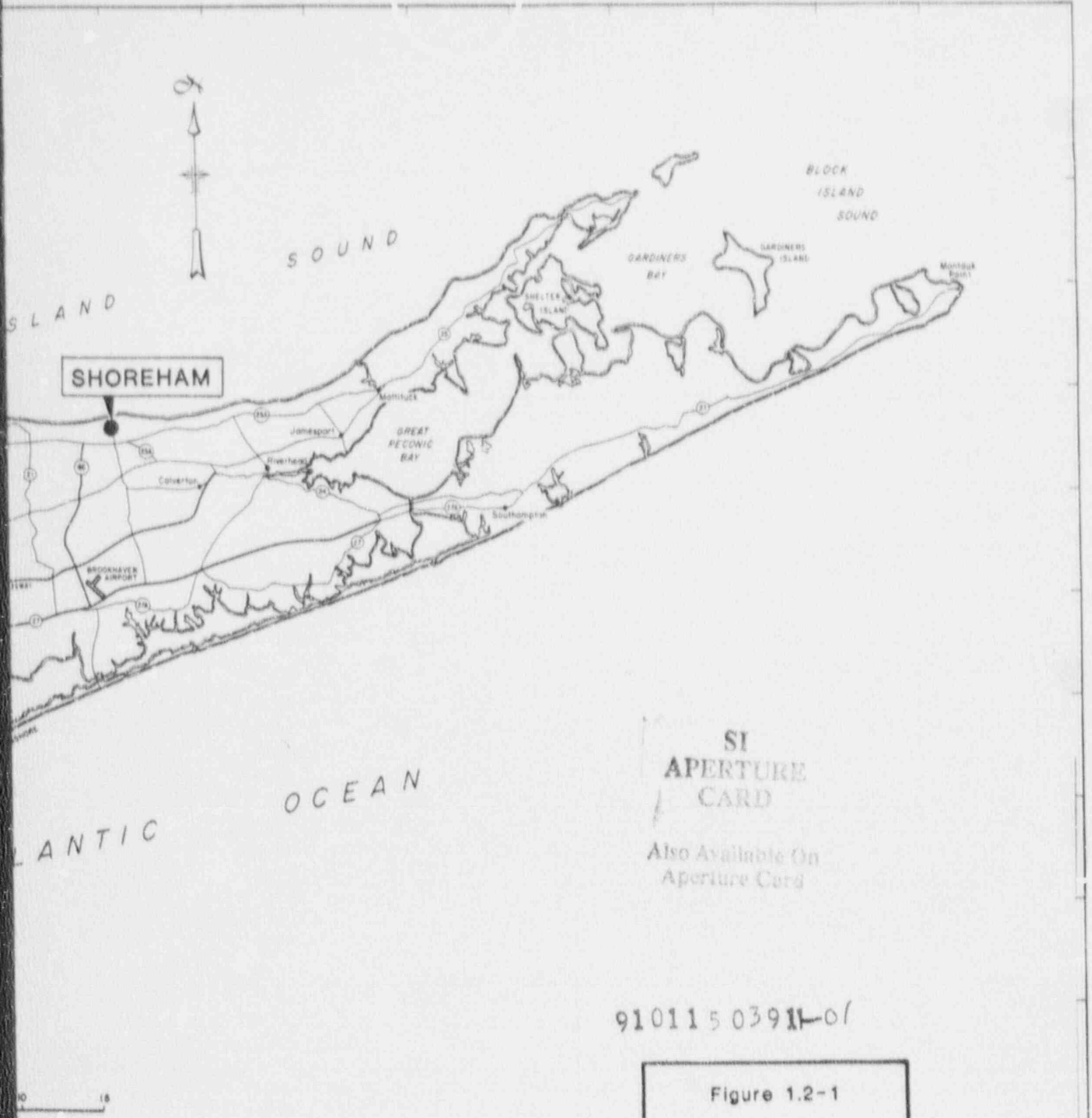
Manhattan
LAGUARDIA AIRPORT
Queens
New York
Brooklyn
JFK INTERNATIONAL AIRPORT
Hicksville
Huntington
Northport
Port Jefferson
SUFFOLK COUNTY
NASSAU COUNTY
Central Islip
LAKE RONKONKOMA
LONG ISLAND
MacARTHUR AIRPORT
GREAT SOUTH BAY
FIRE ISLAND NATIONAL
495
27
110
AT
0
5
SCALE-MILES



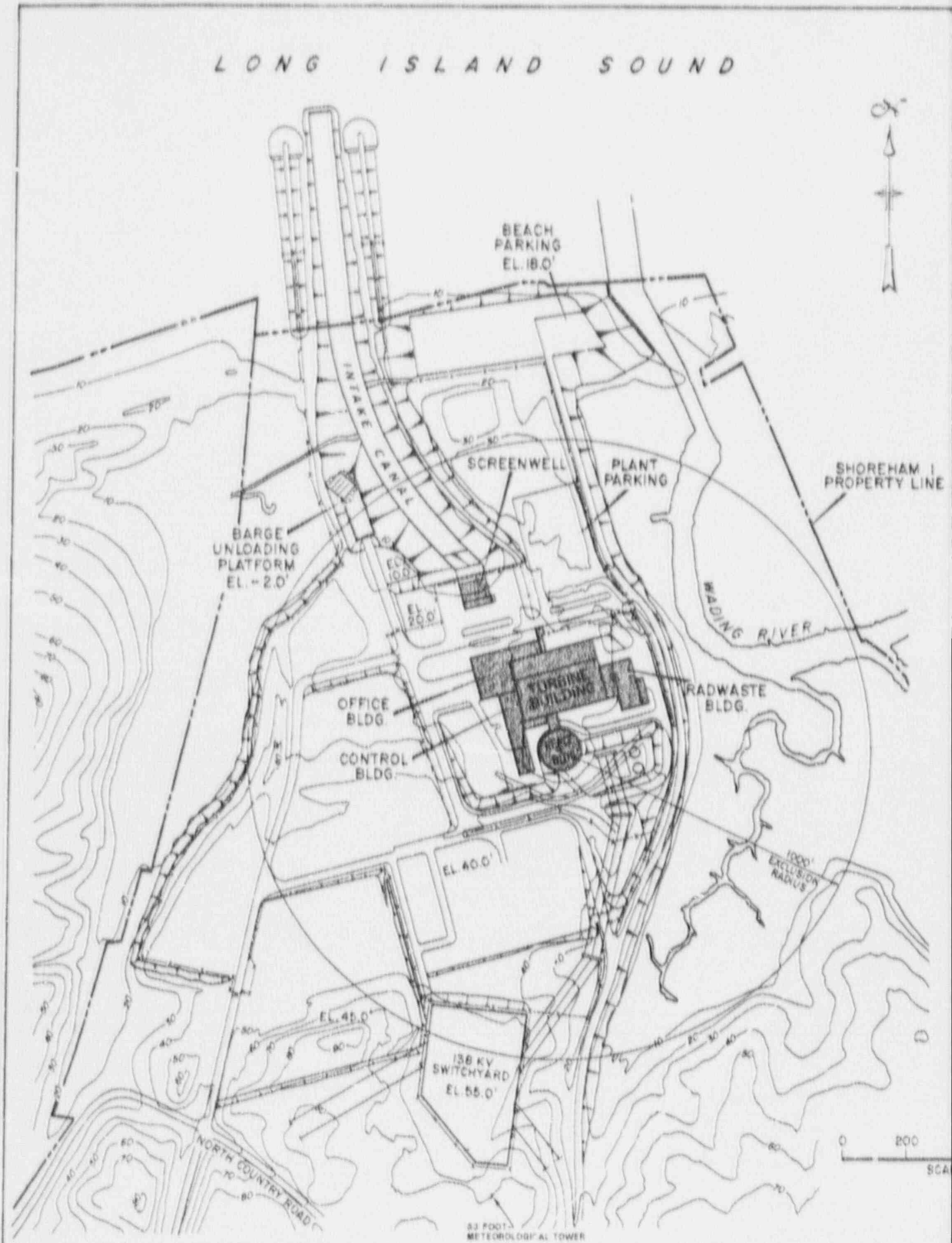
SI APERTURE CARD

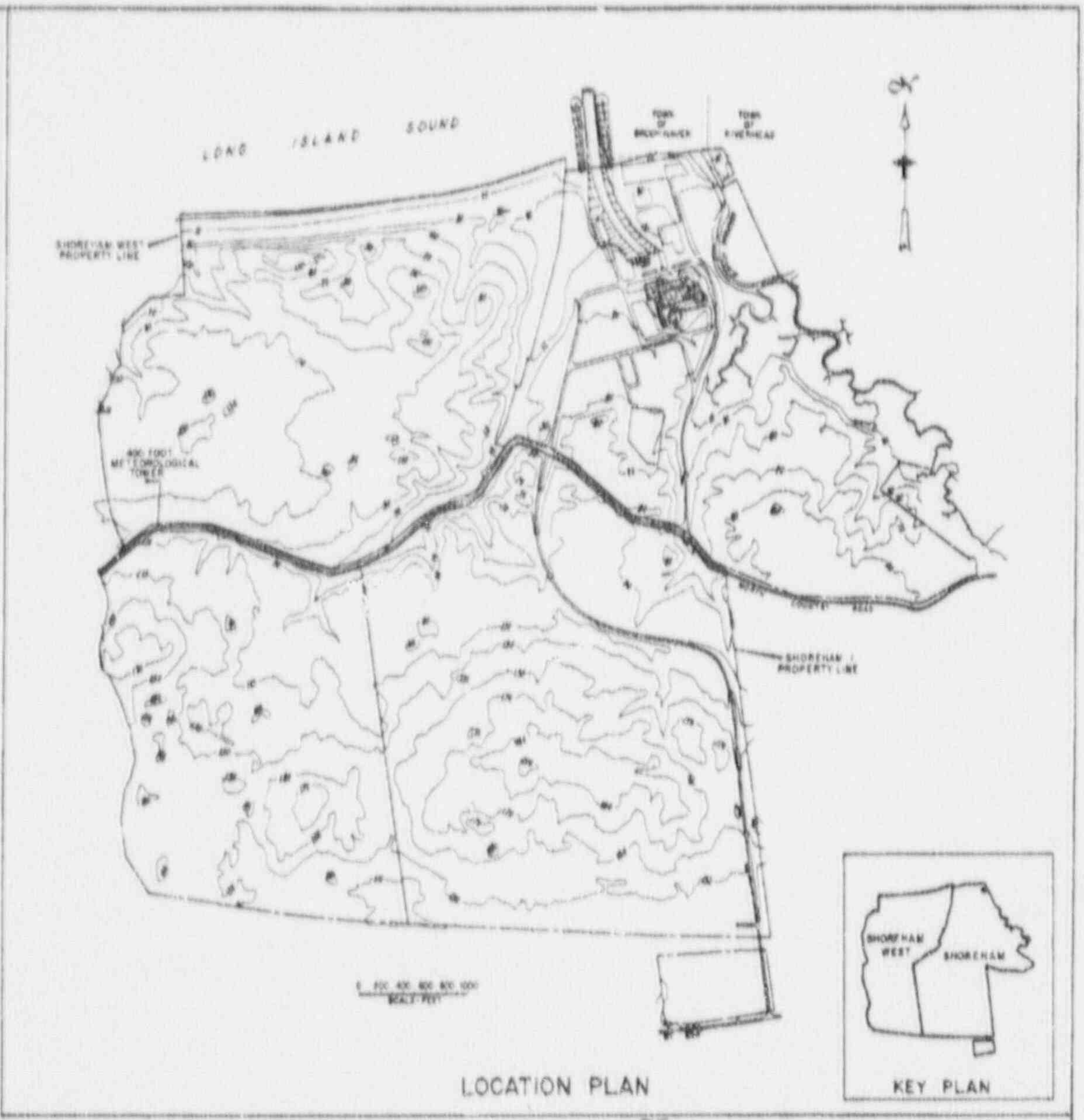
Also Available On Aperture Card

9101150391-01

Figure 1.2-1

GENERAL LOCATION MAP


LONG ISLAND SOUND
BEACH PARKING EL. 18.0'
INTAKE CANAL
SCREENWELL
PLANT PARKING
SHOREHAM 1 PROPERTY LINE
BARGE UNLOADING PLATFORM EL. -2.0'
EL 10.0'
EL 20.0'
WADING RIVER
TURBINE BUILDING
REAC BLDG
RADWASTE BLDG.
OFFICE BLDG.
CONTROL BLDG.
1000' EXCLUSION RADIUS
EL. 40.0'
EL. 45.0'
138 KV SWITCHYARD EL. 55.0'
NORTH COUNTRY ROAD
33 FOOT METEOROLOGICAL TOWER
0
200
SCA
10
20
30
40
50
60
70
80



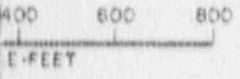
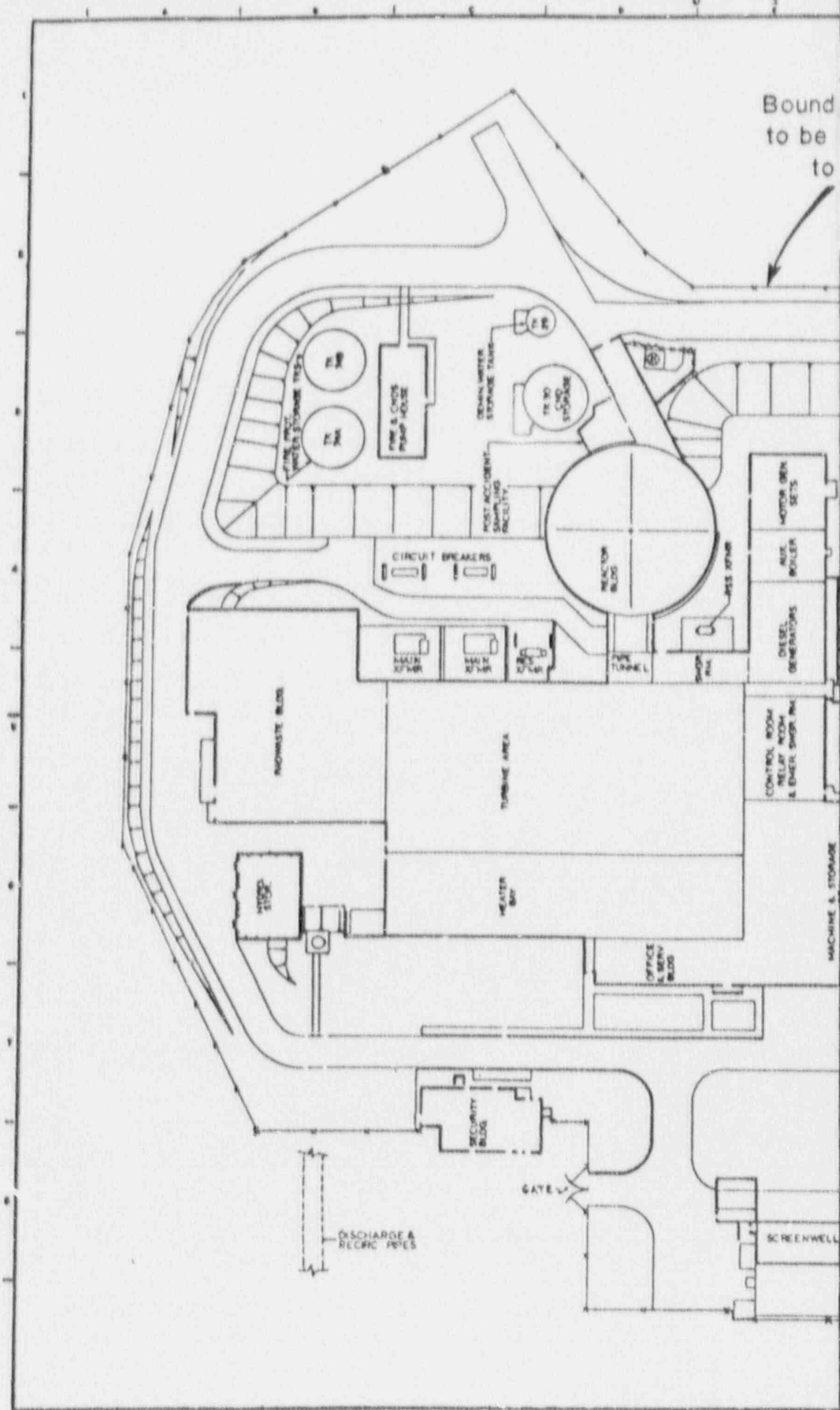


Figure 1.2-2

OPERATION SITE
AND LOCATION PLAN
WITH EXISTING
TOPOGRAPHIC CONTOURS

Shoreham Decommissioning Plan


Bound
to be
to
FIRE PROT. WATER STORAGE TKS.
FIRE & CHOS PUMP HOUSE
DEMIN WATER STORAGE TANK
TK 30 C.R.D. STORAGE
POST ACCIDENT SAMPLING FACILITY
CIRCUIT BREAKERS
REACTOR BLDG
RSS XFMR
MOTOR GEN SETS
AUX. BOILER
DIESEL GENERATORS
MAIN XFMR
MAIN XFMR
RES XFMR
PIPE TUNNEL
RADWASTE BLDG
TURBINE AREA
CONTROL ROOM RELAY ROOM & EMER. SWGR. RM.
HEATER BAY
MACHINE & STORAGE
OFFICE & SERV BLDG
SECURITY BLDG
GATE
DISCHARGE & RECIRC PIPES
SCREENWELL

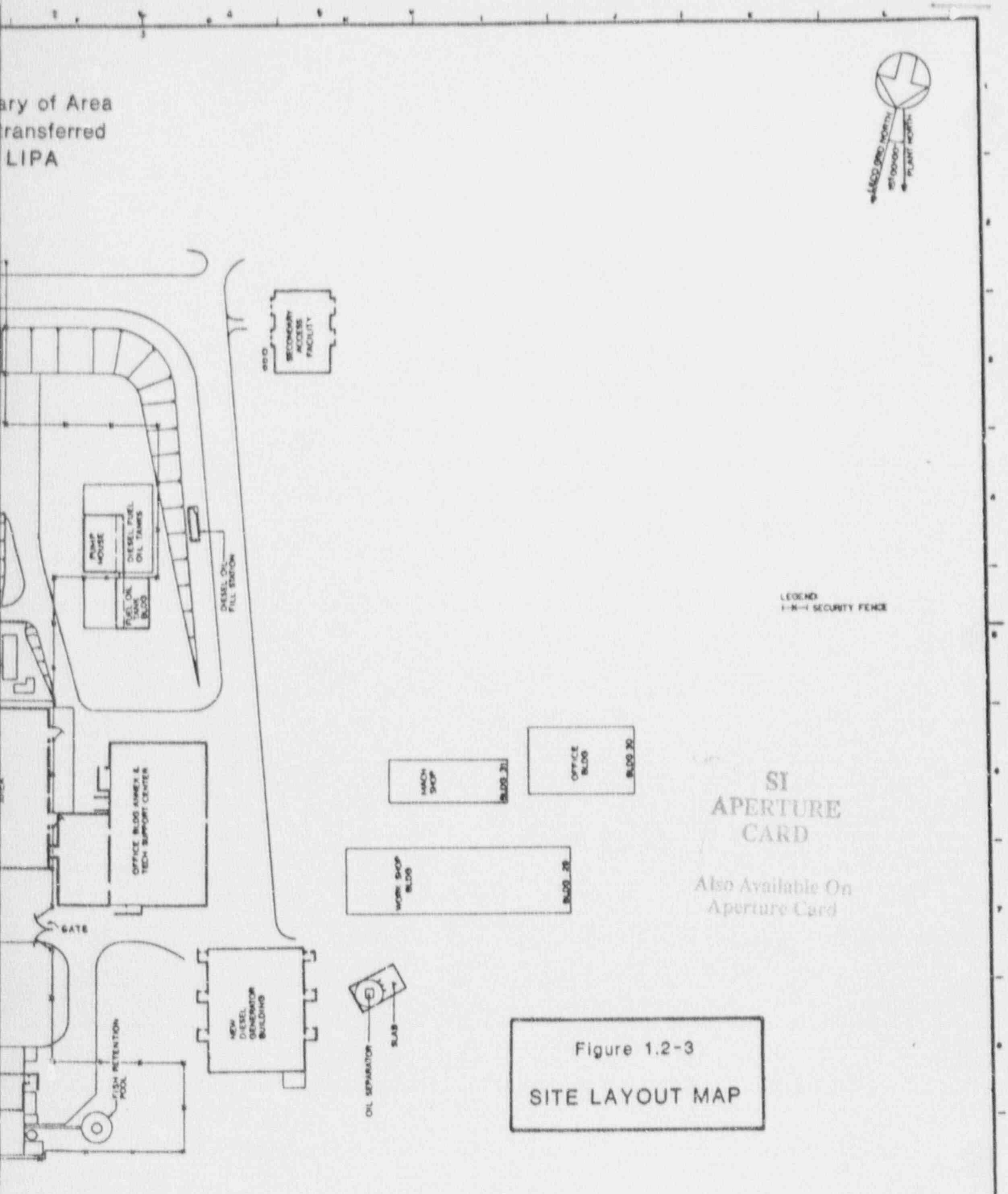


Figure 1.2-3

SITE LAYOUT MAP

SI APERTURE CARD

Also Available On Aperture Card

9101150391-03

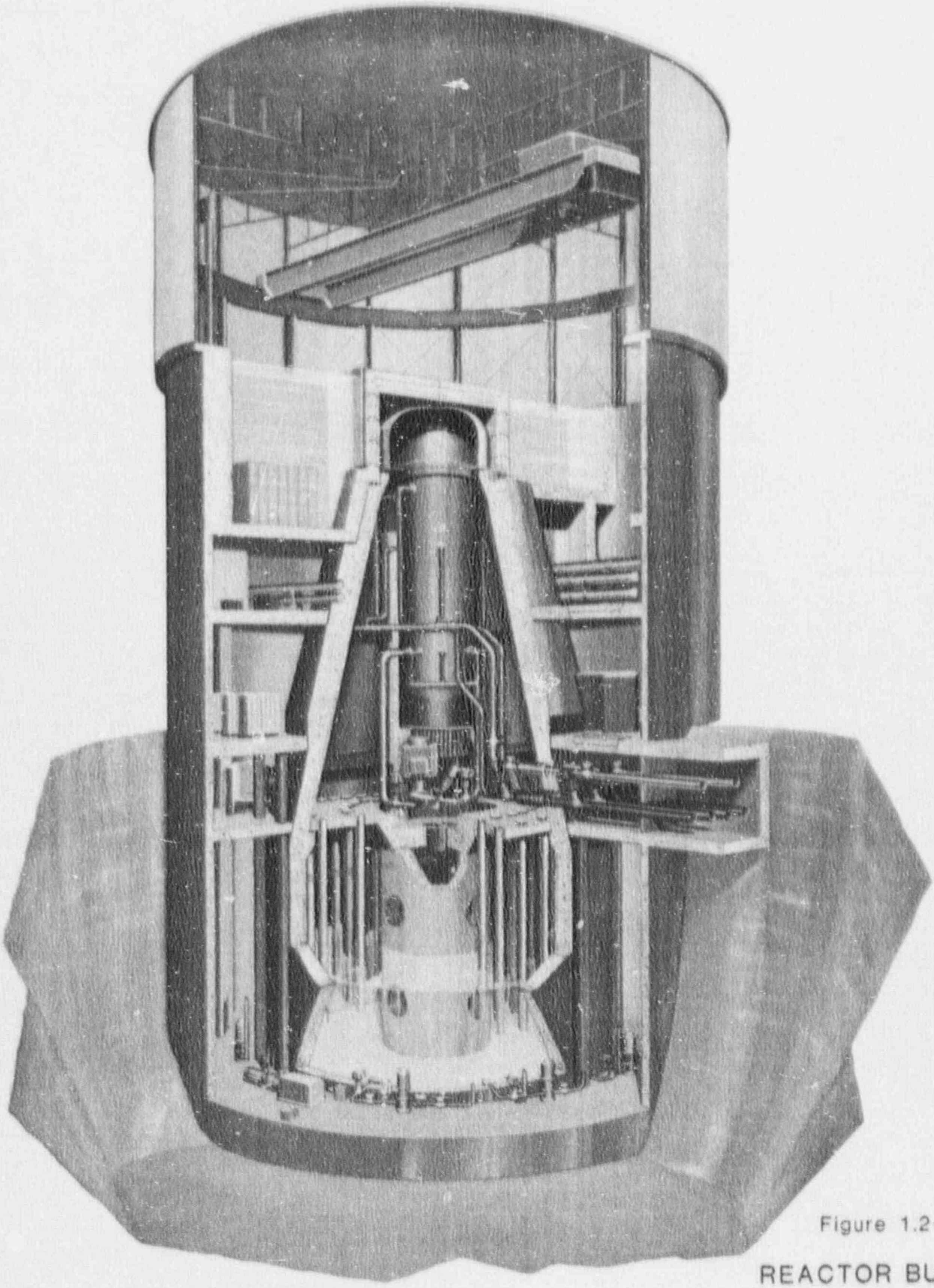


Figure 1.2-4

REACTOR BUILDINC

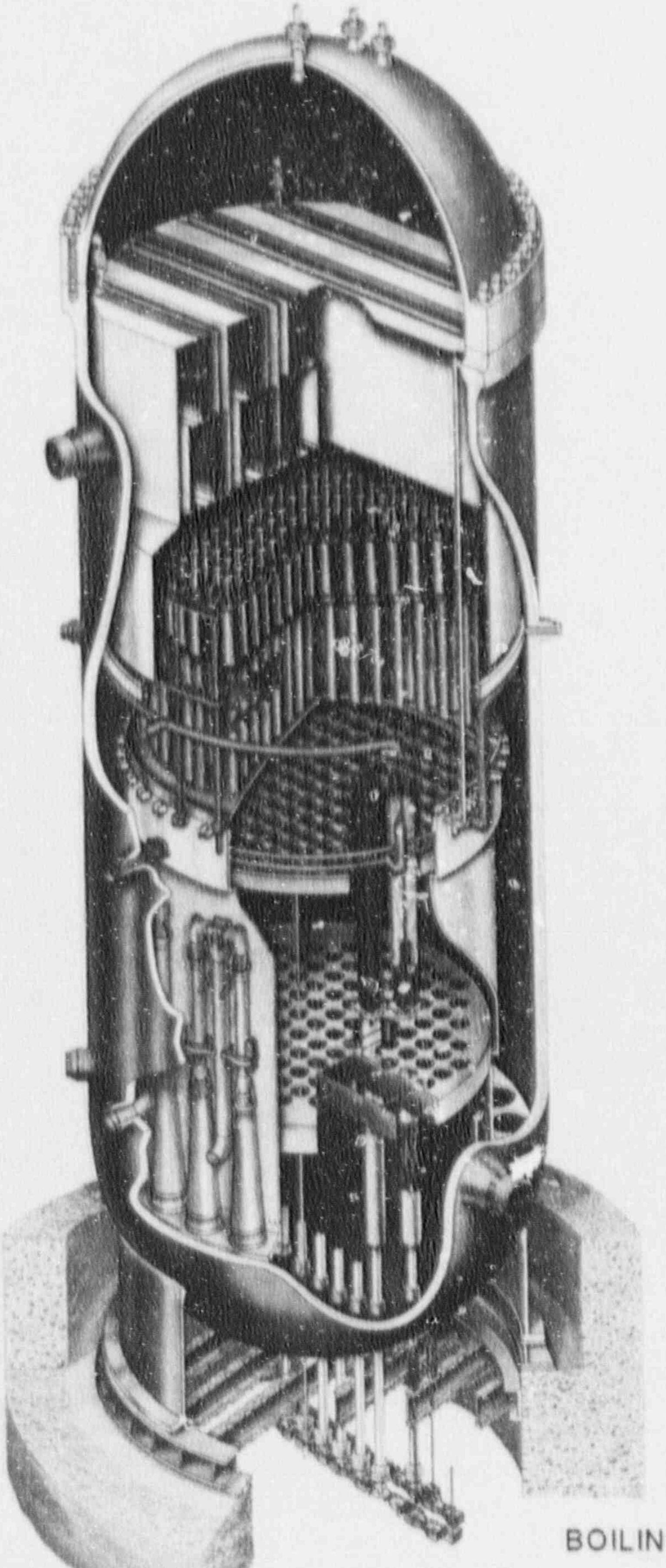


Figure 1.2-5

BOILING WATER REACTOR

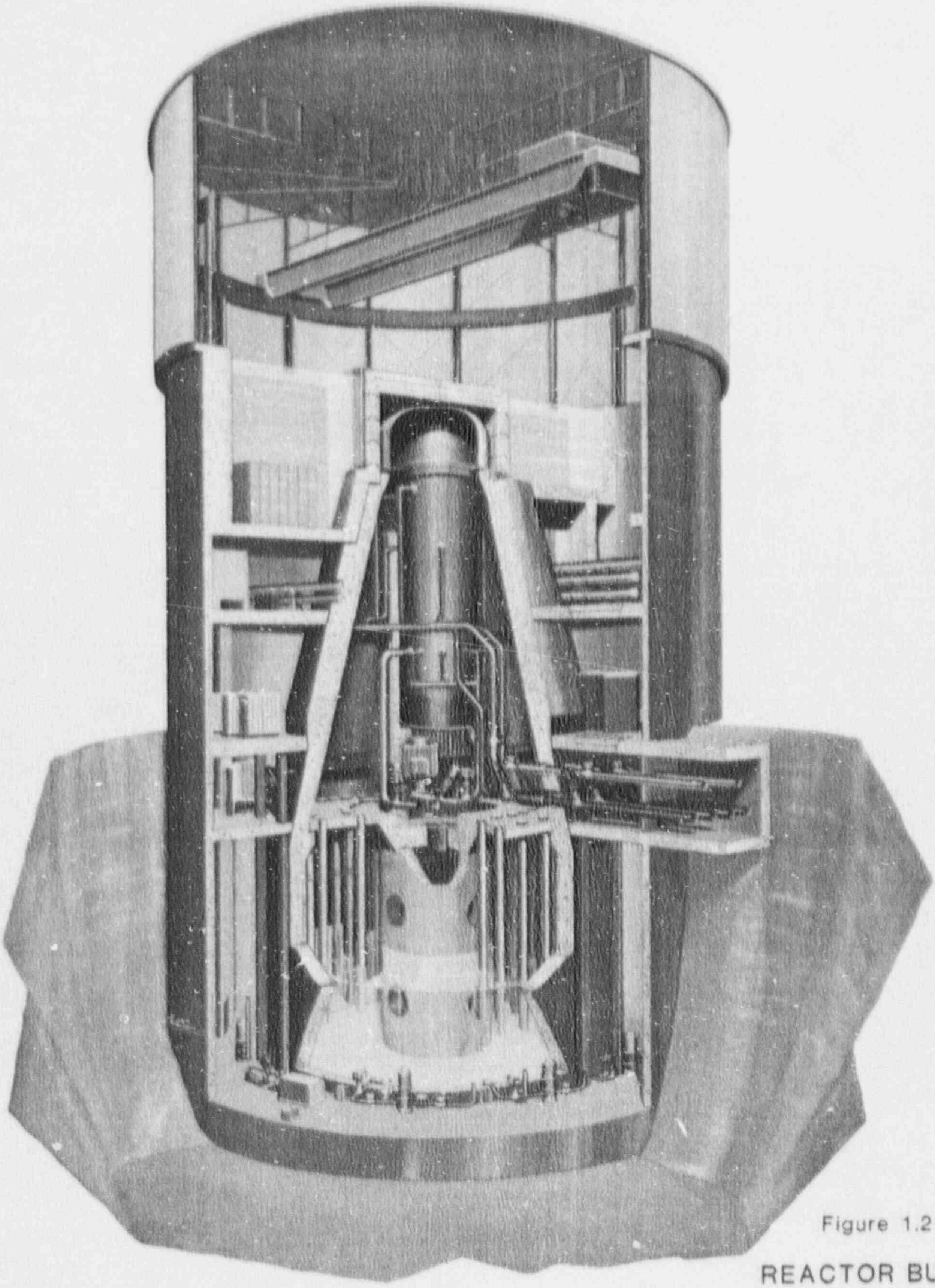


Figure 1.2-4

REACTOR BUILDIN

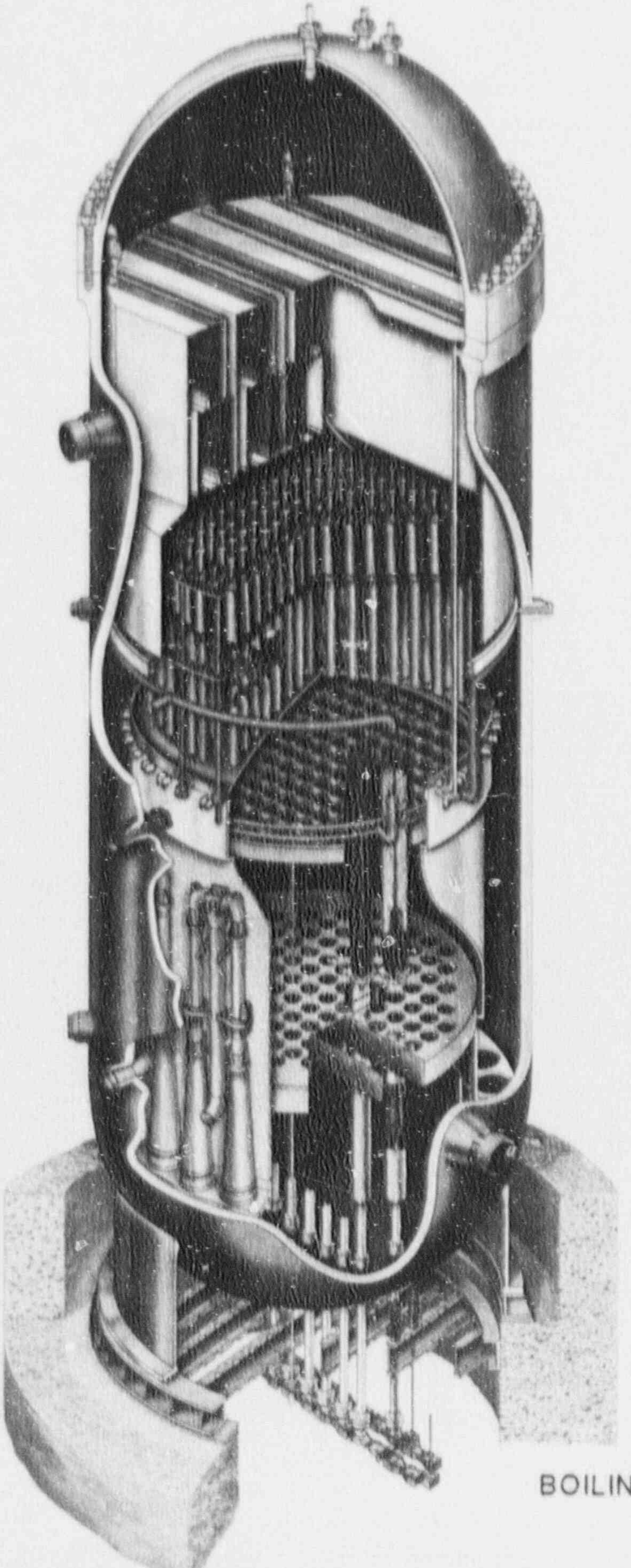
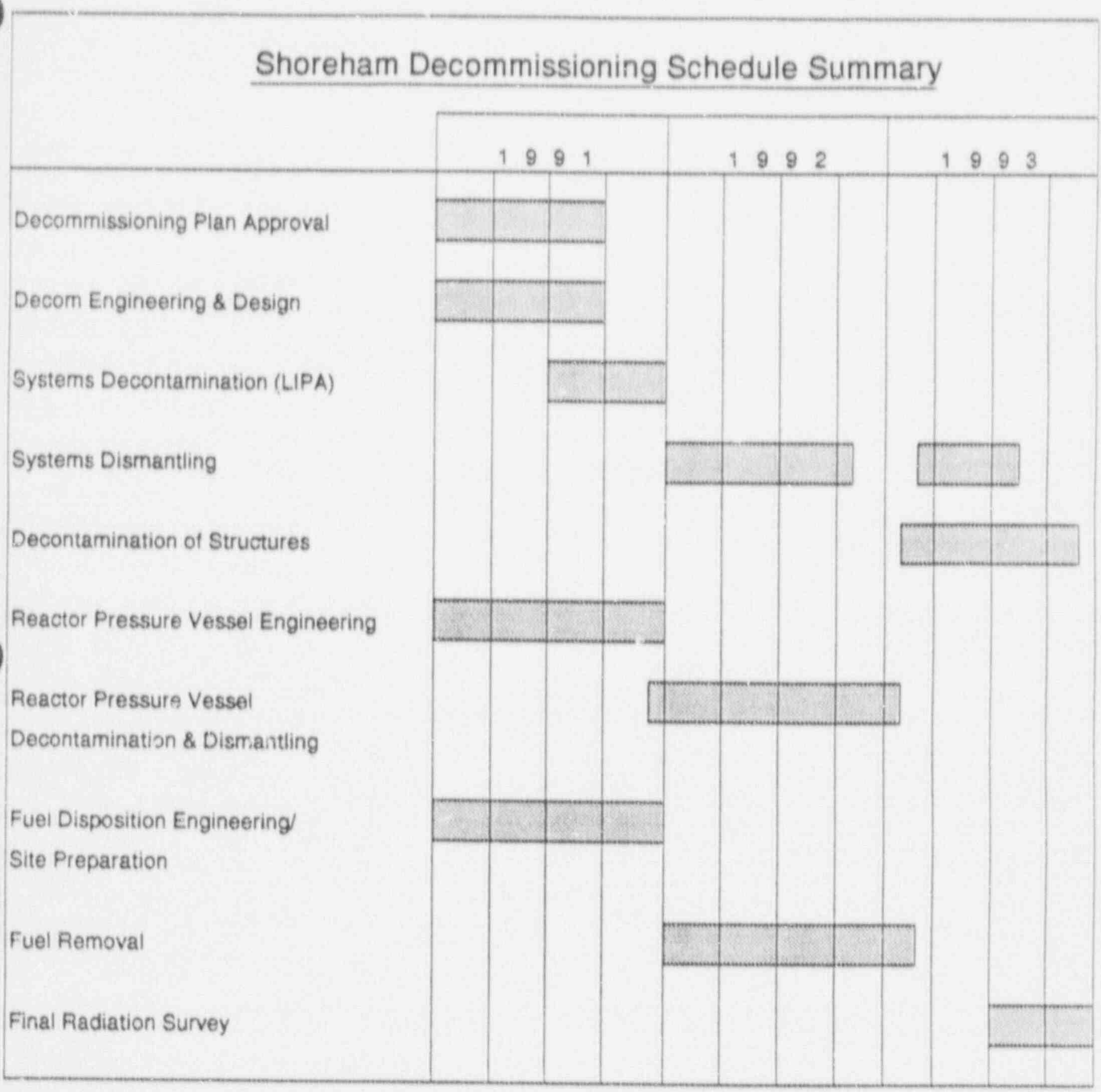


Figure 1.2-5

BOILING WATER REACTOR

Figure 1.3-1


Shoreham Decommissioning Schedule Summary
1991
1992
1993
Decommissioning Plan Approval
Decom Engineering & Design
Systems Decontamination (LIPA)
Systems Dismantling
Decontamination of Structures
Reactor Pressure Vessel Engineering
Reactor Pressure Vessel Decontamination & Dismantling
Fuel Disposition Engineering/ Site Preparation
Fuel Removal
Final Radiation Survey

2.0 CHOICE OF DECOMMISSIONING ALTERNATIVE AND DESCRIPTION OF ACTIVITIES INVOLVED

2.1 Decommissioning Alternative

In accordance with the decommissioning alternatives identified in References 2-1 and 2-2, the DECON alternative has been selected for use at the Shoreham plant. The other alternatives considered were SAFSTOR and ENTOMB.

The limited operating history of the Shoreham plant and the resulting low levels of contamination and activation support the use of DECON. Under this alternative, the structures and systems containing radioactive contaminants will be decontaminated or removed to assure the removal of the Shoreham plant irrevocably from service as a nuclear generating facility and to permit release of the site for unrestricted use. Given the limited amount and extent of contamination and activation, DECON will be much easier to implement at Shoreham than at other plants with more substantial operating histories (Ref. 2-3).

By use of DECON, the existing radiation hazards at the Shoreham plant can be eliminated in the near term, releasing the site for alternative uses in the relatively near future. This will maximize flexibility in selecting future uses for the site.[1] Further, the selection of the DECON alternative will enable LIPA to use existing LILCO personnel, familiar with the Shoreham plant and its brief period of operation, to perform many of the decommissioning activities.

Because of the relative ease with which DECON can be implemented at the Shoreham plant, the other decommissioning alternatives, SAFSTOR and ENTOMB, are not preferable. Under SAFSTOR, decommissioning is deferred for a long period of time (typically 30 to 60 years) to permit radiation levels to substantially decrease by radioactive decay. During this storage period, costs must be incurred to maintain the plant and keep it secure. Likewise, the ENTOMB method involves encasing contaminated structures, systems and components in a long-lived material such as concrete until the radioactivity decays to a level permitting unrestricted use of the site. In light of the minimal contamination and activation levels existing at Shoreham, there is no need to defer decommissioning and incur the substantial costs resulting from such deferral while those levels decay further;

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[1] LIPA has retained consultants to analyze the possible conversion of Shoreham to a natural-gas fired electric generating facility or other non-nuclear use.

they are already sufficiently low to permit decommissioning now with minimal worker exposure to radiation. Additional details concerning LIPA's selection of DECON are contained in the accompanying Supplement to Environmental Report (Decommissioning).

The overall approach to decommissioning the Shoreham plant is consistent with the DECON methodology as described in References 2-1 and 2-2. The intention is to either decontaminate systems and structures to releasable levels or to remove a given system or structure for disposal as discussed in Section 2.2. Systems and structures will generally be dismantled only to the extent necessary to assure the removal of the Shoreham plant irrevocably from service as a nuclear generating facility and to remove radioactive material to permit release of the site for unrestricted use.

Section 2.2 provides a more detailed description of the decommissioning activities at the Shoreham plant.

2.2 Decommissioning Activities, Tasks and Schedule

The scope of work for implementing DECON decommissioning at Shoreham will include the decontamination and removal of activated and contaminated systems and structures. Removal or dismantlement will be performed for those systems and structures that are not decontaminated to the release criteria discussed in Section 4.2. The RPV and reactor internals, because of the radiological conditions resulting from Shoreham's limited operation, will be segmented as described in Section 2.2.1.2.

The major decommissioning activities and tasks for the selected DECON method are discussed in Section 2.2.1. The schedule for LIPA's decommissioning activities is presented and discussed in Section 2.2.2 and in Table 2.2-3 and Figure 2.2-2. It is expected that the tasks and activities described herein will be further developed as additional detailed engineering and planning are performed.

2.2.1 Activities and Tasks

LIPA's decommissioning objective is to safely and efficiently decontaminate or remove all activated and contaminated systems and structures to meet the release criteria identified in Section 4.2. The following categories of activities are required in order to achieve this objective:

1. System and Structure Decontamination and Dismantlement
2. Segmentation of the Reactor Pressure Vessel and Internals
3. Radwaste Management
4. Area Cleanup and Decontamination
5. Final Radiation Survey

A discussion of the major decommissioning activities and tasks is provided in the following sections.

2.2.1.1 System and Structure Decontamination and Dismantlement

LILCO has performed a site characterization study which showed that radioactive contamination and activation at the Shoreham plant are small compared to a plant which has operated commercially. A sampling plan was developed and survey methods selected to record the site data in a meaningful manner. The results of the site characterization study (Ref. 2-4) indicate that the following systems and structures are contaminated or activated:

<u>Systems</u>

- Control Rod Drive
- Process Sampling
- Core Spray
- Residual Heat Removal
- Reactor Water Cleanup
- Liquid Radwaste
- Fuel Pool Cooling and Cleanup
- Condensate Demineralizer
- Reactor Recirculation

<u>Structures</u>

- Primary Containment
- Equipment/Floor Drains and Sumps
- Dryer and Separator Storage Pool
- Reactor Head Cavity
- Spent Fuel Storage Racks
- Spent Fuel Storage Pool

- o Radwaste Laydown Area
- o Reactor Pressure Vessel and Internals

The actual radiological conditions that exist at the Shoreham plant are described in Section 3.1.

Systems that were potentially contaminated by Shoreham plant operations, but were determined to be uncontaminated, will be surveyed as early in decommissioning as practical to allow for remedial measures to be conducted if required.

Based on the results of the site characterization study, conceptual engineering and planning have been performed to determine the most advantageous approach to decommissioning the activated and contaminated systems and structures. Additional detailed engineering and planning will be performed concurrently with the NRC's review of the DP. Both conceptual and detailed engineering and planning have and will incorporate such considerations as: regulatory guidance; maintenance of occupational radiation exposure as low as reasonably achievable (ALARA); occupational radiation exposure; management of LLRW; industrial safety; environmental impacts; costs; and schedule. Another aspect considered is the use of field-proven and state-of-the-art decontamination and dismantlement techniques. LIPA's decommissioning activities will be performed under a QA program as described in Section 7.0 of this DP.

LILCO's Shoreham plant staff is presently planning to commence a decontamination program on five of the nine systems listed above using chemical and mechanical techniques. The program will use "soft" decontamination techniques (i.e., techniques that will not irreversibly damage plant systems and components) such as chemical decontamination and high pressure water hydrolances for mechanical decontaminants and can be carried out under an operating license or POL. The program is designed to achieve levels of contamination that are near or below the release criteria. The program is scheduled to commence in early 1991. This program is expected to be completed prior to license transfer, but, if necessary, LIPA will continue with such soft decontamination prior to approval of the DP. (See Figure 2.2-2.)

After NRC approval of the LIPA DP, those systems or structures that do not meet the release criteria after "soft" decontamination is completed will be dismantled/removed or decontaminated using more aggressive techniques. Pipe and metal dismantlement/removal will be performed using either portable bandsaws, diamond wire saws, abrasive wheel cutting, plasma-arc and/or oxy-fuel cutting techniques. Scabblers, ultra high-pressure water and vacuum grit-blasters are being evaluated for possible use to remove contamination from concrete. Aggressive decontamination techniques include the use of concentrated acids or other chemical solutions to be applied by spray or recirculation. Evaluations of the best alternatives will be performed as part of the further detailed engineering and planning.

Radiological characterization after decontamination and/or dismantlement of systems and structures will be performed to ensure that all contamination levels are at or below the release criteria. If contamination levels are discovered above the release criteria, remedial measures will be evaluated and implemented.

All work performed as part of the Shoreham plant decommissioning will be performed under the controls described throughout this DP, and will be consistent with current industry standards and practices. These include appropriate radiological controls, such as health physics (HP) support, monitoring, contamination control envelopes, local ventilation control with High Efficiency Particulate Air (HEPA) filters, etc., as required to prevent the spread of contamination. A discussion of LIPA's ALARA program is provided in Section 3.2 of this DP.

Systems

The following systems and associated components will be decommissioned by performing a similar pattern of activities:

- Control Rod Drive
- Core Spray
- Residual Heat Removal
- Reactor Water Cleanup
- Liquid Radwaste
- Fuel Pool Cooling and Cleanup
- Condensate Demineralizer
- Reactor Recirculation

LIPA assumes that, prior to the start of decommissioning by LIPA, LILCO's Shoreham plant staff will have completed "soft" decontamination of five of these systems. However, if necessary, LIPA will continue this activity prior to approval of the DP. The schedule provides for LIPA to perform such decontamination if LILCO has not completed it prior to license transfer.

The major tasks associated with LIPA's decommissioning of these systems after "soft" decontamination is completed are:

(1) Radiological characterization to determine the residual contamination levels, if any, after "soft" decontamination.

(2) Dismantlement and removal of all piping and other portions of the systems that are not at or below the release criteria. This includes the dismantlement and removal of all three (3) inch and smaller diameter piping that cannot be characterized properly or in a practical manner. It is LIPA's intent to ship such small bore piping to a licensed vendor for further decontamination, radiological surveys, segregation and ultimate disposal. Also, any embedded piping will be aggressively decontaminated in an attempt to obviate removal.

(3) Radiological characterization of the portions of the systems remaining at the site to ensure that all contamination above the release criteria described in Section 4.2 has been removed.

The Process Sampling System has also been characterized as contaminated. The decommissioning approach for this system is slightly different from that described for the previously discussed systems. There are currently no plans to decontaminate this system, as it is not believed to be cost effective to do so. The major tasks associated with decommissioning the Process Sampling System are:

(1) Dismantlement and removal of the sample piping, drain piping and sampling sink, and packaging as low level radioactive waste.

(2) Radiological characterization of all connecting systems and any lines that remain to ensure that all contamination above the release criteria has been removed.

Structures

Primary Containment

The Primary Containment consists of the Drywell, the Pressure Suppression Chamber and the connecting Vent System (downcomers) between the Drywell and the Reactor Suppression Pool.

Decontamination of the Primary Containment will first be performed by LILCO's Shoreham plant staff using the "soft" decontamination methods described earlier. The major tasks associated with decommissioning the Primary Containment following "soft" decontamination are:

(1) Radiological characterization to determine residual contamination levels after "soft" decontamination.

(2) Decontamination of surfaces which do not meet the release criteria using ultra-high pressure water techniques, mole nozzles and hand wiping techniques, and local removal of coating systems where necessary.

(3) Radiological characterization to ensure that all contamination above the release criteria has been removed.

Equipment/Floor Drains and Sumps

Building sumps collect floor and equipment drainage and provide the means to direct the liquid to the Waste Collector Tank or the Floor Drain Collection Tank. Contaminated sumps (and associated floor drains) are located in the Reactor Building (2), Turbine Building (1), and the Radwaste Building (3) in the foundation mat.

Decontamination of these sumps (and associated floor drains) is expected to be first performed by LILCO's Shoreham plant staff using the "soft" decontamination methods described earlier.

The major tasks associated with decommissioning these sumps and floor drains following "soft" decontamination are:

(1) Radiological characterization to determine the residual contamination level after "soft" decontamination.

(2) Decontamination of surfaces which do not meet the release criteria using hand wiping, grinding, ultra high pressure water or chemical techniques.

(3) Radiological characterization to ensure all contamination above the release criteria has been removed.

Dryer and Separator Storage Pool And Reactor Head Cavity

The Dryer and Separator Storage Pool and the Reactor Head Cavity are in the Reactor Building, and are accessible from the fueling floor. These areas will be utilized in support of decommissioning activities.

Following completion of the RPV segmentation activities described in Section 2.2.1.2, the Dryer and Separator Storage Pool and the Reactor Head Cavity will be decommissioned as follows:

(1) Radiological characterization to determine contamination levels.

(2) Decontamination using strippable coatings or ultra-high pressure water techniques.

(3) Radiological characterization to ensure that all contamination above the release criteria has been removed.

Spent Fuel Storage Racks

Radiological characterization of the Spent Fuel Storage Racks has not been performed, as the Spent Fuel Storage Pool continues to be used to store the Shoreham fuel. LIPA is anticipating that the racks are contaminated to a slight degree.

The tasks associated with decommissioning the Spent Fuel Storage Racks will include:

(1) Removal and processing of water from the Spent Fuel Storage Pool.

(2) Radiological characterization to determine the level of contamination.

(3) Decontamination of internal cells of each fuel rack using high pressure mole nozzles.

(4) Disconnection of the racks from the liner embedments.

(5) Decontamination of the racks with ultra-high pressure water.

(6) Placement of the rack into a strong tight container for shipping for volume reduction and disposal.

(7) Radiological characterization to ensure that all contamination above the release criteria has been removed.

Spent Fuel Storage Pool

Radiological characterization of the Spent Fuel Storage Pool has not been performed as it remains in use to store Shoreham's fuel. For purposes of this DP, LIPA is assuming that the pool is contaminated to a slight degree.

The tasks associated with decommissioning the Spent Fuel Storage Pool, which will be performed in conjunction with the decommissioning of the Spent Fuel Storage Racks, include:

(1) Radiological characterization to determine contamination levels.

(2) Decontamination and removal of fixtures such as underwater work tables, tools, new fuel elevator, refueling bridge and components.

(3) Placement of removed fixtures into strong tight containers for shipping offsite for further processing.

(4) Decontamination of walls and floor using ultra high pressure water techniques.

(5) Radiological characterization to ensure that all contamination above the release criteria has been removed.

Radwaste Laydown Area

The Radwaste Laydown Area is an open area covering approximately 600 square feet of floor space on elevation 50' -6" of the Radwaste Building.

This area is expected to be utilized by LILCO's Shoreham plant staff during their planned decontamination efforts. This area may also be used by LIPA for staging, waste compaction and waste packaging during decommissioning. Following use of the area for such functions, the Radwaste Laydown Area will itself be decommissioned.

The decommissioning of the Radwaste Laydown Area will be comprised of the following tasks:

(1) Preparation for general area decontamination by decontaminating the tented enclosures of loose surface contamination. The collected contamination will be volume reduced and disposed of as LLRW.

(2) Radiological characterization to determine the contamination level of the area.

(3) Mechanical decontamination of the floor area using a scarification process. The scarification process would incorporate a shrouded vacuum pick-up for the debris. All air will be processed through HEPA filters. The dry active waste (DAW) will be disposed of as LLRW.

(4) Radiological characterization to ensure that all contamination above the release criteria has been removed.

2.2.1.2 Segmentation of the Reactor Pressure Vessel and Internals

The reactor assembly consists of the RPV and its internal components. The internal components consist of the shroud, top guide, dryer (steam separator), core support plate, fuel support casting and the jet pump assemblies. Also included are the control blades, control-blade drive housings and drives, incore instruments and incore guide tubes. Figure 2.2-1 shows the arrangement of the reactor assembly in cutaway. Finally, for purposes of this DP, LIPA has analyzed the biological shield wall as part of the RPV and its internals.

During the low-power testing of Shoreham, a region of the reactor assembly, a band near the upper third of the RPV in the reactor core region, became activated as a result of neutron exposure. In addition, the neutron flux activated erosion and corrosion products that were deposited throughout the reactor vessel assembly and supporting systems. The activation analysis indicated that about 600 Curies, mostly Fe-55, Co-60 and Ni-63 (69%, 28%, and 2%, respectively), are present in the reactor assembly, as of July 1, 1990 (see Table 3.1-3).

Current plans are to decontaminate the RPV to the extent possible. LIPA then will segment and dispose of those RPV portions that cannot meet the site release criteria. Although the activities listed below assume the lower portion of the vessel (recirculation nozzles and below) will not need to be removed, additional segmentation may be required depending upon the results of additional radiological characterization. The cost, radwaste volume and personnel radiation exposure estimates in this DP assume full segmentation of the RPV.

The RPV segmentation process is expected to be performed in three areas of the Reactor Building. The three areas are the RPV (i.e., in-situ), the Dry Cutting Station (DCS) which will be located on the refueling floor, and the Wet Cutting Station (WCS), which will be located in the Dryer and Moisture Separator Storage Pool. The DCS and WCS are further described below. Segmentation will be accomplished using a combination of hands-on and remote techniques designed to keep personnel exposure ALARA. Dose rates from the shroud and top guide may prevent the use of hands-on cutting techniques. Therefore, underwater remote plasma arc cutting may be used to cut the shroud and top guide into ring sections. After cutting, these ring sections will be moved to the WCS where each ring will undergo further segmentation, which will also be done under water utilizing remote plasma arc torches. Once the top guide and shroud are removed, it is anticipated that RPV dose rates will decrease to levels which allow draining of the RPV and manual access.

Segmentation will be performed using various cutting techniques. The internals will be segmented using plasma arc, metal disintegration machining and mechanical cutting techniques. The RPV will be segmented using mechanical cutting techniques which include diamond wire sawing to cut heavy sections of steel and power band saws to cut the small diameter RPV nozzle piping.

The major tasks associated with decommissioning the RPV and its internals are discussed in greater detail below. The sequencing and methodology details will be determined during detailed engineering. The major RPV decommissioning tasks are:[2]

(1) Radiological characterization to establish contamination and radiation levels.

(2) Establishing the DCS on the refueling floor. The DCS will be a sheet-metal enclosure, equipped with ventilation and HEPA filtration designed to control the spread of contamination generated during the cutting of activated RPV components.

(3) Erection of the WCS in the Dryer Separator Storage Pool. The WCS will be used to provide water shielding during the plasma arc segmenting of shroud ring sections and the top guide. The WCS will include a work platform which will be positioned above the water shielding. Water filtration equipment will be used to maintain water clarity during cutting operations.

(4) RPV head removal and decontamination to meet release criteria.

(5) Steam dryer assembly removal and transfer to the DCS where it will be segmented into sections which will [illegible] exclusive use tractor trailers for shipment offsite. Manual and remote

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[2] The list of tasks does not include decommissioning the biological shield wall. Due to its inaccessibility, the biological shield wall has not yet been characterized. During the detailed decommissioning, the biological shield wall will be characterized and appropriate decommissioning steps will be formulated and carried out.

track mounted plasma arc cutting will be used to segment the steam dryer assembly.

(6) Moisture separator assembly removal and transfer to the DCS, where it will be segmented into sections which will fit onto exclusive use tractor trailers for shipment offsite. Manual and remote track mounted plasma arc torches will be used to segment the moisture separator.

(7) Underwater removal and cutting of the dry tubes using long handled tools followed by packaging for shipment.

(8) In-situ underwater cutting of the core shroud into ring sections with plasma arc. The first ring section cut will also contain the top guide and core spray spargers. The bottom ring will be cut just above the core support plate. After each shroud ring section is cut it will be transferred to the WCS where it will be segmented into pieces sized to accommodate Department of Transportation (DOT) shipping requirements.

(9) Removal of the core plate from the RPV after draining down the RPV, and cutting of the hold-down bolts and incore guide tubes with hand held plasma torches. The core plate will then be transferred to the DCS and segmented, unless radiological conditions dictate underwater cutting in the WCS. Segmented pieces will be placed on exclusive use tractor trailers for shipment offsite.

(10) Removal of jet pumps from the RPV for segmentation in the DCS, unless conditions dictate underwater cutting in the WCS. Segmented pieces will be placed on exclusive use tractor trailers for shipment offsite.

(11) Cutting of RPV nozzles, after decontaminating the thermal sleeve annulus, using diamond wire rope. The nozzles to be cut using this technique include:

    (1) Four 24" main steam outlet nozzles
    (2) Four 12" feed water nozzles
    (3) Two 10" core spray nozzles.

(12) Cutting the following nozzles using hand-held power band saws:

  (1) Six 1" instrument nozzles
  (2) One 3/4" high pressure leak detection nozzle
  (3) One 4" CRD return line nozzle.

(13) Segmenting the RPV into ring sections using diamond wire rope. The first section will be approximately 5 feet below the top flange. The last cut will be made just above the recirculation discharge nozzle. After each cut is complete, each ring section will be removed from the reactor cavity and transferred to the DCS. Ring sections will be sized to allow for safe and efficient rigging, and will be within the load capabilities of the main hook of the polar crane.

(14) Cutting the ring sections into pieces in the DCS using a diamond wire saw. The first and successive ring segmentation operations will be performed in parallel with the cutting of a new ring section from the RPV. After segmentation, RPV pieces which cannot be decontaminated to meet release criteria will be placed onto exclusive use tractor trailers for shipment offsite.

(15) Cleaning out of debris from the inside of the RPV bottom head. Remaining water in the vessel will be drained and the remaining portion of the RPV will be decontaminated to meet release criteria.

(16) Wrapping and packaging of contaminated and activated segmented pieces in accordance with approved plant procedures prior to shipment off-site for further processing and disposal.

(17) Radiological characterization to ensure that all contamination above the release criteria has been removed.

2.2.1.3 Radwaste Management

LLRW expected to be generated during decommissioning of the Shoreham plant will include the following:

(1) RPV and Internals
(2) Spent Fuel Racks and Appurtenances
(3) Sludge
(4) System Piping and Equipment
(5) Liquid Process Waste
(6) Dry Active Waste

Items not included as decommissioning waste are the spent fuel and fuel support castings, traveling in-core probes and other in-core instrumentation, control rod blades and drives, and any radioactive fluids, resins, filter media and sludge currently contained within systems. Spent fuel disposition is not considered to be a part of decommissioning. It is currently anticipated that the other listed items will be disposed of by LILCO prior to decommissioning.

Refer to Section 3.3 for further discussion of LLRW generation and management.

2.2.1.4 Area Cleanup and Decontamination

Following decontamination and dismantlement of Shoreham's contaminated and activated systems, structures, and the RPV and internals, a general radiological cleanup of the work areas will be performed. A radiological survey will be conducted and, if necessary, decontamination using appropriate techniques will be performed.

2.2.1.5 Final Radiation Survey

A final radiation survey will be performed to demonstrate that the Shoreham plant may be released for unrestricted use. Refer to Section 4.0 for a complete discussion of the final radiation survey.

2.2.1.6 Occupational Exposure Estimate

The area dose rates and exposure estimates for decommissioning activities and tasks are presented in Tables 2.2-1 and 2.2-2, respectively. Radiation exposures were estimated using a combination of measured and calculated exposure rates and prospective stay times. By far the largest component of occupational exposure will be due to the tasks associated with the removal of the activated portion of the RPV and its internals. The exposure rates associated with RPV removal were derived from the Curie contents identified in Table 3.1-3. In addition, it was assumed that during certain activities, the workers would be shielded by three feet of water. The remaining occupational exposure will be due to surveys, and decontamination and dismantling of other Shoreham plant systems and structures. Measured exposure rates for these systems and structures were used along with prospective man-hours to compute man-rem for system and structure decommissioning. A conservative factor was applied to account for the transport and concentration of radioactivity within these systems and structures during decommissioning.

The total exposure is approximately 190 person-rem The RPV removal accounts for 158 person-rem, which is 83 percent of the total. By comparison, the average annual exposure at operating BWRs is about 440 person-rem. Given these relatively small exposures, craft and skilled labor availability should not be affected by 10CFR Part 20 exposure limits. A complete discussion of the radiation protection program is provided in Section 3.2.

2.2.2 Schedule

The decommissioning schedule is presented in Figure 2.2-2. Decommissioning engineering and planning are currently in progress, with further detailed engineering and some procurement activities scheduled to parallel NRC review of the DP.

LIPA assumes the DP will be approved by the NRC by October 1, 1991, at which time decommissioning activities are scheduled to begin.[3] Decommissioning of

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[3] The NRC Staff, in Draft Regulatory Guide DG-1005, suggested that NRC review, evaluation and approval of a nuclear plant decommissioning plan may take one year. Given Shoreham's limited contamination compared to a plant with an extended operating history, LIPA believes that a nine-month

contaminated systems, RPV segmentation and fuel removal operations will be performed in parallel. Fuel removal, although not a part of decommissioning, is a critical path activity in terms of accomplishing various decommissioning tasks, such as clean up of the Spent Fuel Storage Pool. Upon completion of fuel removal activities, the remaining systems and structures will be decontaminated and/or dismantled followed by the final radiation survey and subsequent license termination. The estimated project duration is 27 months with the critical path as indicated in Figure 2.2-2.

Table 2.2-3 provides a list of schedule assumptions by project WBS category. Major schedule assumptions include:

(1) All activities and tasks with the exception of RPV segmentation and project critical path activities will be performed during an 8 hour workday, 5 days per week, with no planned overtime. RPV segmentation and critical path activities are performed on the basis of a 10 hour workday, 2 shifts per day, 5 days per week.

(2) Multiple crews will work parallel activities to the maximum extent possible consistent with optimum efficiency, adequate access for cutting, removal and lay down space and the stringent safety measures necessary during demolition of heavy components and structures.

(3) Removal of plant systems will be performed on an area basis commencing with those outside the containment building. Systems removal will be performed on a level of effort basis in order to balance craft manloading which would otherwise be affected by the intermittent fuel removal activities in the containment building.

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process for NRC review, evaluation and approval is a reasonable assumption. LIPA will be prepared to commence decommissioning by October 1 or, indeed, sooner if the NRC's review and approval move more expeditiously. Such expedition is critical because of the very substantial costs (approximately $150 million per year) being borne by LILCO (and ultimately its ratepayers) to own and maintain Shoreham in its current condition.

(4) Fuel will be removed from the Spent Fuel Storage Pool by March 1, 1993.

(5) The decommissioning project schedule completes on December 31, 1993.

2.3 Organization and Responsibilities

LIPA and LILCO jointly applied to the NRC on June 28, 1990 (Ref. 2-5) to amend the license to allow transfer of the Shoreham plant to LIPA. Included as Appendix C of that application was a detailed description of LIPA's Shoreham project organization. A brief description is provided below. In accordance with Draft Regulatory Guide DG-1005, the description in Appendix C of Reference 2-5 is incorporated herein by reference.

The project organization will be established and in place prior to the transfer of Shoreham to LIPA. As the licensee, LIPA will provide the overall management for the Shoreham decommissioning project. LIPA's decommissioning organization is shown in Figure 2.3-1. Already in place at LIPA are the Board of Trustees, the Chairman and the Executive Director shown on the organization chart. The remaining positions in LIPA's organization will be filled with qualified personnel in three ways.

First, seven individuals with pertinent nuclear energy experience who are presently employed by NYPA will be employed directly by LIPA. The project positions to be held by these individuals are designated on the organization chart by the symbol for "LIPA/NYPA Coemployees." The coemployment positions are those most vital to the conduct of safe and effective decommissioning activities at the plant, and LIPA therefore desires that such positions be filled by persons employed directly by LIPA and accountable directly to LIPA's Executive Director, LIPA's Chairman and LIPA's Board of Trustees. These prospective LIPA employees are presently employees of NYPA, and they will be coemployed by LIPA and NYPA during the Shoreham project. All coemployees except the Executive Vice President-Shoreham Project will be dedicated full-time to the Shoreham project and will reside at Shoreham.

The second source of qualified personnel to fill positions is provided by LIPA's Management Services Agreement (Ref 2-6) with NYPA for technical and management services. It is planned that a number of positions will be filled by employees of NYPA in its capacity as prime contractor to LIPA (i.e., not on a co-employment basis).

The balance of the positions in the LIPA Shoreham organization will be staffed by personnel provided by other contractors (Section 2.5) or by LILCO personnel presently at Shoreham. The Site Agreement between LIPA and LILCO (Ref. 2-7) specifically provides that, through its contractor NYPA, LIPA may request LILCO to assign its own Shoreham personnel to decommissioning activities to be conducted after transfer of Shoreham to LIPA. Such personnel would remain employees of LILCO and work under the supervision of LIPA and NYPA personnel.

2.3.1 Decommissioning Organization and Responsibilities

As shown in Figure 2.3-1, LIPA will have overall control and responsibility for the decommissioning of the Shoreham plant. Responsibility and authority are delegated from LIPA's Board of Trustees through the LIPA Chairman to the Executive Director, to the Executive Vice President-Shoreham Project, to the Resident Manager. The Resident Manager is the senior on-site LIPA manager and has ultimate on-site authority. There are five principal management functions that report directly to the Resident Manager. These functions are:

(1) Decommissioning Project Management
(2) Operations, Maintenance and Radiological Controls
(3) Licensing and Regulatory Compliance
(4) Station Services
(5) Financial and Administrative Services

The following subsections briefly describe the responsibilities and necessary qualifications of the key management positions in LIPA's Shoreham project organization.

2.3.1.1 LIPA Board and Chairman

The LIPA Board of Trustees is responsible for LIPA's overall direction, policy development and policy implementation. Upon transfer of Shoreham to LIPA, the LIPA Board will become responsible for the safe and cost-effective maintenance of Shoreham and the safe, cost-effective and expeditious decommissioning of Shoreham. The Chairman's duties in this regard include overall responsibility for the administration and coordination of LIPA's activities. This includes overall responsibility for LIPA's adherence to the applicable requirements of federal, state and possibly local regulatory bodies.

The LIPA Chairman is appointed by the Governor of the State of New York. The responsibilities of the Chairman as described above may be administered on a day-to-day basis through the services of an appointed Executive Director.

2.3.1.2 LIPA Executive Director

The Executive Director of LIPA is responsible for the day-to-day direction and administration of LIPA, including all matters involving asset transfer, license transfer, maintenance and decommissioning of the Shoreham plant.

In fulfilling these functions, the Executive Director will give direction to, and receive reports from, the Executive Vice President-Shoreham Project.

2.3.1.3 Executive Vice President-Shoreham Project

The Executive Vice President-Shoreham Project reports directly to LIPA's Executive Director and is responsible for the overall direction, radiological and industrial safety, and cost and schedule of the project. He is the corporate officer responsible for QA program implementation and review, protection of occupational and public safety, and coordination with regulatory agencies.

The Executive Vice President-Shoreham Project shall have a bachelor's degree in science or an engineering field associated with power production, and 10 years of experience associated with power plant design and operation, at least 5 years of which shall be nuclear power plant experience.

2.3.1.4 Resident Manager

The Resident Manager reports directly to the Executive Vice President-Shoreham Project, and has overall responsibility for day-to-day management of the decommissioning activities. Through his subordinates, he directs the technical, administrative and regulatory functions to accomplish all of the tasks and activities comprising the decommissioning project.

The Resident Manager shall have a bachelor's degree in science or in an engineering field associated with power production, and a minimum of 6 years of power plant experience, at least 3 years of which shall be nuclear power plant experience.

2.3.1.5 Operations and Maintenance Department Manager

The Operations and Maintenance Department Manager reports to the Resident Manager and is responsible for the operations, maintenance, radiological controls and plant engineering support of the project. He ensures that adequate staffing, procedures, and controls are established to safely support the decommissioning activities without interruption or delays to the project.

The Operations and Maintenance Department Manager shall have a bachelor's degree in engineering or the physical sciences, and 4 years of experience in nuclear services, nuclear power plant operation and/or engineering/design.

2.3.1.6 Decommissioning Department Manager

The Decommissioning Department Manager reports to the Resident Manager and is responsible for the management of Shoreham's direct decommissioning activities, including project engineering, coordination and direction of decommissioning contractors, and work planning/scheduling.

The Decommissioning Department Manager shall have a bachelor's degree in engineering or the physical sciences, and 4 years of experience in nuclear services, nuclear power plant operation and/or engineering/design.

2.3.1.7 Nuclear Quality Assurance (NQA) Department Manager

The NQA Department Manager reports to the Executive Vice President-Shoreham Project and is responsible to the Resident Manager for the development and administration of the Decommissioning QA program. Detailed responsibilities of the NQA Department Manager are described in Section 7.0. The NQA Department Manager has direct access to the LIPA Executive Director as he deems necessary.

The NQA Department Manager shall have at least 5 years experience requiring technical and administrative abilities in nuclear related QA, engineering construction or operations. At least 2 years of professional experience shall be in nuclear QA services.

2.3.1.8 Licensing/Regulatory Compliance Department Manager

The Licensing/Regulatory Compliance Department Manager reports to the Resident Manager and is responsible for the management of all licensing and regulatory matters relating to the decommissioning of the Shoreham plant. The

Licensing/Regulatory Compliance Department Manager is also responsible for coordinating site activities that are necessary to assure conformance with all applicable regulations and license requirements.

The Licensing/Regulatory Compliance Department Manager shall have a bachelor's degree in engineering sciences, and 4 years of experience in nuclear engineering, nuclear design or nuclear power plant operation. At least 2 years of professional experience shall be in nuclear licensing.

2.3.1.9 Finance and Administration Department Manager

The Finance and Administration Department Manager reports to the Resident Manager and is responsible for all finance and administrative functions related to Shoreham's decommissioning. Such functions include the coordination and management of procurement activities, inventory and material control, budget management, and cost control and strategic planning/scheduling.

The Finance and Administration Department Manager shall have a bachelor's degree in engineering or business administration and 4 years of professional experience in power plant operations, maintenance or modifications.

2.3.1.10 Station Services Department Manager

The Station Services Department Manager reports to the Resident Manager and is responsible for managing station support services, including plant security, fire protection and safety, training and miscellaneous site administrative services (clerks, typists, etc.).

The Station Services Department Manager shall have a bachelor's degree in engineering or science and 4 years of nuclear plant experience.

2.3.1.11 Operations Division Manager

The Operations Division Manager reports to the Operations and Maintenance Department Manager and is responsible for staffing the operations engineers and plant operators on each shift. In addition, the Operations Division Manager will provide for the day-to-day planning/scheduling for operations and maintenance activities.

The Operations Division Manager shall have a bachelor's degree in engineering or related technical training, and 4 years of nuclear power plant operating experience.

2.3.1.12 Maintenance Division Manager

The Maintenance Division Manager reports to the Operations and Maintenance Department Manager and is responsible for maintenance of all plant mechanical and electrical equipment, instrumentation and controls systems, and building and site services.

The Maintenance Division Manager shall have a bachelor's degree in engineering or related technical training, and 4 years of fossil or nuclear power plant maintenance experience.

2.3.1.13 Radiological Controls Division Manager

The Radiological Controls Division Manager reports to the Operations and Maintenance Department Manager and is responsible for health physics, radiological health and safety of the workers and the public, radiochemistry, radiological engineering, and radioactive waste handling and disposal.

The Radiological Controls Division Manager shall have a bachelor's degree in engineering or physical sciences, and 4 years of experience in nuclear facility health physics, radiological health and safety, radiochemistry or radioactive waste handling and disposal.

2.3.1.14 Technical Services Division Manager

The Technical Services Division Manager reports to the Operations and Maintenance Department Manager and is responsible for providing technical support and engineering services in areas related to the maintenance of the Shoreham plant. The Technical Services Division Manager will also be responsible for technical interface with the Decommissioning Department engineering personnel to assure that decommissioning engineering plans and activities are compatible with the existing Shoreham plant design. In addition, the Technical Services Division Manager will be responsible for maintaining Shoreham's engineering administrative infrastructure (document control, engineering/design procedures, etc.).

The Technical Services Division Manager shall have a bachelor's degree in engineering and 4 years experience in nuclear plant engineering, design or operation.

2.3.1.15 Nuclear Site Security Division Manager

The Nuclear Site Security Division Manager reports to the Station Services Department Manager and is responsible for the physical security of the site and environs. He will be responsible for establishing procedures and standards for controlling access to the site for staff and contractor personnel, as well as vehicle access control.

The Nuclear Site Security Division Manager shall have at least an associate's degree in administration or related training, and 4 years experience in security. At least 2 years of experience shall be in nuclear power plant security.

2.3.1.16 Fire Protection and Site Safety Supervisor

The Fire Protection and Site Safety Supervisor reports to the Station Services Department Manager and is responsible for coordinating and administrating the fire protection and safety division. This includes reviewing and approving fire protection and safety procedures and reporting all fire protection matters related to plant maintenance and decommissioning activities to the Station Services Manager.

2.3.2 Decommissioning Oversight

As described in the license transfer application (Ref. 2-5), LIPA intends to provide for decommissioning oversight at both LIPA corporate (i.e., Board of Trustees) and Shoreham plant senior management levels.

In addition to the broad oversight functions described in Sections 2.3.2.1 and 2.3.2.2, below, LIPA envisions the establishment of an ALARA Review Committee (ARC) (See Section 3.2) to oversee effective implementation of its radiological controls program.

2.3.2.1 Independent Review Panel (IRP)

The IRP will provide an independent review of the overall safety, regulatory compliance and effectiveness of the LIPA maintenance and decommissioning activities associated with the Shoreham plant. The IRP shall consist of five (5) members appointed by the LIPA Board of Trustees with demonstrated expertise in the areas of utility nuclear operations, academia and/or research in nuclear fields, and nuclear regulation. One member of the IRP will be selected by the LIPA Board of Trustees to serve as IRP Chairman. The IRP Chairman will serve as the liaison between the IRP and the LIPA Chairman and the LIPA Board of Trustees.

The IRP will report directly to the LIPA Chairman and ultimately to the LIPA Board of Trustees. The IRP shall record observations and recommendations and report such information to LIPA's Chairman and Board of Trustees. Routine coordination and communications shall be made through the Executive Director, Executive Vice President-Shoreham Project, and/or through the Shoreham Resident Manager.

The IRP will meet as required, but not less than quarterly, and at any time upon the request of a member of the IRP, the LIPA Chairman or the LIPA Board of Trustees. With respect to the scope of its review, the following general guidelines are provided. However, it is desired that the panel remain independent with respect to review areas and flexible with respect to the amount of detail evaluated.

Generally, the IRP will focus on conformance of the Shoreham decommissioning activities with nuclear safety objectives and on decisions which could affect the health and safety of the public or the environment. Specific IRP activities are expected to include:

(1) Review the adequacy of work plans and activities from a technical and safety perspective

(2) Anticipate problem areas and concerns (e.g., activities that may not have been addressed or were overlooked)

(3) Recommend additional resources in areas of specific expertise that may have been unknown to the project team

(4) Review, at the panel's discretion, various periodic reports generated by the Site Review Committee (SRC) (described below) and/or other reports or documents issued by LIPA or regulatory agencies

(5) Review QA/QC (Quality Control) audit reports and other selected QA/QC documentation

(6) Review health and safety-related issues and plant material conditions, as well as other matters that appear appropriate, and make recommendations in such areas

(7) Tour and assess the Shoreham site

(8) Review violations of codes, regulations, orders, Technical Specifications, license requirements or internal procedures or instructions potentially having nuclear safety significance

(9) Review significant deviations of station equipment from normal and expected performance that could affect nuclear safety

(10) Review all reportable events

(11) Review recognized indications of an unanticipated deficiency in some aspect of design or operations of structures and systems that could affect nuclear safety

(12) Review ARC's activities, including review of meeting minutes, special reports, etc.

(13) Review reports and meeting minutes issued by the SRC.

2.3.2.2 Site Review Committee

The SRC will be organized to oversee LIPA's maintenance and decommissioning activities at the Shoreham plant. The Committee is comprised of the Resident Manager (Chairman), Operations and Maintenance Department Manager (Vice Chairman), Decommissioning Department Manager, Operations Division Manager, Radiological Controls Division Manager, Fire Protection and Site Safety Supervisor, Licensing/Regulatory Compliance Department Manager and NQA Department Manager. Special consultants may be used to provide expert advice as the needs arise. Meetings will be called by the Chairman as occasions for review or investigation arise. However, meetings will be no less frequent than once a month.

The scope of the SRC's oversight responsibility shall include but not be limited to:

(1) Review of all procedures and programs required by the Shoreham plant Technical Specifications or other Shoreham

regulatory documents, and changes thereto, in addition to any other proposed procedures, as determined by the Committee, that may affect nuclear safety

(2) Review of all proposed tests and experiments that could affect nuclear safety

(3) Review of all proposed changes to the Shoreham plant license and Technical Specifications

(4) Review of all proposed changes or modifications to plant systems or equipment that could affect nuclear safety

(5) Investigations of all violations of the Technical Specifications, including the preparation and forwarding of reports covering evaluation and recommendations to prevent recurrence to the Chairman of the IRP and to the Executive Vice President - Shoreham Project

(6) Review of all reportable events

(7) Review of decommissioning activities and facility operations to identify potential safety hazards

(8) Review of decommissioning procedures for those activities specified in Table 7.0-1

(9) Performance of special review investigations or analyses requested by the Resident Manager or the Chairman of the IRP

(10) Review of the security plan, emergency plan, fire protection plan and related implementing procedures, including changes thereto

(11) Review of changes to the Process Control Program and Off-site Dose Calculation Manual

(12) Review of every accidental, unplanned or uncontrolled on-site release of radioactive material to the environs associated with Shoreham's decommissioning, including the preparation of

reports covering evaluation, recommendations and disposition of the corrective action to prevent recurrence and the forwarding of these reports to the Executive Vice President-Shoreham Project and to the IRP.

2.4 Training Program

LILCO is now preparing to modify the current Shoreham training program to meet the reduced requirements associated with maintaining the plant in the defueled configuration. LIPA, in turn, intends to make extensive use of the revised LILCO training program for Shoreham, modifying it as appropriate to reflect LIPA's responsibilities as Shoreham's owner and other license transfer-related factors, such as the changes to LILCO's existing Shoreham plant organization.

For decommissioning of the Shoreham plant, LIPA will augment the revised training program to include specific training commensurate with the varying requirements of the different stages of decommissioning. Given that decommissioning activities are assumed to commence while fuel remains stored in the Spent Fuel Storage Pool, LIPA will retain all elements of the Shoreham training program necessary to ensure safe fuel storage and handling, including protection of workers from hazards associated with such activities. Training to support various station programs, plans, procedures and general administrative and safety requirements will also be maintained as required.

Generally, the training will provide necessary and essential classroom instruction to each individual, ensuring acquisition of knowledge and skills to safely perform their job functions and related tasks. These programs will be conducted in accordance with appropriate procedures. Specialized training applicable to specific activities, tasks and conditions will be developed and provided as decommissioning progresses.

Additionally, on-the-job training (OJT) will be provided by technical and supervisory personnel to continue reinforcing and improving knowledge and skills of the decommissioning staff.

All decommissioning personnel at Shoreham, whether employed by LIPA, NYPA, LILCO or other contractors, will receive appropriate training commensurate with the potential hazards to which they may be exposed.

Training will include, but not be limited to, the following:

- General Employee Training
- First Aid
- Fire Brigade, Fire Protection
- Emergency Plan (on site)
- Security (security areas, access control, badging, screening, etc.)
- Quality Assurance
- Radwaste
- ALARA Matters
- Industrial Safety (including asbestos)
- Hazardous Materials Handling

Supervisory safety training will be an important part of the safety training program. Each supervisory person will receive safety orientation training that defines the safety responsibilities of their position and demonstrates how to develop good safety practices among workers.

A description of some of the specific training programs, courses and requirements that will be in place follows.

2.4.1 General Employee Training

Employees at Shoreham will receive General Employee Training (GET) in the following subject areas, commensurate with their job duties:

(1) General description of the plant and facilities
(2) Job-related policies, procedures and instructions
(3) Radiological health and safety (see Section 2.4.2)
(4) Emergency plan
(5) Industrial safety
(6) Fire protection
(7) Security
(8) Quality assurance

The comprehension of each trainee and the overall effectiveness of the training will be evaluated by administration of a written examination.

For the purpose of defining GET training requirements for the decommissioning project, personnel will be assigned to one of three categories:

- <u>Visitors</u>
  Individuals who infrequently visit radiologically controlled areas (i.e., visitors such as tour groups, vendors, etc.) will be escorted by an authorized, pre-qualified employee while in the radiologically controlled areas and will not require training.

- <u>Plant Staff</u>
  Individuals who work within LIPA's secured areas, but who will not require access to radiologically controlled areas, will receive appropriate training in all GET subjects.

- <u>Decommissioning Staff</u>
  Individuals required to have routine access to radiologically controlled areas, or who will routinely handle radioactive materials or contaminated equipment, must have satisfactorily completed GET, including appropriate radiological safety training, prior to being granted unescorted access to radiologically controlled areas.

Retraining on selected subjects will be conducted as needed and decommissioning staff will be retrained on GET at least annually. An individual's comprehension and the program's overall effectiveness will be evaluated by a written examination.

2.4.2 Radiological Safety Course

The radiological safety course required for decommissioning workers will include the following topics: ALARA practices, introduction to 10 CFR 19 and 10 CFR 20, prenatal radiation exposure (Reg. Guide 8.13, Rev.1), radiological instrumentation and controls, decontamination and radwaste procedures, fire protection and emergency procedures. General subjects, such as the nature and sources of radiation, methods of controlling contamination, interactions of radiation and matter, biological effects of radiation, use of monitoring equipment and risks from occupational radiation exposure, are also to be covered. The course will be comprised of lectures and demonstrations augmented with selected audiovisual aids. The content of the radiological safety course may be revised, as needed, during decommissioning. Respirator training will also be provided for appropriate employees in accordance with Reg. Guide 8.15, Rev. 1 and NUREG-0041.

The comprehension of each trainee and the overall effectiveness of the training course will be evaluated by a written examination. The Radiological Controls Manager will be responsible for the content of the radiological safety training course; a qualified designee will conduct the training.

2.4.3 Work-Specific Training

Radiological training for decommissioning workers that is directed toward specific planned work activities will be conducted by representatives of the Radiological Controls Division prior to the start of the activities. Work instructions for decommissioning tasks will reference procedures and specific concerns/precautions related to health and safety. Lesson plans will include copies of the work procedures.

2.4.4 Radiation Protection Technician Training

The radiation protection technicians will be required to successfully complete appropriate elements of the radiological safety courses described above. Additional training, including training with respect to characteristics of the facility and systems, principles of nuclear safety and details of postulated accidents, will enable technicians to recognize potential problem areas.

2.4.5 Equipment Operator Training

Specialized power tools and equipment will be utilized through the course of the decommissioning project. Operator qualifications for such tools and equipment will be required to ensure that personnel safety and operational efficiency requirements are met. Qualification will be attained by completing the following:

- Study of vendor-supplied literature and applicable operating procedures
- Functional demonstration of the use of the equipment
- Hands-on training under qualified supervision.

The need for operator retraining/requalification will be determined on a continuing basis. The need for retraining will depend on operating complexity, operator continuity of service or other factors deemed appropriate. OJT will be provided to continue reinforcing and improving the decommissioning staff knowledge and work skills.

Determination of training requirements and implementation of equipment operator training and retraining will be the responsibility of the various department managers of employees who operate equipment at Shoreham.

2.4.6 Non-Radiological/Industrial Safety Training

Workers will be given instructions regarding the hazards and safety precautions applicable to the type of work being performed, and will be directed to read and follow applicable job procedures. Only qualified persons will operate equipment and machinery.

Basic occupational safety information is contained in the existing Shoreham Industrial Safety Manual, which will be adapted by LIPA to meet decommissioning needs.

Individuals will be instructed concerning workplace hazards (e.g., flammable liquids and gases, chemicals, hazardous materials and confined spaces) and in procedures for preventing unsafe conditions and unsafe acts.

Examples of activities requiring special training are:

- Crane/hoist operation (including forklifts)
- Powered platforms and scaffolds
- Use of personal protective equipment in elevated work areas
- Disposal of chemicals and hazardous materials
- Use of cutting and welding equipment
- Confined space entry and ventilation

Workers will also be instructed in the use of ladders, in protecting floor and wall openings, in maintaining emergency egress capability and in the proper use of scaffolding.

During the daily readiness review and job briefings, individuals will be instructed in accident prevention.

2.4.7 Training Records

Training record requirements are addressed in existing LILCO procedures, which will be adapted for use by LIPA during LIPA's ongoing review of existing LILCO procedures pertaining to Shoreham. As a minimum, however, training records to be kept by LIPA will include the following:

- The name of the attending employees
- The subject of the training or meeting and a brief description
- The date, time and duration of the training or meeting
- Written examinations
- Instructor's name
- Training expiration date, if applicable

These records will be kept in accordance with 10 CFR 19 and 10 CFR 20.

2.4.8 Trainer Qualification

Training will be conducted by LIPA, NYPA, and LILCO personnel, by contractor training specialists and by equipment vendor training representatives. The background and qualifications of training instructors will be appropriate for the subject matter to be addressed. For example:

- Training on specific aspects and features of the Shoreham plant will be conducted by instructors who are familiar with the plant.

- Training pertaining to personnel radiological safety will be conducted by instructors with education and experience in health physics and radiological safety.

- Training pertaining to nuclear safety will be conducted by instructors with an engineering or science background, nuclear power plant experience and familiarity with applicable regulations.

- Training in decontamination and dismantlement techniques will be conducted by personnel with appropriate experience in these fields.

- Training of equipment operators will be conducted by instructors who are qualified to provide such instruction for general equipment such as cranes, hoists and forklifts, and by vendor representatives for highly specialized equipment.

Training instructors shall have experience consistent with instructional duties. They They also shall have appropriate knowledge of instructional techniques by experience or training. Where required, they shall be certified as a qualified instructor or instructor-trainee.

2.5 Contractor Assistance

LIPA recognizes the potential benefits offered by the well managed use of contractor assistance. There are a number of qualified contractors and consultants offering a wide range of services that are directly applicable or related to many of the Shoreham decommissioning tasks and activities. Moreover, there is a similar pool of contractors and consultants offering services in the project support and staff augmentation areas.

LIPA similarly recognizes that as Shoreham's licensee during decommissioning, LIPA retains ultimate responsibility for the overall project. Thus, LIPA is sensitive to the rigorous controls and owner involvement that are essential to the effective and responsible use of contractor assistance. Section 7.0 describes the QA programmatic requirements related to the control of the work performed by LIPA's contractors.

Since project inception, LIPA has contemplated the use of qualified consultants and contractors to assist LIPA in carrying out the decommissioning of the Shoreham plant. These initial intentions have resulted in the hiring of several contractors and consultants to assist LIPA, as described in Sections 2.5.1, 2.5.2 and 2.5.3 below. LIPA's plans for subsequent project phases and activities are discussed in Section 2.5.4.

2.5.1 New York Power Authority

NYPA is the prime contractor to LIPA for providing technical and management services for the maintenance and decommissioning of the Shoreham facility. As such, NYPA is responsible for decommissioning planning and preparations. NYPA will also supervise and direct work concerning the day-to-day maintenance and decommissioning of the facility. The Management Services Agreement (Reference 2-6) describes NYPA's scope of services to LIPA.

NYPA is a corporate municipal instrumentality and political subdivision of the State of New York, organized and operating pursuant to Article 5, Title 1 of the New York Public Authorities Law. NYPA is the owner and operator of the Indian Point, Unit 3 and James A. Fitzpatrick nuclear power plants under NRC licenses DPR-59 and DPR-64, respectively. The Fitzpatrick plant is a General Electric BWR, quite similar to Shoreham.

Having been an NRC licensee since 1975, NYPA has considerable experience and a favorable record for conducting the activities at its nuclear facilities in a manner that is consistent with public health and safety and protection of the environment. As a result of this experience, NYPA offers an existing staff, programmatic infrastructure and the range of resources that are requisite to the effective planning for and decommissioning of Shoreham.

2.5.2 LILCO Assistance

In accordance with the Site Agreement (Reference 2-7), LILCO will use its best efforts to make available its employees to satisfy needs specified by LIPA for Shoreham maintenance and decommissioning staffing. LIPA and NYPA will attempt to staff the project with such personnel with the obvious objective of benefitting from their site-specific knowledge and experience. Policies and procedures for using LILCO employees, who are to work under the direction and supervision of LIPA and NYPA staff personnel, are to be developed as the project proceeds.

2.5.3 Decommissioning Engineering and Planning

During the summer of 1990, Bechtel was hired by LIPA to provide A/E services for the Shoreham decommissioning project. In this capacity, Bechtel is responsible for providing a comprehensive and broad range of decommissioning consultation services, including project conceptual engineering, detailed engineering and design and planning/scheduling. In addition, Bechtel is to provide engineering support to LIPA during the field implementation phase(s) of the project.

Having served as the prime contractor for the Three Mile Island recovery effort, Bechtel offers considerable experience which is directly applicable to the Shoreham decommissioning project. Moreover, Bechtel has performed numerous decommissioning engineering studies and evaluations for other utilities in the nuclear industry. Lastly, as the principal A/E for over one-half of the nuclear plants that have been built in the United States, Bechtel offers an enormous pool of resources in a wide range of technical disciplines which can be made available for use by LIPA. Such capabilities may provide additional benefits to LIPA in resolving unforseen technical issues that may be encountered during the course of Shoreham decommissioning.

As subcontractors to Bechtel, LIPA has indirectly secured the services of TLG Engineering (TLG) and Power Cutting, Inc. (PCI). TLG is a consulting firm offering considerable experience with nuclear plant decommissioning engineering and cost studies. In addition, TLG offers field, hands-on experience through its participation in the Shippingport decommissioning project. TLG is responsible for performing Shoreham decommissioning cost studies and is assisting LIPA, NYPA and Bechtel with the development of the Shoreham decommissioning cost estimate.

PCI is a "specialty" contractor offering unmatched experience with field machining and cutting technologies in non-standard applications. Much of its experience with "non-decommissioning" projects, such as steam generator replacement and reactor thermal shield repair, can be applied directly to many of LIPA's Shoreham decommissioning activities. PCI is responsible for assisting LIPA and Bechtel with a conceptual plan for segmenting the Shoreham RPV. PCI's involvement includes an evaluation of available technology in field-proven processes that can be used for RPV segmentation.

LIPA will continue to evaluate the need to acquire the services of additional contractors as the Shoreham project evolves.

Specific areas for which contractor assistance is being contemplated include:

(1) Radwaste Management
  o Packaging and handling
  o Shipping casks and container suppliers
  o Transportation
  o Disposal
  o Off-site laundry
  o Liquid waste processing
  o Volume reduction

(2) Decommissioning Specialist
  o Planning engineering
  o Decontamination
  o Dismantling
  o Heavy rigging/handling

(3) Radiation Protection
  o Engineering
  o Radiation protection staff augmentation
  o Analytical laboratory services
  o Dosimetry
  o Radiation surveys.

2.6 References

2-1 U.S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988.

2-2 Final Rule, "General Requirements for Decommissioning Nuclear Facilities," 53 FR 24018 (1988).

2-3 H.D. Oak et al, "Technology, Safety, and Costs of Decommissioning a Reference Boiling Water Reactor Power Station" (prepared for the Nuclear Regulatory Commission by Pacific Northwest Laboratory), NUREG/CR-0672, June 1980; Addendum 1, July 1983; Addendum 2, September 1984; and Addendum 3, July 1988.

2-4 Long Island Lighting Company, "Shoreham Nuclear Power Station Site Characterization Program, Final Report," May 1990; Addendum 1, June 1990; Addendum 2, August 1990.

2-5 "Joint Application of Long Island Lighting Company and Long Island Power Authority for License Amendment to Authorize Transfer of Shoreham," transmitted via LILCO letter SNRC-1734 from W.E. Steiger, Jr. and Richard M. Kessel to U.S. Nuclear Regulatory Commission, June 28, 1990.

2-6 Management Services Agreement By and Between LIPA and NYPA, January 24, 1990.

2-7 Site Cooperation and Reimbursement Agreement By and Between LILCO and LIPA, January 24, 1990.

Table 2.2-1

Dose Rates Present At Shoreham And/or Expected During Decommissioning

Area	Expected General Area Whole Body Dose Rates	Expected Maximum Dose Rates
Inside RPV	0.5 to 20 mR/hr(1)	100 mR/hr to 100 R/hr(2)
Between the RPV and Bio Shield Wall	< 1 to 20 mR/hr	5 to 40 mR/hr(2)
Drywell and Suppression Pool	0.5 mR/hr	1 mR/hr
Reactor Cavity	0.5 to 5 mR/hr	40 to 80 mR/hr(3)
Reactor Building (Elev 175 Ft.)	0.5 mR/hr	40 to 80 mR/hr(3)
Remainder of Reactor, Turbine and Control Buildings	< 0.1 mR/hr	2 mR/hr(3)

(1) Dose rates at the level of the vessel flange are expected after shielding and/or after activated internals are removed.

(2) Unshielded contact exposure rates

(3) Maximum dose rates are expected from transport and/or temporary storage of radioactive material in these areas. Maximum whole body exposure rates in the reactor cavity and building are expected during transfer of activated segments of the RPV internals to cutting and/or packaging areas.

Table 2.2-2

SHOREHAM DECOMMISSIONING RADIATION EXPOSURE ESTIMATE

Decommissioning/ Activity	Estimated Occupational Dose (REM)
Control Rod Drive System	0.3
Core Spray System	0.8
Residual Heat Removal System	2.3
Reactor Water Cleanup System	1.2
Fuel Pool Cooling and Cleanup System	1.7
Condensate Demineralizer System	0.0
Reactor Recirculation System	0.7
Liquid Radwaste System	0.1
Process Sampling System	0.0
Equipment and Floor Drainage System	0.0
Primary Containment	0.2
Floor Drain Sumps	0.0
Dryer and Separator Storage Pool, Reactor Head Cavity and Spent Fuel Storage Pool	0.1
Spent Fuel Storage Racks	0.1
Radwaste Laydown Area	0.0
Segmentation of RPV	158.0
Radwaste Handling and Packaging	14.2
Radwaste Transport	10.0
TOTAL	**189.7**

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
	General Comments (continued)	The schedule assumes that the DP will be approved Oct. 1, 1991. RPV segmentation and critical path activities after fuel removal are worked on a double shift, five day per week, ten hours per shift basis. All other scheduled activities are worked on a single shift, five day per week, eight hours per shift basis. The total schedule duration is 27 months from DP approval to completion of LIPA activities. The WBS is used to classify items in both the schedule and cost estimate. This common classification system relates cost and schedule for proper project control. The DP is based upon several key dates: 1. Submittal of the DP - Dec. 31, 1990. 2. Transfer of the NRC license to LIPA - July 1, 1991. 3. NRC approval of the DP - Oct. 1, 1991. 4. Completion of LIPA decommissioning activities including decontamination, dismantlement, waste disposal and preparation of final radiation survey report - Dec. 31, 1993. Conceptual decommissioning engineering by the architect/engineering (A/E) contractor and LIPA began in 1990 and culminates with the submittal of the DP to the NRC.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
		During the NRC review cycle, LIPA and its consultants will perform further detailed decommissioning engineering, contract with specialty vendors, procure tools, materials and services, test equipment and processes and mobilize and train personnel to perform the physical decommissioning. Except for soft decontamination, LIPA will decontaminate, dismantle, remove, package and dispose of contaminated plant systems and structures after NRC approval of the DP. System and RPV decontamination and dismantlement activities are scheduled for completion by August 1993. General area decontamination, clean-up and radiological surveys will be conducted from July through November of 1993.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
E	Decommissioning Engineering & Planning	This work package contains the activities that are required to prepare and support the DP and decommissioning implementation. Specific activities include: 1. Conceptual engineering and DP preparation. These activities are in process and end with DP submission. 2. Detailed work package development and early procurement of necessary services, materials and equipment. These activities begin with DP submission and complete with NRC DP approval. 3. Supporting the DP through its review and approval cycle. The duration of this activity is dependent upon the time required by the NRC to review and approve the DP. 4. Generating a request for proposal from general contractors (see work package DA), evaluating responses, selecting a vendor and negotiating a contract for GC services. This may be completed prior to Oct. 1, 1991.
DA	External Decommissioning Contractor (continued)	This work package contains the decommissioning implementation management services provided by an outside general contractor. The contractor will supervise the decommissioning craft labor and be responsible for day-to-day implementation of decommissioning activities. It begins after general contractor procurement is complete and ends with completion of decommissioning through LIPA's final survey.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
		On the schedule these activities are shown in Section DG with other management and administration tasks. On the cost estimate the cost of the contractor is shown as a markup on each direct labor activity and is not shown separately.
DB	Decommissioning Special Tools, Materials and Equipment	This work package includes procurement of physical specialties and development and testing of RPV segmentation engineering packages and tooling. Specific activities include: 1. Engineering, development and testing of cutting and disassembly tooling to be used primarily on the RPV. It also includes demonstration, training and mock-up exercises. 2. Procurement of pipe cutting equipment, heavy equipment rental, decontamination equipment, rigging, casks, containers, bulk decontamination consumables and other material required to physically decommission the plant.
DC	Systems Decontamination/ Dismantling (continued)	This work package includes chemically decontaminating and dismantling contaminated systems. It also includes consolidation of contaminated material in a packaging area. Specific activities include: 1. Continuation of chemical decontamination of piping systems by LIPA. This decontamination process is scheduled to be started by LILCO in February 1991, and will be completed by LIPA if it is still in progress at the time of license transfer. It is shown on the LIPA schedule beginning July 1, 1991, which is the projected date of license transfer, and ending with DP approval.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
	(continued)	2. Completion of chemical decontamination. It is shown separately to denote DP approval, and includes provisions for more aggressive decontamination techniques. 3. The removal of the portions of piping systems that were contaminated during the plant operating history. The scope of these activities includes all pipe identified as contaminated in the LILCO site characterization report. Durations shown have been estimated based upon the quantity and size of pipe to be removed and resource leveling considerations. To present a conservative schedule, chemical decontamination was not assumed to reduce the quantity of pipe required to be removed from any system. Should such decontamination successfully reduce quantities to be removed, the duration of these activities may be less than currently scheduled. The schedule segregates work on piping systems by location (outside and inside containment). It assumes systems will be dismantled on an area basis, with systems and system components outside the containment area generally dismantled earlier than those inside containment. These activities can begin when chemical decontamination is complete and will proceed with dismantling using a general plant area approach.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
DD	Decontamination of Structures	This work package includes chemical and mechanical decontamination of plant areas and structures that are not part of a contaminated piping system. It also includes consolidation of contaminated materials in a packaging area. Specific activities include: 1. Decontamination of contaminated non-piping-system structures identified in the LILCO site characterization report. The tasks begin after fuel is removed from the reactor building and other decontamination/dismantling activity is complete. 2. Critical path activities involve final clean-up of the spent fuel storage pool, its associated components and the plant area. These activities will be conducted on an accelerated basis.
DE	Reactor Pressure Vessel Dismantling (continued)	This work package includes full segmentation of the RPV (even though portions of the RPV may ultimately not need to be removed if contamination is below releasable levels) and consolidation of contaminated material in a packaging area. Specific activities include: 1. Planning, engineering and implementing the removal of internal reactor components and the RPV. The RPV and RPV internals will be cut into pieces for packaging, shipping and burial.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
		These activity durations were estimated by a specialty contractor familiar with this type of work. Since these activities have a very small amount of slack time, they will be performed on an accelerated basis. 2. Procuring a specialty contractor for RPV segmentation and removal. This activity is scheduled to begin Jan. 1, 1991. RPV segmentation and in-containment fuel removal activities both require extensive use of the polar crane. Fuel removal will have priority use of the crane since it is a critical path activity. Schedule durations for RPV segmentation reflect this consideration.
DF	Waste Management	This work package includes employing waste volume reduction techniques (if beneficial) and packaging, shipping and burying contaminated materials and equipment. Specific activities include: 1. Procuring a contractor to perform waste management services. It begins in time to have a contractor on-site to support decontamination/dismantlement activities. 2. Contractor performance of waste management activities. It is a "level-of-support" activity that parallels decontamination/dismantlement activities.
DG	Plant Staff, Decommissioning Support, Management and Administration	This work package includes LIPA, NYPA, LILCO and other contractor staff required to manage and support the decommissioning effort. It is a "level-of-support" activity that lasts for the duration of the decommissioning effort.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
DH	Decommissioning Radiological and Environmental	This work package includes radiological surveying and testing activities that support the decommissioning effort. Specific activities include: 1. Survey and final release of plant areas once decontamination/dismantlement activities are complete. It is a "level-of-support" activity that parallels the clean-up activities and extends one month past completion of final plant area clean-up. 2. The anticipated NRC independent verification of the final radiation survey is not included in Figure 2.2-2. It is assumed the NRC will conduct this survey after LIPA's completion of final surveys. The plant will be released for unrestricted use and the license terminated upon completion of this survey.
F	Fuel Disposition (continued)	This work package includes planning, engineering and implementing the removal, packaging and shipment off-site of the nuclear fuel. It is anticipated that fuel will be packaged into licensed casks and shipped to a remote site. Other highly activated materials such as sources and fuel channels will be removed with or prior to the fuel. Specific activities include: 1. Planning, engineering and site preparation required for shipping the fuel. These activities include renting and licensing acceptable casks, preparing the barge dock to accept the barge, if barge shipment is utilized, site work for moving the fuel and casks around the Shoreham site and developing detailed procedures for handling and removing the fuel. It is estimated to begin Jan. 1, 1991, and last one year.

Table 2.2-3 Decommissioning Project Schedule Assumptions and Clarifications

WBS	Name	Discussion
		2. Removal, packaging and shipping of fuel. These critical path activities depend upon arrangements for fuel disposition and licensed cask availability for shipment. Decontamination/dismantlement work in the reactor building has been planned to accommodate the fuel removal schedule.
XXX	Milestones	1. The date of transfer of the Shoreham NRC license from LILCO to LIPA. This is assumed to be July 1, 1991. 2. The approval of the DP. LIPA believes that, due to Shoreham's short operating history and low levels of contamination, this approval can be accomplished by Oct. 1, 1991. 3. The start of fuel removal. It is dependent upon the completion of fuel disposition planning and engineering and cask availability. It is assumed to be January 1, 1992. 4. The completion of fuel removal from the reactor building. It is dependent upon the time required to remove fuel from the spent fuel storage pool and the number of casks available for fuel shipment. It is anticipated to be complete March 1, 1993. 5. The completion of physical decommissioning work. It is dependent upon timely removal of nuclear fuel from the reactor building and completion of decontamination activities. It is anticipated to be complete November 30, 1993. 6. The completion of decommissioning. It is dependent upon the final LIPA survey. It is anticipated to be complete December 31, 1993.

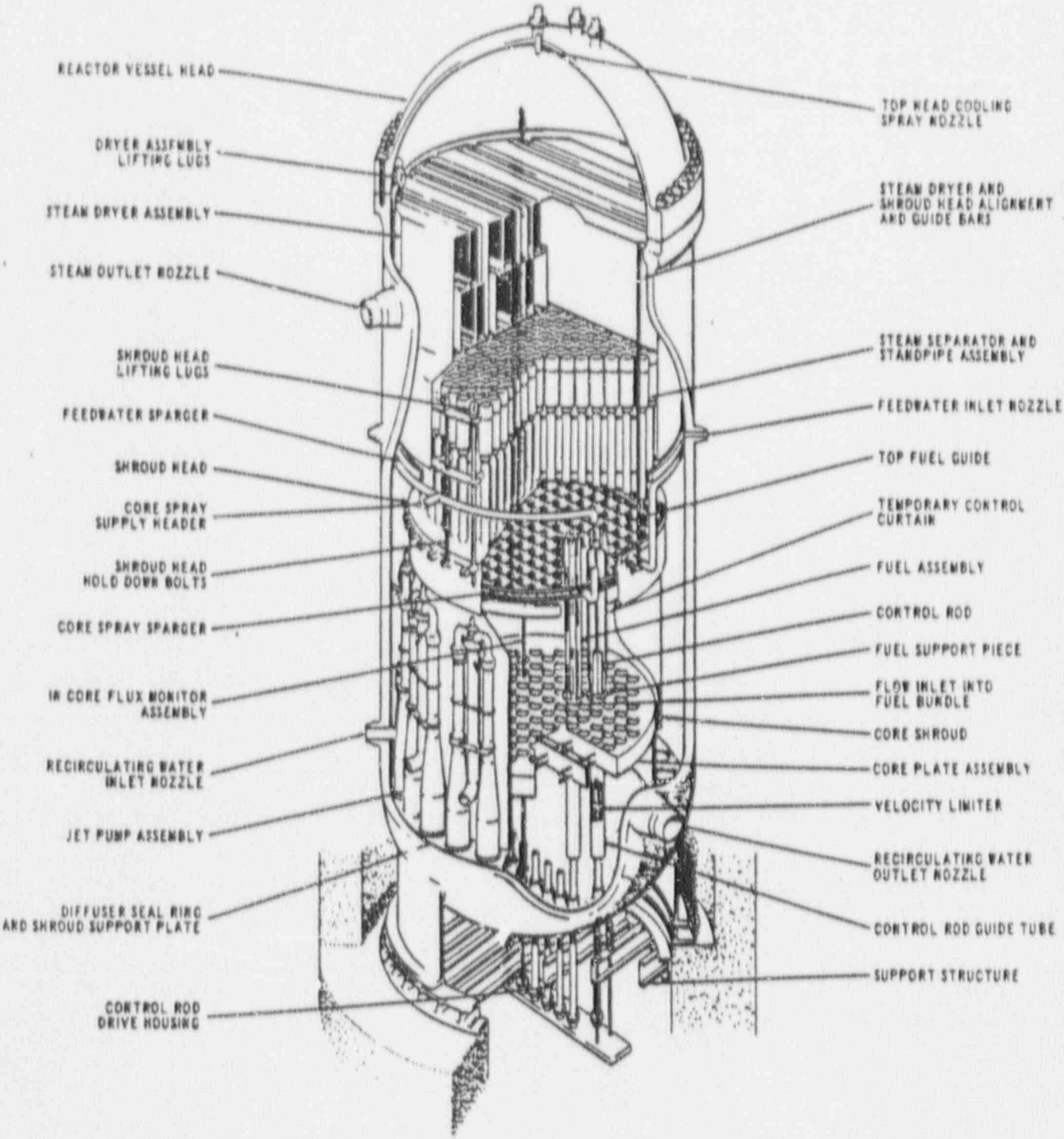


Figure 2.2-1

REACTOR PRESSURE VESSEL
AND INTERNALS

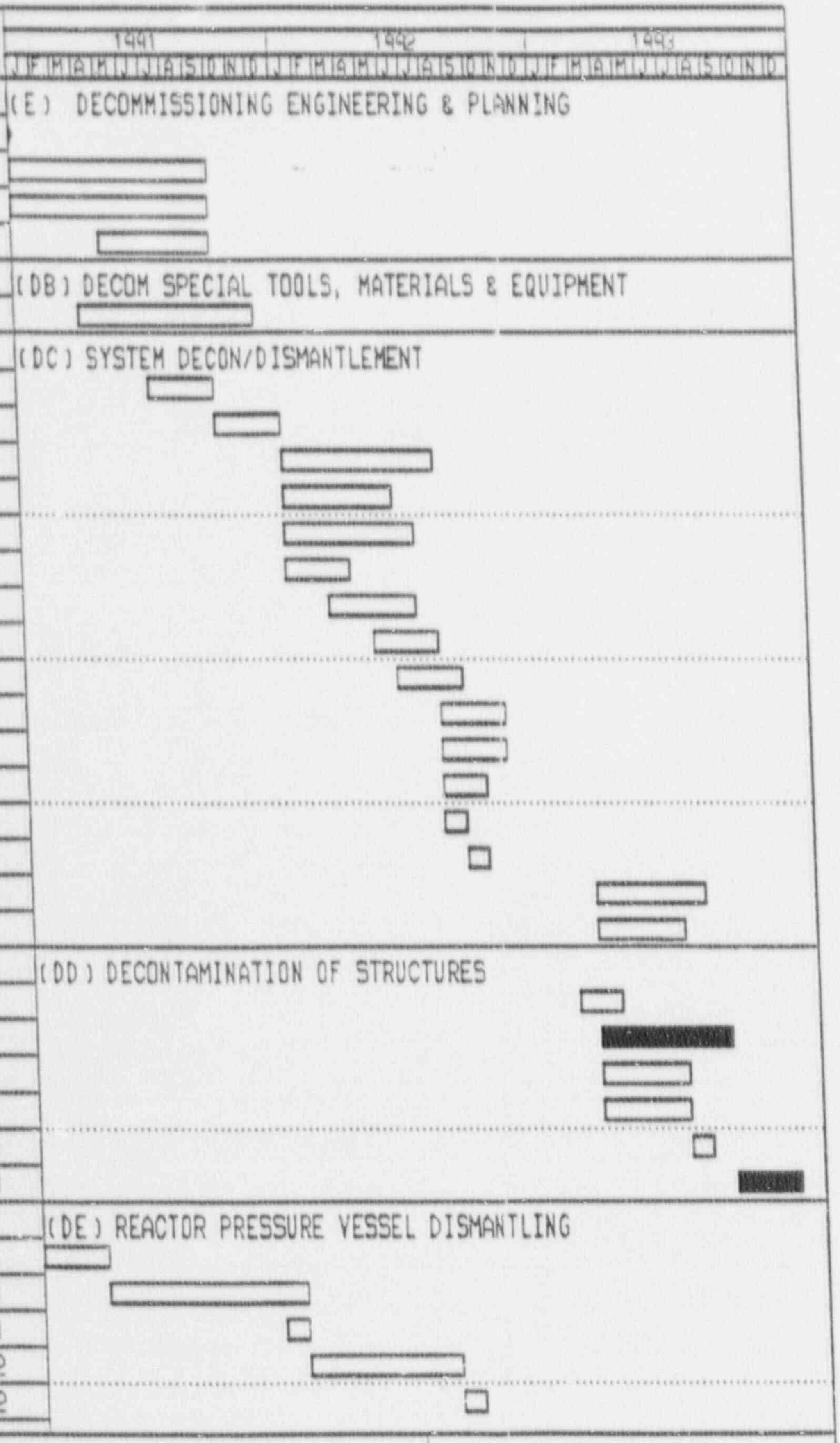
ACTIVITY DESCRIPTION	ORIG DUR	TOTL FLT	EARLY STAR
SUBMIT DECOMMISSIONING PLAN	0		1JAN9
NRC DECOM PLAN REVIEW	9	3	1JAN9
DETAILED DECOM ENGR & PRECONSTRUCTION SUPPORT	9	1	1JAN
GENERAL CONTRACTOR PROCUREMENT	5	3	1MAY
RPV TOOLING, MOCK UP, TESTING	8	2	1APR
CONTINUE CHEMICAL DECON OF PLANT SYSTEMS	3	3	1JUL
COMPLETE DECON OF PIPE SYSTEMS & RX VESSEL	3	4	1OCT
DISASSEMBLE RHR SYS. OUTSIDE CONTAINMENT (E11)	7	4	1JAN
DISASSEMBLE CORE SPRAY OUTSIDE CONT. (E21)	5	8	1JAN
DISASSEMBLE RX H2O CLEAN UP OUTSIDE CONTMT (G33)	6	7	1JAN
DISASSEMBLE CONDENSATE DEMINERALIZER (N52)	3	11	1JAN
DISASSEMBLE CRD OUTSIDE CONTAINMENT (C11)	4	6	1MAR
DISASSEMBLE PROCESS SAMPLING (P33)	3	7	1MAY
CUT PIPING AWAY FROM REACTOR VESSEL	3	1	1JUN
DISASSEMBLE RHR INSIDE CONTAINMENT (E11)	3	4	1AUG
DISASSEMBLE RX RECIRC	3	4	1AU
DISASSEMBLE CRD INSIDE CONTAINMENT (C11)	2	5	1AU
DISASSEMBLE RX H2O CLEAN UP INSIDE CONTMT	1	6	1AU
DISASSEMBLE CORE SPRAY INSIDE CONTAINMENT (E21)	1	5	1SE
DECON & DISMANTLE FUEL POOL CLEAN UP SYSTEM	5	1	1MA
DECON & DISMANTLE LIQUID RADWASTE	4	1	1MA
DECON DRYER/SEPARATOR STORAGE POOL & RX CAVITY	2	2	1FE
DECON & DISMANTLE FUEL POOL EQUIP.,LINER, ETC.	6	0	1MA
DECON & DISMANTLE EQUIP./FLOOR DRAINS & SUMPS	4	1	1MA
DECON PRIMARY CONTAINMENT	4	1	1MA
DECON RADWASTE LAYDOWN AREA	1	1	1JU
FINAL PLANT AREA CLEAN UP FOR RELEASE	3	0	1SE
RPV SEGMENTATION CONTRACT	3	1	1JA
VESSEL SEGMENTATION ENGINEERING	9	1	1AP
DECON RPV	1	1	1DE
WET RPV INTERNALS SEGMENTATION	7	1	1JA
DRAIN DOWN & DECON RPV SHELL	1	1	1AU

iractive
Activity Bar/Early Dates
Critical Activity
Progress Bar

Primavera Systems, Inc. 1984-1988

Planning Unit : Month

LONG ISLAN
DECOMMISSION
SHO
FIG



	EARLY FINISH
	(E) DECOMMISSIONING ENGINEERING & PLANNING
1A	1JAN91A
1	30SEP91
1	30SEP91
1	30SEP91
	(DB) DECOM SPECIAL TOOLS, MATERIALS & EQUIPMENT
91	30NOV91
	(DC) SYSTEM DECON/DISMANTLEMENT
91	30SEP91
91	31DEC91
92	31JUL92
92	31MAY92
92	30JUN92
92	31MAR92
92	30JUN92
92	31JUL92
92	31AUG92
92	31OCT92
92	31OCT92
92	30SEP92
92	31AUG92
92	30SEP92
R93	31JUL93
R93	30JUN93
	(DD) DECONTAMINATION OF STRUCTURES
B93	31MAR93
R93	31AUG93
R93	30JUN93
R93	30JUN93
L93	31JUL93
P93	30NOV93
	(DE) REACTOR PRESSURE VESSEL DISMANTLING
N91	31MAR91
PR91	31DEC91
EC91	31DEC91
N92	31JUL92
G92	31AUG92

D POWER AUTHORITY
ING PROJECT SCHEDULE
REHAM PLANT
URE 2.2-2

Sheet 1 of 2

Data Date: 1JAN91
Plot Date: 28DEC90

NYPA SPECIAL PROJECTS GROUP

Date	Revision	Checked	Approved

ACTIVITY DESCRIPTION	ORIG DUR	TOTL FLT	EARLY START
DRY RPV SHELL SEGMENTATION	5	1	1SEP9
ESTABLISH WASTE CONSOLIDATION/SHIP CONTRACTS	6	1	1JAN9
RADWASTE CONSOLIDATE & SHIP	30	1	1JUL9
STAFF SUPPORT	27	1	1OCT9
AREA RAD SURVEYS/FINAL SURVEY: UNRESTRICTED ACC.	6	0	1JUL9
ENGR/SITE WORK TO PREPARE FOR FUEL SHIPMENT	12	0	1JAN
REMOVE FUEL FROM POOL AND SHIP	14	0	1JAN
MISCELLANEOUS PLANT OPERATIONS	30	1	1JUL
NRC LICENSE TRANSFER TO LIPA	0	3	1JUL
SHOREHAM DECOM PLAN APPROVED BY NRC	0	3	1OCT
START OF FUEL REMOVAL	0	0	1JAN
FUEL REMOVED FROM RX BUILDING	0	0	1MAR
PHYSICAL DECOMMISSIONING WORK COMPLETE	0	0	1DEC
DECOMMISSIONING COMPLETE	0	0	31DEC

Inactive
▭ Activity Bar/Early Dates
▬ Critical Activity
▬ Progress Bar

Primavera Systems, Inc. 1984-1988

Planning Unit : Month

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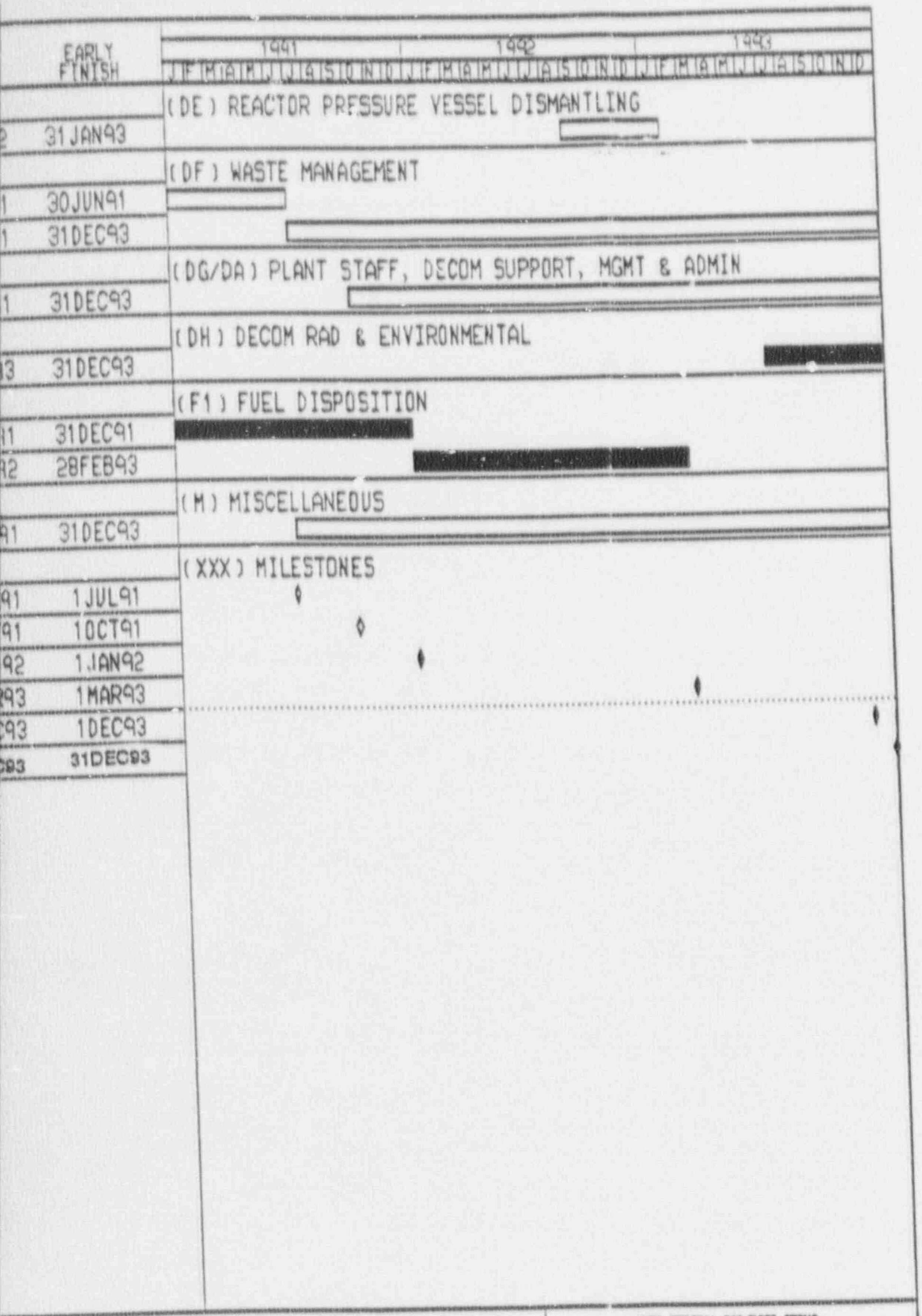


ND POWER AUTHORITY
NING PROJECT SCHEDULE
OREHAM PLANT

Sheet 2 of 2

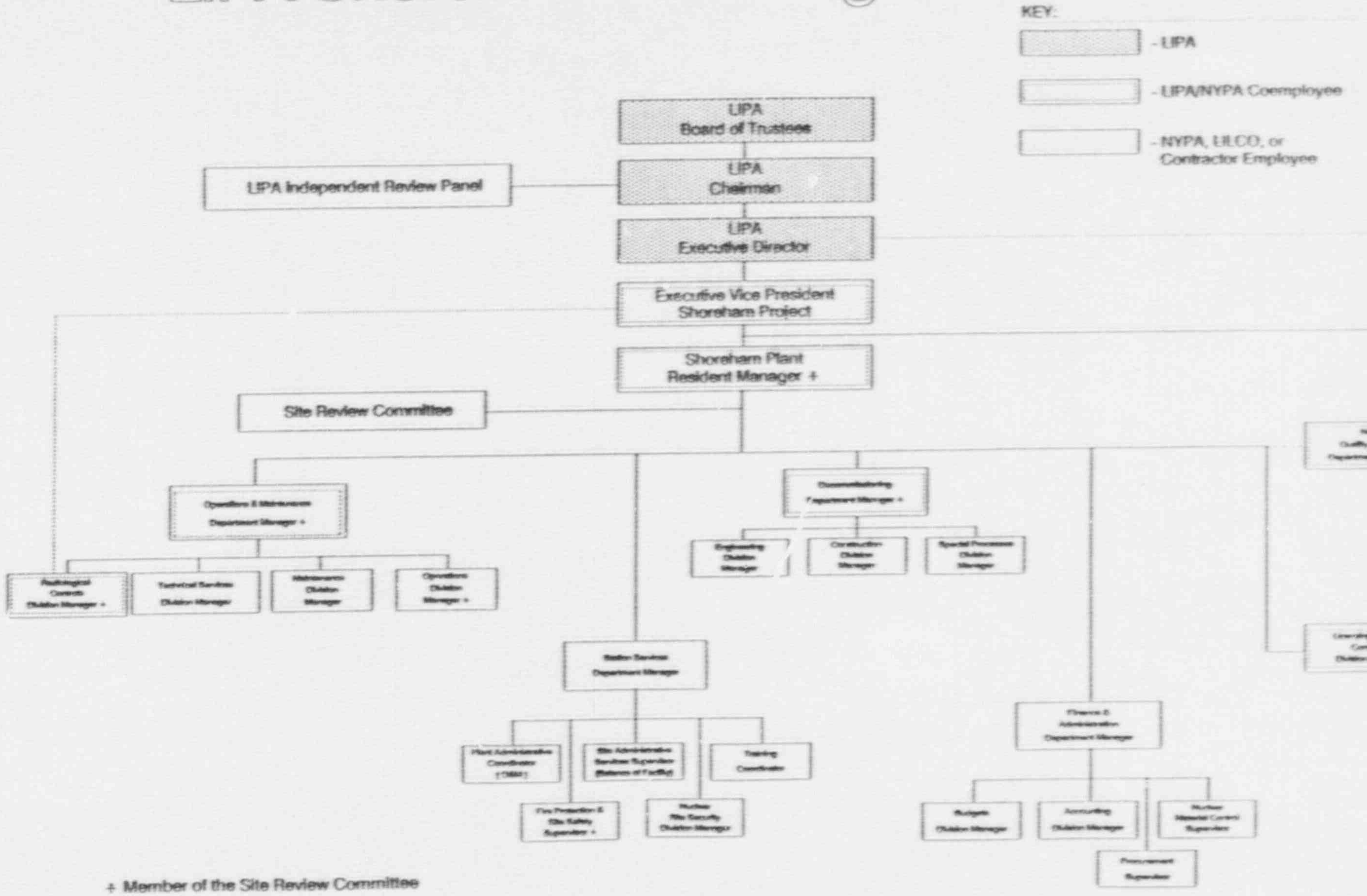
Data Date: 1JAN91
Plot Date: 28DEC90

NYPA SPECIAL PROJECTS GROUP

Date	Revision	Checked	Approved

Figure 2.3-1

LIPA Shoreham Plant Organization Chart



+ Member of the Site Review Committee

3.0 PROTECTION OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY

3.1 Facility Radiological Status

3.1.1 Operating History

Shoreham achieved initial criticality in February 1985. A low power operating license (not to exceed 5% power) was granted in July 1985 and low power testing commenced. The plant was tested intermittently at power levels not exceeding 5% of full power over the course of approximately two years. It was shut down in June 1987. The specific chronology of reactor operation during the Shoreham plant's brief operating history is listed below.

Date	Event
Jan 19, 1985	Fuel loading complete.
Feb 15, 1985	Initial criticality.
Jul 3, 1985	Received 5% low power license.
Jul 7-14, 1985	Reactor critical.
Jul 17, 1985	High pressure coolant injection (HPCI) and reactor building closed loop cooling water (RBCLCW) performance testing, main steam to the steam jet air ejectors.
Jul 23-26, 1985	Reactor critical.
Jul 29-Aug 24, 1985	Reactor critical, testing of HPCI system, reactor feed pumps and reactor core isolation cooling (RCIC), control rod drive (CRD), RBCLCW, low power range monitors (LPRM) testing.
Sep 3-10, 1985	Reactor critical, system expansion testing.

Date	Event
Sep 11-12, 1985	Reactor critical.
Sep 18-27, 1985	Reactor critical.
Oct 3-8, 1985	Reactor critical, RCIC vessel injection, system expansion, reactor water cleanup (RWCU) and scram reactor volume (SRV) testing, initial turbine roll to rated speed.
Aug 4-18, 1986	Reactor critical, RCIC check valve cycle test, HPCI tuning, RBCLCW performance test, main turbine roll, reactor building service water test.
Aug 20-30, 1986	Reactor critical, heat-up to rated pressure plateau, RCIC tuning, RCIC vessel injection and stability, main turbine roll and generator synchronization to the grid - 24 hour run, CRD flow controller tuning.
May 22-June 6, - 1987	Reactor critical; Cf-252 source replacement, RCIC and HPCI rated flow surveillance, HPCI endurance run.
June 1987	Reactor shutdown.
Aug 1989	Fuel removed from reactor and placed in the Spent Fuel Pool.

During this period of Shoreham plant testing, there were no spills, releases or operational events that would have resulted in residual radioactive contamination or could adversely affect decommissioning safety.

3.1.2 Site Radiological Characterization and Radionuclide Inventory

The extent, magnitude and radionuclide content of activation and contamination at the Shoreham plant was determined during the site characterization program (Ref. 3-1).

The program, which was largely completed by June 1990, divided the Shoreham site into four categories:

(1) Structures
(2) Systems
(3) RPV and internals
(4) Soils.

Sections 3.1.2.1 through 3.1.2.4, below provide a summary of the characterization program and its results.

3.1.2.1 Structures

Radiological surveys of the drywell and the Reactor, Turbine and Radwaste Buildings, as well as external surfaces immediately adjacent to these buildings, were completed. The structural surveys were in two categories - unbiased and biased. Survey data collected included:

(1) 211 unbiased survey units with approximately 30 data points each. These survey units are representative of general structural areas such as floors, walls and miscellaneous horizontal surfaces.

(2) 336 biased survey locations. These survey units were used to characterize areas where contamination was likely to occur. Examples are the dryer/separator pit, reactor head cavity, floor drains and the associated sumps.

As would have been expected given the limited extent of plant activities, the site characterization program revealed that the structures at the Shoreham plant are contaminated to a very limited extent, such contamination being found in highly localized areas and in areas where contamination would have been reasonably expected (e.g., reactor head cavity). The contamination on these structures ranged from non-detectable to 78,000 dpm/100 cm^2 (beta-gamma) total surface (i.e., fixed and removable) contamination. Table 3.1-1 provides a summary of the site characterization survey findings of total contamination for those structures that were found to be contaminated. Further analysis of the removable contamination revealed predominantly Co-60 and other trace radionuclides were present.

3.1.2.2 Systems

All 127 fluid bearing systems of the Shoreham plant were evaluated as part of the site characterization program. Of these systems, 27 were deemed to be potentially contaminated, either internally or externally, and were actually surveyed.

Nine of these systems were identified as being contaminated, in part or in whole, in excess of the Regulatory Guide 1.86 criteria. The contamination in these systems ranged from non-detectable to 47,000 dpm/100 cm^2 (beta-gamma) total surface contamination. Table 3.1-2 lists the average total surface contamination of these systems.

Gamma spectrometry was used to identify the radionuclides in the removable contamination in the systems. As in the case of the structural contamination analysis, Co-60 is the predominant radionuclide with trace amounts of other radionuclides.

3.1.2.3 Reactor Pressure Vessel and Internals

The RPV, internals, mirror insulation and the biological shield wall were analyzed for neutron activation. The neutron activation analysis was performed using the computer codes ORIGEN2 and RADCOR. To assure the accuracy of these calculations, dose rate measurements of the two most activated components (the core shroud and top guide plate) were measured in-situ and compared to the calculated dose rates. The calculated activities were then adjusted until the calculated and measured dose rates were in agreement. The results of this analysis are listed in Table 3.1-3. The total activated inventory is calculated to be 602 Curies. Fe-55 and Co-60 account for over 97% of the activity. The core shroud, top guide plate and other reactor internals contain over 96% of the activated nuclide inventory.

3.1.2.4 Soils

Soil in and around the Shoreham site was characterized with 38 unbiased locations distributed within a radius of 1,000 feet of the Reactor Building and 23 unbiased locations inside the protected area, near building exits and outside tanks. Of the 61 total samples analyzed, only one contained an isotopic concentration above background. Specifically, this one sample was taken from a marsh and isotopic analysis revealed a very small concentration of Cs-137 above background. It was concluded, however, that this sample was not representative since marsh samples contain roots which concentrate radioactivity such as cesium. The concentration found in this marsh sample can be attributed to fallout from atmospheric weapons testing and the Chernobyl accident and not from fission product releases from the Shoreham plant since there is no detectable fission product radioactivity found in any structure, system or component in the plant.

3.2 Radiation Protection

3.2.1 Ensuring Occupational Radiation Exposures Are ALARA

It will be a LIPA management commitment, implemented by station procedures, to maintain radiation exposures to all plant workers and the public ALARA. Management's commitment will appear in policy statements, instructions and procedures which will guide radiological work practices. This commitment will also be reflected in initial employee training and in procedures which address work in a radiological environment throughout the completion of the Shoreham decommissioning.

The Resident Manager will have the responsibility to keep personnel occupational exposures within the Shoreham plant annual ALARA goal. The Resident Manager will delegate the planning and execution of the ALARA policy to the Radiological Controls Manager. The Radiological Controls Manager has direct access to the Executive Vice President-Shoreham Project concerning radiological issues potentially affecting plant personnel or the general public. Reporting to the Radiological Controls Manager will be a staff of engineers and technicians trained in the principles of HP and radiological controls. As a vital part of the ALARA Program, plant personnel will be encouraged to offer suggestions for enhancing ALARA.

The Radiological Engineering Section, which reports to the Radiological Controls Manager, will review all procedures to ensure that they are applicable to decommissioning activities and consistent with management's ALARA commitment. The Radiological Engineering Section will also be responsible for the employee suggestion program and the station ARC.

The Shoreham plant ARC will be responsible for reviewing and evaluating plant radiological data, occupational radiation exposures and past and proposed operation and maintenance activities. The ARC will be composed of representatives from the Operations, Maintenance, Technical Services, QA and

Decommissioning Departments and will report findings and recommendations to the Radiological Controls Manager.

Throughout the Shoreham plant decommissioning project, ALARA engineering and administrative controls will be evaluated and utilized to minimize collective and individual radiation exposures. Some of the techniques and controls anticipated during decommissioning are:

- Airborne radioactivity will be monitored and controlled during all decommissioning activities. When systems containing radioactive material are opened, precautions will be taken to prevent any unintentional release of airborne contamination.

- Decontamination and dismantlement activities will be controlled to minimize radiation exposure to personnel by Radiation Work Permits (RWPs). The RWP will describe the work to be accomplished, area and airborne radiation surveillance requirements and protective clothing requirements. To ensure that personnel exposures are maintained ALARA, these tasks will be governed by procedures which have been reviewed for ALARA requirements.

- Personnel will be protected against airborne contamination by HP controls and by engineered control systems such as portable ventilation exhaust systems containing HEPA filters. Negative pressure containment tents may be installed to enhance the removal of airborne radionuclides in situations where high activity may occur. Engineering controls will be used whenever practical. When it is impracticable to apply engineering controls, respiratory protective devices will be used. Filtered ventilation systems will always be used in areas where the cutting or grinding of contaminated systems is planned -- activities which frequently release airborne particulates.

- All components scheduled for disassembly will initially be assumed to be contaminated. Radiological surveys will be performed which will document conditions found. Where contamination is found, RWPs will be written and controls established to protect personnel.

- Cutting techniques will be used that have rapid setup and deployment as well as easy cleanup.

- Radioactive material storage areas will be used to ensure physical protection, exposure to personnel that is ALARA, and material control.

- Before performing decommissioning activities in or near radioactive systems and structures, the merits of ALARA alternatives will be considered. This will include consideration of measures such as installing shielding and/or using remotely controlled equipment versus the ability to perform the task quickly and thus minimize exposure.

- All preliminary work will be performed, where possible, in areas well isolated from radioactive material because this is an effective way to reduce personnel radiation exposure.

- Preplanning of all work activities will be performed for high projected exposure jobs and for work involving high dose rates and contamination levels. Preparatory meetings will be attended by HP personnel, the foreman and the workers directly involved with the job. Consideration will be given to the use of mock-ups or dry runs, especially when extremely complex tasks are to be performed. In some cases, photographs or closed-circuit TV and video tape recordings may be used to permit personnel outside the job area to give guidance while outside of the radiologically controlled area. After completion of the job, debriefing sessions will be held, and experience gained will be used to plan future similar work evolutions.

3.2.2 Health Physics Program (HPP)

An HPP will be established to translate the management commitment to the ALARA policy into a set of procedures and practices for the performance of tasks. LILCO currently has established radiation protection and ALARA programs, and these will be the basis for the decommissioning HPP.

An effective HPP consists of all actions and measures planned or taken to protect workers and the environment, monitor radiation and radioactive materials, control distribution and releases of radioactive material and keep radiation exposure (individual and collective) within the limits of 10 CFR 20 and ALARA.

LIPA will institute the following measures for control of radiological materials and areas:

- Perform radiation and contamination surveys
- Utilize RWPs to delineate controls, identify conditions and specify protective measures to prevent inadvertent exposure of personnel to radiation or radioactive contamination during decommissioning activities
- Arrange the available work areas into segregated sections (e.g., contaminated and "clean" working areas)
- Institute and implement access controls to:
    - control the spread of contamination from contaminated to "clean" areas
    - limit RWP area access to only personnel who are directly involved in the specific task
- Clearly identify and tag all contaminated items as they are removed and note their place of origin and pertinent radiological information
- Monitor work areas so as to alert personnel of any unexpected radiological conditions
- Maintain accurate and updated records of personnel exposure, surveys and lessons learned so as to improve and revise procedures as necessary

- Monitor effluent waste streams through radiation monitoring equipment, surveys and sampling.

LILCO currently uses and maintains a standard industry surveying and monitoring program for personnel and effluent monitoring. LIPA will utilize the existing LILCO program, which includes a wide range of portable and non-portable instruments and lab-counting equipment. The program will be applied during the decommissioning for radiological surveys, personnel monitoring, area monitoring, air monitoring and sample analysis. On a daily basis, or as frequently as required, each type of instrumentation will be source checked to verify that it is functioning properly. In addition, such instrumentation will be maintained and calibrated using proper procedures.

3.3 Radioactive Waste Management

During Shoreham's decommissioning a significant amount of plant resources will be expended in disposing of the spent fuel and in the processing of liquid and solid radioactive wastes. Radioactive wastes include neutron activated materials, contaminated materials and site generated radioactive waste. The following sections address fuel disposal and radioactive waste management.

3.3.1 Fuel Disposal

Although fuel disposal is not specifically considered part of decommissioning as defined in Reference 3-2, LIPA recognizes that fuel disposal activities must be carefully integrated into the overall plan for decommissioning the Shoreham plant, since removal of the spent fuel is a prerequisite of complete release of the site for unrestricted use. Thus, LIPA's options for fuel disposal are briefly discussed herein; requests for NRC approvals that may be necessary to carry out any of these options will be developed and sent to the NRC as separate licensing submissions.

As a result of the limited period of plant operation, the total burnup of the fuel is only about two (2) effective full power days, or 48 megawatt days per metric ton. Presently, all 560 fuel assemblies are stored in the Spent Fuel Storage Pool in the Reactor Building. LILCO's Defueled Safety Analysis Report (DSAR) (Ref. 3-3) estimates that approximately 176,000 Curies of radioactivity are contained in the fuel (as of June, 1990). This estimation is based on a two year decay from the last burnup period. Gaseous activity in the fuel is primarily krypton-85, comprising approximately 1500 Curies of the total activity.

LIPA and LILCO are considering three options for the Shoreham irradiated fuel: (1) shipment to a reprocessing facility; (2) transfer of the fuel to another licensed utility; and (3) on-site storage. Shipment to a reprocessing facility entails the transfer of the fuel from the storage pool to licensed casks which would then be shipped off-site to a licensed reprocessing facility. LIPA is considering two overseas vendors offering reprocessing services. The second option involves a similar scope of Shoreham plant activities, followed by cask shipment to another domestic licensee. The transfer of fuel off-site for both options is estimated to be completed by March 1993. On-site fuel storage is considered an option of last resort because it would not yield the desired result of removing all radioactive material from the Shoreham site.

Fuel and cask handling activities have been considered by LIPA in the development of Shoreham's decommissioning methodology and the decommissioning schedule which is provided in Section 2.2. As the schedule and scope of site activities are very similar for both off-site disposal options, the selection of either option will have no impact on the decontamination and dismantlement activities that are discussed throughout this DP.

3.3.2 Radioactive Waste Processing

During the Shoreham site characterization program, it was determined that the plant's radwaste solidification and off-gas systems were not contaminated. Site characterization further revealed that portions of the liquid radwaste system were slightly contaminated. It is anticipated that the liquid radwaste system will be decontaminated by LILCO prior to decommissioning and that none of the plant's liquid radwaste processing systems or equipment will be used by LIPA during the decommissioning. The Reactor Building ventilation system will remain operable during the duration of decommissioning activities.

Radioactive wastes generated during decommissioning will be processed as necessary using temporary systems supplied by experienced vendors and contractors where appropriate. These systems may include temporary ventilation with filtration for airborne contamination, portable demineralizers for liquid waste processing and compactors for volume reduction of DAW. In addition, Shoreham plant DAW processing and compaction equipment may be used as well if it is shown to be ALARA and cost effective.

3.3.2.1 Gaseous Wastes

Since termination of reactor operation at Shoreham in 1987, short-lived radioactive nuclides have decayed to insignificant levels. Therefore, processing of gaseous waste originating as fission products from reactor operation will not be necessary.

Systems will be required to contain airborne particulate radionuclides that may be generated during the performance of various decommissioning activities. These systems will consist of existing plant ventilation systems augmented by the installation of portable, temporary equipment with HEPA filtration.

3.3.2.2 Liquid Wastes

Radioactive liquid wastes will be generated by decontamination and dismantlement of the Shoreham plant systems and structures. Vendor supplied portable, temporary liquid radwaste equipment will be used to process this waste resulting from Shoreham's decommissioning.

The liquid waste stream will be processed using techniques which are cost effective and meet ALARA goals. LIPA plans to use filtration and demineralization as the primary means to process radioactive liquids. Processed liquids will then be discharged after they have been monitored and approved for release. The waste resulting from the processing will be dewatered in high integrity containers or solidified in approved containers and shipped to licensed burial facilities.

3.3.2.3 Solid Waste Processing and Volume Reduction

Solid radioactive wastes will result from the processing of liquid and airborne particulate waste streams as described above. The majority of solid waste, however, will result from the decontamination and dismantlement of activated and contaminated plant systems and structures.

Table 3.3-1 provides a conservative estimate of the volume of solid radwaste resulting from Shoreham's decommissioning. These estimates are conservative because they do not take credit for any volume reduction techniques and, further, because they assume that no systems or structures will be decontaminated below the release criteria in place. Instead, LIPA has assumed that even with decontamination, all contaminated systems and the RPV and its internals will need to be dismantled and disposed of off-site.

As indicated in Table 3.3-1, the waste contains approximately 602 Ci (see Ref. 3-1), almost all of which is due to activation of the RPV internals. The isotopic composition of Shoreham's anticipated wastes is essentially represented by two isotopes: Co-60 (33% of total activity) and Fe-55 (66% of total activity). All radioactive waste is expected to be Class A waste. No unusual wastes, such as mixed waste or contaminated asbestos, are expected to be produced during decommissioning. Radwaste containing chelates may be produced during chemical decontamination. However, procedures will be developed to ensure that burial site criteria for chelates are met.

LIPA is planning to employ a number of measures with the overall objective of reducing the volume of solid radwaste that will ultimately require disposal at a licensed burial facility. The estimate provided in Table 3.3-1 does not reflect the benefits offered by various volume-reducing techniques which are being contemplated by LIPA.

(1) RPV and Internals

LIPA's plan is to segment the reactor internals for packaging in approved shipping containers. As much of this equipment is contaminated or activated, the segmented components would be packaged and shipped directly off-site for disposal at a licensed facility.

In order to minimize the volume of waste resulting from RPV segmentation, LIPA is planning to employ one or a combination of the following decontamination techniques: (1) chemical decontamination; (2) ultra-high pressure water blasting; and (3) abrasive grit decontamination. Depending on the results of RPV decontamination, the segmented shell sections will be: (1) surveyed, declared clean and released for unrestricted use; (2) packaged and shipped to an off-site vendor for further processing or (3) packaged and shipped directly for disposal at a licensed burial facility. Irradiated vessel sections will be packaged and shipped for disposal at a licensed burial facility. Thus, through an aggressive campaign of decontamination, radiological surveys and material segregation, LIPA will attempt to release for unrestricted use the majority of the RPV which is singularly the largest element of solid radwaste that is listed in Table 3.3-1.

(2) Piping and Equipment

Small bore piping (i.e., 3 inches diameter and under) in contaminated plant systems, if it cannot be fully decontaminated in place, will likely be removed and shipped off-site to a licensed vendor offering decontamination and volume reduction services. LIPA will evaluate such measures for large bore piping and contaminated plant equipment depending on the effectiveness of in-situ decontamination efforts. Based on industry experience and discussions with vendors offering these services, volume reduction factors in excess of 90% are not uncommon.

Contaminated piping and equipment that cannot be decontaminated to levels permitting their release for unrestricted use will be packaged and shipped for disposal to a licensed burial facility.

(3) Concrete Rubble and Dust

Activated or contaminated concrete rubble and dust are not expected during the decommissioning of Shoreham. However, should any such waste be generated, it will be packaged as low specific activity (LSA) material in approved shipping containers.

(4) DAW

DAW consisting of contaminated paper, plastic, coveralls, etc. will be packaged as LSA material in approved shipping containers. DAW will be compacted at the Shoreham site or shipped non-compacted to an off-site vendor for volume reduction and packaging. When feasible, DAW will be used to fill void space in other radwaste shipping containers.

3.3.3 Low Level Radioactive Waste

Existing LILCO plant procedures used for waste processing and characterization, which will be adapted for use by LIPA, will be maintained throughout decommissioning. In addition, isotopic analyses, waste characterization computer codes and activation analyses are some of the methods which have been and will continue to be used to characterize the waste streams resulting from Shoreham's decommissioning.

Radwaste processing will be performed in accordance with an approved Process Control Program and industry-accepted computer codes such as RADMAN will be used to prepare necessary shipping and disposal documentation.

Transportation of processed radwaste will be in accordance with applicable NRC and DOT regulations and plant procedures. It is anticipated that radioactive waste will be shipped either by trailers or shipping casks and such shipments will occur in a practical and efficient continuous manner.

3.3.3.1 LLRW Disposal Options

At the present time, Shoreham has access to the existing LLRW facilities (Barnwell, South Carolina; Beatty, Nevada; and Hanford, Washington). These sites may remain available for use until 1993.

The State of New York is presently working to develop a New York LLRW burial facility. It is presently expected that the State of New York facility will not be in operation by January 1993. Assuming that the permanent State facility is not available by January 1993, a number of storage and disposal alternatives have been and continue to be considered.

First, it bears noting that any delay in the availability of the permanent New York facility is a temporary matter and not a permanent unavailability of a State of New York disposal facility. While it is not certain when a permanent LLRW disposal facility will be operational in New York, there is every reason to believe that the State will in the future have such a permanent facility. In this regard, the State of New York has developed an Interim Management Plan for LLRW, which includes on-site temporary LLRW storage, as well as temporary off-site storage of such wastes at several sites within the State. The Governor has certified that the Interim Management Plan will be capable of handling all of New York's LLRW generated after December 1992.

Second, LIPA has explored and will continue to explore LLRW off-site disposal and storage options. LIPA will explore whether other States which develop LLRW disposal facilities are amenable to accepting some or all of Shoreham's LLRW. LIPA will also explore whether temporary off-site storage facilities are available, such as at another reactor site. Particularly, given the relatively small amount of Shoreham LLRW expected to require disposal, LIPA believes that there may be a number of off-site storage or disposal options available. Despite the current unlikelihood that the States of South Carolina, Nevada and Washington will accept New York LLRW after 1992, LIPA will continue to explore that possibility as well. Thus, it should not be assumed that Shoreham's wastes will have to remain on-site, if, as expected, New York's permanent LLRW disposal facility is not available in January 1993.

However, if it is decided that interim on-site storage of Shoreham's LLRW is the best alternative, space exists at Shoreham for this purpose. LLRW is currently stored at the Shoreham plant at several locations, including the Radwaste Building. It is also possible to store LLRW in a new building which could be built for this purpose in accordance with the guidelines provided by the NRC in Appendix A to Standard Review Plan Section 11.4, "Design Guidance for Temporary On-site Storage of Low Level Radioactive Waste."

3.4 Accident Analysis

Various radiological accident scenarios during the decommissioning of the Shoreham plant have been postulated and examined. These postulated accidents include both on-site events and off-site (transportation) events. The analyses discussed herein used very conservative approaches in treating the source terms, as well as in the methods of calculation. To the extent applicable, these analyses are consistent with the approaches used in the NRC's examination of postulated accidents during decommissioning of the reference BWR (Ref. 3-4).

Prior to discussion of the postulated accident scenarios, it is important to note that the Shoreham structures and systems exhibit only limited contamination and activation and its fuel has been only slightly irradiated. Thus, the scope and potential consequences of credible accidents are inherently limited, and the scenarios discussed, while not technically impossible, are highly unlikely. LIPA intends to implement sufficient measures to ensure that this remains the case throughout the decommissioning of the Shoreham plant, as well as measures to ensure that impacts to workers and the general public from any postulated accident, should one occur, are minimized and that they would not exceed the conservatively calculated impacts reported herein. Such measures include, but are not limited to, the following:

- Significant decontamination efforts prior to commencement of major dismantlement activities such as pipe cutting.

- Use of local contamination control envelopes equipped with HEPA filters where the generation of airborne contamination is likely due to decommissioning activities.

- Use of mechanical cutting techniques where practical in order to minimize the generation of airborne contamination, and to minimize the potential for breach of contamination control envelopes.

- Periodic monitoring and/or testing of HEPA filtration exhaust from local contamination control envelopes and vacuuming equipment.

- Use of existing station ventilation systems to maintain a negative pressure in buildings when airborne contamination is likely to be generated as a result of decommissioning activities.

- Maintaining operability of existing radiation monitors in liquid discharge pathways and building ventilation system exhaust trains, including all alarms and discharge/exhaust control interlocks. Periodic monitor testing will be performed in accordance with approved procedures.

- Maintaining operability of all existing HEPA filters in building ventilation system exhaust trains. Periodic HEPA filter testing will be performed in accordance with approved procedures.

- Compliance with fuel-related requirements of the proposed Shoreham Defueled Technical Specifications (see Section 6.1.1) until all fuel has been removed from the Reactor Building. Such fuel-related requirements address, among other things, communication between control room and fuel handling personnel, operability of the fuel handling platform and polar crane, heavy load handling limits over the Spent Fuel Storage Pool, and use of only the polar crane for spent fuel shipping cask movement over the Spent Fuel Storage Pool.

- Establishment of inspection and/or testing requirements for cranes, hoists, slings, forklifts, trucks and other lifting devices or vehicles.

- Administrative restriction on the use and movement of lifting devices and vehicles.

- Implementation of controls and inspections to minimize fire and industrial safety hazards.

These and other measures will serve to ensure the fulfillment of LIPA's objective of protecting the health and safety of workers and the general public, and of protecting the environment.

The calculated whole body and organ doses to individuals at the Exclusion Area Boundary (EAB) resulting from the postulated decommissioning accidents are compared in Table 3.4-1 to the doses published by the Environmental Protection Agency (EPA) for determining the need to take protective actions in the event of an accident involving exposure of members of the public. These protective action guides (PAGs) are given as ranges: 1 to 5 rem to the whole body and 5 to 25 rem to the thyroid of an individual. (Note: the critical organs for postulated Shoreham decommissioning accident doses are the lung and, in one case, the skin. Comparison is made to the EPA thyroid dose PAG because it is considered to be representative of organ dose guidance.) The highest doses calculated for postulated Shoreham decommissioning accidents are several orders of magnitude below the PAG levels.

The accident analyses demonstrate that no adverse public health and safety or environmental impacts are expected from accidents which might occur during Shoreham's decommissioning operations. The highest calculated dose to an individual located at the site EAB was 1.08 mrem to the whole body and 93.9 mrem to the skin during the postulated worst-case fuel damage accident. This highly conservative, unrealistic scenario is further described in Section 3.4.1.8. The results of the other on-site and transportation accidents analyzed are far below this value. This limiting accident case represents less than 0.11% and 1.9% of the EPA PAG lower whole body and organ limits, respectively.

Table 3.4-2 provides a comparison of off-site releases for postulated Shoreham decommissioning accident scenarios to the NRC's analysis of the reference BWR. In all comparable scenarios, the projected releases from postulated decommissioning accidents at Shoreham are below the reference BWR cases. The only postulated event where the reference BWR release estimates could be exceeded is again the highly conservative worst-case fuel damage accident, the consequences of which are still small fractions of the EPA PAG's as noted above.

Based on the above, it is concluded that there are no significant radiological consequences to the general public nor to the workers from postulated credible accidents during the planned decommissioning operations at Shoreham.

In addition, a plan will be in place to describe the actions to be taken in the event of an emergency at Shoreham while decommissioning is in progress. The purpose of the plan is to safeguard plant personnel, protect health and safety, and prevent damage to property. The plan will define potential types of emergencies, provide procedures to respond to such emergencies, provide an organizational structure for emergency response and identify facilities and equipment available to mitigate accident consequences.

3.4.1 On-Site Decommissioning Accidents

There are a number of on-site accident scenarios that may be postulated during the decommissioning of Shoreham utilizing the DECON alternative. The general approaches for decommissioning Shoreham will involve partial segmentation of the RPV in conjunction with decontamination and dismantlement (if needed) in other specific plant areas as necessary to meet residual radioactivity criteria. Given this approach, the postulated Shoreham decommissioning accident scenarios are generally similar to the bounding scenarios postulated by the NRC for the reference BWR, except for the postulated fuel damage accident. As noted in Section 6.1.1, however, controls to limit the potential for and consequences of a fuel damage event have already been addressed between LILCO and the NRC for the defueled condition, and these controls will be adhered to by LIPA during Shoreham's decommissioning. Like the reference BWR accident analysis, the postulated accidents analyzed herein also encompass the radiological dose consequences and environmental impacts from other accidents that, in theory, could also occur during decommissioning.

The extent of decontamination and dismantlement activities required to decommission Shoreham is significantly less than those which would be required to decommission the reference BWR using the DECON alternative. Thus, with comparable controls on the conduct of work activities, it follows that the likelihood of most postulated accidents occurring at Shoreham is correspondingly lower than the likelihood of such an event at the reference BWR. Coupled with the significantly lower radionuclide inventory at Shoreham as compared to the reference BWR, it also follows that the risk from postulated on-site decommissioning accidents at Shoreham is also lower in terms of their potential on-site and off-site impacts than for the reference BWR.

The following are the postulated on-site accidents analyzed herein:

- Waste Container Drop (Section 3.4.1.1)
- Combustible Waste Fire (Section 3.4.1.2)
- Contaminated Sweeping Compound Fire (Section 3.4.1.3)
- Vacuum Filter-Bag Rupture (Section 3.4.1.4)
- Oxyacetylene Explosion (Section 3.4.1.5)
- Explosion of Liquid Propane Gas (LPG) Leaked from a Front-End Loader (Forklift) (Section 3.4.1.6)
- Contamination Control Envelope Rupture (Section 3.4.1.7)
- Fuel Damage Accident (Section 3.4.1.8)
- Effects of Natural Catastrophes (Section 3.4.1.9)
- Breach of Physical Security Measures (Section 3.4.1.10)

3.4.1.1 Waste Container Drop

Accident Description: This accident scenario assumes that a 4 ft x 4 ft x 8 ft steel container containing activated concrete rubble from the biological shield wall is dropped during removal operations, resulting in container rupture. (It is to be noted that little, if any, activated concrete removal is envisioned during Shoreham decommissioning.) The ruptured container causes some concrete rubble to be spilled and generates a relatively small amount of dust. The airborne dust is then removed by the plant ventilation system and exhausted to the environment. No credit is taken for particulate removal by the HEPA filters. It is assumed that the container is completely packed with activated concrete from the inner 1 foot of the reactor biological shield wall (Ref. 3-5) and that 10% of this material becomes airborne. It is also assumed that this activity has the nuclide mixture for activated concrete in the inner 1 foot of the reactor biological shield. This nuclide mixture is primarily composed of : Fe-55 (51%), H-3 (46%), Co-60 (2.6%), Ni-63 (0.01%), and C-14 (0.01%). A total of 300 uCi is released from this accident over an assumed eight-hour period (Ref. 3-5).

An atmospheric dispersion factor (X/Q) of 1.22 x10^{-3} sec/m^3 is used to calculate the airborne activity concentration at the EAB (EAB = 311 meter or 0.193 mile). This value is calculated for the Shoreham site for a 1 m/s wind speed (approximately 2.2 mph), stable wind conditions and an F stability category (Ref. 3-6). The EAB conservatively represents the site boundary, and the two terms are used interchangeably in this text. Worker and off-site doses are calculated, the latter using the parameters and methodology given in Regulatory Guide 1.109 (Ref. 3-7). Worker doses during recovery from postulated accidents have been considered in separate calculations not reflected herein; however, the worker recovery doses at Shoreham are bounded by the analyses performed by the NRC for the reference BWR (Ref. 3-4).

Analysis of Effects and Consequences: This type of accident is immediately apparent to the workers in the area and they can be evacuated within 15 minutes following the container drop accident. The worker whole body and lung doses are estimated as 5.36×10^{-4} mrem and 2.91×10^{-2} mrem respectively for a 15 minute exposure (Ref. 3-5) with no credit taken for respirator protection.

The whole body and lung doses to an individual (maximum) standing at the site boundary are 6.48×10^{-5} mrem (child) and 3.36×10^{-3} mrem (teen), respectively (Ref. 3-5). The population dose from this accident from the EAB to 20 miles from Shoreham is estimated as 3.03×10^{-5} man-rem to the whole body and 1.56×10^{-3} man-rem to the lung (Ref. 3-5). The container drop accident poses no serious risks to the plant personnel or to the general public and has no significant environmental impact.

3.4.1.2 Combustible Waste Fire

Accident Description: Absorbent materials such as rags or paper wipes are assumed to be used for a variety of purposes during decontamination and dismantlement, and are disposed of appropriately after use. Materials that have come into contact with contaminated surfaces may hold small quantities of radionuclides. Anticontamination clothing (coveralls, caps, hoods and shoe covers) may also become contaminated through use. These wastes are collected in 55 gallon waste containers, and it is assumed that about ten such containers are needed for the dismantlement operations. It is conservatively assumed that about 10% of the total system contamination (Ref. 3-1) comes in contact with the rags and paper wipes or anticontamination clothing during dismantlement. A fire is assumed to occur in one of the ten 55 gallon containers for two hours in a working area. A container is assumed to contain 66.2 uCi (Ref. 3-5) of radioactive material. The maximum fractional airborne release measured during the burning of contaminated waste under similar conditions was 1.5×10^{-4} (Ref. 3-4). Thus, about 9.93×10^{-3}uCi are airborne in the Reactor Building, and 4.96×10^{-6}uCi are released to the atmosphere through the building HEPA filter (99.95% filter efficiency) system (Ref. 3-5). It is also assumed that all of the released activity is due to Co-60 for conservatism.

Meteorological and other parameters required for dose calculation are consistent with those described in Section 3.4.1.1.

Analysis of Effects and Consequences: Again, this type of accident is immediately apparent to the workers in the area and they can be evacuated within 15 minutes following the accident. The worker whole body dose and lung doses are estimated as 1.74×10^{-7} mrem and 2.92×10^{-5} mrem, respectively, for a 15 minute exposure (Ref. 3-5) with no credit taken for respirator protection.

The whole body and lung doses to an individual (maximum) standing at the site boundary are 8.04×10^{-12} mrem (child) and 1.63×10^{-9} mrem (teen), respectively (Ref. 3-5). The population dose from this accident from the EAB to 20 miles from Shoreham is estimated as 4.30×10^{-12} man-rem to the whole body and 7.56×10^{-10} man-rem to the lung (Ref. 3-5). The combustible waste fire accident poses no serious risks to plant personnel or to the general public and has no significant environmental impact.

3.4.1.3 Contaminated Sweeping Compound Fire

Accident Description: Sweeping compound is composed of sawdust treated with oil or other additives to enhance the collection of loose surface contamination. A fire is postulated to occur in used sweeping compound containing radioactivity removed from floor surfaces. It is conservatively assumed that about 10% of the total system contamination (Ref. 3-1) after piping system dismantlement operations is covering one floor surface uniformly. It is assumed that an average of 2.5×10^{-4} m^3 of sweeping compound is used for each m^2 of surface swept (Ref. 3-4). It is also assumed that the contaminated sweeping compound is stored in 55 gallon containers and a fire occurs in one of these containers for two hours. The activity in this container is estimated as 420 uCi (Ref. 3-5). The release fraction from the fire is assumed to be similar to that measured from burning waste, 1.5×10^{-4}. Thus, about 6.3×10^{-2}uCi are airborne in the Reactor Building, and 3.15×10^{-5}uCi are released to the atmosphere through the building HEPA filter (99.95% filter efficiency) system. All of this activity is assumed to be Co-60 for conservatism. Credit is taken for particulate removal by the HEPA filters.

Meteorological and other parameters required for dose calculations are consistent with those described in Section 3.4.1.1.

Analysis of Effects and Consequences: This type of accident is immediately apparent to the workers in the area and they can be evacuated within 15 minutes following the accident. The worker whole body dose and lung doses are estimated as 1.10×10^{-6} mrem and 1.85×10^{-4} mrem, respectively, for a 15 minute exposure (Ref. 3-5) with no credit taken for respirator protection.

The whole body and lung doses to an individual (maximum) standing at the site boundary are 5.1×10^{-11} mrem (child) and 1.03×10^{-8} mrem (teen), respectively. The population dose from this accident from the EAB to 20 miles from Shoreham is estimated as 2.73×10^{-11} man-rem to the whole body and 4.80×10^{-9} man-rem to the lung (Ref. 3-5). The contaminated sweeping compound fire accident poses no serious risks to plant personnel or to the general public and thus has no significant environmental impact.

3.4.1.4 Vacuum Filter-Bag Rupture

__Accident Description__: Sharp objects, such as metal shards, could rupture a filter-bag during surface cleaning operations involving the use of a vacuum cleaner. When the filter bag is ruptured, all of the collected material in the bag is assumed to become airborne in the building because of the mechanical and aerodynamic forces of the 1.4 m^3/min vacuum cleaner air flow (Ref. 3-4). To maximize the calculation of the atmospheric release, the bag rupture is assumed to occur at the time just prior to the bag change (i.e., when the filter bag is full). It is assumed that 10% of the total system contamination (Ref. 3-1) is covering the entire Reactor Building floor. It is also assumed that ten bag changes are needed to vacuum the entire floor and during the cleaning process one bag is ruptured. The airborne dust is then removed by the plant system to the environment over a period of two hours. It is estimated that 66.2 uCi of material (assumed to be entirely Co-60) is airborne in the Reactor Building and that 3.31×10^{-2} uCi is released to the atmosphere through the building HEPA filter (99.95% filter efficiency) system (Ref. 3-5).

Meteorological and other parameters required for dose calculation are consistent with those described in Section 3.4.1.1.

__Analysis of Effects and Consequences__: This type of accident is immediately apparent to the workers in the area and they can be evacuated within 15 minutes following the accident. The worker whole body dose and lung doses are estimated as 1.16×10^{-3} mrem and 1.95×10^{-1} mrem, respectively, for a 15 minute exposure (Ref. 3-5) with no credit taken for respirator protection.

The whole body and lung doses to an individual (maximum) standing at the site boundary is 5.36×10^{-8} mrem (child) and 1.09×10^{-5} mrem (teen), respectively (Ref. 3-5). The population dose from this accident from the EAB to 20 miles from Shoreham is estimated as 2.87×10^{-8} man-rem to the whole body and 5.04×10^{-6} man-rem to the lung (Ref. 3-5). The vacuum filter-bag rupture accident poses no serious risks to the plant personnel or to the general public and has no significant environmental impact.

3.4.1.5 Oxyacetylene Explosion

Accident Description: While it is expected that only partial segmentation of the RPV will be required, oxyacetylene cutting torches may be used to cut recirculation piping should it be determined that full segmentation of the RPV is necessary. (RPV segmentation would not involve the use of oxyacetylene cutting torches in either case.) For purposes of this accident analysis, it is therefore assumed that recirculation pipe cutting using oxyacetylene torches will be performed.

Violent explosions can occur when acetylene and oxygen are incorrectly mixed. The degree of explosive violence depends on how closely the gas mixture approximates the ratio for complete combustion. Oxyacetylene explosions can occur from such causes as flow reversals, nozzle obstructions or flashbacks. This accident is postulated to occur during cutting of the recirculation piping system. The cuts are assumed to be 2 inches wide on 28-inch diameter, 0.375 inch thick stainless steel pipe, and would be performed within a portable filtered ventilation enclosure (i.e., greenhouse or tent). It is assumed that all the filters contained within a portable enclosure are damaged. It is assumed there are ten filters and the accident occurs when all the filters are fully loaded.

The mass of material that can be deposited on enclosure HEPA filters without causing serious operational problems, such as an excessive pressure drop, varies considerably with the filter construction and particle size of the deposited material. In this accident, it is assumed that 2.3 kg material is deposited per filter (Ref. 3-4). This results in 3.52 uCi of activity in the filter material (Ref. 3-5). To maximize the results, it is further assumed that about the same amount of activity on the walls of the enclosure is also released due to the explosion. Credit is taken for particulate removal by the HEPA filters of the building ventilation exhaust system. Therefore, a total of 7.04 uCi is released to the station ventilation system (Ref. 3-5) and a total of 3.52×10^{-3} uCi is released to the atmosphere through the building HEPA filter (99.95% filter efficiency) system. For conservatism, it is assumed that all the released material is Co-60 and it is released over a two hour period.

Meteorological and other parameters required for dose calculations are consistent with those described in Section 3.4.1.1.

__Analysis of Effects and Consequences__: This type of accident is immediately apparent to the workers in the area and they can be evacuated within 15 minutes following the accident. The worker whole body dose and lung doses are estimated as 1.23×10^{-4} mrem and 2.07×10^{-2} mrem, respectively, for a 15 minute exposure (Ref. 3-5) with no credit taken for respirator protection.

The whole body and lung dose to an individual (maximum) standing at the site boundary is 5.7×10^{-9} mrem (child) and 1.16×10^{-6} mrem (teen), respectively (Ref. 3-5). The population dose from this accident from the EAB to 20 miles from Shoreham is estimated as 3.05×10^{-9} man-rem to the whole body and 5.36×10^{-7} man-rem to the lung (Ref. 3-5). The oxyacetylene explosion accident poses no serious risks to the plant personnel or to the general public and has no significant environmental impact.

3.4.1.6 Explosion of Liquid Propane Gas (LPG) Leaked From a Front-End Loader (Forklift)

__Accident Description__: An LPG powered forklift for loading concrete rubble and moving light equipment is assumed to be used to support dismantling operations. An accidental leak of LPG is postulated to occur during the loading of concrete rubble in the Reactor Building. Two cases are considered:

(a) It is assumed that this accident occurs when a 4 ft x 4 ft x 8 ft steel container is completely filled with activated concrete rubble from the first (i.e., inner) one foot of the reactor biological shield (Ref. 3-1). It is assumed conservatively that about 20% of the concrete rubble in the container escapes from the Reactor Building to the environment as dust. It is assumed that this activity has the nuclide mixture for activated concrete in the first foot of the reactor biological shield (see Section 3.4.1.1).

It is also assumed that the pre-filters and filters in both the exhaust filter banks are ruptured simultaneously (with 50 filters per bank) and they are fully loaded with activated concrete material from the first one foot of the biological shield wall. It is assumed that the loading capacity of each filter is 2.3 kg of deposited material. This accident results in a total release of 684 uCi (Ref. 3-5). It is also assumed that this activity has the nuclide mixture for activated concrete in the first foot of the reactor biological shield (see Section 3.4.1.1).

(b) Only the activity in the prefilters and filters is considered. Concrete rubble is not considered (corresponding to the assumption made in the LPG explosion accident considered in the NRC study of the reference BWR (Ref. 3-4)). A total release of 84 uCi (Ref. 3-5) results. It is assumed that all of this activity is Co-60.

Meteorological and other parameters required for dose calculation are consistent with those described in Section 3.4.1.1.

<u>Analysis of Effects and Consequences</u>: This type of accident is immediately apparent to the workers in the area and they can be evacuated within 15 minutes following the accident. For case (a), which considers both concrete and filter activity sources due to the actual nuclide mix, the worker whole body dose and lung dose are estimated as 1.22 x 10^{-3} mrem and 6.64 x 10^{-2} mrem, respectively, for a 15 minute exposure (Ref. 3-5).

For case (b), which considers filter activity sources only, all of which are composed of Co-60, worker whole body dose and lung dose are estimated as 1.47 x 10^{-3} mrem and 2.47 x 10^{-1} mrem, respectively, for a 15 minute exposure (Ref. 3-5).

In both cases, no credit is taken for respirator protection for worker lung dose estimation.

For case (a), the whole body and lung doses to an individual (maximum) standing at the site boundary is 1.48 x 10^{-4} mrem (child) and 7.76 x 10^{-3} mrem (teen), respectively (Ref. 3-5). The population dose from this accident up to 20 miles from Shoreham is estimated as 6.92 x 10^{-5} man-rem whole body and 3.55 x 10^{-3} man-rem to the lung (Ref. 3-5). This accident poses no serious risks to the plant personnel or to the general public and has no significant environmental impact.

For case (b), the whole body and lung doses to an individual (maximum) standing at the site boundary are 1.36 x 10^{-4} mrem (child) and 2.76 x 10^{-2} mrem (teen), respectively (Ref. 3-5). The population dose from this accident up to 20 miles from Shoreham is estimated as 7.28 x 10^{-5} man-rem whole body and 1.28 x 10^{-2} man-rem to the lung (Ref. 3-5). This accident poses no serious risks to the plant personnel or to the general public and has no significant environmental impact.

3.4.1.7 Contamination Control Envelope Rupture

Accident Description: Contamination control envelopes equipped with temporary ventilation systems and local HEPA filtration are to be erected in areas where radioactive materials are expected to be generated as a result of decommissioning activities. It is postulated that a collapse of such an envelope occurs in combination with loss of material deposited on the HEPA filter, resulting in release of radioactive materials from within the envelope and from the filter. The limiting scenario for this type of accident would involve rupture of the DCS in the Reactor Building during segmentation of the RPV or reactor internals.

In order to conservatively estimate the potential release associated with this event, the total activity in the RPV and in those reactor internals to be cut in the DCS was first multiplied by the ratio of the cut metal volume to the total activated metal volume. This nuclide mixture is primarily composed of: Fe-55 (69.2%), Co-60 (28.6%), Ni-63 (2.14%), Ni-59 (0.015%), H-3 (0.014%), and C-14 (0.003%). This provided the maximum amount of activated material which could be released from all RPV and internals segmentation activities performed in the DCS. These activities are expected to last about one year. Assuming the unlikely possibility that the DCS HEPA filter is unwittingly inoperable for an entire day, the maximum airborne activity concentration in the DCS would be 1/365 of this total; however, it is conservatively assumed that 1/300 of this total is airborne in the DCS at the time of collapse. The estimated quantity of radioactive material released from the envelope is 2990 uCi (Ref. 3-8).

The filter contribution to the release from the DCS is based on the conservative assumption that the gamma dose rate from the material collected on the HEPA filter is limited to 100 mrem/hr because of worker exposure considerations. Assuming a 99.95% filter efficiency for all of the above isotopes except H-3 and C-14, which are assumed to be in gaseous form, it is calculated that 42,300 uCi are released to the Reactor Building from the HEPA filter (Ref. 3-8).

Based on the above, a total of 45,290 Uci of activated material could be released to the Reactor Building from the postulated rupture of the DCS envelope and associated HEPA filter failure. This material is assumed to be immediately mixed in and diluted with only 25% of the Reactor Building air volume, and is released to the environment through the building HEPA filter system. The HEPA filter efficiency is 99.95% for all of the above isotopes except H-3 and C-14, which are assumed to be in gaseous form. The resulting off-site release quantity is 30.1 uCi of radioactive material (Ref. 3-8).

Meteorological and other parameters required for dose calculation are consistent with those described in Section 3.4.1.1

Analysis of Effects and Consequences: This type of accident is immediately apparent to the workers in the area and they can be evacuated within 15 minutes following the accident. The worker whole body and lung doses are estimated as 9.08 x 10^{-1} mrem and 2.20 x 10^{-2} mrem, respectively for a 15 minute exposure (Ref. 3-8) with no credit taken for respirator protection.

The whole body and lung doses to an individual (maximum) standing at the site boundary are 1.79 x 10^{-5} mrem (child) and 1.25 x 10^{-3} mrem (teen) respectively (Ref. 3-8). The population dose from this accident from the EAB to 20 miles from Shoreham is estimated as 1.28 x 10^{-4} man-rem to the whole body and 8.96 x 10^{-3} man-rem to the lung (Ref. 3-8). The contamination control envelope rupture poses no serious risks to plant personnel or the general public and has no significant environmental impact.

3.4.1.8 Fuel Damage Accident

Assuming that irradiated fuel has not been removed from the Spent Fuel Storage Pool prior to commencement of major decommissioning activities in the Reactor Building, the potential may exist for accidental damage to the fuel. LILCO has previously addressed the worst case hypothetical accident which could occur relative to this concern in a separate submittal to the NRC (Ref. 3-9).

The scenario described therein postulates that the entire gaseous fission product inventory contained in the fuel, consisting of approximately 1500 Curies of Krypton-85, is released to the atmosphere. The resulting off-site doses to an individual at the EAB were determined to be 1.08 mrem to the whole body and 93.9 mrem to the skin. The analysis also demonstrated that no active cooling is required to safely maintain the fuel in the Spent Fuel Storage Pool because of the very low decay heat generation rate (approximately 550 watts as of June 1989). This analysis has been reviewed and approved by the NRC in connection with issuance of a license amendment authorizing LILCO to suspend off-site emergency preparedness activities (Ref. 3-10.) The NRC concluded that such an accident posed no significant hazards consideration. This same accident analysis is also used by LILCO in support of its pending application for a DOL or POL. This pending LILCO application has been noticed in the Federal Register with a preliminary determination that the amendment involves no significant hazards consideration.

Based on the above, no new analysis is required to support this DP. As explained in Section 6.1.1, should fuel remain stored in the Spent Fuel Storage Pool while Reactor Building decommissioning activities are being performed, LIPA will maintain compliance with the applicable requirements of the pending Defueled Technical Specifications (DTS) in order to protect the irradiated fuel. In addition to these controls, heavy loads to be lifted over the refueling floor, but not over the Spent Fuel Storage Pool, will be sized to be within the lifting capacity of the Polar Crane. This crane is designed to lift such heavy loads as the RPV head and the drywell head.

3.4.1.9 Effects of Natural Catastrophes

Accident Description: The Shoreham plant is designed to meet stringent federal criteria for protection of the buildings and systems against natural phenomena. Design criteria are summarized in the following statement from the Shoreham USAR (Ref. 3-11): "Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami and seiches without loss of capability of performing their safety functions." The structural integrity of the plant will be preserved throughout decommissioning to the extent required for safety of workers and the off-site general public. In addition, until all fuel has been removed from the Reactor Building, no structural modifications will be made to the Reactor Building which could reduce the structural integrity of the Reactor Building below USAR design criteria as they relate to safe fuel storage. Once fuel is removed, no USAR design criteria will be applicable to Shoreham decommissioning activities.

Analysis of Effects and Consequences: It is estimated that, while natural phenomena could cause severe damage to the plant resulting in small radiological public safety impacts, they are low probability events. Also, the impact of these events will be much less than the impacts calculated in the USAR design-basis accidents which are based on nuclear fuel parameters that are much more severe than those for the fuel currently stored in the Spent Fuel Storage Pool.

3.4.1.10 Breach of Physical Security Measures

Accident Description: An accident scenario of this kind was assumed to involve unauthorized access by plant personnel or the general public into a radiologically controlled area. The cause of such an accident would be due to failure of plant personnel to follow RWP procedures when accessing an area or when escorting members of the general public. Another cause could involve an individual from the general public breaching the security fence undetected and entering a radiologically controlled area.

A less likely accident scenario also was assumed to involve sabotage by a plant employee or a member of the general public, resulting in a fire in a radiologically controlled area.

Analysis of Effects and Consequences. The consequences due to radiation exposure of plant personnel or a member of the general public from an unauthorized entrance to a radiologically controlled area or deliberate circumvention of security procedures are not expected to be significant because of the low levels of radioactive contamination throughout the plant. Radiation exposures are therefore expected to be low and should not pose a significant risk.

The consequences of an accident involving sabotage such as a fire would be similar to accident scenarios involving a fire as previously discussed in Sections 3.4.1.2 and 3.4.1.3. The resulting exposures to the general public were determined to be within general background levels and should not pose undue risk.

3.4.2 Off-Site (Transportation) Accidents

The only potential off-site accident which could vary from those associated with normal plant operation or maintenance would involve the transportation of radioactive wastes from decommissioning.

Radioactive wastes from Shoreham decommissioning will be packaged in accordance with applicable NRC and DOT requirements, and shipped by truck to licensed volume reduction and disposal facilities. Evaluation of postulated accidents involving truck transportation of radioactive wastes packaged in accordance with these criteria can be found in Reference 3-4 for Type A waste packages. These evaluations would both envelop and be representative of the range of postulated accidental impacts from shipment of Shoreham decommissioning waste materials.

The impacts of even the most severe radioactive waste transport accident as evaluated in References 3-4 and 3-12 are a small fraction of the EPA PAGs.

3.4.3 Conclusions

The doses to individuals at the EAB from postulated on-site accidents during the decommissioning of Shoreham are summarized in Table 3.4-1. Table 3.4-1 also provides the accident doses in terms of the fraction of the EPA PAGs. A comparison to estimated releases from comparable accident scenarios evaluated for the decommissioning of the reference BWR is provided in Table 3.4-2.

As shown on these tables, the potential doses from all postulated decommissioning accidents at Shoreham are small fractions of the EPA PAGs, and releases are enveloped by the reference BWR postulated accident releases in all but one case. Doses from postulated Shoreham decommissioning accidents are also considerably smaller than those associated with accidents postulated to occur during the licensed full-power operation of Shoreham.

On this basis, it is concluded that postulated decommissioning accidents at Shoreham would not involve any significant radiological consequences and would have no significant environmental impacts.

3.5 Occupational Safety

LIPA's fundamental philosophy at the Shoreham plant is that management is responsible for safety and must play an active role in managing to achieve safety, both radiological and otherwise. Management is responsible for ensuring that employees are trained and do work safely. All personnel are responsible for taking proper safeguards to minimize their exposure to unsafe work conditions and practices.

LIPA will adapt the existing LILCO safety program as identified in the Shoreham Industrial Safety Manual (Ref. 3-13) to the extent that it applies to decommissioning activities. Where additional safety instructions unique to decommissioning activities are required, they will be provided.

The Shoreham Industrial Safety Manual will provide personnel at Shoreham with an effective means of preventing unsafe conditions and unsafe acts on the job. The program presents policies and procedures and establishes a safety organization by which these policies will be enforced and through which feedback can be channeled and incorporated as program revisions.

In addition to procedures, the following basic guidelines will be followed:

(1) Regularly inspect job sites and company property for possible hazards.

(2) Plan all work to minimize personal injury, property damage and loss of productive time.

(3) Maintain a system for promptly detecting and correcting unsafe practices and conditions.

(4) Provide proper tools and equipment.

(5) Enforce the wearing of personal protective equipment.

(6) Enforce the use of machine guards.

(7) Investigate every accident to determine its cause and to guard against a recurrence.

It will be the responsibility of all Shoreham personnel to comply with site safety procedures for their own well-being and for the well-being of their coworkers. LIPA approved contractor equivalent programs may also be utilized. It will also be the responsibility of all Shoreham personnel to report any unsafe condition or uncorrected problem. Management will respond to each report of unsafe work conditions and shall ensure that appropriate corrective actions are taken as soon as practical.

3.6 References

3-1 Long Island Lighting Company, "Shoreham Nuclear Power Station Characterization Program, Final Report," May 1990; Addendum 1, June 1990; Addendum 2, August 1990.

3-2 Final Rule, "General Requirements for Decommissioning Nuclear Facilities," 53 F.R. 24018 (1988)

3-3 Long Island Lighting Company, "The Shoreham Nuclear Power Station Defueled Safety Analysis Report," Attachment 3 to LILCO letter SNRC-1664 from W. E. Steiger to U.S. Nuclear Regulatory Commission, January 5, 1990.

3-4 H.D. Oak, et al. "Technology, Safety, and Costs of Decommissioning a Reference Boiling Water Reactor Power Station" (prepared for the Nuclear Regulatory Commission by Pacific Northwest Laboratory), NUREG/CR 0672, June 1980; Addendum 1, July 1983; Addendum 2, September 1984; and Addendum 3, July 1988.

3-5 Long Island Lighting Co., Nuclear Engineering Department, Calculation No. CCI 036601, Rev. 1, "On- and Off-site Doses From Accidents During Decommissioning For a One Piece Lift, December 1990.

3-6 J.N. Hamawi, " ACCDOS," ENTECH ENGINEERING INC, P104-R5, Rev. 6, January, 1986.

3-7 U.S. Nuclear Regulatory Commission,Regulatory Guide 1.109, "Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents For The Purpose of Evaluating Compliance with 10 CFR 50,/Appendix 1," October 1977.

3-8 Bechtel Calculation "No. 900-140, "Decommissioning Dose Due To Contamination Control Envelope Failure," Rev. O, December 20, 1990

3-9 Long Island Lighting Company, "Shoreham Nuclear Power Station, Radiological Safety Analysis for Spent Fuel Storage and Handling," NED 4170024, September 1989. Transmitted via

LILCO letter SNRC - 1641 from W.E. Steiger to U.S. Nuclear Regulatory Commission, December 15, 1989.

3-10 Federal Register, August 6, 1990, 55 FR 31915, "Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1); Exemption."

3-11 Long Island Lighting Company, "Shoreham Nuclear Power Station, Updated Safety Analysis Report, Revision 3, June 1990.

3-12 "Environmental Aspects of Commercial Radioactive Waste Management," DOE/ET-0029, Volume 2, Chapter 7.3, Prepared by Pacific Northwest Laboratories for the U.S. Department of Energy, Richland, WA, May 1979.

3-13 Long Island Lighting Company, "Shoreham Nuclear Power Station Industrial Safety Manual."

Table 3.1-1

STRUCTURAL CONTAMINATION RESULTS

Structure	Average Total Surface Contamination (DPM/100 cm^2)	Maximum Total Surface Contamination (DPM/100 cm^2)
Primary Containment	<1,000	3,000
Contaminated Equipment/ Floor Drains and Sumps	5,000	11,000
Dryer/Separator [(1)] Storage Pool	<1,000	2,000
Reactor Head Cavity	9,000	78,000
Spent Fuel Storage Pool [(2)]		
Radwaste Laydown Area	11,000	55,000

(1) At time of site characterization, there were several inches of water in the pool. Values shown are for pool walls.

(2) The Spent Fuel Storage Pool and Spent Fuel Storage Racks are assumed to be contaminated in excess of Regulatory Guide 1.86 limits.

Table 3.1-2

System Contamination Results

Systems	Average Total Surface Contamination dpm/100 cm^2	Estimated Total Surface Activity uCi
Reactor Recirculation	14,000	250
Control Rod Drive	8,000	300
Residual Heat Removal	12,000	430
Core Spray	47,000	720
Liquid Radwaste	2,400	160
Reactor Water Cleanup	28,000	620
Fuel Pool Cleanup	26,000	790
Condensate Demineralizer	6,000	26
Process Sampling	12,000	23

Table 3.1-3

Estimated Radionuclide Inventory in the RPV, Internals and Biological Shield Wall[1]

	Activity, Curies (2)							
Component	H-3	C-14	Fe-55	Co-60	Ni-59	Ni-63	(3) Others	Total Curies
Core Shroud	0.0381	0.0043	118.6620	47.3915	0.0283	3.9020	-	170.0263
Jet Pumps	0.0018	0.0002	5.5189	2.2041	0.0013	0.1815	-	7.9077
Top Guide Plate	0.0744	0.0084	232.1502	93.6200	0.0553	7.6298	0.2349	333.7731
Core Support	0.0017	0.0002	5.2119	2.0816	0.0012	0.1714	-	7.4680
Spray Header	-	-	0.0010	0.0004	-	-	-	0.0015
SRM/IRM Dry Tubes	-	0.0023	50.7000	21.4000	0.0107	1.55	1.7600	75.4230
CRD Guide Tubes	-	0.0002	3.9600	1.6800	0.0008	0.121	0.1370	5.9000
Mirror Insulation	-	-	0.1304	0.0521	-	0.0043	-	0.1868
Vessel Cladding	-	-	0.0921	0.0368	-	0.0030	-	0.1319
Vessel Wall	0.0002	-	0.3272	0.0114	-	0.0004	0.0133	0.3525
Biological Shield	0.0099	-	0.3805	0.0100	-	0.0006		0.4010
Total by Isotope:	0.1261	0.0156	417.1342	168.4878	0.0977	13.5641	2.1452	601.5708
Percent of Total:	0.02%	0.00%	69.34%	28.01%	0.02%	2.25%	0.36%	

Note:

(1) Calculated neutron induced activities as of July 1990.

(2) The activities of the core shroud, top guide plate, SRM/IRM dry tubes and CRD guide tubes have been normalized to exposure rate measurements. Normalization has not been performed for any other component.

(3) Includes Mn-54 for the dry tubes and guide tubes. For other components, include isotopes with less than 0.01% contribution to total activity.

Table 3.3-1

Estimated Radioactive Waste Data for Shoreham Decommissioning(1)

Component/ System	Burial Volume(ft^3)	Total Activity(Ci)(2)	Average Gross Concentration	10 CFR 61 Waste Class
RPV and Internals	16,500	601.17	1.28	A
Reactor Recirc	6,000	2.45E-4	1.44E-6	A
Control Rod Drive	500(2)	3.00E-4	2.12E-5	A
Residual Heat Removal	15,100	4.30E-4	1.01E-6	A
Core Spray	1,600	7.19E-4	1.59E-5	A
Reactor Water Cleanup	9,200	6.16E-4	2.36E-6	A
Fuel Pool Cleanup	2,500	7.86E-4	1.11E-5	A
Condensate Demineralizer	2,000	2.62E-5	4.69E-7	A
Process Sampling System	300	2.29E-5	2.69E-6	A
Spent Fuel Rack and Appurtenances	8,300	5.65E-4	2.40E-6	A
Process Waste & DAW	7,700	negligible	unknown, assumed negligible	A
Demineralizer Resins/Filters	3,200	negligible	unknown, assumed negligible	A
Liquid Radwaste	6,000	1.60E-4	9.14E-7	A
Mirror Insulation	400	negligible	negligible	A
TOTALS	79,300	601.17		

Note: See next page.

Notes:

(1) As of March - April 1990, except for the RPV and Internals which are as of July 1990.

(2) Does not include control blades or control rod drives.

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Table 3.4-1

Accident Dose Comparisons

	Whole Body[1]		Organ	
Accident Type (On-site Accidents Only)	EAB Dose To Maximum Individual (mrem)	Percent of EPA PAG Lower Dose Limit (1 rem)	EAB Dose to Critical Organ of An Individual (mrem)	Percent of EPA PAG Lower Dose Limit (5 Rem)
Waste Container Drop	6.48 E-5	6.48 E-6	3.36 E-3	6.72 E-5
Combustible Waste Fire	8.04 E-12	8.04 E-13	1.63 E-9	3.26 E-11
Contaminated Sweeping Compond Fire	5.10 E-11	5.10 E-12	1.03 E-8	2.06 E-10
Vacuum Filter-Bag Rupture	5.36 E-8	5.36 E-9	1.09 E-5	2.18 E-7
Oxyacetylene Explosion	5.70 E-9	5.70 E-10	1.16 E-6	2.32 E-8
LPG Explosion a) with waste container rupture	1.48 E-4	1.48 E-5	7.76 E-3	1.55 E-4
b) without waste container rupture	1.36 E-4	1.36 E-5	2.76 E-2	5.52 E-4
Contamination Control Envelope Rupture	1.79 E-5	1.79 E-6	1.25 E-3	2.50 E-5
Fuel Damage Accident	1.08 E-0	1.08 E-1	9.39 E+1	1.88 E-0

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[1] Whole body dose as used here is the sum of whole body air submersion dose and whole body inhalation dose (actually, dose commitment).

Shoreham Decommissioning Plan

Table 3.4-2

Accident Release Comparisons

Accident Type (On-site Accidents Only)	Calculated Offsite Release From Shoreham (Curies)(1)	Calculated Offsite Release From the Reference BWR (Curies)(2)
Waste Container Drop	3.00 E-4	Not Evaluated
Combustible Waste Fire	4.96 E-12	6.0 E-9
Contaminated Sweeping Compound Fire	3.15 E-11	1.1 E-6
Vacuum Filter-Bag Rupture	3.31 E-8	8.5 E-4
Oxyacetylene Explosion	3.52 E-9	1.2 E-4
LPG Explosion		
a) with waste container rupture	6.84 E-4	Not Evaluated
b) without waste container rupture	8.40 E-5	8.6 E-3
Contamination Control Envelope Rupture	3.01 E-5	1.4 E-4
Fuel Damage Accident	1.50 E+3	Not Evaluated

Notes: 1) See applicable accident descriptions for assumed radionuclide compositions.

2) Radionuclide compositions for releases from the reference BWR are identified in Appendix E of Reference 3-4.

4.0 PROPOSED FINAL RADIATION SURVEY

This section describes the methodology by which the final radiation survey will be conducted and the criteria which will be proposed to the NRC for release of the facility and site for unrestricted use.

4.1 Final Radiation Survey

The purpose of the final radiation survey is to demonstrate and document that contaminated materials, structures, systems, areas and components have been successfully removed or decontaminated to levels at or below those defined in Section 4.2 to allow release of the site and facility for unrestricted use. The scope of the final radiation survey will include the entire site but will concentrate on those areas which were affected by the limited scope of nuclear operations and those areas which may be negatively impacted radiologically by the conduct of decommissioning activities as further discussed in Section 4.1.2.

4.1.1 Basis of Final Survey

This final radiation survey plan has been prepared in accordance with guidance from and meets the intent of NUREG/CR-2082, "Monitoring for Compliance with Decommissioning Termination Survey Criteria" (Ref. 4-1), Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Power Reactors" (Ref. 4-2), NUREG/CR-2241, "Technology and Cost of Termination Surveys Associated with Decommissioning of Nuclear Facilities" (Ref. 4-3) and NUREG/CR-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (Ref. 4-4). The plan utilized data from the Shoreham Characterization Program Final Report (SCPFR) (Ref. 4-5).

4.1.2 Survey Design

Due to the short operating period and low power levels (below 5%) at which the Shoreham plant operated, radioactive contamination was found in only several structures and nine systems as described in Sections 2.2 and 3.1. These structures and systems are the focus of all planned decommissioning activities. In addition, the final radiation survey will include those areas (indoor and outdoor) that may potentially have been contaminated due to Shoreham plant operations but were determined to be uncontaminated during the site characterization program (Ref. 4-5), and any area or system that could potentially become inadvertently contaminated during the decommissioning activities. Further, Reference 4-5 as well as ongoing routine survey data as described later will be used as a guide for either reducing survey points or not surveying in areas or systems for which no potential for contamination exists or existed such as in the Diesel Generator Building.

The final radiation survey of each system, structure and area will be scheduled to ensure that surveyed areas, structures and systems will not be recontaminated by subsequent decommissioning operations.

The final radiation survey will be divided into unbiased and biased sampling schemes. Unbiased sampling will be performed for all areas included in the survey. Biased sampling will be performed in all areas where decontamination was performed prior to decommissioning, in areas where physical decommissioning activities occurred, including adjacent areas which may have been contaminated during decommissioning, and in areas affected by the limited scope of nuclear operations.

4.1.3 Natural Background

The importance of reliable background data cannot be overemphasized since release criteria are specified in terms of acceptable levels of radioactivity above background. Therefore, it is important that information on background radiation be available so that the contribution to dose rate from non-Shoreham plant sources can be identified once survey data are taken (i.e., measured site radioactivity levels minus the contribution from natural background and fall-out material would be the residual levels due to Shoreham plant activities). Background includes "instrument background," background due to naturally occurring radioactive materials and background due to man-made items containing radioactive materials.

Evaluation of natural background levels for structural surfaces and soil radioactivity for the Shoreham site was performed during the site characterization program (Ref. 4-5) and will be verified for the final survey. The evaluation of surface and soil radioactivity was performed by taking measurements and samples from an area that was close enough to the Shoreham plant site to be representative of it, but far enough away to be reasonably sure that no enhancement of radioactivity from Shoreham plant operation occurred. Background exposure rates at one meter above soil and construction materials were not determined at that time and so will require determination for the final survey.

The following methods were and will be used to determine background levels:

(1) The background level used for removable contamination is a function of the smear counting instrument. Thus, the background will be determined by counting an unused smear.

Because each smear counter is unique, this background will be determined for each instrument used at the time of the final radiation survey and will be checked daily.

(2) Total (fixed plus removable) surface contamination background will be determined for such items as bare or painted concrete or concrete block and painted steel surfaces. Measurements will be made for each type of material. Surfaces used for the background determinations will be chosen based upon their similarity to the materials in the potentially contaminated areas at Shoreham. Materials used for the total surface background determinations will be chosen from site structures at locations that were not affected by Shoreham operations.

(3) External background exposure rate.

From these background data, a statistical analysis will be performed to determine the background value(s) which will be used during the final radiation survey for a given survey measurement using the guidance in References 4-1 and 4-3.

4.1.4 Preliminary Survey

A preliminary radiological survey of the structural surfaces in the Reactor, Turbine, and Radwaste Buildings will be conducted prior to the final radiation survey in order to formulate plans for an efficient and comprehensive final survey (see Refs. 4-1 and 4-3). The preliminary survey will aid in determining the required sampling density (i.e., the number of sample points for which data must actually be recorded for the final survey in order to provide a statistically valid result). During the preliminary survey, decisions will be made concerning logical divisions of the site into separate survey units. A survey unit will consist of a tract of land, one story of a building, a room, a roof, a loading dock or any area naturally distinguishable from other areas of the Shoreham site.

4.1.4.1 General Approach

Within each survey unit (e.g., Turbine Building elev. 15), at least 30 random sampling locations will be selected at roughly uniformly spaced points per Reference 4-1.

Direct instrument contamination measurements and smear samples for removable surface contamination will be made at each selected sample location in a survey unit.

For indoor surveys, Geiger Mueller (GM) measurements for beta-gamma activity will be made at 1cm above surfaces and smear samples will be taken to measure removable beta contamination as described in Section 4.1.6. Additionally, areas showing higher activity levels will be sampled for laboratory analysis in an effort to determine the radionuclide identity and concentration.

For outside surveys, GM measurements for beta-gamma activity will be made at 1cm above surfaces and smear samples for removable beta activity will be taken from man-made surfaces such as roofs and roadways also as described in Section 4.1.6.

Exposure rate measurements will be taken with a uR meter or uRem meter at 1 meter above the soil surface. Soil surface samples will be taken for laboratory analysis from areas showing activity levels that exceed exposure rate background levels to determine if it is due to reactor originated materials (fission and/or activated corrosion products).

4.1.4.2 Use of Preliminary Survey Data

The data obtained during the preliminary survey will be used to devise a final radiation survey plan that will ensure that a statistically valid final survey will be performed. From the preliminary survey results, it will be decided whether (1) systematic, (2) simple random, or (3) stratified random sampling is more appropriate for the final survey as described in Refs. 4-1 and 4-3. The preliminary survey data will also be used by LIPA to determine the minimum number of survey blocks (N) needed for the final survey. From this information, the total number of survey measurements which must actually be recorded in a survey unit as opposed to just being scanned during the final radiation survey can be determined.

A minimum of 30 initial sampling locations will typically be selected for a survey unit during the preliminary survey. The measurements identified in Section 4.1.4.1 will be performed at each location. Then, the number of measurements needed for the final survey to adequately determine the average surface contamination levels for each survey unit will be calculated where valid results above the lower limit of detection are found. Where individual results are below the lower limit of detection, the lower limit of detection value will be used in calculations of the average surface contamination level. N will be calculated as follows, using Refs. 4-1 and 4-3 for guidance:

$N = (ts/rx)^2$

where:

N = the minimum number of survey blocks that a survey unit must be divided into for the final radiation survey;

t = the t statistic for 95 percent confidence and 29 degrees of freedom;

r = acceptable relative error;

x = the average radiation or contamination level; and

s = standard deviation of the radiation or contamination levels.

4.1.5 Final Radiation Survey

The final radiation survey will be conducted upon completion of the preliminary survey and evaluation of the data as per Section 4.1.4. The final radiation survey scope will be as described in Sections 4.1 and 4.1.2 and will consist of indoor and outdoor areas, structures and systems as described below. It also will include biased and unbiased sampling schemes depending on past history as described in Section 4.1.2. Use will be made of the survey points included in the site characterization program (Ref. 4-5) as much as possible to allow for direct comparisons to prior surveys.

4.1.5.1 Indoor Survey

For the final radiation survey, each indoor survey unit selected will be divided into two sub-units:

(a) Lower surfaces comprised of floor surfaces, wall surfaces up to a height of 2 meters and any other surface easily accessible to the surveyor standing on the floor; and

(b) Overhead surfaces comprised of ceiling surfaces, wall surfaces more than 2 meters above the floor and any other surfaces not described in (a).

The floors and lower walls of a particular survey unit will be divided into blocks by a rectangular grid system that should cover the entire area. The blocks formed by this grid system will be referred to as "survey blocks" and the corners of the survey blocks called "grid points". The factors that will guide the set up of a grid system are as follows:

- No survey block will have a side measuring less than 1 meter;
- No survey block will have a side measuring more than 3 meters; and
- There will be at least N survey blocks (as defined in Section 4.1.4.2) in the sample population unless this violates the first criterion above.

The radiological conditions to be characterized for each survey block on the lower surfaces [(a) above] will include:

(1) exposure rates at 1 meter above the center of each survey block.

(2) beta-gamma count rates by direct instrument survey at 1 cm above the surface measured and recorded at the corners (grid points) and center of the survey block.

(3) surface beta-gamma contamination levels at the same points as (2).

(4) a gross alpha activity measurement will be taken on the smear sample with the highest detectable beta activity in each survey block.

Measurements will be taken as described in Section 4.1.6.

If the entire survey block is only 1 square meter, then the corner measurement points will be moved 30 cm towards the center of the block per Reference 4-1. Because adjacent survey blocks would share "corner" measurements, each measurement will be considered independently when calculating the average for a survey unit for comparison to the release criteria.

Then, each survey block will be scanned over the entire surface with an open thin window pancake GM detector and ratemeter to locate the maximum beta-gamma contamination level. At this location, each type of measurement will be made and recorded. Thus, data will be recorded near the surface at 6 locations for a given survey block even though the entire surface is scanned.

For horizontal and vertical surfaces not covered by (a) or (b), such as cable trays and instrument panels, contamination is typically uniform but horizontal surfaces show higher contamination levels than vertical surfaces. This is because deposition on upper surfaces tends to be due to settling of contaminated dust particles rather than due to spills or leaks as on floors and lower walls. For this reason, the standard procedure for these surfaces will be to take measurements (2) and (3) on both vertical and horizontal surfaces at 30 uniformly spaced locations in the survey unit. Thus, these surfaces will not be divided into survey blocks. If operations history in the area of interest, however, indicates a higher potential for non-uniform contamination, the preliminary survey "N" calculation will be performed for determination of the number of measurements for the final survey.

4.1.5.2 Systems and Equipment

Equipment from systems will be selected for final radiation survey sampling based on three conditions:

(1) Equipment is from a system where contamination was previously present;

(2) Equipment is from systems previously found not to be contaminated in Reference 4-5, but for which a potential for contamination existed or exists due to a decommissioning activity;

(3) Equipment is from a system not surveyed during the site characterization program (Ref. 4-5) for reasons stated in that report.

Components to be surveyed will be opened by removal of flanges, covers, valve bonnets, etc. The number of components to be sampled for a given system will be based upon a strategic sampling of representative components for each system from each of the categories above so as to provide objective evidence that a system's levels of residual contamination are within limits to allow its release for unrestricted use. The sampling scheme will use a progressive approach such that successively more samples will be taken if any contamination above release limits is found.

Condition (1) systems will be surveyed with higher sampling density than Condition (2) and (3) systems. Some Condition (3) equipment and systems may not be surveyed depending upon LIPA's evaluation of whether Reference 4-5 provides adequate objective evidence of whether such a system had no potential for contamination.

Systems grouped under Condition (1) will be surveyed at open pipe ends resulting from decommissioning work and at locations that represent potential "worst case" contamination traps for that system. These will include:

- Surfaces against which flows have impinged, such as internals of pumps, turbines or blowers.
- Components that restrict or divert flow, such as valves or piping tees.
- Structures that provide horizontal surfaces where loose materials may settle, such as tank bottoms or filter housing.

If deemed necessary, systems falling under Conditions (2) and (3) will be surveyed as described above to verify their previously determined non-contaminated status. To accomplish this, at least one component from each type of "contamination trap" will be surveyed for each system or sub-system.

Selected equipment will be surveyed by direct measurement for total surface beta-gamma contamination and by swiping for obtaining smear samples for removable beta and alpha surface contamination. The components that are selected for survey will be opened to expose interior surfaces for measurement.

Smear samples will be taken from the internal surfaces of opened equipment or components. All smear samples will be analyzed for gross beta activity and at least one smear sample with the highest detectable beta activity from each selected system will also be counted for gross alpha activity.

4.1.5.3 Outdoor Survey

Previous data from the SCPFR (Ref. 4-5) and the Radiological Environmental Monitoring Program (REMP) for the outdoor areas of the Shoreham plant indicate no contamination above background radiation in these areas. However, in the unlikely event that decommissioning activities affect these areas, then a verification survey of the affected area will be performed. Such areas will be identified as follows. Outdoor areas and/or soil will be subject to additional final radiation survey data collection only if there is reason to believe that the decommissioning program has or may have adversely affected them, such as in the case of a radwaste transport route. This will be determined from routine contamination surveys of building exits, personnel and material access routes, laydown and staging areas; from monitoring airborne emissions from the building exhaust systems and outdoor air sampling which will determine the potential for airborne deposition onto outdoor surfaces and soil; from biased soil sampling near areas that could be suspected of becoming contaminated; and from future REMP data. Should a verification survey of a particular area be deemed appropriate, the approach identified in NUREG/CR-2082 (Ref. 4-1) will likely be used.

4.1.6 Measurement Techniques

Specific procedures for the analytical techniques to be utilized for the final survey will be the same or similar to those that will be used by the HP group during decommissioning operations.

Direct instrument surveys for beta-gamma surface contamination will measure total surface contamination (i.e., both fixed and removable contamination). The measurements will be made by placing a thin window (<2 mg/cm^2) pancake GM detector (with a count ratemeter) approximately 1 cm from the surface of interest and noting the count rate. The net beta-gamma count rate is corrected for detector and geometric efficiency to disintegrations per minute per active area of the detector (window area) and then multiplied by the ratio of 100 cm^2 to the active window area to produce dpm/100 cm^2. Typical pancake GM ratemeter detection systems have a sensitivity of approximately 4000 to 5000 dpm/100 cm^2 for betas above 100 kev. Scan rates will be approximately 1 to 2 inches per second at 1 cm from the surface.

Removable surface contamination will be measured by rubbing a cloth or paper smear over a 100 cm^2 surface area with moderate pressure. The smear will then be counted for gross beta-gamma activity by timed counting. The results will be converted to and expressed as beta-gamma dpm/100 cm^2 removable.

Exposure rates that will be encountered during the final survey are expected to be near background, i.e., a few uR/hr above natural background. To measure these very low exposure rates, a detector and ratemeter calibrated to read out in uRem/hr or uR/hr will be used. Exposure rate measurements will be measured at one meter from the surface of the area of interest.

Soil samples will generally be taken from the upper 5 to 15 cm of soil. Maximum concentrations of radionuclides in soil will be determined from samples collected at measurement points showing maximum gamma (or beta-gamma) levels. Average radionuclide concentrations will be estimated from "unbiased" samples taken at random from each stratum.

If subsurface contamination is suspected, bore holes will be augured and lined with in-walled plastic pipe. A collimated gamma scintillation detector and scaler will be used to "log" the holes at 15 to 30 cm intervals. The gamma readings will be related to soil concentration by comparison to selected matched soil samples taken from the bore holes. Additionally, any water found in bore holes will be sampled for laboratory analysis.

4.1.7 Quality Assurance

QA with respect to the final survey will be addressed as an integral part of the decommissioning QA program presented in Section 7.0. The QA objectives for the final radiation survey are to ensure confidence in the sampling, processing, analysis, interpretation and use of data generated. QA applies to all steps of the final radiation survey, especially the following:

- Data quality objectives will be used in selecting survey instrumentation, sample collection and analysis methods, and in determining the sampling strategy,
- Qualified personnel trained on the survey and sampling procedures will perform surveys and collect samples,
- Independent redundant measurements will be made as appropriate,
- Measurements and samples will be taken using approved procedures,
- Samples will be identified, handled and stored in a traceable manner to assure validity of results,
- Measurements and sample analyses will be performed with instruments that are calibrated and are operationally stable,
- Shoreham plant laboratory QC will be maintained and contractor laboratories will be required to have a comparable QA/QC program,
- Records and calculations will be checked for error and use of appropriate recording and calculation techniques.

4.2 Release Criteria

LIPA will use criteria no less stringent than the following in assessing whether the Shoreham structures, systems and components remaining on the site may be released for unrestricted use:

- the criteria in Table 1 of Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors" (Ref. 4-2), as limits for both loose and fixed surface contamination; and
- 5 uR/hr above background at one meter for reactor-generated gamma emitting isotopes as the limit for direct exposure from residual radioactivity.

The foregoing criteria were identified by the NRC in NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (Ref. 4-4). LIPA is continuing to assess whether to adopt criteria in addition to or more stringent than the foregoing criteria and will advise the NRC if it proposes to do so.

LIPA is also considering additional analyses to provide assurance that the above release criteria minimize radiation exposure to the public from unrestricted use of the site. These analyses include the use of generic pathway models such as in NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning" (Ref. 4-6), to determine the total effective dose and associated risk to an individual from any residual radioactive contamination. LIPA expects to conduct these analyses and comparisons during detailed engineering for Shoreham's decommissioning in mid-1991.

4.3 References

4-1 U.S. Nuclear Regulatory Commission, "Monitoring for Compliance With Decommissioning Termination Survey Criteria," NUREG/CR-2082, June 1981.

4-2 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.86, "Termination of Operating Licenses For Nuclear Reactors," June 1974.

4-3 U.S. Nuclear Regulatory Commission, "Technology and Cost of Termination Surveys Associated with Decommissioning of Nuclear Facilities," NUREG/CR-2241, February 1982.

4-4 U.S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988.

4-5 Long Island Lighting Company, "Shoreham Nuclear Power Station Site Characterization Program, Final Report," May 1990; Addendum 1, June 1990; Addendum 2, August 1990.

4-6 U.S. Nuclear Regulatory Commission, "Residual Radioactive Contamination from Decommissioning, Draft Report for Comment," NUREG/CR-5512, January 1990.

5.0 COST ESTIMATE FOR DECOMMISSIONING AND FUNDING METHOD

5.1 Cost Estimate

A cost estimate was performed for the selected DECON decommissioning alternative for the Shoreham plant based upon the scope of work described in this DP.

LIPA's estimate considers the Atomic Industrial Forum (AIF)/National Environmental Studies Project's (NESP) report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates" (Ref. 5-1), and Pacific Northwest Laboratories' report, "Technology, Safety, and Cost of Decommissioning a Reference Boiling Water Reactor Power Station" (Ref. 5-2). It also conforms to decommissioning cost estimate guidelines contained in NRC Regulatory Guide 1.159 (Task DG-1003), "Assuring the Availability of Funds for Decommissioning Nuclear Reactors" (Ref. 5-3). It has been formatted according to the Shoreham project WBS, which is LIPA's method by which Shoreham decommissioning work will be classified and monitored.

The estimated cost to decommission Shoreham is $186,292,000 in 1991 dollars. Summary and detail costs by WBS and assumptions utilized in arriving at the estimate appear in Tables 5.1-1, 5.1-2, and 5.1-3.

5.1.1 Basis of Cost Estimate

The DECON decommissioning alternative with immediate disposal of low level wastes was evaluated for Shoreham. The decommissioning cost estimate and schedule are based on the removal of all contaminated systems as well as certain clean components and structures blocking access to these systems.

The estimate does not assume that the soft chemical decontamination program planned by LILCO will reduce the scope of Shoreham's decommissioning. Accordingly, the estimate assumes a project scope of work by LIPA encompassing decontamination and/or dismantlement of all presently contaminated systems and structures. In light of this and other conservatisms in the estimate, LIPA believes that the estimate is adequate to cover the cost of most scenarios that could develop during decommissioning implementation. This also supports the contingency percentages utilized in the estimate (see Tables 5.1-1 and 5.1-2).

Since fuel removal is a critical path item (it extends one month beyond RPV segmentation - see Figure 2.2-2) it impacts period-dependent staff and contractor costs. These costs related to fuel removal are included in the estimate but are not shown separately from other staff costs in the estimate. The direct cost of fuel removal and disposal, however, is not included in this estimate (in conformance with NRC Regulatory Guide 1.159, Ref. 5-3).

To ensure a meaningful site-specific estimate, costs are based upon representative labor rates for the Shoreham area. Typical craft labor rates and staff salary data were taken from recent labor contracts and utility records for similar positions. Staff costs identified reflect the participation of LIPA, NYPA and LILCO throughout the entire decommissioning as defined in the Site Agreement (Ref. 5-4) and Management Services Agreement (Ref. 5-5).

The cost estimate and schedule have been developed using LIPA's Shoreham project WBS. The estimate, schedule and tables of assumptions are presented by WBS category, allowing for review and comparison on a consistent basis. Cost estimate assumptions appear in Table 5.1-3.

5.1.2 Cost Estimate Methodology

The methodology used to develop the cost estimate is consistent with the approach presented in AIF/NESP-009, "An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives" (Ref. 5-6), and the U.S. Department of Energy (DOE) "Decommissioning Handbook" (Ref. 5-7). These references use a unit cost factor method for estimating decommissioning activity costs to standardize the estimating calculations. Activity-dependent costs are estimated from the item quantities, which are in turn developed from plant drawings and site characterization studies. Examples of unit cost factor development are presented in the AIF/NESP studies.

Critical path methodology was used to determine the duration of the longest sequence of decommissioning activities. This duration was used to determine management, administration, field engineering, equipment rental and other period-dependent costs.

Typical salary and hourly rates for period-dependent personnel costs were provided by their respective organizations. Other period-dependent costs were taken from vendor data and appropriate sources of construction costs.

Activity-dependent and period-dependent costs were totalled to provide the base cost of decommissioning. Contingencies were applied after considering AIF/NESP-036 guidelines (Ref. 5-1) and Shoreham-specific conditions (and conservatisms as discussed above).

The unit cost factor method provides a standardized basis for establishing reliable cost estimates. The detail of activities provided in the unit cost factors for craft activity labor, equipment and consumables provides assurance that no cost elements have been omitted. These detailed unit cost factors, coupled with the plant-specific inventory of contaminated systems and structures, provide confidence in the completeness and accuracy of the cost estimate and the appropriateness of applied contingencies.

5.2 Funding Method

As described in References 5-8 and 5-4, LIPA has specifically ensured adequate funds for Shoreham's decommissioning by obtaining LILCO's agreement to fund Shoreham's decommissioning.

The Asset Transfer Agreement between LIPA and LILCO (Ref. 5-8) expressly provides that "LILCO will pay LIPA for Costs Attributable to Shoreham." Section 5.3 (a). Section 2.4 of the Site Agreement (Ref. 5-4) further provides that "LILCO's obligation to pay all Costs Attributable to Shoreham ... is unconditional and not contingent on any PSC action." The phrase "Costs Attributable to Shoreham" is defined in detail in Section 1.12 of the Site Agreement. Covered costs specifically include costs incurred by LIPA in connection with asset transfer or license transfer and "costs incurred by LIPA or NYPA ... attributable to LIPA's or NYPA's ownership, possession, Maintenance, Decommissioning or dismantling of Shor[illegible] Thus, LILCO is comprehensively obligated to pay all costs that LIPA or its co[illegible]rs might incur in decommissioning Shoreham.

The Site Agreement contains the detailed mechanism for implementing LILCO's funding obligations. These provisions, fully functional since January 1990, are contained in Article III. Briefly, the mechanism established pursuant to the payment provisions is as follows:

(1) In accordance with the Site Agreement, LIPA has established: (i) the Cost Reimbursement Fund for the purpose of paying suppliers (including NYPA) which contract with LIPA to perform Shoreham-related work; and (ii) the

LIPA Reimbursement Fund for the purpose of paying LIPA for all costs related to Shoreham incurred by LIPA. On January 24, 1990, LILCO remitted to LIPA $4,817,777 for deposit in the Cost Reimbursement Fund and the LIPA Reimbursement Fund. Together with certain amounts not yet billed by LIPA, these moneys were to reimburse LIPA and NYPA for all Shoreham-related costs incurred up to January 1, 1990 and to pay for costs estimated to be incurred by LIPA and NYPA during the first three months of 1990. Site Agreement, Sections 3.3 and 3.4.

(2) Since February 1990, LILCO has remitted each month to LIPA for deposit in the Cost Reimbursement Fund and the LIPA Reimbursement Fund the amount of money projected by LIPA to be required to meet cash needs for the third following month. Site Agreement, Sections 3.3(b), 3.4(b), and 3.5. In this way, the two Funds will at all times have a three-month "cushion" of funds. LILCO is obliged to continue such payments until the Site Agreement is terminated consistent with NRC requirements. Site Agreement, Sections 2.4 and 7.1.

(3) LILCO's monthly payments to LIPA for deposit in the Funds will be based upon LIPA's projections of anticipated cash requirements. LIPA may at any time submit revised monthly cash flow projections to LILCO. LILCO is obligated to provide money for the two Funds in accordance with the most recent cash flow projection. Site Agreement, Section 3.2.

(4) LILCO will advance LIPA an additional amount of operating or other funds if such funds are required by any regulatory authority or if LIPA and LILCO so agree. Site Agreement, Section 3.16(b).

Thus, all expenses to be incurred by LIPA in connection with Shoreham's decommissioning will be paid by LILCO in advance, on a projected, as-needed basis. LILCO's ability to pay in conformity with the Asset Transfer Agreement and the Site Agreement also is sound (Ref. 5-9). LILCO submitted both the Asset Transfer Agreement and the Site Agreement to the NYPSC for approval. The NYPSC approved the Asset Transfer Agreement in Opinion 89-9, dated April 13, 1989, and the Site Agreement in an order dated June 7, 1990. These approvals ensure that LILCO will have sufficient funds, through approved NYPSC ratemaking, to pay for Shoreham's decommissioning.

LILCO has previously submitted to the NRC a letter addressing the decommissioning funding provisions of 10 CFR 50.33(k)(2) and 50.75(b) (Ref. 5-10). LILCO showed therein that those provisions should not be applied to plants that are closed prior to full-power operation and therefore should not be applied to Shoreham. To the extent that they might apply, LILCO in the alternative requested an exemption. LILCO's submittal further showed that the above-referenced agreements provide reasonable assurance that adequate funds will be available for plant decommissioning. LILCO's request that the NRC staff so determine is presently pending before the NRC (Ref. 5-11).

The foregoing provides a firm basis for concluding that at all times there will be sufficient moneys for payment of all Shoreham-related costs, including all costs related to Shoreham's decommissioning.

5.2.1 Additional Assurances

Several additional considerations provide further assurance of the adequacy of the Shoreham decommissioning funding mechanism.

Many of the uncertainties surrounding the cost of Shoreham's decommissioning have been resolved. LIPA's site-specific cost estimate (Section 5.1) has considered the existing conditions at the Shoreham plant, available regulatory guidance in the area of nuclear plant decommissioning, state-of-the-art decontamination and dismantlement technology, current issues and challenges related to radioactive waste management and the use of a local labor force to perform the decommissioning activities. Thus, with this comprehensive and detailed cost estimate, the level of funding necessary for LIPA to decommission the Shoreham plant has been defined.

LIPA's proposed schedule which is described in Section 2.2, inherently provides additional assurances that adequate funds will be available to decommission the Shoreham plant. First, having selected the DECON alternative, LIPA has estimated the cost of Shoreham's decommissioning that will be completed in the near term (i.e., by late 1993). Thus, the uncertainties associated with estimating the cost of decontamination and dismantlement activities that would be preformed 30 to 40 years out in the future have been eliminated.

Second, with LIPA's commitment to the DECON alternative and near term decommissioning of the Shoreham plant, any need to assure the long term (i.e., 30 to 40 years) integrity of the proposed funding arrangement, including assurances as to LILCO's financial position and stability, is also eliminated.

Lastly, the annual expenditures associated with decommissioning are well within

LILCO's recent, historical financial outlays for operations and maintenance activities at the Shoreham plant. For example, budgeted Shoreham expenditures during 1990 are approximately $92 million, excluding property taxes. Evaluation of LIPA's decommissioning cost estimate and schedule result in maximum annual decommissioning expenditures totalling $75 million. Thus, the decommissioning project in itself does not represent a new financial burden to LILCO. LILCO is now demonstrating the ability to fund Shoreham plant activities in excess of those that are expected to be performed during the course of Shoreham's decommissioning.

5.3 References

5-1 Atomic Industrial Forum/National Environmental Studies Project, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

5-2 H.D. Oak, et al, "Technology, Safety, and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," prepared for the Nuclear Regulatory Commission by Pacific Northwest Laboratory, NUREG/CR-0672, June 1980; Addendum 1, July 1983; Addendum 2, September 1984; and Addendum 3, July 1988.

5-3 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159 (Task DG-1003), "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," August 1990.

5-4 Site Cooperation and Reimbursement Agreement by and between LILCO and LIPA, dated as of January 24, 1990.

5-5 Management Services Agreement By and Between LIPA and NYPA, January 24, 1990.

5-6 Atomic Industrial Forum/National Environmental Studies Project, "An Engineering Evaluation of Decommissioning Alternatives," AIF/NESP-009, May 1976.

5-7 U.S. Department of Energy, "Decommissioning Handbook," DOE/EV1028-1, November 1980.

5-8 Amended and Restated Asset Transfer Agreement between LILCO and LIPA, dated as of June 16, 1988 and Amended and Restated as of April 14, 1989.

5-9 Long Island Lighting Company Letter SNRC-1697 from W.E. Steiger, Jr., to U.S. Nuclear Regulatory Commission, March 15, 1990, transmitting LILCO's Annual Financial Report.

5-10 Long Island Lighting Company Letter from V.A. Staffieri to U.S. Nuclear Regulatory Commission, June 11, 1990.

5-11 U.S. Nuclear Regulatory Commission Letter from W. Brown to V.A. Staffieri, Long Island Lighting Company, December 3, 1990.

Table 5.1-1

Shoreham Decommissioning Plan
Summary Decommissioning Cost Estimate

DESCRIPTION	Cost ($000s)
Decommissioning Engineering & Design	4,386
Special Tools, Materials & Equipment	17,309
Systems Decontamination/Dismantling	24,567
Decontamination of Structures	5,434
Reactor Pressure Vessel Decontamination/Dismantling	13,746
Waste Management	5,042
Plant Staff, Decommissioning Support, Management & Administration	101,328
Decommissioning Radiological & Environmental	528
Miscellaneous	6,827
Subtotal	179,165
Contingency	7,127
TOTAL	186,292

Table 5.1-2 D
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WBS	COST ACTIVITY DESCRIPTION	ACTIVITY SUMMARY Waste Volume (cu ft)	Craft Labor (m-hrs)	Total Cost	(C Decon	Remove	Pa
E	DECOMMISSIONING ENGINEERING & DESIGN						
	LIPA/NYPA Staff			1,878			
	A/E Conceptual Engineering			660			
	A/E Detailed Engineering			1,533			
	A/E Implementation Support Engineering			315			
DA	EXTERNAL DECOMMISSIONING CONTRACTOR						
	(see Note 1)						
DB	SPECIAL TOOLS, MATERIALS, EQUIPMENT						
	RPV Internals Segmentation			$6,016			
	RPV Segmentation			1,064			
	Decontamination Equipment			197			
	Heavy Equipment Rental			1,866			
	Pipe Cutting Equipment			95			
	Small Tool Allowance			79			
	Health Physics Supplies			8,103			
	Rigging/CCEs/Tooling/Etc.			1,311			
	Procure Casks, Liners & Containers			113			
DC	SYSTEMS DECONTAMINATION/DISMANTLING						
	Control Rod Drive (C-11)	500	42,028	2,815	$1,229	$1,299	
	Core Spray (E-21)	1,600	9,407	1,097	195	390	
	Residual Heat Removal (E-11)	15,100	77,902	9,730	2,024	2,744	
	Reactor Water Cleanup (G-33)	9,200	10,191	3,601	295	411	
	Fuel Pool Cleanup (G-41)	2,500	20,406	2,073	483	756	
	Condensate Demineralizer (N-52)	2,000	2,637	774	71	85	
	Reactor Recirculation (B-31)	6,000	10,474	2,621	247	397	
	Liquid Radwaste (G-11)	6,000	48,083	5,015	1,366	1,635	
	Sampling (P-33)	300	914	242	23	116	
DD	DECONTAMINATION OF STRUCTURES						
	Primary Containment System		12,709	837	787		
	Dryer/Sep Pool/Reactor Cavity/SFP		2,273	148	141		
	Radwaste Laydown		332	28	21		
	Equip./Floor Drains & Sumps		14,544	1,086	131	842	
	Misc Equip/Comp/interferance Removals		239	78		68	
	Spent Fuel Rack Removal	8,300	19,357	3,914	1,195	56	
	Miscellaneous Removals		540	39		34	
DE	REACTOR PRESSURE VESSEL DECON/DISMANTLING						
	RPV Removal/Segmentation	16,500	143,455	13,746	53	8,558	
DF	WASTE MANAGEMENT						
	Process Liquid Waste		1,422	3,104	295		
	Package additional condensate demin resins	3,200	367	552			
	Disposal of contaminated solid waste	8,100	2,100	2,449			
DG	PLANT STAFF, DECOMM. SUPPORT, MGMT. & ADMIN						
	LIPA Staff (incl. LIPA, NYPA & LILCO)			98,131			
	Implementation Engineering Support			2,353			
	Independent Review Panel			302			
	NRC Fees			606			
DH	DECOMMISSIONING RADIOLOGICAL/ENVIRONMENTAL						
	License Termination Survey			423			
	Final Report to NRC			131			
M	MISCELLANEOUS						
	Plant Energy Budget			3,780			
	Nuclear Property Insurance			2,839			
	Nuclear Liability Insurance			549			
	TOTAL FOR DECOMMISSIONING	79,300	419,380	186,292	8,556	17,390	

Note 1: External Decommissioning Contractor costs are calculated as a markup of direct labor costs.

These costs ar

etail Decommissioning Cost Estimate
n Decommissioning Plan

COST SUMMARY

osts are in Thousands of 1991 Dollars)

kage	Ship	Bury	Staff	Other	Subtotal	Contingency		Total
						%	Amount	Costs
			1,878		1,878	0.0%	0	1,878
			660		660	0.0%	0	660
			1,533		1,533	0.0%	0	1,533
			315		315	0.0%	0	315
				$6,016	$6,016	0.0%	$0	$6,016
				1,064	1,064	0.0%	0	1,064
				171	171	15.0%	26	197
				1,623	1,623	15.0%	243	1,866
				83	83	15.0%	12	95
				68	68	15.0%	10	79
				7,04ι	7,046	15.0%	1,057	8,103
				1,140	1,140	15.0%	171	1,311
				98	98	15.0%	15	113
$5	$1	$124			2,657	5.9%	158	2,815
14	3	371			973	12.7%	124	1,097
141	23	3,634			8,566	13.6%	1,164	9,730
85	14	2,200			3,005	19.8%	596	3,601
23	4	593			1,860	11.5%	213	2,073
18	3	470			646	19.7%	127	774
56	10	1,434			2,144	22.3%	477	2,621
56	10	1,434			4,500	11.5%	516	5,015
3	1	74			216	12.0%	26	242
2		7			796	5.2%	41	837
					141	5.0%	7	148
1		4			26	8.0%	2	28
2	1	49			1,025	6.0%	61	1,086
					68	15.0%	10	78
93	20	1,980			3,344	17.0%	570	3,914
					34	15.0%	5	39
609	76	4,450			13,746	0.0%	0	13,746
446	425	1,452			2,618	18.6%	486	3,104
73	4	374			451	22.5%	101	552
97	29	1,848			1,973	24.1%	476	2,449
			98,131		98,131	0.0%	0	98,131
			2,353		2,353	0.0%	0	2,352
				281	281	7.5%	21	302
				563	563	7.5%	42	606
				403	403	5.0%	20	423
			125		125	5.0%	6	131
				3,600	3,600	5.0%	180	3,780
				2,704	2,704	5.0%	135	2,839
				523	523	5.0%	26	549
1,723	622	20,497	104,994	25,383	179,165		7,127	186,292

included with their respective direct labor activity.

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Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
	General Comments	The cost estimate is based on the DECON decommissioning alternative in which radioactively contaminated systems and structures are promptly decontaminated/removed. All estimated costs are in 1991 dollars. Fuel assemblies will be removed during decommissioning but the direct costs associated with fuel removal are not included in the cost estimate. Most contaminated systems will be chemically decontaminated prior to dismantlement/removal. LIPA has conservatively assumed for cost estimation purposes that chemical decontamination will not reduce the inventory of contaminated material to be dismantled/removed. Plant system inventories and contaminated components were taken from LILCO drawings, equipment and structural specifications and the LILCO site characterization report. The cost estimate was based upon several schedule milestone assumptions which are included in Table 2.2-3. Craft labor rates were based upon recent labor contract rates provided by LILCO. Average hourly rates were developed for the following craft classifications:
	(continued)	

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
		Laborer $27.97 Craftsman $38.82 Foreman $39.08
		Overhead and profit multipliers of 64.3 percent and 17.5 percent were applied to labor and equipment, respectively. These multipliers cover the cost of an external decommissioning contractor to manage and administer craft labor and decommissioning construction.
		The estimate assumes no credit for salvage or recovery of plant assets.
		Unit cost factors (UCFs) were developed for the types of activities likely to be performed in decommissioning. These UCFs were developed consistent with AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates."
		Each UCF incorporates adjustment factors to account for conditions that will increase the estimated time to complete a given activity. Some factors are used only on UCFs for contaminated systems/structures. Others are applied to all UCFs. Some difficulty factors in the Shoreham estimate include:
		1. Height/accessibility factor - an adjustment to account for the difficulty of working on ladders and scaffolds (based upon the elevation of the system/component on which work is being performed).
	(continued)	A height factor of .2 was used for elevations between 20 and 40 feet and .4 for elevations above 40 feet. It is applied to the basic duration adjusted for a site specific labor factor.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
	(continued)	2. Respiration factor - an adjustment to account for the difficulty of working with a respirator. A respiration factor of .15 was used for work on contaminated systems/structures. It is applied to the basic duration adjusted for a site specific labor factor. 3. Protective clothing factor - an adjustment to account for the difficulty of donning and working in protective clothing. A protective clothing factor of .23 was used for work on contaminated systems/structures. It is applied to the basic duration adjusted for a site specific labor factor. 4. Radiation/ALARA consideration factor - an adjustment for the difficulty of working in a radiologically contaminated environment. A radiation factor of .15 was used for work on contaminated systems/structures. It is applied to the basic duration adjusted for a site specific labor factor. 5. Distributable labor factor - a markup on direct craft labor hours to account for indirect (distributable) labor and the erection of scaffolding. A distributable labor factor of .35 was used for all UCFs. It is applied to basic duration adjusted for a site specific labor factor.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
		6. Work break factor - an adjustment for work breaks allowed to craft labor. A work break factor of .083 was used for all UCFs. It is applied to the direct labor hours after applying the other adjustment factors.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
E	Decommissioning Engineering & Planning (continued)	The costs for this work package include the activities that are required to prepare and support the DP and prepare for decommissioning implementation. Costs for this work package end with DP approval. 1. LIPA staff costs include 1991 budgeted decommissioning-related expenditures through DP approval. LIPA costs do not include projections for license transfer-related expenditures. 2. NYPA staff costs include 1991 budgeted decommissioning-related expenditures through DP approval. NYPA costs do not include budgeted license transfer-related expenditures. 3. Conceptual engineering (external consultant) costs include 1990 contract expenditures relating to developing the DP. 4. Detailed engineering (external consultant) costs include 1991 contract expenditures for detailed decommissioning engineering and planning prior to DP approval. 5. Implementation support engineering (external consultant) costs include staff mobilization to Shoreham and the implementation of field support operations prior to DP approval. 6. The estimate does not include costs for plant maintenance prior to approval of the DP (and initiation of decommissioning).

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
DA	External Decommissioning Contractor	The costs for this work package include the decommissioning construction management services provided by an outside general contractor. The costs for these services are built into the UCFs as a markup on direct labor (64.3%) and materials (17.5%). Assumptions for the external decommissioning contractor include: 1. The contract will begin Oct. 1, 1991, and be completed Dec. 31, 1993. 2. An average cost for each staff category position was used with typical markups to cover payroll adds, burden and contractor profit. 3. Payroll costs assumed an average 160 hours per month per person. 4. All site personnel were assumed to be on a temporary assignment, with one return trip home per month and a per diem allowance. 5. An average monthly allowance was included for personal computer rental/purchase and incidental office equipment/supplies. 6. On-site office accommodations, utilities and services were assumed to be provided by the site and were not included in the cost estimate. 7. Relocation to and from the job site are covered in the per diem/travel allowance. 8. Costs are included to administer craft payroll.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
DB	Decommissioning Special Tools, Materials and Equipment	The costs for this work package include procurement of special tools and equipment, pipe cutting equipment, heavy equipment rental, decontamination equipment and bulk decontamination consumables. It also includes procurement labor for casks, liners and containers. Specific costs covered include: 1. Developing the WCS and DCS, and special tools for use in the WCS. Also included are costs to build specialized tools for sectioning reactor internals and the RPV (e.g., an underwater plasma arc torch on tracks). These costs were estimated by a specialty contractor with considerable experience in this type of work. 2. Equipment for temporary decontamination systems. 3. Heavy equipment rental costs based upon industry standards and databases. 4 Plasma arc and oxyacetylene torches, portable bandsaws, hydraulic shears and miscellaneous other pipe-cutting equipment. 5. Health physics supplies such as exposure monitoring instruments and protective clothing. 6. Rigging and tooling items required to remove piping systems and components. 7. Contracting for cask, liner and container purchase or rental (costs for purchasing or renting these items are included in the "Packaging" section for each line item).

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
DC	Systems Decontamination and Dismantling	The costs for this work package include chemically decontaminating and dismantling contaminated systems. They also include consolidation of contaminated material in a packaging area. Specific assumptions include: 1. Decontamination and dismantlement of systems identified as contaminated in the LILCO site characterization report: Reactor Recirculation (B-31) Control Rod Drives (C-11) Residual Heat Removal (E-11) Core Spray (E-21) Condensate Demineralizer Tanks (N-52) Reactor Water Cleanup (G-33) Fuel Pool Cooling and Cleanup (G-41) Liquid Radwaste (G-11) Process Sampling (P-33) The plant inventory for each system was prepared from LILCO drawings, equipment and structural systems. 2. Decontamination and removal include costs for craft labor and consumables. These costs are calculated based upon UCFs and the inventory for each system. 3. Packaging includes the cost of containers and the labor to package waste into containers. 4. Shipping costs include transportation of radioactive waste to the licensed disposal facility in Barnwell, S.C. They are based upon published rates for truck, container and cask shipments. 5. Burial costs are based upon a rate of $240 per cubic foot, which is explained in WBS category DF (Waste Management).

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
DD	Decontamination of Structures	The costs for this work package include decontamination and removal of plant areas and structures that are not part of a contaminated piping system. It also includes consolidation of contaminated materials in a packaging area. Specific assumptions include: 1. Areas identified as contaminated in the LILCO site characterization report are assumed to be decontaminated: Primary Containment Reactor Cavity Dryer-Separator Pool Spent Fuel Pool Radwaste Laydown Area Equipment/Floor Drains and Sumps Spent Fuel Racks There are no concrete structures identified as activated or contaminated to levels requiring removal. These structures will be retired in place and removal costs are not included. 2. Decontamination, removal, packaging, shipping and burial categories include the same costs as explained in WBS code DC (Systems Decontamination and Dismantlement) above.
DE	Reactor Pressure Vessel Dismantling (Continued)	The costs for this work package include full segmentation of the RPV and consolidation of contaminated material in a packaging area. Specific assumptions include:

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
	(continued)	1. A worst-case contamination scenario was used to calculate the cost of decommissioning the RPV and its internals. Costs in this category therefore include fabrication, testing, mockup, training and service of underwater cutting equipment. 2. Removal costs of all internals and the RPV itself are included. 3. RPV components to be removed include: RV Flange RV Shell RV Lower Head RV Upper Head Shroud Shroud Head Moisture Separator Steam Dryer Upper Guide Grid Core Support Plate Jet Pumps CRD, Incores CRD, Housings, Sleeves Mirror Insulation 4. RPV components will be sectioned at wet and dry cutting stations in the Reactor Building. Estimated costs to build these enclosures and supporting systems are included in the DB (Special Tools, Materials and Equipment) WBS category. 5. RPV section sizes will be based upon radiological conditions, size, weight, container availability and shipping vehicle capabilities.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
		6. The RPV and internals will be shipped to and buried at the licensed disposal facility at Barnwell, S.C. 7. Detailed packaging, shipping and burial assumptions are shown in WBS category DC (Systems Decontamination and Dismantlement).
DF	Waste Management (continued)	The costs for this work package are limited to the processing and disposal of liquid waste condensate demineralizer resins and contaminated solid waste. The packaging, shipping and burial costs for systems and the RPV appear with each specific work package. Container, shipping and burial costs shown here, however, apply to all packaging, shipping and burial activities. Specific assumptions include: 1. Burial cost for radioactive waste was assumed to be at $240 per cubic foot for disposal in year 1992. Included in this rate is a $40 per cubic foot base charge and a $120 per cubic foot surcharge, as mandated in the Federal Low-Level Radioactive Waste Policy Act (Public Law 99-240, as amended in 1985). The surcharge will apply to all New York waste until New York submits a complete license application for a low-level waste disposal facility. The remaining $80 per cubic foot is to allow for projected surcharges for Curie content, heavy packages, miscellaneous handling fees, taxes and special funds.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
		2. Container costs and labor for packaging radioactive wastes were estimated by container type: Type — Cost — Packing Time 55 gallon drum — $ 30 — 8 hours B-25 box — 500 — 10 hours CNS-8-120B liner — 4,450 — 24 hours CNS-14-195H liner — 4,800 — 24 hours C-container — 2,500 — 16 hours 3. Truck shipments of radioactive waste were estimated at $1,400 per shipment.
DG	Plant Staff, Decommissioning Support, Management and Administration (continued)	The costs of this work package include post-DP approval expenditures for LIPA, NYPA, LILCO, engineering construction support personnel, an IRP and NRC fees over the 27-month decommissioning schedule that is presented in Section 2.2. These costs represent 54.5 percent of the cost estimate. Specific assumptions include: 1. LILCO staff included is based upon projected needs for plant staff complement assuming a POL at time of DP approval. The estimate assumes that, in accordance with the Site Agreement, LILCO will provide personnel to staff some positions in LIPA's site organization in the areas of operations and maintenance, station services, decommissioning, finance/administration, licensing/regulatory compliance, QA and miscellaneous corporate support (see Figure 2.3-1). Contract security, maintenance and health physics personnel are included in the staff projections.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
		LILCO costs and miscellaneous contractors' costs were developed using the LILCO 1991 cost center budgets. Hourly rates for these functions were developed and applied to the anticipated number of personnel on site. 2. The estimate assumes integration of LIPA's and NYPA's staff with LILCO to create the site organization shown in Figure 2.3-1. NYPA costs have been estimated by Site Agreement cost category for each activity. 3. Estimated Shoreham plant staff costs during decommissioning were developed by using actual LIPA, NYPA and LILCO staff costs and contractor unit rates. The estimating bases reflect the requirements, relationships and provisions set forth in existing executed agreements and contracts. 4. IRP costs assume a panel of five consultants at $25,000 per year each for 27 months. 5. NRC fees assume a staff of two inspectors at $62 per hour for 173.33 hours per month for 27 months.
DH	Decommissioning Radiological and Environmental	The costs in this work package include final survey and testing activities required for license termination.

Table 5.1-3 Cost Estimate Assumptions

WBS	Name	Discussion
M	Miscellaneous	The costs in this work package include plant energy and nuclear insurance. 1. A full current plant electrical load of 4,295 MWh/ month at a cost of $31.00/MWh was used for the duration of decommissioning. 2. Costs for nuclear property insurance ($1.2 million per year) and nuclear liability insurance ($344,883 per year) were taken from the 1990 LILCO budget. LILCO's current levels of insurance were assumed to be maintained for the duration of decommissioning.

6.0 TECHNICAL AND ENVIRONMENTAL SPECIFICATIONS, AND OTHER ADMINISTRATIVE CONTROLS, IN PLACE DURING DECOMMISSIONING

The following sections address the Technical Specifications and other administrative controls and limits to be provided during the decommissioning of the Shoreham plant. Section 6.1 addresses those controls and limits for radiological and nuclear safety during decommissioning, while Section 6.2 addresses non-radiological environmental controls and limits.

6.1 Radiological and Nuclear Safety Controls and Limits

6.1.1 Defueled Technical Specifications (DTS)

A set of DTS was submitted to the NRC by LILCO on August 30, 1990 (Ref. 6-1) in connection with LILCO's efforts to obtain a DOL or POL for Shoreham. These DTS were prepared by LILCO following discussions with the NRC staff (see Ref. 6-2) and supersede those Technical Specifications originally proposed by LILCO in an attachment to its DOL/POL application (Ref. 6-3).

The DTS are primarily directed toward ensuring the safe storage and handling of irradiated fuel currently being stored in the Spent Fuel Storage Pool in the Reactor Building. Upon approval by the NRC, the DTS will eliminate the Safety Limits section, as well as the majority of the Technical Specification Limiting Conditions for Operation (LCOs) and Surveillance Requirements normally associated with full power operation of a BWR.

Because of the low burn-up condition of the Shoreham irradiated fuel (less than two effective full power days), a very limited amount of fission products is contained in the fuel and the rate of decay heat generation is negligible (i.e., less than 550 watts as of July 1989). Based on the low hazard associated with these conditions, the DTS do not require active cooling of the fuel, nor is secondary containment integrity required for fuel storage and handling purposes. The only fuel-related nuclear safety considerations addressed in the DTS are fuel criticality monitoring, Spent Fuel Storage Pool water level and chemistry, heavy load handling, fuel handling equipment operability, communications, building settlement, seismic monitoring and electric power availability. The electric power availability requirements are non-safety related and are included only for purposes of ensuring that sufficient instrumentation and control capability is available for monitoring and maintaining the unit status.

The remaining DTS requirements, which are not directly related to fuel, involve meteorological monitoring, sealed source contamination, area temperature monitoring, liquid holdup tank Curie limits and administrative (i.e., organizational and programmatic) controls. The programmatic requirements specify that a security plan, an emergency plan, a fire protection program, a Process Control Program, an Offsite Dose Calculation Manual, a QA program, a Radiological Effluents Control Program, a REMP and a Radiation Protection Program be maintained. Refer to the DTS (Ref. 6-1) for specific details of these provisions.

LIPA will maintain compliance with the fuel-related requirements of the DTS until the fuel has been completely dispositioned outside the Reactor Building. It should be noted that nearly all of the DTS requirements are structured so that they would not apply once the fuel is no longer stored in the Spent Fuel Storage Pool. Thus, since the fuel is considered to represent the primary potential radiological hazard at Shoreham (however small the risk), it is probable that LIPA, upon disposition of the Shoreham fuel, would apply to the NRC to eliminate any remaining controls in the DTS and provide any necessary controls by other administrative mechanisms.

6.1.2 Other Radiological Administrative Controls and Limits for Decommissioning

The DTS described in the previous section were developed prior to the preparation of detailed plans for decommissioning. The DTS are not intended to address the potential hazards which may be associated with particular decommissioning activities. Other measures are needed to ensure that appropriate protection is provided against such potential hazards.

In view of the extremely minor impact to plant workers and to the general public from routine decommissioning activities and from accidents postulated to occur during decommissioning (see Sections 3.2 and 3.4, respectively), LIPA does not consider it necessary that such measures take the form of Technical Specifications. It is considered appropriate to address this need through administrative controls, such as the programs, procedures and commitments described throughout this DP.

Refer to the following sections for details concerning the proposed programs, procedures and commitments which LIPA intends to implement during the decommissioning of Shoreham:

- Organization and responsibilities (Section 2.3)

- Training program (Section 2.4)
- Radiation protection programs (Section 3.2)
- Radioactive waste management (Section 3.3)
- Commitments and assumptions related to accident analysis (Section 3.4)
- Occupational safety (Section 3.5)
- Final termination survey (Section 4.1)
- Residual release criteria (Section 4.2)
- Environmental controls and limits (Section 6.2)
- Quality Assurance (Section 7.0)
- Security (Section 8.0)

The controls and limits described in the referenced sections are adequate to protect the environment and the health and safety of workers and the general public during Shoreham decommissioning activities.

6.2 Environmental Controls and Limits

On January 5, 1990, LILCO submitted an application to the NRC (Ref. 6-3) to amend the full-power operating license for Shoreham to a DOL or POL. Attached to the LILCO DOL/POL application is a set of Technical Specifications for the defueled condition which include, as Appendix B, a "Non-Radiological Environmental Protection Plan," or "EPP" (Ref. 6-3). With the exception of commitments related solely to impacts from full-power operation of the plant which have been removed, the EPP proposed in Reference 6-3 is identical to the EPP attached to the Shoreham full-power operating license. (This proposed revised EPP was resubmitted by LILCO to the NRC without additional changes along with the radiological DTS described in Section 6.1.1 above).

It is LIPA's intent upon transfer of the Shoreham license to adapt the EPP proposed by LILCO in References 6-1 and 6-3, as well as existing LILCO environmental controls (programs, procedures, permits, etc.) needed to meet federal, and any applicable state and local, environmental requirements.

6.3 References

6-1 "Revised Technical Specifications to Replace those of Attachment 2 to SNRC-1664," transmitted via LILCO letter SNRC-1752 from John D. Leonard, Jr. to U.S. Nuclear Regulatory Commission, August 30, 1990.

6-2 LILCO letter SNRC-1752 from John D. Leonard, Jr. to U.S. Nuclear Regulatory Commission, August 30, 1990.

6-3 "Proposed Revision to NPF-82 and Technical Specifications (NUREG-1357)," transmitted via LILCO letter SNRC-1664 from W.E. Steiger to U.S. Nuclear Regulatory Commission, January 5, 1990.

7.0 QUALITY ASSURANCE PROVISIONS FOR DECOMMISSIONING

LIPA will establish and implement a QA program for decommissioning of the Shoreham plant. This section defines the decommissioning QA program, including the program scope. In general, LILCO's proposed QA program, as presented in the DSAR Section 17.2, "Quality Assurance During the Defueled Phase" of Reference 7-1, is being adapted for use by LIPA. This section defines how the LILCO QA program will be applied by LIPA to decommissioning.

The existing LILCO QA program is structured to comply with 10 CFR 50 Appendix B (Ref. 7-2). The LIPA decommissioning QA program will be implemented for those items and activities listed in Table 7.0-1 to the extent required to assure that activities are conducted in a controlled manner designed to protect the health and safety of both project workers and the general public and to protect the environment.

The decommissioning QA program implemented by LIPA will provide for compliance with appropriate regulatory and license requirements. Specific QA requirements and organizational responsibilities for implementation of these requirements shall be specified in various implementing documents and procedures. The requirements stipulated in the program are mandatory and shall be imposed on all personnel and organizations, including contractors, who perform Shoreham plant decommissioning activities as defined in Table 7.0-1. Safety-related structures, systems and components will be defined and governed by the QA program description contained in Section 17.2 of the DSAR until fuel is removed from the plant.

7.1 Organization

The LIPA Shoreham project organization for decommissioning is described in Section 2.3. That discussion addresses the general responsibilities and qualifications of management personnel involved in decommissioning. This section describes applicable responsibilities for implementation of the decommissioning QA program for decommissioning. This section also describes in more detail the organization of the NQA Department.

The Executive Vice President-Shoreham Project, who reports directly to the LIPA Executive Director, is ultimately responsible for the QA program established to support the decommissioning of the Shoreham plant. The Executive Vice President-Shoreham Project will keep the Executive Director and the LIPA Chairman and Board of Trustees apprised of significant QA developments. He has overall responsibility for the engineering, modification, licensing, testing, maintenance and decommissioning of the Shoreham plant. This responsibility includes ensuring that organizations and personnel under his supervision comply with the QA requirements in the performance of their duties.

The Resident Manager has the overall responsibility for the implementation of the QA program for decommissioning. The Resident Manager will also have responsibility for implementation of the QA program requirements for maintenance and operation of safety-related structures, systems, and components as defined in the DSAR Section 17.2.

The NQA Manager reports directly to the Executive Vice President-Shoreham Project and is responsible to the Resident Manager for administration of the decommissioning QA program. The NQA Manager also has direct access to the LIPA Executive Director as he deems necessary. This organizational arrangement provides the necessary independence between personnel performing activities subject to the controls of the QA program and those responsible for performing the reviews, audits, surveillance and inspections.

The NQA Manager is responsible for directing the activities of the QC and Quality Systems (QS) Managers. His principal objective is to ensure that the Shoreham plant and all support organizations establish and conform to adequate standards and procedures in accordance with the QA manual. He has the authority to stop work when circumstances so warrant. His duties and responsibilities include the following:

(1) Development and administration of the overall QA program to be applied during decommissioning of the Shoreham plant, including the modification of the LILCO Quality Assurance Manual to meet LIPA's decommissioning QA/QC requirements as specified throughout this section of the DP. He is responsible for distribution and control of the LIPA Quality Assurance Manual (QAM) and NQA procedures, and revision of QA program documents as required

(2) Defining the content of and changes to the QAM subject to review and approval

(3) Maintaining a working interface and communications with other organizations, regulatory agencies, consultants, contractors, inspection firms, etc., as required to effectively execute LIPA's QA program requirements

(4) Assuring the establishment and continuous implementation of the QA training program for QA and other project personnel

(5) Review and approval of applicable documents to assure the inclusion of appropriate quality requirements

(6) Performance of audits to evaluate the implementation of the QA Program

(7) Participation as a member of the SRC.

The NQA Manager is authorized to evaluate the manner in which all activities, both at the station and off-site, are conducted with respect to quality by means of reviews, audits, surveillance and inspections. He shall perform this evaluation on a planned and periodic basis to verify that the QA program is being effectively implemented. He is responsible for periodically evaluating and reporting on the status and adequacy of the QA program and its implementation to the appropriate levels of LIPA's management. He has the authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions, through designated channels; and to verify implementation of corrective action(s). He has the authority to initiate stop work action or to control further processing, delivery or installation of nonconforming material through designated channels.

The NQA Department will be composed of engineers as well as other technical and clerical personnel as needed to effectively implement LIPA's QA program. Additionally, the staff may be supplemented when necessary by consultants, contractors or other organizations. Line responsibility, coordination and communication in such cases shall be through the QC and QS Managers.

Qualifications of the NQA Manager are described in Section 2.3 of this DP.

The Decommissioning Manager is responsible for implementation of site nuclear decommissioning activities in accordance with the applicable provisions of the LIPA QA program. This includes assuring that the required controls are placed on engineering, decontamination and dismantlement activities. Such responsibilities are also applicable to the work performed by contractors, subcontractors, etc., under the direction of the Decommissioning Manager.

The Operations and Maintenance Manager is responsible for operation and maintenance of plant systems and equipment and is also responsible for implementing required controls in the area of radiation protection and safety.

7.2 Shoreham Quality Assurance Program

LIPA's QA program will be derived from the existing LILCO QA program. It will consist of two sets of requirements documents: the DSAR Section 17.2 requirements for safety-related structures, systems and components that are needed in maintaining the Shoreham plant until such time as the nuclear fuel is removed from the site; and the QA requirements for decommissioning activities.

With respect to QA requirements for decommissioning activities the LIPA QAM will be developed to establish the overall quality requirements which govern the implementing documents (i.e., procedures). The QAM shall describe how compliance with appropriate quality and safety requirements is to be accomplished. The manual shall be issued under the authority of the Executive Vice President-Shoreham Project and shall be reviewed and approved by the NQA Manager. Changes to the QAM shall be reviewed and approved by the NQA Manager and by the Executive Vice President-Shoreham Project.

Procedures will be developed which provide specific controls and instructions for performing the decommissioning activities specified in Table 7.0-1. Procedures shall be provided where applicable to assure that activities important to quality or health and safety are performed in the required manner. Procedures shall be approved by authorized personnel reviewed by technically competent persons other than the preparer, reviewed by QA personnel and approved by the SRC, when related to the decommissioning activities specified in Table 7.0-1. The process of procedure review and approval will be formally designated in a written administrative procedure.

Training programs shall be established for those personnel performing activities specified in Table 7.0-1 such that they are knowledgeable about the documents and their requirements and proficient in implementing these requirements. These training programs shall assure the following:

(1) Personnel responsible for performing activities are instructed as to the purpose, scope and implementation of applicable controlling documents.

(2) Personnel performing activities are trained and qualified, as appropriate, in principles and techniques of the activity being performed.

(3) The scope, objective and method of implementing training programs are documented.

7.3 Design Control

Engineering and design functions shall be subject to LIPA's QA program. Design control procedures shall be developed by the Operations and Maintenance Manager and approved by the NQA Department.

Appropriate provisions of design control shall include specifying design input, specifying applicable regulatory requirements, codes, and standards, the correct translation of input in design documents, verifications of design by persons other than the originator and assurance that changes to the design beyond design tolerance are properly reviewed and controlled. Design controls shall include appropriate controls over design interfaces. Design documents include documents such as drawings, specifications, calculations and data sheets. Computer programs used for engineering and design shall also be documented, verified and validated for their intended use, and configuration controlled.

When measurements and samples are required for such activities as the site radiological characterization and final radiation survey, data quality objectives shall be established. Data quality objectives shall be defined in terms of precision, accuracy, repeatability, comparability, completeness, minimum detection levels and acceptable error rates. Sampling activities shall be described in plans and procedures. Specific QC samples will be taken to evaluate data quality and data will be validated to assess the objectives and other QA requirements (e.g., calibration). QC samples shall include, as appropriate, background samples, redundant samples and laboratory spiked samples. Data quality evaluation shall include the in-process utilization of such techniques as QC charts.

7.4 Procurement Document Control

Measures shall be established to assure that applicable requirements (regulatory requirements, codes, standards, design bases, etc.) are clearly included or referenced in the procurement documents for material, equipment and services. For purchased goods or services falling under LIPA's decommissioning QA program, the scope of which is specified in Table 7.0.1, the procurement documents shall specify quality requirements which are consistent with those specified throughout this section of the DP.

Requirements related to the procurement of equipment, components and services will be specified in a written administrative procedure. Procurement documents and changes thereto, including documents which initiate the procurement process, shall be approved by designated management personnel and shall be approved by the NQA Department to ensure that applicable QA and regulatory requirements, design bases and other requirements are adequately and clearly specified prior to release.

7.5 Instructions, Procedures and Drawings

Instructions, procedures and drawings shall be developed to the extent necessary to assure that activities specified in Table 7.0.1 are conducted in a controlled manner designed to protect the health and safety of both project workers and the general public. Instructions, procedures and drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Implementation of such procedures will be subject to QA surveillance and audit. Existing Shoreham plant LILCO instructions, procedures and drawings shall be used to the maximum extent practical to ensure continuity with existing operations. The following typical procedures for decommissioning shall be developed as the need(s) arise:

(1) Plant administrative procedures
(2) Design control procedures
(3) Audit procedures
(4) QA surveillance procedures
(5) Document control procedures
(6) Records management procedures
(7) Emergency procedures
(8) Calibration procedures
(9) Radiation protection procedures
(10) Process procedures
(11) Sampling procedures
(12) Pipe and metal cutting procedures
(13) Radioactive material packaging and shipment procedures
(14) Inspection procedures
(15) Decontamination procedures.

7.6 Document Control

Measures shall be established to control the issuance of documents, such as instructions, procedures and drawings, including changes thereto, which prescribe the performance of activities specified in Table 7.0-1. These measures shall assure that documents, including changes, are reviewed for technical adequacy and approved for release by authorized personnel and distributed and controlled to assure that current copies are made available and are being used by personnel performing the prescribed activities. Instructions, procedures and drawings shall be reviewed by a technically competent person other than the preparer, reviewed by NQA personnel and approved by a management member of the organization responsible for the prescribed activity. Procedures for activities covered by Table 7.0-1 shall be approved by the SRC. When plans, instructions, procedures and/or drawings are packaged for implementation, such packages shall be reviewed and approved to assure that all technical and QA/QC requirements are included and that requirements are not missed during the course of assembling such packages. Changes to documents shall be reviewed and approved by the same organization that performed the original review and approval.

7.7 Control of Purchased Material, Equipment and Services

Measures shall be established to assure that purchased material, equipment and services conform to procurement documents. These measures shall include provisions, as appropriate, for vendor evaluation and selection, objective evidence of quality furnished by the vendor, inspection and audit at the vendor source, and inspection of products upon delivery. The vender's technical adequacy and the adequacy of the vendor's QA shall be verified prior to use. The effectiveness of the control of contractor services shall be assessed by surveillance and audit at intervals consistent with the importance of the service.

Material and equipment for items and activities included in Table 7.0-1 shall be inspected upon receipt at the plant site prior to use or storage to determine that procurement requirements are satisfied. These inspections shall be implemented consistent with the potential adverse health effects resulting from the use of the material or equipment.

7.8 Identification and Control of Materials, Parts and Components

Measures shall be established for the control of materials, parts and components for items and activities specified in Table 7.0-1. Such items shall include samples obtained for the site radiological characterization and the final radiation survey until they are no longer needed. These identification and control measures shall be designed to prevent the use or shipment of incorrect or defective materials, parts and components.

7.9 Control of Special Processes

Measures shall be established to assure that special processes, including welding, nondestructive examination (NDE), decontamination and radiological and chemical analyses are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria and other special requirements.

Welding Procedures

Welding shall be performed in accordance with qualified procedures. Such procedures shall be qualified in accordance with applicable codes and standards, shall be reviewed to assure their technical adequacy, and shall be performed by qualified personnel.

NDE Procedures

NDE shall be performed in accordance with procedures formulated in accordance with applicable codes and standards, shall be reviewed to assure their technical adequacy, and shall be performed by personnel qualified in accordance with applicable codes and standards.

Decontamination Procedures

Decontamination of systems and structures to be released for unrestricted use shall be performed in accordance with procedures formulated in accordance with applicable codes and standards, shall be reviewed to assure their technical adequacy, and shall be performed by qualified personnel.

Analytical Procedures

Analysis of samples for release of systems and structures for unrestricted use, for radioactive shipments, and for the final radiation survey shall be performed in accordance with procedures formulated in accordance with applicable codes and standards, shall be reviewed to assure their technical adequacy, and shall be performed by qualified personnel.

7.10 Inspection

Measures shall be established for inspection of items and activities specified in Table 7.0-1 to verify conformance with documented instructions, procedures and drawings. Inspection witness and hold points shall be established as determined appropriate by technically competent personnel, with the concurrence of the NQA Department.

Required inspections and surveillances shall be performed in accordance with appropriate instructions. Such instructions shall contain a description of objectives, or surveillance acceptance criteria, and prerequisites for performing the inspection or surveillance. The instructions shall also specify any special equipment or calibrations required to conduct the inspection.

Personnel performing required inspections shall be qualified based upon experience and training in the applicable inspection method(s). Required inspections shall not be performed by individuals who are assigned to either perform or directly supervise the inspected activity.

7.11 Test Control

Measures shall be established to assure that tests necessary to assure quality or health and safety are controlled and accomplished, and test results are approved by authorized personnel in accordance with approved procedures. Such tests shall include verification of capacity of cranes and transport vehicles prior to use in performing critical moves.

7.12 Control of Measuring and Test Equipment

Measures shall be established to assure that tools, gauges, instruments and other measuring and test equipment used in the activities specified in Table 7.0-1 are properly controlled, calibrated and adjusted in accordance with approved procedures at specified periods to maintain accuracy within necessary limits.

7.13 Handling, Storage, Shipping and Housekeeping

Measures shall be established to control the handling, storage and shipping of radioactive materials and to maintain acceptable levels of housekeeping. Areas shall be provided for storage, control and containment of radioactive material (including samples). Also, as discussed previously, ALARA principles shall be implemented to control radiation exposure to personnel.

Handling, storage and shipment of radioactive material shall be controlled based upon the following criteria:

(1) Safety restrictions concerning the handling, storage and shipping of packages for radioactive material shall be followed.

(2) Shipments shall not be made unless all tests, certifications, acceptances and final inspections have been completed.

(3) Procedures shall be provided for handling, storage and shipping operations.

Shipping and packaging documents for radioactive material shall be consistent with applicable state and federal regulations.

7.14 Inspection, Test and Operating Status

Inspection, test and operating status of equipment and components associated with radioactive material shall be established based upon the following:

(1) Inspection, test and operating status for radioactive material shall be indicated and controlled.

(2) Status shall be indicated by tag, label marking or log entry.

(3) Status of nonconforming parts or packages shall be positively noted and tracked.

7.15 Nonconforming Materials, Parts or Components

Measures shall be established to control materials, parts or components which do not conform to specified requirements in order to prevent their inadvertent use. These measures shall include, as appropriate, procedures for identification, documentation, segregation, disposition and notification to affected organizations. Nonconforming items shall be reviewed and accepted, rejected, repaired or reworked.

7.16 Corrective Action

Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, discrepancies, deviations, defective materials and equipment, and nonconformances are promptly identified and corrected. The identification of the condition adverse to quality, the cause of significant conditions and the corrective action taken shall be documented and reported to appropriate levels of management.

7.17 Quality Assurance Records

Records shall be maintained to furnish evidence of activities affecting quality. Records shall be identifiable and retrievable. Requirements shall be established concerning records retention, such as duration, location and assigned responsibility. Such requirements shall be consistent with the potential impact on quality, health and safety of the public, safety of project personnel and applicable regulations. Such records shall include:

(1) Personnel Qualification Records - Qualification records of personnel including those personnel performing special process activities, such as welding, NDE, etc.

(2) Procurement Records - Quality related procurement documents.

(3) Audit, Inspection and Surveillance Reports - Appropriate records pertaining to audits, inspections and surveillances.

(4) Radioactive Material Control - Records associated with radioactive material and personnel exposure.

(5) Final Site Survey Records - Records associated with the final radiation survey and any equipment released for unrestricted use in accordance with draft Regulatory Guide DG-1006 (Ref. 7-3).

7.18 Audits

The NQA Manager shall implement a system of planned audits to verify compliance with appropriate requirements of the decommissioning QA program (including subcontractor QA programs) and the Shoreham plant Physical Security Program, Fire Protection Program and Emergency Preparedness Program. Audits shall determine the effectiveness of the programs. The audits shall be performed in accordance with written procedures or checklists by appropriately trained personnel not having direct responsibility in the areas being audited. Audits shall be used to verify technical performance as well as procedural compliance. Audit results shall be documented and reviewed by management having responsibility in the area audited. Follow-up action, including verification of discrepant areas, shall be taken where indicated.

Audit reports covering the results of each audit shall be prepared. These reports shall include a description of the area audited, identification of individuals responsible for implementation of the job function(s) audited and for performance of the audit, identification of discrepant areas and recommended corrective action as appropriate. Audit reports shall be distributed to the appropriate management level and to those individuals responsible for implementation of audited job functions.

Measures shall be established which assure that discrepancies identified by audits or other means are resolved. These measures shall include notifications of the manager responsible for the discrepancy, obtaining satisfactory corrective action and verification of corrective action implementation. Discrepancies shall be resolved by the manager responsible for the discrepancy. Line management shall resolve disputed discrepancies.

7.19 References

7-1 Long Island Lighting Company," The Shoreham Nuclear Power Station Defueled Safety Analysis Report," Attachment 3 to LILCO letter SNRC-1664 from W.E. Steiger to U.S. Nuclear Regulatory Commission, January 5, 1990.

7-2 Code of Federal Regulation, Title 10, Part 50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants."

7-3 U.S. Nuclear Regulatory Commission, Draft Regulatory Guide, Task DG-1006, "Records Important to Decommissioning of Nuclear Reactors," September 1989.

7-4 C.F. Holoway et al, "Monitoring for Compliance with Decommissioning Termination Survey Criteria (prepared for the Nuclear Regulatory Commission by Oak RidgeNational Laboratory), NUREG/CR-2082.

Table 7.0-1

Decommissioning QA Program Applicability

1. Protection of the radiological health and safety of the public, project personnel, and the environment (including RETS, REMP, ODCM)
2. Exposure to radiation
3. Adherence to NRC regulations
4. Design, procurement, fabrication and operation of decontamination equipment
5. Design, procurement, erection, testing and operation of specialty/engineering equipment for dismantlement and disposition of contaminated equipment (RPV, piping)
6. Control of radioactive material and contamination
7. Shipment of radioactive waste
8. Control of activities for site characterization for decommissioning engineering
9. Control of activities for the final site radioactive survey as described in NUREG-CR-2082 (Ref. 7-4)

8.0 SECURITY

8.1 Current Security Plan Provisions

In October 1990, LILCO submitted to the NRC the Shoreham Nuclear Power Station Security Plan for Long Term Defueled Condition (Ref. 8-1), and Addendum A, Long Term Defueled Condition, No Spent Fuel in the Secured Area (Ref. 8-2).

LIPA's decommissioning security plan will utilize the NRC approved versions of References 8-1 and 8-2 to a large extent, with the most notable differences explained in Section 8.2. Both References 8-1 and 8-2 are applicable since it is anticipated that fuel will still be on site at the onset of decommissioning.

8.2 LIPA Decommissioning Security Plan

References 8-1 and 8-2 are LILCO security plans, and as such do not reflect the considerations resulting from the transfer of the Shoreham plant and license to LIPA. Accordingly, LIPA will revise the Reference 8-1 plan to reflect the transfer to LIPA, assuming fuel is still in the Spent Fuel Storage Pool. Changes to Reference 8-2 will be implemented when the fuel is removed from the Spent Fuel Storage Pool, which is expected to be completed by March 1993.

8.2.1 Facility Description

Transfer of Shoreham to LIPA will necessitate changes to the physical description of the plant in the security plans because revised boundary lines are to be established between LIPA's and LILCO's property. Figure 8.2-1 shows the anticipated LIPA Secured Area (defined in References 8-1 and 8-2) during decommissioning, before and after fuel is removed. Changes to this may be required to support certain decommissioning activities such as fuel removal, and will be reflected in the decommissioning security plan.

The Owner Controlled Area will remain as described in References 8-1 and 8-2, and will remain LILCO property. The Protected Area will initially be limited to the Refueling Deck, Elevation 175' of the Reactor Building, as it is described in Reference 8-1. After fuel is removed, the Protected Area will no longer be required and will be eliminated (see Reference 8-2).

There are no Vital Areas as defined in 10 CFR 73.2 (see Reference 8-1).

8.2.2 Organization

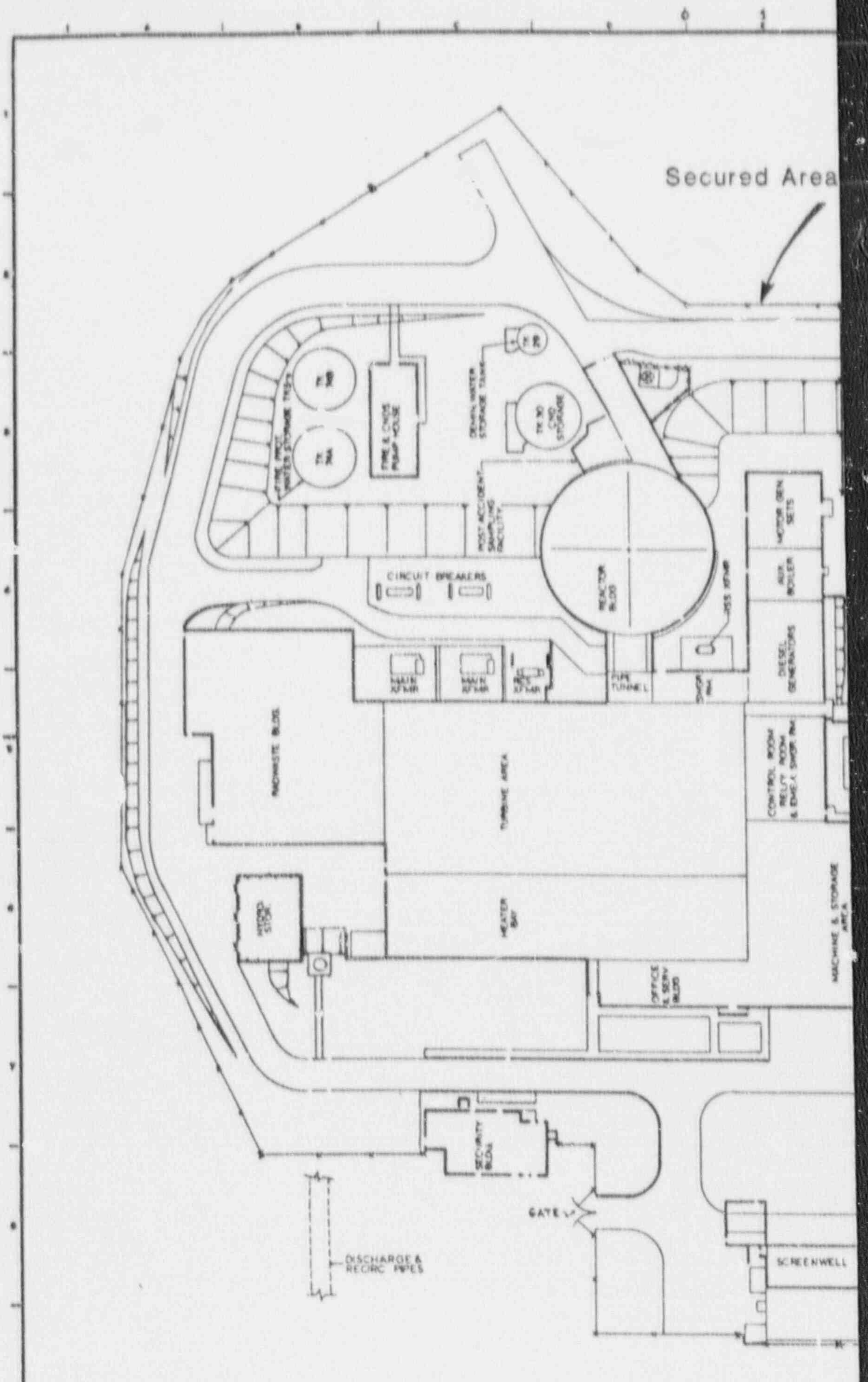
LIPA's organization responsible for Shoreham plant security is broadly described in Section 2.3. As part of the process of transferring the Shoreham plant from LILCO to LIPA, LIPA intends to assimilate the existing LILCO security organization so as to provide physical protection of the plant following transfer. Thus, it is expected that the organizations described in References 8-1 and 8-2 would remain largely intact, with limited changes to reflect LIPA's ownership of the plant and the organizational structure described in Section 2.3.

Since LILCO will retain title to the Owner Controlled Area, patrols of this area will jointly be managed by LIPA and LILCO.

8.3 References

8-1 Long Island Lighting Company, "Shoreham Nuclear Power Station Security Plan for Long Term Defueled Condition," transmitted via letter SNRC 1762 from John D. Leonard, Jr. to U.S. Nuclear Regulatory Commission, October 9, 1990.

8-2 Long Island Ligthing Company, "Shoreham Nuclear Power Station Security Plan for Long Term Defueled Condition, Addendum A, No Spent Fuel in the Secured Area," transmitted via latter SNRC-1762 from John D. Leonard, Jr. to U.S. Nulear Regulatory Commission, October 9, 1990.


Secured Area
FIRE PROT. WATER STORAGE TKS
TK 76A
TK 76B
FIRE & CHLOR PUMP HOUSE
DEMIN WATER STORAGE TANK
TK 30 CND STORAGE
POST ACCIDENT SAMPLING FACILITY
CIRCUIT BREAKERS
REACTOR BLDG
MAIN XFMR
MAIN XFMR
RES XFMR
PIPE TUNNEL
SWGR RM
MOTOR GEN SETS
AUX BOILER
DIESEL GENERATORS
CONTROL ROOM RELAY ROOM & EMER SWGR RM
RADWASTE BLDG
TURBINE AREA
HEATER BAY
HYDRO STOR
OFFICE & SERV BLDG
MACHINE & STORAGE AREA
SECURITY BLDG
GATE
SCREENWELL
DISCHARGE & RECIRC PIPES

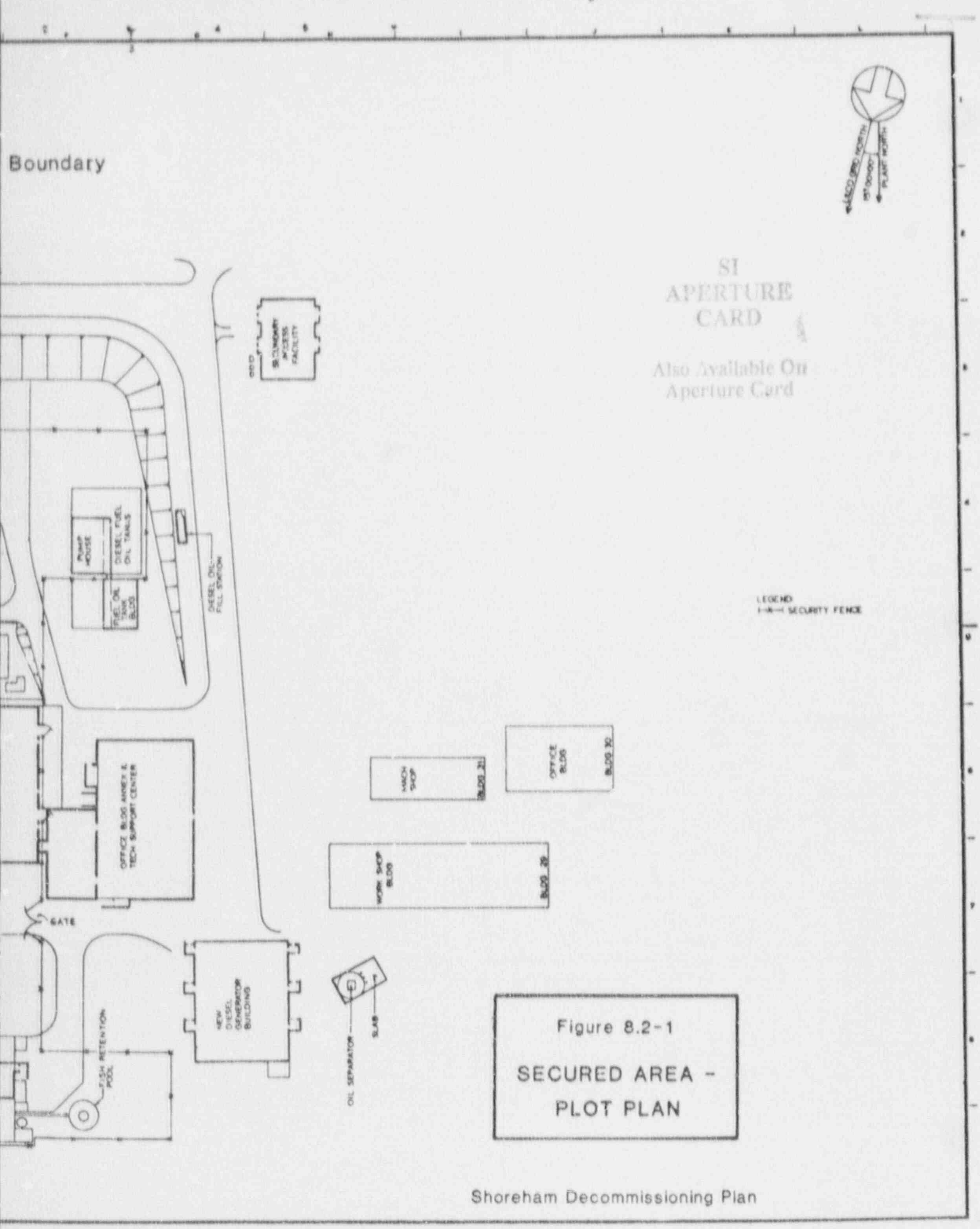


Figure 8.2-1

SECURED AREA -
PLOT PLAN

Shoreham Decommissioning Plan

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