U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION V

Report No. 50-312/80-32

Docket No. 50-312 License No. DPR-54 Safeguards Group ______

Licensee: Sacramento Municipal Utility District

P. O. Box 15830

Sacramento, California 95813

Facility Name: Rancho Seco

Inspection at: Clay Station and Sacramento, California

Inspection conducted: September 22 - October 3, 1980

Inspectors:	H S North H. S. North, Radiation Specialist, NRC, (Team Leader)	1/12/81 Date Signed
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	H S North for J. B. Smathers, PhD., University of California at Los Angeles	1/12/81 Date Signed
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Approved by:	F. A. Wenslawski F. A. Wenslawski, Chief, Reactor Radiation Safety Section	1/12/81 Date Signed
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Inspection Summary:

Inspection on September 22 - October 3, 1980 (Report No. 50-312/80-32)

Areas Inspected:

Special, announced appraisal of the health physics program, including organization and management, qualifications and training, quality assurance, procedures, external and internal exposure controls, survey and access controls, instrumentation, ALARA, radioactive waste, facilities and equipment, accident response capabilities and NUREG-0578 - Lessons Learned items. The inspection involved 360 inspector-hours onsite by five NRC inspectors.

Results: Several significant weaknesses in the health physics program were identified. These weaknesses are in the areas of staffing and organization (Section 2.4), exposure controls (Section 4.4), ALARA (Section 6.1), Facilities and Equipment (Section 7.7), and general procedure development (Section 9.1).

No items of noncompliance were identified.

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1.0 Health Physics Appraisal - Introduction

The Health Physics Appraisal Team's review of the Rancho Seco Nuclear Generating Station's radiation protection organization and practices was not structured or conducted as a compliance inspection, in that the scope of the review was broader than is normal in such inspections, reaching into the management of the program at both the site and corporate level. Further, the team was not constrained by existing Technical Specifications or regulatory requirements as a basis for their conclusions. In judging acceptability, the team used their collective professional judgement on numerous occasions to evaluate areas not covered by regulations.

In a number of areas, the team considered present practices in need of corrective action but at the same time did not believe the existing conditions posed an immediate threat to the health and safety of the workers or the public at large. Conversely, the labeling of an area of interest as acceptable should not be inferred as meaning no further improvement is warranted.

The Appraisal Team wishes to acknowledge the cooperation and frankness exhibited by members of the SMUD organization interviewed.

The Team was very favorably impressed by the unusually high level of housekeeping observed at the station. Further, the support of outside training and the opportunity for participation in technical meetings was found to be outstanding.

During the Appraisal, the Team was convinced by interviews with management and bargaining unit personnel of a strong management commitment to a good radiation protection program. However this commitment was not found to be clearly communicated to all levels of the organization from a high management level.

The Appraisal Team participated in and observed training, toured the facility both collectively and individually, interviewed management and bargaining unit personnel, examined facilities and equipment, reviewed procedures and records, and observed work practices. It is believed that the team achieved a good understanding of the strengths and weaknesses of the existing program. The Team believes that the resulting conclusions can be beneficial in developing a stronger and more effective health physics and radiation protection program.

The Appraisal Team consisted of the following individuals:

James B. Smathers, Ph.D., Director of Medical
Physics, Department of Radiation Oncology, UCLA
Certified American Board of Health Physics
Registered Professional Engineer
Former licensed Senior Reactor Operator

Leo H. Munson, Senior Research Scientist,
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Certified American Board of Health Physics

Seymour Block, Senior Health Physicist,
Radiological Assessments Branch
Office of Nuclear Reactor Regulation, USNRC
Certified American Board of Health Physics

Raymond F. Fish, Senior Radiation Specialist,
Region V, USNRC
Registered Professional Engineer (Nuclear Engineering)

Harry S. North, Senior Radiation Specialist,
Region V, USNRC
Certified American Board of Health Physics
Team Leader

2.0 Radiation Protection Organization and Management Oversight

2.1 Onsite Organization

2.1.1 Description

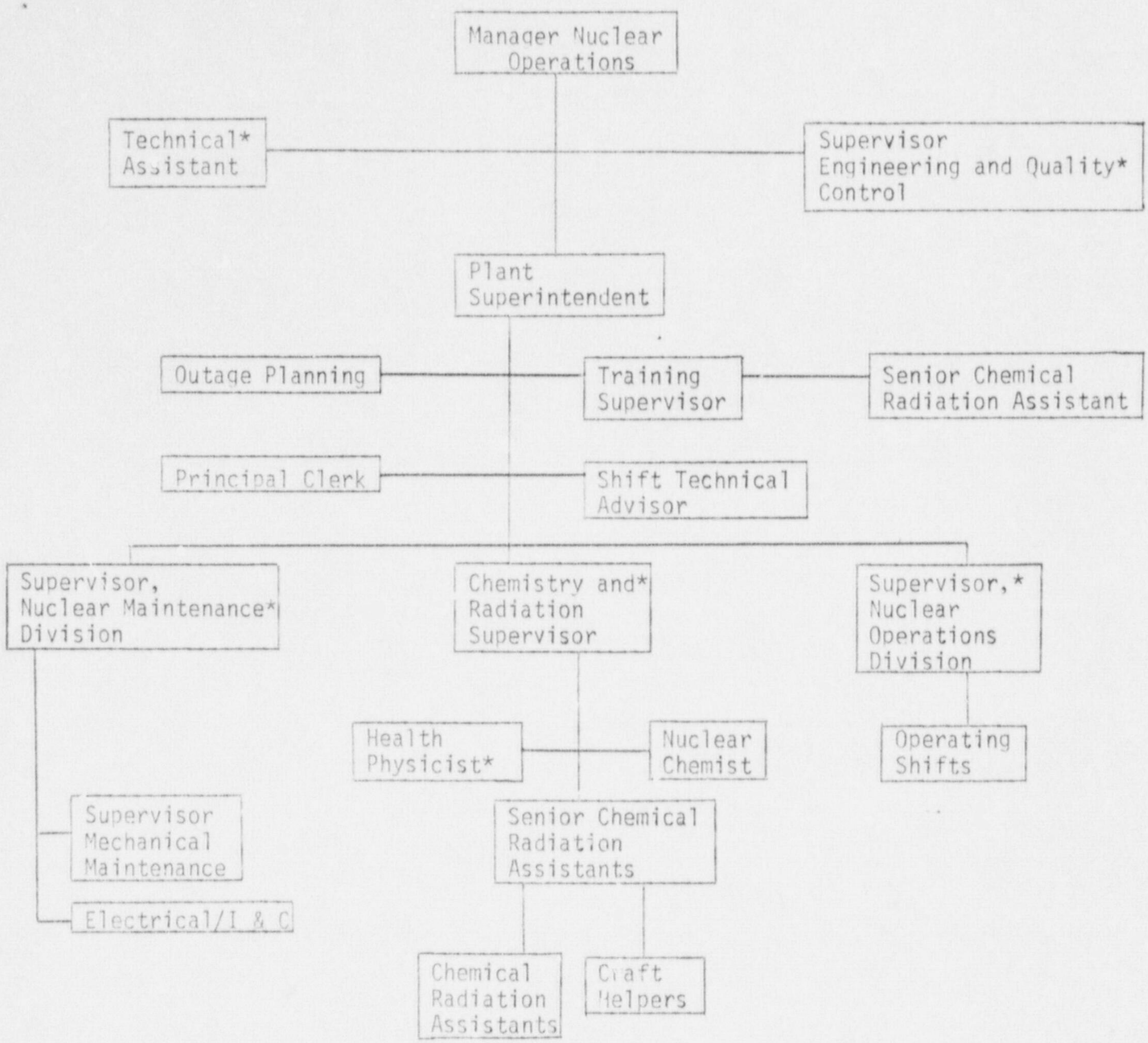
The organization of Rancho Seco Nuclear Generating Station is as shown in Figure 6.2-2 of the Technical Specifications and as shown, with emphasis on radiation protection, in Figure 1.

The Chemistry and Radiation Supervisor (CRS) has direct access and reports to the Plant Superintendent. Direct supervision of Chemical and Radiation Assistants (CRA) (technician level personnel), is by the Senior Chemical and Radiation Assistants (SCRA). Two acting SCRAs have been assigned to special functions, one to the training organization and the other to radioactive waste related activities.

The SCRA assigned to radwaste is assisted by CRAs and Craft Helpers (CH).

The Nuclear Chemist (NC) and Health Physicist (HP) provide technical support to the CRS but normally have no responsibilities for supervising personnel or staff support. The NC acts for the CRS during this absence.

Although the existing organization provides for direct, prompt communication between the CRS and the Plant Superintendent, in practice a breakdown of this desired goal may be



*Denotes membership on Plant Review Committee

RANCHO SECO NUCLEAR GENERATING STATION
ONSITE ORGANIZATION

Figure 1

occurring. As a result of increasing demands on the Plant Superintendent's and CRS's time, caused by increased public and industry concerns and regulatory pressures, the opportunity for interaction has been substantially reduced.

2.1.2 <u>Duties and Responsibilities</u>

Rancho Seco, Administrative Procedure AP-1, Rev. 5, <u>Responsibilities and Authorities</u>, supplements the functions described in specific job descriptions for the CRS, NC, HP and SCRAs. The CRS has overall responsibility for the technical and administrative aspects of the chemistry and radiation protection program which includes chemistry, radiochemistry, radiation protection, ALARA, environmental monitoring, radioactive discharges, radioactive waste, internal quality control programs, maintaining the emergency plan current and maintaining contact with offsite agencies. The CRS is also a permanent member of the Plant Review Committee (PRC). The procedure redelegates certain of these responsibilities to the NC, HP and SCRAs. The NC is assigned technical responsibility in the area of chemistry and radiochemistry and is delegated the responsibilities of the CRS during his absence.

The responsibilities assigned to the HP include the following major areas;

1. ALARA - develop, refine and verify application of programs, make suggestions for plant modifications;

2. Health Physics - develop, modify and provide implementation guidance to SCRAs, analyze radiation data and provide training;

3. Records - insure maintenance of required records of dosimetry, shipments, releases, etc;

4. Emergency Planning - maintain plan current, plan drills and exercises and conduct critiques, respond to emergencies;

5. Quality Control - provide internal review of health physics operations;

6. Evaluate Policies concerning - radiation and environmental monitoring, radiation counting and control.

The SCRAs are assigned principal responsibility for supervision of and the assignment of duties to the CRA, CH staff, the conduct of chemistry, radiochemistry and health physics activities and training in practical aspects of assigned duties. In addition, they are to evaluate, develop and recommend changes in the areas of analytical, control and health physics procedures. SCRAs are expected to work with outside contractors in the areas of waste disposal, whole body counting, environmental monitoring and health physics support activities.

Section 1.0, General Information of the Radiation Control Manual, AP-305, states in part that; "The requirements contained herein, are no different for SMUD (Sacramento Municipal Utility District) personnel than any other SMUD safety requirements; and as a result, failure to comply with Radiation Control Procedures can result in disciplinary action and possibly even dismissal." The CRS stated that this was interpreted as authority to enforce radiation protection requirements.

Job descriptions are available for all positions and are understood by the incumbents. There appears to be a lack of understanding of the responsibilities assigned to the radiation protection group on the part of other working groups, e.g., operations and maintenance. The lack of understanding is greatest among offsite groups, e.g., contractors and construction, who view the radiation protection group as responsible for post job cleanup.

The job descriptions provide an adequate description of responsibilities, authorities and reporting chains at the supervisory level.

2.1.3 Staffing

At the time of the Appraisal the Chem-Rad organization was not fully staffed. The organization was authorized a total of 16 CRAs and 7 CHs however, the staff included only 11 CRAs and 3 CHs. Five contract radiation protection technicians were onsite to augment the permanent staff. Six of the CRAs had been recently hired and were not fully trained. The HP had submitted his resignation and his last day coincided with the last day of the Appraisal.

A total of five SCRAs (3 permanent and 2 temporary) were on the staff. The three permanent SCRAs were assigned responsibilities for health physics, chemistry and radiochemistry

and internal quality control/training. One of the temporary SCRA's was assigned permanently to the training organization and the other was assigned to radwaste related activities.

Prior to the establishment of a new position a <u>Goal Oriented Job Analysis</u> (GOJA) must be completed for the proposed position. After appropriate processing by the personnel organization, the positions may be approved. GOJAs had been completed for both the temporary SCRA positions and job announcements for permanent positions were expected shortly.

Discussions with the CRS and SCRA (health physics) identified direct supervision of CRAs as a problem area. Both stated that responsibilities associated with their respective positions severly limited the opportunity for job site supervision of CRAs. At the time of the appraisal the CRS was pre a GOJA for the position of Assistant Chemistry a iation Supervisor (ACRS). This position would provide r direct supervision of the health physics, chemistry and quality control/training SCRAs.

The CRS believed that since the position which he occupied was becoming increasingly administrative in character, the creation of a subordinate technical supervisory position (ACRS) was necessary to relieve the SCRAs of some administrative duties and provide for more direct supervisory effort.

Delays in establishing this position, which had been approved in principle by plant management, appeared to be principally concerned with the GOJA and with obtaining approval of the proposed salary schedule. Since Rancho Seco is a municipal utility, operating under civil service rules, greater difficulty apparently exists in creating new positions and obtaining salary schedule revisions than for utilities not constrained by such rules.

During outage periods the existing staff is restructured to create a two shift work force. The HP and NC split the two shifts with two SCRAs on days and one SCRA on the back shift. One CRA is assigned to chemistry duties and all others to radiation protection activities. The permanent CRA staff is augmented with contract technicians who are assigned the more routine duties while the CRAs are assigned the more unusual tasks.

The staffing level in the past did not permit the assignment of specialists exclusively to specific tasks, however with increasing support from the District (SMUD) office greater specialization is possible and is occurring in such areas as Emergency Planning.

Administrative support for the Chem-Rad group consists of a Senior Utility Typist Clerk, a Clerk Typist and a Clean Room Clerk. The Clean Room Clerk performs such functions as stocking clean anti-contamination clothing.

The CRS reported that increased staffing of 4 or 5 CRA's and one SCRA would probably be required if shift health physics coverage was required.

2.2 District Organization

2.2.1 Description

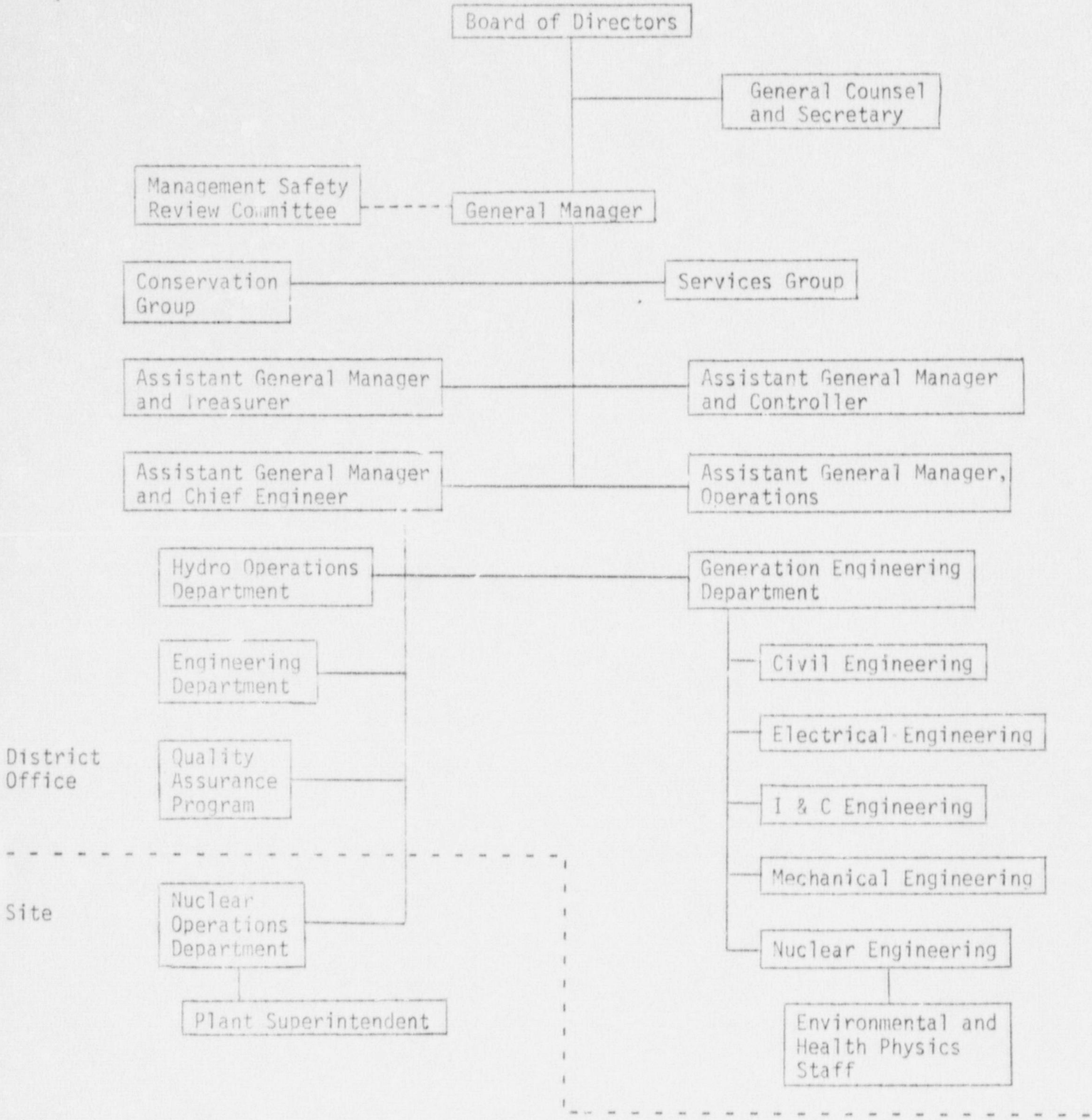
Until recently the District office support of station radiation protection activities was limited to a single individual. Recent additions to the staff have made possible increased support of onsite activities. The District organization is as described in Figure 6.2-1 of the Technical Specifications. This organization is summarized with emphasis on the health physics - radiological engineering support aspects in Figure 2.

2.2.2 Duties, Responsibilities and Staffing

The staff supporting the environmental and health physics aspects of Rancho Seco consists of four individuals with the following backgrounds and duties;

(1) Senior Environmental Specialist, with a BA in biology and an MS in environmental health with a specialty in radiological health, spends approximately half time on station related activities. This individual has had four years of technician and supervisory experience at another power reactor and was the Rancho Seco plant health physicist during the preoperational period and first year of operations, a total of four years.

(2) Staff Health Physicist, BS in Nuclear Biology, with five years university health physics technician experience and additional experience in nuclear plant computer software modeling. Spends full time



SACRAMENTO MUNICIPAL UTILITY DISTRICT

ORGANIZATION

Figure 2

on Rancho Seco related activities. This individual has experience in emergency planning and is the Emergency Planning Coordinator for SMUD.

(3) Principal Engineering Technician (Environmental/Health Physics) formerly a SCRA at Rancho Seco with nuclear navy and a total of 4-½ years operating experience and 2 years health physics training experience at commercial power reactors. This individual works full time onsite with the Generation Engineering Construction group providing day to day liaison with the Station radiation protection group concerning engineering design changes and construction activities. In addition he is to work with a consultant in the preparation of an ALARA development program and collects data for the Senior Environmental Specialist.

(4) Senior Engineering Technician (Environmental/Health Physics) with a BA in environmental studies and four years as an engineering aid at the Station. This individual has no health physics experience. Approximately 50% of his time is devoted to environmental activities including computer based meteorological and dose calculations and environmental report preparation.

The staff is augmented with two part time student assistants who assist principally in the handling and preparation of environmental data.

2.2.3 District Commitment to Radiation Protection

Discussions with Station and District office management personnel identified a commitment to a good radiation protection and ALARA program. However these commitments are not clearly defined in published District policy statements. Few problems have been encountered in obtaining temporary staff or task assistance in the area of radiation protection when such assistance was available through contracts with service organizations. Equipment problems are not as easily solved. District management has emergency authority to commit funds up to $100,000 with Board approval after the fact; however, this authority must be used with discretion. At the present time, funding for radiation protection related matters is not a problem.

Management recognizes the District's need to remain competitive in the selection and retention of qualified

personnel at all levels including radiation protection. At the time of the Appraisal, Station and District personnel were conducting a nuclear utility industry survey of salaries and benefits, to provide a basis for comparison with Rancho Seco.

The loss of personnel from the radiation protection staff has accelerated in recent years. Prior to 1979 the radiation protection work force experienced low losses; however, in 1979 two CRAs were lost and in 1980, to the date of the Appraisal, four CRAs and the HP had left the radiation protection organization. Early in 1980, the authorized level of technician staffing was increased from 10 to 16, however, at the time of the Appraisal only 11 CRAs were employed. It should be noted that staff losses seemed to be more closely related to increased opportunity than to salary limitations.

2.3 Management Oversight

This topic heading incorporates an evaluation of both management adequacy and manager effectiveness. The information used in these evaluations was obtained principally from station personnel both within and outside the radiation protection organization. Some discussion in these areas was also held with District staff personnel. In the area of management, the Appraisal Team examined the planning, organizing, directing, coordinating and controlling functions as they impacted on the radiation protection organization.

2.3.1 Management Adequacy

The general consensus was that planning was not a major problem either during routine or outage operations so long as only station groups were involved. Specific cases where planning was inadequate or breakdowns occurred were cited, however these appeared to be the exception rather than the rule. Specific problems in planning were identified in connection with work involving the Generation Engineering Department. In general the station view was that information available during early outage planning was not communicated to the station so as to permit adequate, onsite preparations to accommodate the actual needs which arose during the outage. One reported example of such a breakdown in planning and coordination concerned the early information that an estimated five outside contractor groups would be onsite for certain specified

work. This information was included in Station planning for radiation protection coverage. When the work force arrived onsite it was found that radiation protection coverage was required for five work groups, five inspectors groups and five enginering groups. In this case it was necessary to reschedule and delay other work to permit the outside contractor's work groups to complete their tasks. When this problem was discussed with Generation Engineering, it was stated that the Station had been informed 3 to 4 months before the work began of the need for 15 CRAs. However when the work was to begin, the Station did not have the necessary manpower to support the work required. Generation Engineering noted that a municipal utility was at a disadvantage when compared with an investor owned utility. SMUD must arrange for design, prepare detailed specifications, request bids, obtain bid approval, issue a purchase order, arrange for delivery and performance of the contracted task. Frequently the delivery phase immediately preceeds the task work phase with minimal lead time. For an investor owned utility the process can be shortened significantly by deletion of the bidding and bid approval phase permitting more lead time before the actual work.

An additional problem described by the CRAs appears to be related to the delays incurred in the use of purchased engineering services. Several CRAs stated that they had been required to make repeated entries into areas of higher radiation accompanying contract engineering personnel as a result of repeated engineer reassignments to the design phase of one specific task.

The existing methods for organizing activities and establishing priorities for the radiation protection group appear to be adequate excepting the previously identified problem with the Generation Engineering group. The span of control within the Chem-Rad group appears to be acceptable with two exceptions. First the responsibility for radwaste related activities should be assigned to a specific individual. It would appear that this function should be outside the Chem-Rad group with support from that group as necessary. An operation oriented task such as radwaste should be separated from the oversight function provided by radiation protection. Second, the planned position of ACRS should be filled promptly. At the time of the Appraisal the CRS was unable to devote the necessary time to supervisory and job site observations because of other demands on his time.

Adequate guidance for directing individuals exist in job descriptions and AP-1, Responsibilities and Authorities. It was the opinion of members of the Chem-Rad staff that the responsibilities and authorities of the radiation protection group may be not be clearly understood by other onsite and contractor groups. Clarification, in the form of policy statements originating at a high management level, in the areas of radiation protection and ALARA are needed.

The District employes a uniform Employee Performance Evaluation Report for all personnel. Employees are evaluated several times during the probationary period and annually thereafter. While the evaluation report form uses the term "established standards" in several cases this refers more to a comparison with group norms than with actual standards, since no performance standards exist for the radiation protection group. Acceptable performance as indicated by the evaluation report is not required for routine wage increases. Meritorious increases require acceptable evaluation reports. In practice, since CRAs rotate assignments, all are evaluated by the three SCRAs with a final review by the CRS. Because the evaluation reports become a permanent part of each employee's record, adverse comments are included only in the most significant cases.

The existing evaluation system provides for management review and discussion of results with and acknowledgement by the employee. During the discussion, problem areas may be discussed informally. The present system and its use appears to be reasonably effective in controlling employee performance.

2.3.2 Quality Assurance

Managements' controlling role is satisfied in part by the Station and District quality assurance and control functions. Rancho Seco Quality Control Instruction (QCI) No. 2, Rev. 11, SMUD Nuclear Operations Quality Assurance Audit Program, provides for yearly, scheduled, systematic, planned audits of radiological safety and control. Provisions are also included for random, unscheduled audits on the basis of criteria contained in the QCI. The QCI provides for the inclusion on the audit team of supplementary technical specialists who do not have specific organizational duties and responsibilities in

the specific area being audited. The audit teams which conducted audit Nos. 0-174 (2/28/78) and 0-258 (9/11 and 14/79) Radiological Safety, 0-318 (9/3-5/80) Radiological Safety and Control, and 0-319 (9/4-5 and 9/80) Housekeeping, included such supplementary technical specialists. Audit reports which are submitted to the Quality Assurance Director (QAD), consist of a summary and detailed findings, conclusions and recommendations. The QAD provides a summary of audit findings to the Management Safety Review Committee (MSRC). The MSRC includes in its membership the Manager, Nuclear Operations, Plant Superintendent and the Technical Assistant. The audited group is responsible for resolving nonconformance identified in the audits and reporting the corrective actions. The QAD may request followup audits of corrective actions. With the exception of Audit Report 0-319 each previously identified audit report included followup actions related to the previous annual audit. The Manager, Nuclear Operations, had responded to the findings of audits 0-174 and 0-258. Responses to audit reports 0-318 and 0-319 were not available at the time of the Appraisal.

AP-1, Responsibilities and Authorities, states that the CRS "Administer(s) the Chemistry and Health Physics Quality Control Program." The SCPA assigned to quality control responsibilities conducts a program based on AP-306 Section VIII Quality Control - Secondary Chemistry, Radiochemistry and Counting Room. In addition, this individual or the assigned CRA are responsible for weekly inspections in the following areas:

(1) Area posting;
(2) Container labeling;
(3) Radiation control problem identification;
(4) Adherence to Radiation Work Permit (RWP) requirements;
(5) Self Contained Breathing Apparatus (SCBA) cylinder pressures;
(6) Calibration verification of a sample of pocket ionization chambers (PIC)
(7) Verification of film badge controls provided by security personnel, and
(8) Examination of vent and drain bottles for labels and radiation levels.

The topics included on the checklist represent areas where problems had been previously identified. When problems are identified by the inspections the results

are documented, discussed with the responsible person(s) and identified to the CRS. Problem areas are specifically examined for appropriate corrective action during the subsequent inspection.

The Team believes that the use of a radiation protection specialist as a member of the audit team and a formal quality control function within the Chem-Rad organization, responsive to identifed problem areas, are beneficial and significant additions to management's controlling function.

2.3.3 Manager Effectiveness

The manager effectiveness portion of the Appraisal addressed: establishing goals, motivation, communications, maintaining cooperation, innovation, decision making and subordinate development.

Except for keeping exposures As Low As Reasonably Achievable (ALARA), radiation protection program goals are not formally stated. When goals exist they usually are the result of regulatory pressure or commitments to NRC in response to identified problems.

The plant superintendent formerly required an annual formal statement of goals by the CRS however this practice was terminated after 1979 because of the increased workload occasioned by TMI. Presently the CRS is so burdened with administrative and supervisory duties that he is able to address matters of immediate concern only and cannot devote time to areas having longer range importance.

The staff appears to be motivated more by a sense of pride of workmanship and respect for the CRS than as a result of any positive action by the CRS. Several individuals interviewed expressed resentment at the attitude conveyed to Rancho Seco workers by some members of the SMUD organization. This attitude reflected the view that Rancho Seco had damaged the prestige historically enjoyed by SMUD because of the controversy associated with nuclear power and because Rancho Seco represented the highest cost power in the SMUD system. This perception of lessened worth to the organization and the community was sufficiently disturbing to some staff members to call it to the Appraisal Team's attention.

Salary increases are used to reward good performers, however other forms of recognitition of good or outstanding performance were rare. The SCRAs as immediate supervisors with differing supervisory techniques have a greater impact on CRA motivation than the CRS.

Correction of substandard performance, while not a significant problem, may be more difficult for SMUD than for an investor owned utility since employees are members of a civil service system. In general, supervisors viewed the staff as capable and well motivated while staff members liked and respected the supervisory staff. Exceptions to this general statement appeared to be minor and of lessening importance.

Communications within the Chem-Rad group were identified as a problem area by a significant number of individuals interviewed. The CRS was viewed as friendly and approachable but often unavailable because of the many demands on his time. The CRS interfaces daily with the SCRAs however many CRAs feel that the communications stop at that level. In addition, the professional staff (NC and HP) members felt isolated and lacking in management input, guidance and followup necessary to be effective.

The professional staff was expected to demonstrate initiative in the pursuit of assigned tasks. However, they felt thwarted because they were outside the supervisory line and were dependent on the SCRAs and CRAs to support their activities. The CRAs expressed concern with what they believed to be poor communication both downward and upward through the SCRAs. Another problem concerned the isolation from other activities in the Chem-Rad group. CRAs are rotated between assignments in chemistry and radiation protection with little information transfer between the separate task groups. This lack of information concerning other task group activities increases the difficulty experienced when task reassignments occur. The CRAs believed that regular staff meetings would serve to minimize the problems encountered when rotation occurred.

With respect to communications between other onsite groups and the Chem-Rad staff, a regular morning meeting of supervisors appears to satisfy the need. No significant problems in communications between onsite divisions or departments and the chemistry-radiation protection group were identified.

The CRS has a positive attitude concerning his staff, their abilities and performance. He expects the staff to be self motivated and as a result does not provide much guidance. He recognizes a lack of motivation concerning radiation protection on the part of other Rancho Seco divisions and departments.

The Chem-Rad group does not have a formal mechanism for identifying or responding to suggestions for program innovations. The informality that exists permits individuals to suggest changes but does not provide for feedback to the originator. Those individuals with more experience at Rancho Seco believed the radiation protection program to be more innovative and receptive to change than the newer employees. The difference in perception of the innovativeness of the organization appears to be more closely related to ease and effectiveness of communication within the organization than to an unwillingness to consider new ideas or methods of operation. The CRS encourages decision making at the lowest appropriate level. By some this is perceived not as an encouragement to make decisions but as a lack of decisiveness on the part of the CRS. When personally involved he attempts to obtain input from others as an aid in the decision making process. Technical decisions are made promptly, however decisions involving personnel matters are not usually as readily resolved. The existing organization imposes some constraints on decision making by the CRS in the areas of personnel selection, program conduct and allocation of funds.

No formal subordinate development program exists, however significant opportunities for development have been made available. Supervisors and professional level personnel have been able to attend specialized training courses or professional meetings on an average of about once a year. Two sessions of a special two week course in chemistry and radiochemistry theory and practice were provided for CRAs at a local university. The SCRAs have attended a specialized training course at B&W. Recently several CRAs were denied permission to attend a National Registry of Radiation Protection Technicians (NRRPT) certification preparatory course. However SMUD purchased the course video tapes and manuals and made available facilities for their use at other than normal working hours. SMUD is presently paying overtime to CRAs using the course materials

to prepare for the NRRPT certification examination. The Team was informed that training in leadership and personnel relationships was to be provided to all station "heavy" foreman (SCRAs) and above during November 1980. It appears that while District and Station management have provided exceptional opportunities for personnel development the benefits of the available training would be increased by incorporating the training in a more structured program.

2.4 Conclusions: Radiation Protection Organization and Management Oversight

Based on the above findings, improvement in the following area is required to achieve an acceptable program.

(1) The Appraisal Team believes that the present staffing and organization of the Chem-Rad group is not adequate to provide the necessary support for routine operations. Implementation of the proposed revised organization which includes an Assistant Chemistry and Radiation Supervisor, two additional SCRAs in the areas of training and radwaste management and increasing the CRA staff to the authorized level to reduce the reliance on contract radiation protection technicians for routine operations would appear to resolve the Team's major concerns in this area. Further, the loss of the station HP creates a void which increases the already heavy load on the CRS. Vigorous efforts to fill this position with a qualified individual should be pursued expeditiously.

The following matters should be considered for improvement of the program.

(1) Increased effort should be directed to improving the coordination and planning of activities involving Generation Engineering to permit a planned rather than reactive response in radiation protection related areas.

(2) Communications within the Chem-Rad group should be improved to provide for a more knowledgeable transition and improved awareness of plant conditions and problems when personnel duties are rotated.

(3) Means to minimize the loss of qualified personnel from the Chem-Rad group should be pursued.

(4) Consideration should be given to the assignment of staff support to the Health Physicist and Nuclear Chemist positions as an aid in the discharge of their duties.

3.0 Personnel Selection, Qualification and Training

Discrepancies identified in NRC inspections and SMUD audits made just prior to this appraisal for which corrective action commitments have been established but due dates not yet reached have not been reiterated in this report.

3.1 Personnel Selection and Qualification

The qualifications of Rancho Seco's Chem-Rad staff were reviewed. At the time of the appraisal, it was established that (1) the CRS met the qualification criteria for Radiation Protection Manager (RPM) defined in Regulatory Guide 1.8 and ANSI/ANS 3.1-1978 (Revision of N18.1-1971), Section 4.4.4, (2) the staff HP onsite and two other health physics personnel also met the RPM requirements, (3) the SCRAs (equivalent to first line supervision) met the requirements of ANSI 3.1-1978 (Revision of N18.1-1971), Section 4.4.4 and (4) the CRAs (11) exceeded the requirements of Section 4.5.2 of the standard. Most had academic degrees and/or from 3-25 years of experience in radiation protection related functions.

Personnel at Rancho Seco were included in the Civil Service program. Position descriptions were documented for each position and included details of duties, educational and experience requirements, and desirable qualifications. Employment and promotional opportunity notices correlated closely with position descriptions and were posted within the District (SMUD). A bid process was utilized to select the successful candidate. For CRA openings, a supplemental application was used, requiring details of education and experience in the areas of chemistry and radiation protection. The selection process included documented evaluations by two or more interviewers, a competitive examination and qualification and experience reviews.

General qualifications for contract health physics personnel were included in the formal contract for these services. This contract required the contractor to provide the facility with personnel qualifications and resumes and provide for authorized plant personnel to individually evaluate and accept or reject each person supplied. The contract senior health physics technicians onsite met the requirements of ANSI N3.1-1978 (Revision of N18.1-1971).

3.2 Training Program

The licensee's training program was separated into two categories. Certain portions of the training were the responsibility of the formal training group and other portions were the responsibility of each organization. Coordination and cooperation between the organizations appeared to be appropriate.

The training group provided (1) non-licensed operator training, (2) licensed operator training including senior licensed operator and requalification training, (3) general plant health physics and orientation training which may include the required security orientation, and (4) systems training and emergency plan training to all plant personnel.

The Chem-Rad group had as an assigned position, SCRA (QC/Training) that was responsible for providing training within the Chem-Rad organization. Facilities and courses provided by the formal training group were used in this program if appropriate in the judgment of the SCRA.

3.2.1 Required Training

All personnel, SMUD employees and visitors were required to attend a security, safety, and health physics orientation presentation prior to being authorized access to the secured area. This 30-minute slide and tape presentation allotted seven minutes for security, twelve minutes for safety and eleven minutes for health physics, including emergency evacuation signals and required actions. A written examination was given and test results and attendence were documented. A 70% score was required to pass.

Personnel requiring unescorted access to the Radiation Controlled Area (RCA) were required to successfully complete an eight-hour Basic Radiation Control Measures training course with a score of 70% or better. In special circumstances, based upon the radiation work background of the individual, an abbreviated version of the basic course may be given, but the same written examination and passing score were required. The Basic Radiation Control Measures course used video tapes, slides, large scale mock-up pocket dosimeters and stand-up lectures. The course covered regulatory and administrative dose limits; radiation zone definitions; posting and marking definitions and requirements; genetic and somatic effects of radiation; survey instruments and techniques for self-survey; radiation dose terminology and numerical conversion from rad to

mrad, rem to mrem, etc,; discussion and demonstration using large scale mock-ups of self-reading dosimeters; and techniques and sequence of donning and removal of protective clothing. After completion of the presentation and test, examination questions missed by anyone in the group were reviewed with the whole group.

A review of this presentation indicated that it was acceptable with one exception. The regulatory limit on whole body radiation dose was stated as 3 rem/qtr, and no explanation or amplification of the restrictions applying to this limit were given.

Personnel expected to use respiratory protective equipment were required to attend respiratory protection training. This training consisted of an approximately one hour video tape presentation followed by a written test with a 70% or better score to pass. Each individual then donned a supplied air respirator and was instructed on air flow control. A full face filter mask is used for mask fit testing in a quantitative test chamber.

For SMUD employees, Emergency Plan training was required and includes a review of the emergency plan, the evacuation plan, and emergency signals and actions.

Annual retraining is required in the security, safety and health physics orientation presentation; Basic Radiation Control Measures Course (authorization for unescorted access to the RCA was rescinded if not current); respiratory protection training (authorization to wear respiratory protection was rescinded if not current) and emergency plan training. Records were maintained of attendance at all training courses. Due to past problems in maintaining required qualification training current, a monthly manual review of the security printout of individuals authorized to enter the controlled access area and respiratory protection authorization file was conducted. If training was past due or due within the next month, written notification was issued to management. The licensee has found that the existing training records system does not identify those individuals requiring retraining effectively thus necessitating the use of the security access control listing and respiratory protection authorization file.

The on-the-job training for new Chem-Rad personnel provided for two-month rotating assignments to the radio-chemistry

laboratory, cold chemistry laboratory and health physics functions. A SCRA was assigned to provide guidance and training. Discussions with new personnel in training indicated a wide variation in the quality of training received.

3.2.2 Supplemental Training

Additional training for various plant personnel was included in the documented program offered by the training organization. Of significance to the radiation protection program at the plant was the systems training available to all personnel and the health physics training given to operations personnel. This training was provided on a scheduled basis and is of appropriate depth for the majority of the group attending. Attendance, although voluntary, was documented. No tests were given, however.

3.2.3 Proficiency Maintenance Training

NRC Inspection Report No. 50-312/80-19 identified an item of noncompliance related to SMUD's lack of a retraining program for Chem-Rad personnel. The corrective action commitment date had not yet arrived at the time of this appraisal. Efforts were underway to provide a retraining program. Discussions with licensee personnel indicated they had received an oral directive to dedicate ten percent of personnel time to training. An initial quarterly schedule had been established, but not adhered to because of personnel availability due to work load. Systems training for Chem-Rad personnel was conducted in conjunction with the training group and attendance is documented but attendance was on an as-available basis. Records of overall training hours were kept and balanced between personnel. Contract health physics technicians were not included in the refresher training. An exchange of experience and information between the contract and permanent personnel could contribute to the overall program.

3.2.4 Professional Development

It was noted during the appraisal that several members of the Chem-Rad staff were actively preparing for the NRRPT examinations. SMUD is to be commended for its support of these efforts. Discussions with Chem-Rad personnel indicated that, as far as they were aware, no formalized, coherent professional development plans were in place for the CRS or his people.

3.3 Conclusions: Personnel Selection, Qualification and Training

Based on the above findings, this portion of the licensee's program appears to be acceptable provided the commitments for corrective actions resulting from previous NRC inspections and SMUD internal audits are satisfied.

Based on the above findings, the following matters should be considered for improvement of the program:

(1) The recent emphasis on formalization and documentation of the training program should be continued.

(2) The use of a state-of-the-art training records system, possibly associated with an ALARA, RWP, dosimetry records system, should be considered.

(3) The existing training program should be revised to clearly identify the exposure limits of 10 CFR 20. The existing presentation leads to a conclusion that the limit is exclusively 3 rem per quarter whole body.

(4) The teaching abilities of the SCRAs providing on-the-job training should be considered in making training assignments.

(5) Chem-Rad group training and systems training should be on a required rather than voluntary basis. Training should be equalized on a subject or topic basis rather than on an hourly basis.

(6) A professional development plan for Chem-Rad staff members should be considered.

(7) Inclusion of the contract health physics technicians in refresher training should be considered.

4.0 Exposure Controls

4.1 External

SMUD uses a commercial film badge service, R.S. Landauer, Jr. and Company. The monthly badges incorporate two filtration levels in the holder which permits division of the reported dose into soft (poorly penetrating) and hard (penetrating) radiations. Self-reading pocket ionization chambers (PIC) are used on a daily basis with the individuals recording their own doses as they leave the RCA. The PIC record cards are evaluated weekly for total dose received and the information is circulated to the appropriate supervisors.

For unusual monitoring requirements, an in-house TLD system is used; Matsushita, Inc., Model UD 702D. The TLD holder contains 4 chips, 2 LiF and 2 CaF_2. One of the LiF chips has minimal filtration to allow measurement of soft radiation while the other 3 have the same filtration and respond primarily to penetrating radiation. The dosimetry systems available to the licensee do not provide for the measurement of photon energies greater than 3 MeV.

Neutron doses are calculated based on the product of levels measured with calibrated survey instruments (Eberline Rem Ball) and stay times. Where applicable, this dose is added to the total recorded doses and to the computer record of the film badge service. Such occasions are rare as current administrative procedures preclude containment entry above 15% of rated power. If entry is made, all individuals must remain behind the biological shields.

Plant procedures require that for entry into high radiation areas (100 mrem/hr to 1000 mrem/hr), a continuously indicating dose rate instrument is required. Lock and key control is used for areas above 1 rem/hr.

The responsibility for verifying that everyone entering the RCA is wearing a film badge is presently assigned to the security guards at the entrance to the area. An alternate plan for this responsibility, to take effect with the new computerized security systems (no guard present), had not been prepared. The Chem-Rad staff seemed to prefer the system used during outages when they logged everyone in and out, issued and read PIC's and controlled access.

Skin dose is determined using TLD dosimeters; however, during previous steam generator maintenance work, no skin exposures were noted. Current practice is to dress all such workers in sufficient coveralls so that the beta radiation does not penetrate to the film badge worn on the inside set of coveralls. A uranium slab or equivalent beta source is not used for TLD calibration or test exposures of contractor supplied film badges.

SMUD routinely submits spiked film badges as part of an internal quality control check on the film badge processor. The badges are exposed using the survey instrument calibration system described in section 4.3.4. PICs are calibrated every six months using this source. Drop tests of PICs, as described in

ANSI N322, are not performed as a part of the routine PIC calibration program. The film badge processor was the subject of a quality assurance audit in May, 1977 and is scheduled for reaudit no later than May, 1982.

4.1.1 Exposure Review

The dosimetry records are maintained in a multiplicity of written records. The record system used makes any review of dosimetry records very laborious and time consuming. The sum of the weekly PIC totals is compared against the monthly film badge results and major discrepancies are investigated.

One analysis had been made comparing the doses received during 1976, 1977, and 1978 in performing 13 major repetitive tasks such as drum removal, let down filter replacement, spent fuel coolant filter replacement, etc. This one RWP vs. man-rem analysis was the only one known to exist.

Skin exposures are recorded in a separate log book. In some cases these exposures were not recorded in the individual's dosimetry record. For a number of individuals who have terminated employment and received their NRC form 5 the skin exposure was not included because no record existed in the individual's file. The office staff attributed this record breakdown to the system and a shortage of help.

4.1.2 Exposure Limitation

The allowable weekly dose for a radiation worker at SMUD is 100 mrem/wk. Exposures in excess of this limit require the concurrence of the individual's immediate supervisor for the increased exposure. Above 300 mrem in a week, the CRS and the immediate supervisor must give written approval. For quarterly total doses above 1.0 rem, but less than 2.0 rem, the PRC must give prior written approval. For doses above the 2.0 rem level but less than 2.5 rem, the individual directly involved must be interviewed by the PRC before written approval is given. 2.5 rem is the maximum quarterly dose allowed. Both the necessity for the particular individual to receive additional exposure and the degree of risk involved are discussed with the individual.

Tours of the plant indicate that the area surveys are current, posted levels accurate, and the radiation areas

above 1r/hr at 18 inches are locked to prevent unauthorized entry. The shift supervisor maintains control of keys to these areas.

Remote handling tools and systems were reported to be used infrequently. A redesign of several filter change systems was in progress with the goal of minimizing the staff man-rem dose.

4.2 Internal

4.2.1 Bioassay

A Helgeson whole body counter is used to monitor internal body burdens of radioisotopes. Personnel are counted at a minimum of once a year as part of the respiratory protection mask screening evaluation. Whole body counts on SMUD radiation workers are normally performed prior to work in a radiation area, and annually thereafter, and upon termination. Contract personnel are counted before beginning work and on task completion. Special counts are performed as required by the HP.

The Helgeson Company performs all the data reduction and submits a monthly report giving the percent of body burden versus isotope. If a body burden of greater than 10% of MPBB is determined, the CRS is immediately notified. A local printout of the counts found in certain energy peaks is examined and should an unusual count be noted, a call is placed to the Helgeson office for an immediate processing of the data and a verbal report.

Dose calculations due to internal body burdens are not performed unless the body burden reaches 10% of the MPBB. This is an undocumented rule of thumb within the Chem-Rad group and the models used would be those suggested by the NCRP, ICRP, or MIRD, again an undocumented aspect of the program.

A SMUD Quality Assurance audit was conducted at Helgeson headquarters in March 1976. The audit discovered several documentation problems which were corrected. The audit did not address how the absolute efficiency was verified to be constant and how the absolute efficiency of the system was initially determined. A review of records indicates this information is not available onsite. The Chem-Rad group does not perform any calibration, stability, or quality control checks on the unit.

A procedure for urinalysis assays for tritium exists but is seldom used as ambient airborne tritium levels are in the 10^{-8} uCi/cc range. Procedures and equipment necessary to perform urinalysis should biosurveillance become necessary are available.

4.2.2 Respiratory Protection

(1) Administrative Responsibility

A memorandum from the Manager, Nuclear Operations Department dated 31 January 1978, designated the CRS as the individual responsible for respiratory protection and the HP as the individual responsible for exposure reduction concept development. This clear commitment by management was not known by the Chem-Rad staff. When six members of the Chem-Rad staff were questioned four different individuals were identified as responsible for the respiratory protection program.

Despite this uncertainty concerning administrative responsibility, a good program was found to exist except for breathing air quality.

(2) Respiratory Protection Equipment

Based on a review of the inventory, mask maintenance and inspection logs, it was determined that 338 full face, clear view, single canister respirators are stored ready for use within the plant. An additional 25 masks are reported available in the warehouse. The Chem-Rad group has 15 self-contained breathing (SCB) systems assigned to it with four located at access control, five at the control room area, two each in the two emergency lockers and two at the chlorine tank area. These are checked for serviceability on a monthly basis with weekly checks of cylinder pressure. The plant safety group has an additional undetermined number available for fire protection use. At the time of the appraisal, five units had been returned to the manufacturer for reconditioning. Replacement units are drawn from the fire protection supply as necessary when radiation safety units are withdrawn from use for maintenance.

A large supply of supplied air disposable hoods, rain suits, replacement respirator filters, and spare SCB cylinders are available for use. Sorbent

cartridges for the full face mask respirators are stored on site but no protection factor is claimed for their use. They are used for ALARA considerations when the airborne iodine concentration is measurable but less than 25% MPC. Rancho Seco Audit Report No. 0-318 reported that procedure AP 305-5.3.11 permitted use of an acid gas-organic vapor canister in airborne radioactive environments not exceeding 100 times MPC. The procedure had not been corrected to reflect the guidance contained in NUREG 0041. After a single use, the mask is smeared to determine its contamination level and segregated for cleaning based on this level. The filters are removed and the outside surface decontaminated. The filters are inspected visually for damage, and monitored at the connection snout for radiation. If the level is above 2500 cpm the filter is disposed. If less and the filter appears to be undamaged the filter is reused. The filters are not evaluated for residual filtering capacity prior to reuse.

The masks are double washed and double rinsed using four plastic garbage cans as the wash containers. After drying they are smeared and if the smear is above background by as much as one count, without regard to counting stastics, the masks are rewashed.

Communication systems suitable for use with the full face mask respirators have not been found and this has led on occasion to communication problems between workers, particularly in noisy areas.

(3) Engineering Controls

Tents and glove boxes are fabricated to contain particulate releases when the occasion arises. Examples are steam generator tube plugging, work on the reactor head "O" ring and stud tents. Appropriate systems are used in concert with portable ventilation systems having high efficiency filters.

(4) Respirator Training

In addition to the usual day of training given all personnel, those who are to be respirator qualified are given an hour of additional training on respirator usage, and practical training. The latter includes

wearing a full face supplied air respirator under air flow conditions and a fitting in the test booth wearing a full face canister respirator. The test booth used is an Air Techniques, Inc. TDA-50 DOP Aerosol system with TDA-70 booth. During the fitting all the facial and physical movements suggested in NUREG 0041 are performed. The training appears complete and is well done. The mask fits were routinely showing measured protection factors of greater than 100.

To become respirator qualified the individual must:

(a) complete respirator lecture training and pass the test;
(b) complete respirator fit training;
(c) successfully pass medical evaluation; and
(d) have a whole body count

This sequence is repeated on an annual basis to renew respirator qualification.

The use of the SCB systems is reserved for emergency situations and this training is discussed in Section 3.2.1.

(5) Medical Examination

The initial medical evaluation for approval for use of respiratory protective equipment is given by the occupational nurse. It consists of completion of a medical history questionnaire, blood pressure determination, and spirometer test. The acceptable spirometer measurements of vital capacity percentage varies with age and height as specified in published tables. Any SMUD employee noted to have elevated blood pressure, questionable spirometer test, or a history of a major medical problem such as diabetes is referred to the SMUD physician in Sacramento for further evaluation. A contractor employee exhibiting any of the above is denied respirator qualification for medical reasons.

The medical exam is given on a yearly basis and is required as a part of respirator recertification.

It is the team's opinion that the occupational nurse takes her responsibilities in this area seriously and does an excellent job of performing the medical screening.

(6) Breathing Air Sources

There are three onsite sources of air either used or planned for use with respiratory protective equipment. At the training center a RIX compressor with teflon piston rings is used to supply the air for the supplied air mask training and operation of the DOP test booth. This system was formally used for filling the SCB supply cylinders. This system draws its intake air from an elevation four feet above the ground by the side of the building and does not include pre or post filters. The supplied air is not monitored for CO or other toxic gases, nor has a grab sample ever been taken for laboratory analysis to verify that the air meets a minimum of class D air as required by 29 CFR 1910.134(d).

The auxiliary building system air supply i[illegible]urnished by three Joy oilless compressors, cl[illegible] The air intake for the compressors is loca[illegible] 10 feet from the floor above the compresso[illegible] intake air is filtered to remove dust. The compressed air goes through a moisture separator but is not monitored for CO or other toxic gases. When used for supplied air masks and hoods, the air is further filtered through a MSA manifold filter which is stated to remove all oil vapors, particles, water, and organic vapors. The filter is not designed to remove CO or other toxic gases. In addition, no mechanism exists to evaluate the residual capacity or effectiveness of this filter. This air has never been analyzed to confirm that it is of class D quality. The Team's concern was increased when 8 barrels of 35% hydrazine solution were noticed 12 feet from the compressor and a flammable materials storage cabinet containing liquid hydrocarbons was observed to be located 18 feet from the compressor. SMUD had outside environmental consultants survey the area for hydrazine levels and values far less than the federal and state standard of 0.1 mg/M^3 were found. However, hydrazine when heated to decomposition emits highly toxic forms of nitrogen compounds and no evaluation of this hazard had been made (Reference: Dangerous Properties of Industrial Materials, 5th Edition, N. Irving Sax, Van Nostrand Reinhold Co.)

A third compressor (Mako, Inc.) was installed in the spring of 1979 exclusively for the filling of SCB cylinders. Because initial testing indicated that the location of the compressor was unsatisfactory in that hydrocarbon fumes could contaminate intake air, the system has not been placed in routine use. A new, separate building at a location free of any hydrocarbon fumes is in the planning stage and this system will not be used until placed at its new location.

The licensee's staff had requested a control change to increase the system's safety-CO monitor to automatically shut the system down with the compressor switch in either manual or automatic mode of operation. Also under consideration is a CO monitor automatic-manual dead man switch which would preclude bypassing the CO automatic shutdown without deliberate and continual operator intervention.

SCB cylinders are presently being filled at the Galt fire deparment. In addition, the Sacramento Fire Department has several approved portable compressors which could be borrowed in an emergency.

(7) General

Procedures call for mandatory use of respiratory protection when smearable contamination reaches 10,000 dpm/100 cm^2 or airborne levels reach 25% of MPC.

The training of the staff in the proper operation of the test booth has been quite informal. Since initial installation, a new operator has been trained by the previous operator. The booth was initially set up and the operating procedures established by the HP using the operating manual furnished with the unit.

Two CRAs have had the one day Mine Safety Appliance course on the repair of SCB systems. However, SMUD is not equipped to do the specialized maintenance on these systems and they are sent to the factory for repair.

Air samples are initially taken as part of the routine in determining what protective measures should be required on the RWP. If the level of airborne activity (as determined by G-M pancake detector measurements of an air sample filter) exceed 3×10^{-10} uCi/cc, the sample is decayed for half an hour and recounted. If still above 3×10^{-10} uCi/cc, the sample is sent to the counting room for detailed analysis using the Ge(Li) system.

4.3 Surveillance Program

The following areas of the Rancho Seco radiological controls program were examined: (1) the routine radiation and contamination survey program; (2) radiation survey records and (3) access controls including RWP adequacy.

4.3.1 Routine Surveillance

The program defining the routine surveillance activities was found in AP 305 "Radiation Control Manual", Enclosure 7.8, "Frequency of Surveys, Routine Operation", and Enclosure 7.9, "Frequency of Surveys, Maintenance Shutdowns (over 3 days)", and in specific procedures AP 305-8, "Methods for Conducting Radiation Surveys", AP 305-24, "Reactor Building Air Samples", and AP 305-26, "Auxiliary Building Air Samples."

Routine surveillance includes daily and weekly radiation level measurements, smear samples, and airborne radioactivity surveys. Routine survey "packages" were prepared daily which included forms for recording effluent monitor readings and air flow rates and predrawn plot plans of areas scheduled for that day's routine surveys. The weekly cycle covered the routine schedule. The scheduled frequency varied from twice per day for all radiation zone step off pads during a maintenance shutdown to once per week for the Fuel Storage Building unless refueling was in progress.

Routine surveys of the Reactor Building were scheduled daily if access was required as in a maintenance shutdown, but routine surveys of the Reactor Building (except for containment air sampling) were not done during operation unless access was necessary. Neutron measurement capability was available. However, routine reactor containment entries are not made during operation.

Gamma radiation measurements were normally made as a waist high scan of the general area coupled with specific measurements at defined boundaries and hot spot locations. Specific measurement locations were not identified either on the plot plans or in the facility itself for routine measurement.

Smear surveys were normally made using three different methods: (1) large area smears using "Maslinn" cloth or "K" pads as a general evaluation of area status, (2) individual numbered cloth smears and, (3) numbered paper smears. In the latter two methods, smears were wiped over an area of approximately 100 cm^2 and counted on laboratory counters located either in the counting room or at grade level in the Auxiliary Building, for more precise determination of contamination levels. It was noted that the numbered cloths smears used in the Auxiliary Building surveys were kept separated prior to counting, but the numbered paper spears used for surveys of the outside areas, Maintenance Shop, Administration Building and site exit points were not separated to avoid possible cross contamination.

During conduct of contamination (smear) surveys in the Auxiliary Building, the CRA carried a dose rate instrument for conducting a simultaneous radiation survey. It was noted that during contamination surveys of outside areas, no instruments were used.

The routine airborne surveys (particulate, iodine and tritium) were made daily at various locations within the Auxiliary Building and weekly of the Reactor Building atmosphere. A continuous air monitor was operated in the grade level corridor of the Auxiliary Building as a trend monitor and to alert personnel to noble gas leaks that might occur.

The location, frequency and content of the routine surveillance program appeared adequate.

4.3.2 Radiation Survey Records

The licensee's radiation survey program records were reviewed against the recommendations of ANSI N-13.6-1966 (R 1972), "Practice for Occupational Radiation Exposure Records Systems." The records system was found to be deficient in that: (1) retrievability of records to verify radiation protection activities (sample results

and survey records) was not always possible; (2) survey records were not complete in that signatures, time and instruments used were not always included and, (3) survey records were frequently written in pencil.

The referenced standard recommends that Occupational Radiation Exposure Records Systems should enable the employer to:

(1) Evaluate the effectiveness of the radiation protection program.

(2) Demonstrate and facilitate compliance with contractual requirements and applicable governmental regulations.

(3) Reconstruct for legal or medical purposes, situations and conditions for analysis of the radiation dose received by individuals.

Section 5 of the referenced standard provided guidance on records that may be necessary to establish the conditions under which individuals were exposed. The examination of the survey records identified the following deficiencies when compared with the guidance.

Guideline:	Date and time of survey.
Finding:	Numerous surveys were noted that did not indicate time of survey.
Guideline:	Identification (type and serial number) of the particular radiation detection instrument used to perform the survey.
Finding:	Numerous surveys did not identify any instrument or serial number.
Guideline:	Identification of the individual performing the survey.
Finding:	Numerous surveys did not identify the surveyor, either by signature or initial.

Guideline: The standard implies that records should be permanent and retrievable "to provide for workmen's compensation programs or for conduct of litigation which may transpire many years in the future".

Finding: Numerous records were noted as having been written in pencil.

Records to assure continued surveillance of radiation work activities could not always be found, for example, RWP 80-32 was issued on 1/16/80 to provide "radiation control of the Decon of Reactor building, -27 ft." and was valid until 4/16/80. Only eight air samples could be identified as being specific for the RWP authorized work even though work activities were conducted on both day and swing shift for numerous entries. Respiratory protection was identified on RWP 80-32 as being required. RWP 80-79, issued on 3/14/80 for "Reactor Building weld platform and structure platform", also required respiratory protection. No radiation survey or air sample records could be found to enable one to conclude that adequate radiation protection surveillance was provided for entries made on 3/26/80.

At Rancho Seco, survey records, (routine, special (RWP), air samples) are assembled into daily packages and the package is reviewed and signed by the SCRA and the CRS. An Appraisal Team review of selected packages for 1979 and 1980 indicated a wide variance in the quality of the written surveys. Some excellent records were noted, that is, the surveys were thorough, prepared in ink, and clearly recorded radiological conditions with appropriate date, time, instrument type and number and signature. Others were noted to be essentially devoid of value as records of information, for example, on 7-3-80, daily survey A-12 had a note stating, "See attached results of analysis." No analytical results were attached nor could they be found in the complete package. The thoroughness and effectiveness of the dual review was questionable.

The retrievability of radiation protection records was complicated by the apparent lack of a coherent system of record storage. Records of evaluations of radiological conditions relating to specific work activities were scattered among the RWP file, daily survey packages, air sample files, and the outage log file.

4.3.3 Access Controls

Rancho Seco's restricted area was defined as the operations area, protected by a chainlink fence and guarded at the entry points. The security fence was responsible for ensuring that personnel are authorized site access and procedure AP 305-18, "Radiological Control Duties of Security Personnel", directed them to ensure that all personnel leaving the main access gate pass through the installed portal radiation monitor or if it is not operating, that they monitor themselves with a "Frisker" supplied by the Chem-Rad group. Security personnel were further directed to notify the Shift Supervisor if an individual causes the portal monitor or frisker to alarm. Access to the radiologically controlled area defined as any part of the restricted area that requires control of access, occupancy or working conditions for radiation protection purposes, and which lay within the restricted area of the site - was provided through separately manned stations with additional access controls. The Team reviewed the licensee's methods for controlling access and work within the controlled area.

Primary access control to the controlled area was through the use of an RWP system and the continuously manned security control points. All personnel entering the controlled area were required to be verified as authorized by security personnel at the entry point. Written orders directed security personnel to ensure by visual inspection that personnel were wearing a radiation film badge and PIC and, by computer check, that personnel were authorized to enter the area. Inclusion of personnel on the authorized computer listing may be rescinded by Chem-Rad group for various reasons including: lack or overdue health physics training or retraining, not meeting respiratory protection authorization requirements, and exposure restrictions. After appropriate verification by the guard on duty, each person was logged into the area by computer entry by time, security badge number and area. This process was reversed for exiting.

During normal operation, personnel entering the controlled area were instructed to (1) procure a PIC (the number and range as specified on the RWP, or, as a minimum, one low range PIC); (2) verify that the PIC is reading zero or less than 25% of full scale; (3) enter the initial PIC reading on their personal dose control card, along with the date, time and activity code and RWP number used; (4) enter the same information on the RWP form provided

at the same location; and (5) proceed to the dressing area and controlled area entry point. Upon exit, personnel were to perform surveys of their protective clothing and place the clothing in appropriate locations. Coveralls, lab coats and PVC overshoes were saved for reuse if generally clean and contaminated to less than 1000 cpm. Contaminated items and all plastic protective items are either placed in bags for laundering or in trash containers for disposal. After a personal whole body survey using friskers provided, logging out on the computer by the guard, the individual was to read his PIC and enter the exposure received on the RWP form and the dose control card. An additional check for contamination was required using a hand and foot counter upon leaving the change room area. A final check was provided using the portal monitor upon exit from the site at the main gate.

During outage periods, the system used was similar except that all PICs issued and read by Chem-Rad personnel stationed at the access control point. In the judgment of the Team, the practice of issuing and reading of PIC by Chem-Rad personnel should be expanded to include normal operating periods to provide more accurate and reliable dose records.

The RWP system was defined in Section 3.7 of the Radiation Control Manual and in Procedure AP 305-4, "Radiation Work Permit (RWP) Procedures." An RWP was normally required for maintenance work in a radiation area; any entry or work in areas with potential neutron exposures; entry or work in areas or on equipment where beta-gamma contamination levels exceeded 200 dpm/100 cm^2; any entry or work in a high radiation, secured or airborne radioactivity area, any work involving the opening, cutting or welding of lines or equipment which contain radioactive fluids or solids and in other situations as determined necessary by the HP. RWPs were issued for only one specific job and were valid only to the end of that job or a maximum of three months, whichever is less. Access for routine walk through surveillance did not require an RWP. Areas meeting the above criteria were marked with a sign stating "RWP Required for Entry".

RWP's may be initiated by anyone. The procedures require the initiator to provide the location, job description and the names of individuals assigned to perform the work. The RWP was then presented to the Chem-Rad group.

A survey of the area was performed and results documented on the RWP, including radiation and contamination levels and air sample results. MPC and stay times were calculated and entered and the required protective clothing, dosimetry, respiratory protection, additional health physics coverage required, and any special instructions as necessary were specified. The form was presented to the SCRA for review and signature and then forwarded to the Shift Supervisor for his review and approval. The completed, approved RWP was distributed to Shift Supervisor, Health Physics Office for entry into the RWP book and one copy was maintained at the entry to the change room. Additional personnel sign in sheets may be added to the RWP if the number of entries exceeded the capacity of the original form.

Selected RWP's for 1979 and 1980 were reviewed for compliance with procedural requirements and for adequacy of the surveys performed and radiation protection controls stipulated on the form for the work involved. No noncompliance with procedural requirements was noted; surveys and radiation protection controls appeared adequate and appropriate for the initial entries using the RWP's. As noted in Section 4.3.2 of this report, records providing assurance that continued surveillance was performed and adequate could not always be found. Other radiation protection controls, (e.g., whole body counts, personal contamination surveys and dose evaluations) indicated record system inadequacies rather than lack of radiological control.

Periodic observation by the Team of personnel entry and egress from the controlled area indicated that personnel adhered to the established system in an automatic and familiar manner. An internal audit by the SCRA, QC/Training, had been conducted weekly since March 1979. The audit covered posting of radiation, high radiation, secured, airborne radioactivity, and "RWP - Required-For-Entry" areas; security personnel's checking for film badges for controlled area entry, and compliance with RWP requirements for activities being conducted under RWP authorization. Reports were documented and findings issued to the CRS. The audits appeared to be w[illegible]one and effective in identifying problem areas and [illegible]ld be continued.

The adherence to posting and labeling requirements for radiation control were observed during the appraisal period. Past inspections by the NRC and internal audits

by SMUD had revealed inadequacies in compliance in these areas. A weekly routine survey of area posting has been instituted and dated stickers applied to signs in addition to the weekly audit conducted by the SCRA, QC/Training. No deviations from posting and labeling requirements were identified.

4.3.4 Instrumentation

Instruments associated with the radiation protection program were adequate for routine and outage operations. The supply, maintenance and calibration of the portable survey meters and fixed area, effluent and process monitors were reviewed. The licensee's performance in this area was considered to be adequate.

Portable Instruments

At the time of the Appraisal approximately 118 portable survey meters were available. During normal operation about 15% are being maintained while 85% of the inventory is available for use. During outages, about 45 to 50% are undergoing maintenance and repair. Shortages may develop if all the contract radiation protection technicians normally employed during an outage are engaged in work requiring instruments. About 2% of the inventory is missing (i.e., considered lost or vandalized) during an outage. The licensee believes that instrument mutilation is caused by contract technicians since vandalism is not observed during periods of normal operation.

Inventory control is adequate but not ideal. There are insufficient centralized locations in the auxiliary building for storage of instruments to make them quickly available. The licensee pointed out that contract technicians were indifferent to where they deposited their instruments after use.

Survey meters, limited to emergency use, are available within sealed lockers at selected locations. One emergency use survey meter is dedicated to prompt analysis of radioiodine that may be collected on a silver zeolite cartridge (also contained in the locker).

Each instrument has an assigned control card as well as individual forms specifying dates for battery check, semi-annual calibration and emergency equipment inventory.

Maintenance records are also kept for each instrument. An Equipment Repair Record with the history of repair and maintenance of all radiological survey instruments (including air samplers) contains the following headings: Date, Initial, Equipment Fault, and Repairs Made. This function is performed by the Instrument and Control (I & C) group. Two people spend full time maintaining radiation protection instrumentation.

Calibration of portable survey meters is performed at the 40' level in the Auxiliary Building. The room contains a rolling instrument stand set on tracks fixed to the floor. At one end of the tracks is a lead shield housing two ^{137}Cs sources of about 1 and 110 Ci respectively. The instrument to be calibrated is placed on the stand and positioned so that the center of its sensitive volume is roughly in the center of the beam. The rolling stand is then positioned at the appropriate location as indicated by a graph (distance vs. dose rate) for the aforementioned sources. The dose rate vs. distance values have been established using Victoreen "R" meter measurements whose accuracy is traceable to NBS calibration. Permanent floor markings indicate the 100 mr/hr isodose line when the largest source is exposed. Two technicians are required to operate the facility. One stands behind the calibrator shield and raises the desired source by means of a source rod handle. The source is held in this position while the other operator adjusts the appropriate potentiometer of the instrument being calibrated to the desired dose rate setting. Whenever possible, the second operator locates himself either behind a concrete wall, where the radiation level is negligible, or behind the 100 mr/hr line demarcation. An optical viewing stand may be used to read the instrument when the source is raised. An area monitor with an audible alarm and flashing light is used to warn personnel in the calibration room, and in the control room, that the source is in an exposed position. Because the noise from this alarm is high pitched and piercing in the calibration room, it is usually muffled or defeated during calibrations so that only the flashing light indicates an exposed source. The alarm can only be deactivated by the control room operator. After completion of calibration at each point, the source is returned to the shield usually with sufficient force to cause hard surface contact with the base. The operator working the source was cautioned to check for potential source leakage at a frequency greater than semi-annually, the technical

specification requirement for sealed source leak tests. The Team was concerned that the existing calibration procedure required personnel in a downrange location in the calibration area when the source was in an exposed position. Measurements made adjacent to the face of the person holding the source in the raised position indicated 180 mr/hr. The calibration system and procedure as presently used does not assure that personnel exposures are maintained ALARA during the calibration of portable survey meters.

Calibration of survey meters for beta radiation is not performed per se. Use is made of correction factors for "cutie pie" type detectors from the report BNWL-MA-62 Pt 2 "Portable Radiation Survey Instrumentation Manual." From the correction factor curves given in this report, a factor of two is used to correct for beta response, independent of beta energy. However, upon review of the curve, the team member commented that a factor of three would provide a more conservative but not unrealistic correction. The HP concurred in this change. This higher correction factor will be used in the future on the Rad Owl 1, 2, and 4 and the Victoreen 470, all of which have cutie pie geometries.

During a tour of the Auxiliary Building it was noted that all observed portable instruments had calibration stickers that indicated up-to-date calibrations, and all had their range switches in the proper "off" position.

During the appraisal, a calibrated survey meter (Eberline, Cutie Pie RO-3B), which had been supplied by Battelle-Pacific Northwest Laboratories, was checked in the calibration facility to compare the licensee's source calibration against Battelle's. The maximum deviation between the instrument indication and the expected reading using the licensee's calibration data was an acceptable 10% over three decades of the instruments range.

Neutron rem-meter survey instruments are calibrated with 1 and [illegible] Ci, ^{238}PuBe neutron sources. While the neutron source is being used, the cesium sources are locked in the lead shield and cannot be used. Calibration of a neutron rem-meter was not observed during this appraisal.

Calibration of each type of survey meter is detailed in the licensee's procedure manual. It should be noted that the licensee has an unusually large number of different types of instruments from different vendors including Eberline, Victoreen, Technical Associates, Johnson Laboratory, Xetex, Ludlum, Studsvik, Nuclear Measurements Corporation, and Radeco. I&C personnel expressed frustration at not being consulted whenever new instruments are purchased from new vendors. This is because they are responsible for repair and maintenance and would, therefore, require appropriate schematic drawings and spare parts. Such items should be available prior to or immediately following receipt of any new instruments to support a more effective survey instrument maintenance program.

Records of equipment repair were examined. A history of maintenance of all instruments is kept in the I&C files. The records contained relevant information and appeared to be complete.

Remote Area Monitoring Systems (RAMS)

The licensee has 15 Victoreen ionization chamber remote area monitors (RAMS) located throughout the plant. All monitors have readouts and alarms both locally and in the control room. The control room also has a recorder which records dose rates for each RAM channel. Ranges are from 0.1 to 10^7 mr/hr. A field calibrator, with a fixed 100 mCi ^{137}Cs source, is used to check calibration consistency on a quarterly basis. Two I&C people are required to perform this calibration check; one in the control room and the other at the RAM location. Telephone communications are made to assure that the read-out of each channel in the control room is consistent with the read-out at the channel location. Recorder values are also checked. A channel failure is visually annunciated in the control room. On a monthly basis electronic test signals and a small check source, activated from the control room, are used to verify system operability.

Process Monitors

There are 8 particulate and gas monitors and 14 liquid process monitors installed to detect early indication of system malfunctions. The range of sensitivity extends to 10^{-6} uCi/cc for the particulate and gas monitors. The liquid sample/detector systems can detect activity down to 2×10^{-7} uCi/cc.

In almost all cases the monitors read-out and alarm at the detector location and in the control room. Electronic

test signals and point check sources are used to verify system and calibration integrity respectively. Point check sources of ^{133}Ba and ^{137}Cs are placed on the end of the thin aluminum windows of the gas and the moving tape particulate monitors. This same technique is used for the liquid monitors which have a thicker cap upon which the source is taped. The reactor building monitor consists of three scintillation detectors; one for particulates, one for iodine in steam and one for noble gases.

Noble gas detectors are calibrated for ^{133}Xe. All monitors will alarm at high signal or channel failure. Two Nuclear Measurements Corporation portable airborne particulate, continuous air monitors (CAMS) are available for routine, special purpose or emergency use as required. They are located at grade level and in the spent fuel area.

Portal Monitors

The three portal monitors at the security guard station, that are used as final personnel contamination checks, were examined. Alarms on these monitors are set to be activated at dose rate levels of from 0.1 to 0.2 mr/hr which is high enough above background to preclude spurious alarms. A small ^{137}Cs was used by a Team member to check the 8 detector channels of each system. The source was placed at the distance from each G-M detector necessary to provide a dose rate of about 0.1 mr/hr. The alarm was activated in all cases. A pulse generator is also used to routinely check the read-out/alarm console for proper operation.

Hand and Foot Counter

The hand and foot counter located at the controlled access entry point in the Auxiliary Building, was checked by a Team member with a small ^{137}Cs source. The alarm for each monitor was activated at a 300 c/m reading of the 500 c/m full scale count ratemeter. The GM probe, used as a frisker to monitor personnel at the step-off pad interface between controlled and clean area of the Auxiliary Building (i.e., access control point), was also checked and found to be in proper operating condition.

Lapel Samplers

There are 4 lapel samplers available but they are not being used. The principle use of these samplers was to

determine the breathing zone airborne concentrations whenever unapproved respirator hoods were worn. The licensee maintains low levels of airborne radioactivity with 10 MPC-hrs being the highest level they have measured. Respiratory protection is required whenever 25% of MPC is observed with airborne radioactivity monitors or whenever smear samples show greater than 10,000 dpm/100cm^2. Prior to NIOSH acceptance of their present air supplied hoods, lapel samplers were used inside the hood to demonstrate compliance with regulatory requirements. No credit was taken or could be taken for the unapproved hood. After approval of the hood, the lapel samplers were no longer used.

4.3.5 Independent Measurements - Survey

During the Appraisal (September 27, 1980) a survey of the area inside the security fence but outside the controlled access area was conducted. An Eberline, PRM-7, "Micro R" per hour meter, serial number 247, with ranges of 0 to 25, 50, 500 and 5000 micro r/hr. The instrument was last calibrated (^{137}Cs) February 6, 1980. The survey included ground areas, waste (non radioactive) containers, equipment, contractor work areas and storm drains and ditches. No contamination or indication of loss of control of radioactive materials was identified.

4.4 Conclusions: Exposure Controls

External

Based on the above findings, improvement in the following area is required to achieve an acceptable program:

(1) The dosimetry records system is a multiplicity of written documents requiring a significant number of man hours to maintain. Occasional system break downs have occurred which have resulted in loss of management control of radiation exposure records.

A state-of-the-art dosimetry records system should be established providing as a minimum data from the following sources: pocket ionization chamber readings, film badge and TLD results, respiratory protection qualification status, calculated neutron doses, and the RWP under which the exposure occurred.

Based on the above findings, the following matters should be considered for improvement of the program:

(1) During outages pocket ionization chambers are issued and doses recorded by a dedicated health physics clerk. It

is recommended that this procedure be expanded to include normal operation.

(2) ANSI N322 recommends that as part of the test procedure pocket ionization chambers be drop tested from a height of 1 meter. The Team has reservations concerning the routine use of this test but would suggest that as a quality control measure, a representative sample of all new pocket dosimeters be tested as recommended by the standard before being placed in service.

(3) A uranium slab source or equivalent should be used for beta calibration of TLD badges, beta factor determination for survey instruments, and beta dose quality control checks on the film badge processor.

(4) Procedural restrictions on entering containment during operation generally preclude the exposure of staff to photon sources above 3 MeV, however a dosimeter system should be acquired and calibrated for such use should the need arise.

(5) The Team believes that the use of retrospective analysis of man-rem vs. RWP should be increased. This action would support ALARA by providing a clearer picture of those jobs resulting in significant exposures and the trends for jobs performed on a repetitive basis. (See Section 6.1 also)

Internal

Based on the above findings, this portion of the licensee's program appears to be acceptable but the following matters should be considered for improvement of the program:

(1) A quality assurance audit of the organization supplying the whole body counter service should be performed to verify that the absolute efficiency determination and the stability of this system are adequate. Periodic quality control tests of counter operation should conducted.

Respiratory Protection

Based on the above findings, improvements in the following areas are required to achieve an acceptable program:

(1) The breathing air supplied by the two compressor systems in use should be tested to assure that it meets class D standards. In addition, the air intakes for the two compressor systems should be located so as to preclude the intake of hydrazine, hydrocarbon, or other potentially toxic vapors. The air from both compressors should also be monitored on a continuous basis for CO.

(2) Administrative responsibility for the respiratory protection program should be clearly delegated. The site staff should be made fully aware of the January 31, 1978 memo, concerning respiratory protection responsibilities, from the Manager, Nuclear Operations, and those individuals designated should vigorously pursue their identified responsibilities.

Based on the above findings, the following matters should be considered for improvement of the program:

(1) A test to evaluate used respirator filters for filter damage and residual filter capacity should be conducted prior to reuse.

(2) The search for an effective full face respirator communication system should be renewed and continued until an acceptable system is found.

(3) Statistical analysis should be used in the evaluation of respirator post washing smears to preclude unnecessary washing of clean systems.

(4) The training received by SMUD staff, including attendance at manufacturer sponsored courses, in the proper operation and maintenance of respiratory protective equipment should be documented in a formal manner.

(5) As planned, the Mako compressor should not be used until moved into its own building and until the modification of the CO interlock when the compressor switch is in manual is completed. In addition, an additional modification to preclude the CO monitor switch being left in the manual position is suggested.

(6) Air samples should routinely be taken during work requiring respiratory protection to verify that airborne levels have not significantly changed from initial values and that the protection factor in use is appropriate.

(7) Procedure AP 305-5.3.11, Rev. 1, allows the use of the acid gas organic vapor canisters with a protection factor of 100 for radioiodine airborne contaminants, however NUREG 0041 does not allow a protection factor for iodine for this type of canister. The procedure should be corrected and all staff members alerted to the change.

(8) The 10% of maximum body burden trigger point for the implementation of calculations to include the internal whole body dose with the external whole body dose is not documented in the procedures nor are the calculational models to be used referenced. This should be formalized by a specific procedure.

(9) No mechanism presently exists to test or determine the residual capacity of the supplied air manifold filters for dust, water, and oil vapors. Some mechanism to determine the serviceability of these filters should be developed.

(10) Some concern and uncertainty exists among the operating staff as to the conditions which require the use of a SCBA system and those which allow the use of a full face mask respirator. Since there is no formal health physics coverage presently on backshifts and weekends, it is appropriate that additional training in this area be given.

Surveillance Program

Based on the above findings, improvement in the following area is required to achieve an acceptable program:

(1) The surveillance program was found to be deficient in the generation and/or retrievability of radiation protection records to verify that appropriate surveillance had been performed. An in-depth review and upgrade are needed to meet the guidance provided by ANSI N13.6-1966 (R 1972) in the areas of (1) protection of the company; (2) accessibility, coherency and retrievability of records for use in evaluating and planning radiation protection for future work, and (3) for use in determining trends and ALARA actions for improved radiation control.

Based on the above findings, the following matters should be considered for improvement of the program:

(1) Specific measurement locations should be included in the routine survey program to aid in standardization of survey results and to make identification and evaluation of trends possible.

(2) Assure appropriate handling of smear samples to avoid cross contamination.

(3) Consider the use of a radiation detection-type instrument during contamination surveys outside the controlled access area to increase the effectiveness of the survey and to promote the identification of unknown sources of radiation.

(4) Examine the management survey record review process to provide a more effective review and to eliminate dual efforts.

Instrumentation

Based on the above findings, improvement in the following area is required to achieve an acceptable program:

(1) Measures to reduce the exposure of personnel during the calibration of portable instruments should be instituted. Radiation levels of 100 and 180 mr/hr were measured adjacent to operating personnel.

Based on the above findings, the following matter should be considered for improvement of the program:

(1) Increased coordination between the Chem-Rad group and I&C concerning the acquisition of new instruments could prove beneficial by providing an evaluation of serviceability and spare parts availability.

5.0 Radioactive Waste Management

The primary responsibility for radioactive waste management has been delegated to the Chem-Rad group. Operations personnel are responsible for operating the liquid and gaseous radioactive waste systems. Administrative Procedure AP 1 assigns to the CRS the responsibility to execute and review the radioactive discharge control and radwaste handling programs. The plant superintendent has the overall responsibility for maintaining environmental releases of plant origin within regulatory requirements.

5.1 Liquids

The Rancho Seco facility has been designed such that releases of liquid radioactive wastes to the environment are considered to be abnormal. The regenerant holdup tanks represent the only source of liquid radioactive waste that could be released offsite. Liquids used to regenerate the ion exchangers that clean up the secondary water system go to the regenerant holdup tanks. Thus contamination of the secondary system from a primary to secondary leak could result in an offsite release of liquid radioactive waste. The contents of these holdup tanks are transferred to one of two retention basins and then released to Hadselville Creek. There is a radiation monitor having the capability to actuate a shutoff valve on a high radiation signal in the line between the regenerant holdup tanks and the basins. The contents of the holdup tanks and the basins are sampled and analyzed for activity and chemical content prior to being released to the basin and creek respectively. All such releases must be approved by the plant superintendent prior to the actual release.

A contaminated sump in the Auxiliary Building had been piped to the polisher demineralizer and makeup sump during construction. Early in the operating life of the plant this error was discovered when activity in the makeup sump was pumped to the regenerant holdup tank. In January 1980 a small amount of activity was detected in the regenerant holdup tank. The source of the activity was determined to be this old pipe connection. A permanent fix of the problem was accomplished by installing a blank flange. The activity (^{134}, ^{137}Cs and tritium) was contained in four regenerant holdup tank volumes and released to the creek via the basins. The releases were made in accordance with procedure AP 305-13, Environmental Releases of Liquid Radioactivity; however, relative to these releases, the PRC had authorized a temporary modification to this procedure because of the specific circumstances. Required approvals were obtained for the three releases (one did not contain measurable amounts of activity) and appropriate records made. The total activity released consisted of about 143 mCi of tritium, 1.3 mCi of ^{134}Cs and 2.3 mCi of ^{137}Cs.

Until November 8, 1979 the licensee was disposing of liquid radioactive waste by shipping to an organization that was licensed to receive such waste. During 1979 the activity present in these shipments varied over the range of 0.2 - 5.96 Ci. These disposals were made in accordance with procedure AP 305-12B, Bulk Radioactive Liquid Shipment. The shipments of liquid radioactive waste had been made on a regular basis. They were terminated because the licenses of all waste disposal organizations were modified to eliminate this type of disposal.

The licensee processes liquid radioactive waste through three subsystems - reactor coolant waste, miscellaneous liquid waste and the makeup and purification system. These subsystems have been described in the FSAR (Sections 11.1.2.2.1, 11.1.2.2.2, 9.2.2 and 11.1.4.2.4). The equipment in these subsystems has been used to process the radioactive waste liquids. The NC has been determining the decontamination factors for the various components on a regular basis. The processing results in most of the activity being deposited on ion exchange resins or in evaporator concentrates. The evaporator distillates contain primarily tritium. The liquid wastes discussed in the previous paragraph have been the evaporator concentrates. The evaporator distillates have been used within the facility.

5.2 Solidification

The first solidification of liquid waste (evaporator concentrates) at Rancho Seco occurred during the period July-October 1980. Chem-Nuclear, under contract, processed the miscellaneous waste concentrates using their (Chem-Nuclear) equipment and urea-formaldehyde as a solidifying agent. The PRC had reviewed and approved a Special Test Procedure (STP), No. 409, that was prepared to cover the solidification processing. On September 2, 1980 the MSRC reviewed and concurred in the 10 CFR 50.59 safety evaluation related to the solidification program described in STP 409. Specific procedures for processing the concentrates, including quality assurance testing, were followed. The quality assurance effort included testing each batch of chemicals and periodically duplicating the solidification process in the lab using the components. Each container was checked by Chem-Nuclear personnel for solidification completeness. The processing was closely followed by the NC and the assigned CRA. The activity present in each processed container varied over the range of 1.8 - 2.3 curies. These containers were shipped to a land burial site with each shipment normally consisting of two containers. Procedure AP 305 - 12A, Shipments of Radioactive Materials Offsite, was followed in preparing these shipments. The licensee is still trying to decide on the future procedure to be used for processing the liquid radioactive waste concentrates.

5.3 Solids

The licensee's solid radioactive waste program consists essentially of collecting and packaging wastes for shipment to and burial at a commercial burial site. This type of waste includes compactible materials (e.g., protective clothing, rags and

disposable coverings), filters and spent resins. There have been no resin waste shipments since October 1978. Most of the compactible materials have been placed in 55 gallon steel drums. The compactor used to load the drums is located in its own room on the ground level floor of the Auxiliary Building. Some wooden containers have been used for larger items and noncompactible materials. Interviews with employees disclosed that there was no active program to reduce the volume of solid waste generated. Containers for disposing of many of the filters have required shielding within the container or a shielding overpack.

The primary responsibility for the solid radioactive waste program has been assigned to the Chem-Rad group. The operations group has the responsibility for operating plant equipment used to transfer spent resins from the storage tank to the shipping container. Utility personnel and contract health physics technicians have been provided to assist in packaging and storing the solid radioactive waste. Procedure Nos. AP 305-10 and AP 305-12A (Radioactive Waste Disposal In-Plant and Shipments of Radioactive Materials Offsite respectively) provide the guidance and instructions for the solid radioactive waste program.

The licensee has a separate facility, located west of the warehouse building, for storing radioactive waste. The facility consists of an inner fenced storage area, a dirt berm for shielding purposes with a simple maze entrance and an outer fence. There is a drain in the southeast corner of the inner storage area. The dirt berm is 10-12 feet high and the fences are 6-7 feet high. The gates in both fences are kept locked with padlocks except during periods of use and the shift supervisor has control of the keys. The inner fence has been posted in accordance with 10 CFR 20.203 (c) (1) and (e) (1) and the outer fence was posted in accordance with 10 CFR 20.203(b). The gate to the inner area was also posted with the words "Personnel Monitoring Required." The drain in the inner area had been posted with words of caution not to dispose of liquids down the drain.

On September 26, 1980 a tour was made of the radioactive waste storage area. At the time of this tour the following items were being stored in the yard.

a. A number of 55 gallon steel drums containing compacted materials. Drums that were to be included in the next waste shipment had been separated from the other containers in the yard.

b. Some filters in shielded containers were stored behind portable shields.

c. Some wooden boxes were covered with protective covers (e.g., canvas).

d. Shields, consisting of corrugated pipe filled with concrete and having a cover, were being used to store containers with filters that had higher levels of radiation.

e. Some contaminated equipment was being stored inside a four walled cave of lead bricks because of the radiation levels.

f. A few 55 gallon drums of slightly contaminated oil.

The containers in the yard were labeled in accordance with 10 CFR 20.203(f)(1) and (2) or 49 CFR 173.392(c)(8). The tops of the containers or the labels identified the major isotopes present and the radiation levels at contact and at 3 feet. The information on the top of the containers did show the effect of fading from exposure to the sun (the storage yard was not covered).

A radiation survey was made during the tour of the waste storage facility. This survey was made using a Region V Eberline Model E-520 survey meter (No. NRC 8253) with a GM detector. This survey meter was last calibrated on October 3, 1980. The maximum radiation level detected at a distance of about 12 inches from the outside of the inner fence was 100 mr/hr. The radiation level around most of this inner fence was less than 4 mr/hr. Radiation levels outside the outer fence were less than 0.5 mr/hr. The results of surveys of various containers stored inside the waste storage facility confirmed or were slightly less than the values recorded on the containers.

The September 26 tour included the area immediately north of the cooling towers where (1) contaminated equipment inside two locked, covered trailers, (2) drums of charcoal and (3) a contaminated, empty liquid tank trailer were being stored. The area was barricaded with rope and posted in accordance with 10 CFR 20.203(b). One of the trailers was posted in accordance with 10 CFR 20.203(c)(1) and (e)(1) and the other was posted in accordance with 20.203(e)(1) plus the words "Caution Radioactive Contaminated Area". The sealed drums of charcoal, which contained small amounts of iodine-131, were labeled in accordance with 10 CFR 20.203(f). The survey around the perimeter of the roped area disclosed a maximum radiation level of slightly less than 1 mr/hr with most of the perimeter being less than 0.5 mr/hr. The maximum radiation level at about 12 inches from the door to one of the trailers

was 40 mr/hr with most of the perimeter of the trailer (at the same distance) being less than 5 mr/hr. The maximum radiation level around the other trailer at about 12 inches was 1.5 mr/hr. The maximum radiation level around the perimeter of the tank trailer at 12-18 inches was 1.2 mr/hr with most of the perimeter being less than 0.5 mr/hr. Radiation levels up to 50 mr/hr were detected along the bottom of the tank.

The licensee contracted with TERA Corporation to review the handling of waste drums and miscellaneous radioactive waste components. The contract also required an evaluation of and comments regarding the filter review effort by the SMUD Special Review Committee - refer to page 55 of this report. TERA submitted a formal report on the tasks performed under the contract. The following recommendations, and others, were included in the report findings.

a. The radwaste storage area should be upgraded to provide protection (roof) against exposure to the elements, shielding to reduce sky-shine, and control of run-off (leakage or rain).

b. A 55-gallon drum shielded overpack transfer cask should be procured.

c. Shielded or other drums should be removed from the Auxiliary Building.

With respect to upgrading the radwaste storage area, the licensee said that the engineering work should be performed during 1981 with construction expected to take place during 1982.

5.4 Gases

Radioactive waste gases can be grouped into three types of releases based upon the handling and release point. Most of the radioactive gas is temporarily stored in the four waste gas decay tanks before being released to the Auxiliary Building/Radwaste Area/Fuel Area discharge stack (Auxiliary Building stack) via the waste gas discharge header. Radioactive waste gases containing low levels of activity are released directly to the environment via the continuous exhaust plenum and Auxiliary Building stack. The third type of radioactive waste gas release results from purging the containment building. Purges are released to the environment via the Reactor Building exhaust stack. The gaseous wastes pass through prefilters high efficiency particulate air (HEPA) filters and charcoal

absorbers prior to being released to the environment via either the Auxiliary Building or Containment Building stacks.

Procedure AP 305-14 controls the release of airborne radioactivity to the environment. This procedure requires that grab samples be obtained and analyzed prior to a Containment Building purge or the release of a waste gas decay tank. Weekly sampling is required for periods of continuous purging. Weekly samples (particulate and iodine) are analyzed to provide data on the continuous releases from the Auxiliary Building stack. The sample results are used to complete the discharge permit that is required by the procedure. The permits are prepared and signed by the CRS (or HP or NC) as well as the shift supervisor. The plant superintendent must sign permits for the release of a waste gas decay tank that has not been held for at least 45 days.

HEPA filters and charcoal absorbers are also located in the control room emergency ventilation system and inside the Containment Building. Technical Specifications 4.10, 4.11 and 4.12 require the testing of the control room emergency ventilation filtering components, the filtering components for containment purges and the absorber (charcoal) units inside the Containment Building respectively. These tests are required to be performed during each refueling interval. The tests are required to be performed using DOP for the HEPA filters and Freon-112 (or equivalent) for the charcoal. The HEPA filters must have a filtering efficiency of 99.9% and the charcoal absorbers must have an efficiency of 99.5%. According to the licensee they have been trying to meet the HEPA and charcoal filter testing requirements in their technical specifications as well as the more extensive requirements being incorporated into the currently issued technical specifications. Some adjustment to the more restrictive requirements is necessary because the Rancho Seco filter trains do not contain heaters. The adjustment relates to the laboratory testing of the charcoal (not presently required by the technical specifications) where a temperature of 30 degrees centigrade is used instead of 80 degrees. The relative humidity was 70 percent during the most recent testing, but 95 percent is expected to be used in the future.

The most recent required filter testing plus the testing of the filters (HEPA and charcoal) in the Auxiliary Building stack system took place in February and March 1980, during the refueling outage. The testing of the filters was performed in accordance with approved surveillance procedures; however, the

1980 test was also performed under STP 078. STP-078, which was approved by the PRC on February 4, 1980, incorporated the applicable surveillance procedures. The testing was performed by Nuclear Containment Systems, Inc. of Columbus, Ohio. The testing included laboratory testing of charcoal samples for methyl iodide absorption as well as inplace testing of the filters. The Nuclear Containment Systems' report of the 1980 testing of the HEPA filters, charcoal absorbers and charcoal samples was examined. The following summarizes the report.

a. The laboratory tests using méthyl iodide were performed in accordance with ASTM D 3803-1979 and RTD-M16-1T.

b. The laboratory results for methyl iodide removal varied over the range of 81.1 -99.4% removal efficiency for 2 inches and 99.4 - 100% removal efficiency for 4 inches of charcoal. (This is not a technical specification required test.)

c. A visible inspection of the inplace HEPA filters and charcoal absorbers was made.

d. Airflow distribution measurements were made and the maximum and minimum values were within 20% of the average value.

e. The inplace HEPA filter testing showed the removal efficiency varied over the range of 99.9 - 99.98% for all banks.

The work performed by Nuclear Containment Systems, Inc. met the requirements of ANSI N510-1975 and the results were acceptable according to the technical specifications. Nuclear Containment Systems subcontracts the laboratory testing; however, the lab results have been provided in a Nuclear Containment Systems report.

5.5 <u>Conclusions - Radioactive Waste Management</u>

Based on the above findings, this portion of the licensee's program appears to be acceptable but the following matters should be considered for improvement of the program:

(1) A volume reduction effort should be incorporated into the solid radioactive waste program.

(2) The waste storage area should be upgraded to provide: (a) protection against the elements, (b) storage capability for waste containers with higher levels of radiation,

(c) an internal drain collection system and (d) a storage capability for contaminated equipment. This upgrading should be accomplished with minimum delay.

(3) Staff effort should be devoted to providing an acceptable method for disposing of the contaminated oil in the waste storage area.

6.0 ALARA Program

SMUD has an established policy of keeping all personnel radiation exposures as low as reasonably achievable. The Radiation Control Manual, Section 1.0 - General Information, states this policy in terms of insuring "that all exposure to radiation is held to a minimum." Very recently upper-level management, including the General Manager, signed an ALARA Policy Statement that discusses the philosophy of the policy and delineates the requirements for personnel instruction and training, assignment of responsibilities, auditing of the program and enforcement authority. According to this statement policies and implementing procedures will be issued in accordance with SMUD administrative procedures. The ALARA Policy Statement will be reviewed and approved by the MSRC who will have the responsibility for its implementation. The Radiation Control Manual states that the Plant Superintendent is responsible for protecting all persons against radiation of plant origin. Plant Administrative Procedure No. 1 assigns the responsibility to "coordinate and schedule health physics operations...to insure health physics activities will produce ALARA" to the CRS. This procedure also assigns to the HP the responsibility to "develop, refine and verify the application of programs in maintaining the radiation exposures of employees and the public to a level 'as low as reasonably achievable.'" The job descriptions for the CRS and the HP include duty assignments to assure and maintain radiation exposures as low as reasonably achievable. Section 3.1 of the Radiation Control Manual, Access Control, also mentions minimizing exposure to radiation. The above summarizes the documented commitment to ALARA, the assigned responsibilities, and related procedures and instructions generated to date. According to the licensee a contract with an outside organization to provide recommendations on the scope of an ALARA program is presently being discussed.

Approximately two months ago an ALARA Committee was established. The Corporate Health Physicist is the chairman and the membership includes radiation safety personnel from the plant staff and district office staff. Possible expansion of the membership or changes in the method of operating were discussed during the September 29, 1980 meeting of the Committee. Minutes are prepared for each meeting. The Committee developed a form to facilitate employee suggestions

for reducing personnel exposures. On August 6, 1980 a memorandum was sent to all site supervisors by the CRS requesting a new effort to make personnel exposure reduction a serious program and providing copies of the ALARA suggestion form with the instruction that ALARA suggestions be discussed at each safety meeting. About 12 ALARA suggestions have been made to the Committee to date. Persons making suggestions will be informed of the Committee's action on their suggestion.

The extent of the ALARA program in effect was ascertained by interviewing personnel at the site as well as at the District Office and examining related written material. The following items were identified as being part of the ALARA program.

a. Preplanning discussions have been held in connection with activities (e.g., modifications, repairs and maintenance) that would be expected to result in higher personnel exposures.

b. RWP's are required for all entries inside controlled areas (e.g., radiation and contamination areas, airborne radioactivity area, and areas where opening, cutting or welding on lines or equipment containing radioactive fluids or solids takes place). The RWP provides information on the protective clothing to be worn, the radiation survey results, special dosimetry requirements and any other special instructions for the safe performance of the work.

c. Time, distance and shielding (temporary and permanent) have been used to reduce exposures received by personnel during the performance of their work inside controlled areas.

d. Selection of personnel to perform some of the activities has been made on the basis of ALARA considerations.

e. Radiation safety training of personnel includes the subject of ALARA and a discussion of each individual's responsibility in keeping his/her exposure ALARA. Mock-ups of some of the equipment (e.g., upper and lower steam generator heads) have been purchased and used to train personnel prior to actually performing the work.

f. Purchase and use of improved equipment has resulted in lower personnel exposures.

g. Some proposed work has been delayed because of ALARA considerations.

h. There is an active program to reduce the crud generated in the primary coolant system. In addition, a consultant evaluates the primary and secondary water chemistry results, including

radiochemistry data, for the purpose of providing quarterly trends. The object of the trending reports is improved water chemistry which also impacts on the ALARA program.

i. Expansion of the radiation protection staff, both on a temporary basis during refueling or maintenance outages and the proposed permanent increases, is considered to be directly related to the ALARA program.

j. On a monthly basis site upper management receives information on exposures greater than 300 mrem.

k. The Radiation Control Manual provides administrative controls related to authorizations required for increasing exposures to be received by personnel. The individual's immediate supervisor must approve exposures above 100 mrem per week. A secondary approval by either the HP or the CRS must be obtained for exposures of 300 mrem or greater per week. Exposures above 1 rem per quarter must be approved by the PRC. The maximum administrative exposure limit has been set at 2.5 rem per quarter.

l. There have been a few instances where reviews of completed work have been made for the purpose of improving repeat performance of these activities and reducing associated personnel exposures.

m. Drums with higher levels of radioactive waste have been stored in low or no traffic rooms in the Auxiliary Building rather than the radwaste storage yard, specifically for ALARA reasons.

Interviews with site and district office personnel yielded several comments related to the ALARA program. There is an understanding by most of the staff that management supports an ALARA program; however, only a few were aware of a documented commitment to this program. The staff also indicated that usually there was adequate financial support for the ALARA program. With respect to weaknesses in the ALARA program most of the persons mentioned the failure to provide additional shielding, or make other changes, to the several filters that result in a significant portion of the operating exposures received. In April 1979 the PRC approved corrective actions for about 8 types of filters as recommended by a Special Review Committee; however, the corrective actions have not yet been implemented. A second weakness mentioned by most of the individuals was the problem of a lack of communication in various areas of the organization (e.g., employee-immediate supervisor, employee-employee, group-group). Another significant weakness concerns past exposure data not being readily available (refer to Sections 4.1.1 and 4.4).

The following comments were also suggested as weaknesses in the ALARA program that need to be addressed.

a. Improvement in and additional preplanning could result in lower exposures being received.

b. Post work reviews should take place to provide a timely opportunity for suggestions to reduce exposures during subsequent similar activities. Very few of these types of reviews have taken place.

c. Work performed by or under the cognizance of Generation Engineering needs ALARA evaluations by radiation safety personnel including coordination with site radiation safety personnel. The Principal Engineering Technician (HP), who is part of the Generation Engineering staff, has the ALARA evaluation responsibility, but to date this evaluation effort has not been implemented.

d. Radiation safety training should include more group specific material.

e. Supervision should be more involved in the ALARA program as it relates to their area of interest and not rely entirely on radiation protection personnel to keep radiation exposure of their personnel ALARA.

f. Engineering advice or evaluation may be advisable prior to the use of temporary lead shielding for ALARA reasons.

g. Operations should take actions to reduce hot spots within the plant rather than relying on temporary lead shielding to reduce exposures resulting from such hot spots.

Section C.1.b of Regulatory Guide 8.8 discusses the importance of upper-level management support and the need for designating responsibility and authority in connection with the ALARA program. In establishing such a program, upper management should ensure the presence of (1) designation of responsibility for development of an ALARA program, (2) the means for providing the resources necessary to implement the program, (3) an effective measurement system and (4) a means for reviewing ALARA results and incorporating corrective actions resulting from such review. The above described information on the licensee's ALARA efforts shows that upper-level management guidance in the four areas described in the previous sentence was not discernable; however, the basic policy statement that was recently signed by upper-level management provides for implementing policies and procedures in these areas. Presently the ALARA program appears to be supported by a limited amount of documentation that

consists of the responsibility assignments to the CRS and the HP and the basic statement in the Radiation Control Manual regarding exposures being held to a minimum (the recent policy statement had not been formally issued).

6.1 Conclusions: ALARA Program

Based on the above findings, improvement in the following areas is required to achieve an acceptable program:

(1) Upper-level management guidance needs to be provided in the areas of (1) assigning responsibility for the development of an ALARA Program, (2) establishing an effective measurement system, (3) reviewing results and taking corrective actions, and (4) establishing implementing procedures.

(2) The ALARA program, including upper-level management guidance and implementing procedures and instructions, needs to be more fully documented.

(3) The exposure data record system should be improved so as to provide information that can be used during preplanning efforts related to keeping exposures ALARA.

Based on the above findings, the following matters should be considered for improvement of the program:

(1) Implementation of the recommendations by the Special Review Committee related to the filter improvement program should be completed as soon as possible.

(2) A special effort should be made to assure adequate communications exist at all levels of the organization with respect to the ALARA program.

(3) The ALARA review related to work performed by or under the cognizance of Generation Engineering and coordination with site radiation safety responsibilities needs to be implemented in a more timely manner.

(4) An effort should be made to provide adequate storage for drums containing higher levels of radioactive waste so that rooms in the Auxiliary Building do not need to be used for this purpose.

(5) The ALARA program should include operational actions that could result in lowering the radiation levels resulting from hot spots.

7.0 Facilities and Equipment

7.1 Access Control Area

A number of different activities are conducted in this area within a confined space which separates the locker room from the controlled area step-off pads. The dosimeter issue desk, RWP and dosimeter sign in-out desk and hand and foot counter are all located in the locker room.

The personnel decontamination area is located just off the controlled entrance-exit area and consists of one shower (unisex) and two scrub sinks. The respirator cleaning-issuance area, the decon clothing issuance and dressing area, the security access control check point, the equipment removal survey area, and the personnel exit radiation survey area are all in the same general area with a flow pattern that is less than ideal and square footage that is considered inadequate by the health physics staff.

The respiratory mask storage and cleaning area appears to be too small. The use of four garbage type cans for washing respirators raises questions concerning the efficiency and efficacy of the procedure.

The equipment decontamination area is adequate in size, is adequately secured, and is conveniently located.

The instrument storage capability appeared adequate for normal operations.

7.2 Chemistry Laboratory

The hot chemistry lab has adequate space, however, both the Chem-Rad staff and the Team believe the cold chemistry lab is over crowded. Without enumerating all the equipment contained in the lab, the amount of free bench space for sample preparation and recording data is minimal.

The hot chemistry laboratory contains a sample collection hood from which samples are drawn for analysis and counting. Adequate engineering features for sampling under normal and anticipated occurrences have been incorporated into the system. Shielding has been installed on walls and floors to keep radiation from piping ALARA. During the appraisal, a let-down line sample was drawn after purging the sample line. The procedure observed was for the CRA to rinse a one liter plastic collection bottle and cap with the sample water pouring

from the flexible sample line. The bottle was then filled and capped. Excess water was wiped off the bottle with paper towels which were then placed in a plastic bag for disposal. The sample was then taken to a nearby chemistry bench and placed behind a lead shield. The operation was performed at hand contact with the CRA wearing surgical gloves to preclude hand contamination.

At the request of a Team Member, a measurement was made of the sample bottle which was found to indicate a contact dose rate of 150 mr/hr. The usual dose rate was said to be about 70 to 100 mr/hr. The chemistry supervisor was contacted and the following points were discussed:

(1) The CRA should have had a dose rate meter in the sample hood to monitor the sample during collection. This would provide assurance that only a normal and not a high level (e.g., crud burst) sample was being collected. Procedure A-11 "Reactor Sampling System" calls for an area monitor or a portable monitor to serve the sampling station. The area monitor in the chemistry laboratory is located at some distance from the station and does not effectively serve the function required by procedure A-11.

(2) The CRA should wear dosimeters for extremity monitoring.

(3) With respect to ALARA, the procedure should be reviewed with the goal of reducing radiation exposure received by the CRA to levels that are ALARA without sacrifice of collection and sample integrity.

7.3 Counting Room

The counting room, adjoining the radiochemistry laboratory, was equipped with the following instruments:

(a) Nuclear Chicago Unilux II-A liquid scintillation counter. The system has a demonstrated lack of stability requiring major maintenance four times in the past year. Efficiencies as determined using NBS traceable sources were acceptable in magnitude but unstable with time.

(b) Beckman Low Beta, Wide Beta II, counter. The system appeared to be well maintained and functioned properly. It was calibrated using NBS traceable liquid sources. The background was noted to be 13 cpm; a value which is significantly above the 3-4 cpm normally obtained with such a system.

(c) Tennecomp Systems Inc., TASC-2 Radioisotopic Analysis System, Ge(Li) system. System calibrated using NBS mixed fission product liquid standards in the geometries used for plant samples (e.g., crud-2" planchett, 50 cc bottle-liquid sample; NRC gas sample-liquid sample; charcoal filter--liquid deposited on one end but sample counted twice for half the normal time on each end; silver zeolite cartridges, same as charcoal; liquid scintillation vial--10 cc liquid sample; aluminum wall gas marinelli beaker (1.24 ℓ and 4.35 ℓ), liquid filled; plastic marinelli beaker (2 ℓ and 5 ℓ), liquid filled; high volume air sampler charcoal canister, evaporated liquid source).

(d) Northern Scientific, Econ II Series, multichannel analyzer with Ge(Li) detector. A manual system without any computer supported data reduction.

Additionally, another computer-based multichannel analyzer was in the room which belonged to a subcontractor and was being used in a research effort by the contractor.

The SMUD staff indicated that a ^{127}Xe NBS gas source was on order and the containers used for gas samples would be recalibrated using this multienergy source.

7.4 Chem-Rad Office Areas

The office and administrative space allocated to the NC, the HP, and the CRS is considered adequate. However, no space has been allocated to the CRAs for data reduction and report preparation. The space allocated for external dosimetry, badge preparation, and data handling is insufficient since these activities occur in the administrative office which is being used for this activity as well as the normal administrative functions of the Chem-Rad group. A separate work area is needed for the TLD system, film badge issurance, preparation of special dosimeters, and beta calibration work.

7.5 Chem-Rad Support Facilities and Equipment

The whole body counter (WBC) facility while remotely located, is adequate in size. The location away from the power block and increased background appears satisfactory. The Team believed that instructions should be posted for the normal operation of the counter as well as specific instructions for actions to be taken when communications with the WBC contractor breakdown.

The present laundry facilities are considered adequate; however, it was anticipated by plant personnel that the facility will be moved to allow installation of the remote primary sampling system. The location for the new laundry was not known and the use of a contract laundry service was a distinct possibility. At present, all clothing less than 10 mr/hr at contact is washed. Clothing over 10 mr/hr is disposed of as radioactive waste. All washed clothing is monitored after cleaning for residual contamination prior to its being folded for reuse.

Adequate supplies of all disposable protective clothing and coverings were observed to be on hand.

The fitting and testing area for respiratory protection is located in the training center. Both this area and the training facilities were considered adequate.

Adequate supplies of portable shielding (e.g., lead blankets) were available.

Portable containments and ventilation systems with HEPA filters are available for use when activities with anticipated high levels of airborne contaminents are to be performed.

7.6 Facility Ventilation

As part of the appraisal air flows in various laboratories and engineered systems were measured for comparison with existing standards and guides. Capture velocities of 100-150 linear feet per minute (lfm) are recommended for laboratory hoods at the hood face with the door open. (Patty, F.A., Ed. (1958) "Ventilation" page 285 in Industrial Hygiene and Toxicology (Inter Science Publishers, Inc., New York)). The instrument used was an Alnor Velometer, Type 6006B equipped with a type 6050 probe, (0 to 300 lfm). The following were the flow rates measured:

(1) Trash compactor barrel cover at edge of cover with cover raised -- no detectable flow;

(2) Decontamination room, front surface of ultrasonic cleaning tanks -- no detectable flow with damper in any of four allowable positions;

(3) Decontamination room, work table-scrub area: no detectable flow;

(4) Radiochemistry Laboratory Hoods, with the face open to permit work in the hood,

by pass-through	85 lfm
small hood by door	110 lfm
oxygen analyzer hood	125 lfm
primary sample hood	60 lfm

(5) Flow from counting room to radiochemistry laboratory as measured in doorway - 10 lfm.

(6) Cold chemistry lab

hood	125 lfm
atomic absorption hood (used for radioactive samples)	5 lfm

7.7 Conclusions: Facilities and Equipment

Based on the above findings, improvements in the following areas are required to achieve an acceptable program:

(1) Review and modify the present method of reactor coolant sample collection and handling so as to reduce hand exposures.

(2) The ventilation provided by engineered systems should be evaluated to assure that recommended air flows are achieved. Special equipment such as the radioactive waste compactor should be equipped with a device which indicates ventilation system failure or loss of flow.

Based on the above findings, the following matters should be considered for improvement of the program:

(1) The access control area should be evaluated and consideration given to improving the facilities to provide adequate space for the many functions occurring in this area.

(2) Provisions for appropriate desk or work space to be used by the CRAs for data reduction or report preparation should be considered.

(3) Appropriate facilities for film badge preparation, TLD preparation and evaluation and beta calibrations should be considered.

(4) The following matters relative to the counting equipment should be considered:

(a) The instability of the liquid scintillation counting system should be corrected or the equipment replaced.

(b) A second, computer based Ge(Li) or intrinsic Ge spectometer system should be considered as back up for the present system.

8.0 Emergency Response Capability

The licensee's current emergency response capability has evolved from planning which began prior to the issuance of the operating license. Currently additional planning is underway to upgrade the emergency response capability to meet the new requirements. Some modifications related to the new requirements have already been implemented. Emergency response has involved both District Office and site personnel with the former mainly involved in the planning effort and the annual drill (exercise).

The current response by SMUD to radiological emergencies is primarily limited to onsite actions. There are provisions for downwind environmental monitoring offsite by SMUD personnel during emergency situations; however, at some point in time representatives from either Sacramento County or the California State Office of Emergency Services are expected to relieve SMUD of this reponsibility.

The Emergency Plan describes the organization that comes into existence for the purpose of responding to the various types of incident situations. Emergency position assignments, with designated alternates also identified, have been made. Position responsibilities have been described and the assembly points for the various groups of site personnel have been established. The emergency plan does not currently make use of District Office personnel with expertise in the areas of radiation safety and environmental monitoring.

The Emergency Plan is supported by implementing procedures. The procedures relate to the following types of emergency situations: medical injury (both with and without contamination), contamination and excessive radiation exposure, fire, sabotage and civil disturbance, and evacuations. Modifications to either the plan or implementing procedures must be reviewed by the PRC, and the Plant Superintendent and the Manager of Nuclear Operations must approve all such changes prior to implementing them. The plan and implementing procedures must be completely reviewed on an annual basis. The most recent modification (revision 9, dated March 31, 1980) incorporated the Technical Support and Operations Support Centers into the Emergency Plan; however, the change did not include a listing of the supplies,

equipment and instrumentation to be maintained at the Technical Support Center. Neither the plan nor the implementing procedures make reference to or incorporate those routine procedures (e.g., surveys, radiation work permits, control of access to "controlled area", etc.) from the Radiation Control Manual that will be used during an emergency situation.

The emergency response training covers both initial and retraining efforts. Such training has been coordinated with the radiation safety training program. In addition the licensee conducts quarterly and annual drills. The quarterly drills are primarily directed toward practicing the evacuation of personnel to assembly locations and testing the communications equipment. Normally the quarterly drills also involve first-aid or fire fighting response. The annual drills involve the offsite support agencies. A drill that exercises the medical response portions of the Emergency Plan, including the transporation to and treatment at the hospital, is also conducted once a year.

The emergency drills provide operations personnel, radiation protection personnel and members of the site staff assigned to locations other than the assembly points with an opportunity to perform activities under simulated incident situations. The annual drills also provide radiation protection personnel assigned to the assembly locations with an opportunity to conduct simulated offsite environmental monitoring. Other onsite groups participate in the drills only to the extent of going to the assembly points for personnel accountability. Groups at the assembly points that provide a manpower pool backup do not receive any training related to performing emergency support activities under incident conditions (e.g., high levels of radiation, significant airborne radioactivity or changing levels of contamination).

There are no specific training sessions on changes to the emergency plan or implementing procedures. Critiques have been held following the drills to identify weaknesses in the plan or implementing procedures that need to be corrected or areas where additional training is needed.

The equipment and supplies in the emergency lockers located at the two assembly points and the control room area were compared to the inventory lists in the emergency implementing procedure related to evacuation. The assembly point lockers were found to contain the required items including 9 PICs for personnel dosimetry, a portable GM survey meter and a high range (500 or 1000 r/hr) portable dose rate survey meter. The survey meters had been calibrated within the last 3 months - the calibration frequency is quarterly. The lockers also contained 3 full face air-purifying respirators

(particulate and charcoal canisters), 2 SCBA devices and a portable air sampler with filters for particulate and iodine sample collection. The contents of the control room area locker differ from the other lockers in the following manner: the instrumentation consists of a portable ion chamber survey meter (Eberline Model RO-1 or equivalent) and frisker monitor, 20 sets of protective clothing plus extra shoe covers and gloves, additional PICs (10 total), first-aid suitcases, medical oxygen cylinders, emergency gas sampling equipment and emergency procedures for airborne radioactivity sampling. Five SCBA devices are kept in the area near the control room for emergency purposes. The emergency lockers have been inventoried on a monthly basis. Following the inventory the locker is secured with a wire seal.

8.1 Conclusions: Emergency Response Capabilities

Based on the above findings, this portion of the licensee's program appears to be acceptable but the following matters should be considered for improvement of the program (it is understood that additional modification of the response plan and procedures are going on to meet amended 10 CFR 50 Appendix E requirements):

(1) The Emergency Plan or implementing procedures should include or specifically reference those procedures in the Radiation Control Manual that are expected to be used during emergency situations.

(2) Emergency response should include the use of District Office personnel with expertise in the areas of radiation safety and environmental monitoring during emergencies.

(3) Training related to the Emergency Plan and its implementation needs to be expanded to assure that onsite support groups are prepared to function under emergency conditions, including significantly higher radiation levels, changing levels of contamination and other changed environmental conditions. Also provisions should be included for specific training related to changes in the Emergency Plan or implementing procedures.

(4) The contents of the emergency equipment lockers should be evaluated to assure that adequate supplies of personnel monitoring devices and portable survey instruments would be available in the event of an emergency. The review should consider the type of radiation (e.g., energy) and the areas of the individual to be monitored (e.g., skin, extremities, multiple locations).

9.0 General Procedure Development

Specifications and requirements for written procedures for radiation protection were provided in Section 6.8, Amendment 24, of the Technical Specifications. In addition responsibility, authority and policy for preparation, revision and review were contained in the plant Administrative Procedures. The PRC was chartered to review each procedure and administrative policy and changes thereto. Certain procedures, including the chemistry and radiation protection were also required to be approved by the Plant Superintendent. Radiation protection procedures are contained in Administrative Procedures Section AP 305, Chemistry Procedures in Section AP 306, Emergency Procedures in AP 500 and non-licensed training procedures in AP-700.

The master copy of all procedures was maintained in a document control section of the administration building. Controlled copies were produced and distributed to a formal list of station users.

A review of Chem-Rad procedures disclosed significant deficiencies with respect to the criteria of ANSI N18.7-1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants, in that:

(1) All procedures were not current.

(2) Each procedure did not indicate approval status.

(3) Currentness of a procedure was not readily apparent to the user.

(4) Some procedures were not readily available to users.

Selected master copies of Chem-Rad procedures were examined to verify review and approval processes and their currentness. The appropriate forms with review and approval signatures of the PRC designee and plant superintendent were appended to each copy and revision. It was noted that some procedures (AP 305-11 and AP 305-16) indicated no review or revision since 1975 and numerous procedures indicated that the last review or revision was in 1976 and 1977, i.e., AP 305-17, AP 305-18 and most instrument calibration procedures.

Administrative Procedure AP 27 required a procedure review at two year intervals. A revision may constitute a review. The plant Technical Assistant (TA) was assigned the responsibility for examining plant procedures at a six-month frequency to determine those procedures overdue for review and those due for review within the next six months. The TA examinations had been accomplished and documented.

Formal notification of the results was communicated to the Plant Superintendent who reviewed the information and transmitted notices to the responsible organizations. It is apparent that followup to assure completion of the reviews was not accomplished.

Discussions with the CRS indicated awareness of the problem, including recognition that the Radiation Control Manual was significantly out of date. He stated that response to the plant superintendent's notices was limited to those procedures judged to be most important because of work load and available resources. Increased emphasis was being placed in this area. Part of this increased emphasis was the recent inclusion of discussions on procedure applicability, clarification and revision needed, in the weekly safety meetings held with the CRAs. Continued emphasis on technician participation should be encouraged.

Document control notices distributed to document holders indicate the review, revision and approval status of specific documents when each review, revision or approval action was completed. These notices are normally maintained in the front of each document. Each procedure, however, did not display an approval status as recommended in Section 5.3.2 of ANSI N18.7-1976. Users of a specific procedure could not readily determine whether a specific procedure was current and approved without reference to the various notices. It may be necessary to review twenty or more document control notices to make that determination. Some procedures in AP 306 were dated 1974 on the specific procedure. After considerable effort, the Team member determined these procedures to be current.

The purpose of a procedure should be clearly indicated. However, certain of the analytical procedures, such as those for boron and chloride determinations, were not sufficiently described in the purpose statement for it to be obvious to laboratory personnel which procedure was to be used for a specific analysis. In discussions with CRAs and by personal observation, it was noted on several occasions that CRAs had to call supervision to verify which procedures to use. Experienced personnel may have sufficient familiarity to know which procedures to use; however, approximately half of the CRAs were new to the facility.

An office memorandum to all Rancho Seco personnel carried the following statement:

> "This Radiation Control Manual conveys the operating philosophy for providing the health, safety, and well-being of employees and visitors at Rancho Seco. The purpose of this Manual is to provide guidelines to achieve and maintain a safe working environment with minimum personal discomfort and a high degree of efficiency.

"Each employee shall become thoroughly familiar with this Manual, and follow its instructions, not only to protect himself, but to ensure that he does not jeopardize the safety of others."

In the Chem-Rad group, controlled copies of the Radiation Control Manual were available in the CRS's Office, the SCRA Office and in the Chemistry Laboratory. However, reference copies were not readily available to the Chem Rad personnel assigned to radiation protection functions.

Interviews with Chem-Rad personnel indicated that they were aware of, rather than "thoroughly familiar" with the manual. It appears that personnel were reluctant to request the manual for casual reading in that it would indicate spare time to management. Management stated that they encouraged personnel to read the manual and procedures but admitted that a technician office area with reference material including the Radiation Control Manual and procedures would increase the potential for use and review. It was recommended that documents, procedures and instructions which plant personnel are expected to know and follow be made readily available to them.

9.1 Conclusion: General Procedure Development

Based on the above findings, improvement in the following area is required to achieve an acceptable program:

(1) Revise procedure format to conform to the guidance contained in ANSI N18.7 to assure that each procedure indicates its approval status and currentness to the user.

Based on the above findings, the following matters should be considered for improvement of the program:

(1) Review the availability of documents, procedures and instructions to assure that they are readily accessible to personnel expected to know and follow them.

(2) Review and revise procedures to assure that the purpose for which they are provided is clearly indicated.

10. NUREG-0578-Lessons Learned

During the Appraisal, licensee actions with respect to certain topics identified in NUREG-0578 were evaluated at the request of NRR.

Section 2.1.6.a "Integrity of Systems Outside Containment Likely to Contain Radioactivity"

SMUD's January 7, 1980 letter to the NRC regarding the status of actions required by NUREG-0578 identified those systems or parts of systems outside containment likely to contain radioactivity. These systems have been leak tested and the results submitted to the NRC in letters dated April 11, and May 22, 1980. The May 22, 1980 letter stated that the leakage rate from the High Source Level Reactor Coolant Sampling System would be measured when the installation was completed. These systems will routinely be checked for leakage in accordance with approved surveillance procedures. The appraisal disclosed that the following three such surveillance procedures had not yet been prepared and approved: Pre-refueling Leakage Identification, Reactor Building Spray System Leakage, Waste Gas System Leakage. The licensee stated that these three procedures would be written and approved prior to the next refueling outage when the tests are next required to be performed.

The licensee reviewed the plant design for potential leakage release paths from these systems due to design and operator deficiencies. As the result of this review, relief valves for the make-up filter and reactor coolant pump seal return were to be rerouted to suitable tanks or sumps instead of the present open floor drains. The licensee was considering the possibility of routing these valves to the flash tank. The possibility of blank flanging of these valves was also being considered. In addition, changes were to be made to prevent contaminated water spilled in the Auxiliary Building from leaving the building at grade level. According to the licensee an Engineering Change Notice (ECN) was issued on October 1, 1980 for the construction of sloped dams at the grade level entrances to the Auxiliary Building. The dams are expected to be constructed by January 1, 1981.

Section 2.1.8.a "Improved Post Accident Sampling Capability"

SMUD's January 7, 1980 letter to NRC identified an interim system to be used for the collection of primary coolant and containment atmosphere samples. A SMUD letter of April 11, 1980 specified the limitations of the existing and modified sample system which were principally related to the projected exposures resulting from sampling activities under accident conditions.

The licensee has installed a temporary sample line in the sample collection hood to collect a 1 cc reactor coolant sample in accordance with procedures AP-305-29, Emergency Reactor Coolant Sampling - Liquid. As reported by SMUD, use of this sampling line as installed,

under accident conditions, could result in excessive exposure to the operator. The system has not been designed for remote operation and the operator would be required to handle the post accident sample at close distances. A work order for design and installation of an extension rod to work the sample line valves at some distance was given to I&C several months ago, but nothing has been developed with respect to its installation. The placement of an extension rod for valve operation would allow shielding to be installed in the hood for radiation protection of the individual collecting the sample.

The valve installed to permit the collection of a 1 cc sample was borrowed from other equipment until a permanent valve could be procured and installed. A June 1980 work request, issued for installation of the permanent valve had not been acted on as of September 29, 1980. The system had not been tested with the temporary valve in place because contamination of the temporary valve would have rendered it useless in the equipment for which it was originally purchased. Training in this procedure and use of this system was given to 14 individuals the week of June 8, 1980.

Collection of the reactor building atmosphere sample is described in procedure AP 305-27, Airborne Radioactivity - Emergency Sampling. The SMUD letter of April 11, 1980 to NRR describe the limitations of this sampling procedure with respect to source term values.

The technique involves collection of a 100 ml sample in a glass container from a valved tap on the reactor building atmosphere monitor. Equipment for collection of the sample was available. The procedure provides instructions for the analysis of the sample using either laboratory equipment (Ge(Li) spectrometer) or a portable count rate meter and hand held G-M detector.

2.1.8.b "Increased Range of Radiation Monitors"

The SMUD, April 11, 1980 letter specified that procedures would be written and approved for estimation of noble gas releases from the reactor and auxiliary building vents. Procedure AP 305-28, Gaseous Effluent Release Rate Estimation, was issued initially April 25, 1980. The procedure provides guidance for the use of portable dose rate instrument surveys of plant vents and conversion to effluent release rates.

Further, the letter stated that fixed dose rate instruments would be installed by June 1, 1980.

Four process monitors have been installed for accident monitoring. One monitor is for reactor building purge, one for auxiliary building vent and two for main steam lines. These monitors read out in dose rate which is converted to uCi/cc by using a calibration curve. The monitors are installed in shielded cubicles about 2' x 2' x 1' with a GM detector in the front and center of the shield. The reactor and auxiliary building accident monitors have a range to 100 R/hr while the steam line monitors go to 1R/hr. The former monitors have a 4" lead shield in front of the detector while the latter pipe line monitors are unshielded. In accordance with Bechtel calculations, the source terms generated during post accident conditions should provide not more than 100 R/hr through the 4" lead shield. The source terms were generated based on a steam generator rupture release of 15 isotopes including 6 xenons, 5 iodines and 4 kryptons; the geometry of the source/detector and the ¼" wall steel pipe which absorbs a large fraction of ^{133}Xe. The Team reviewed the Bechtel calculations and found them to be acceptable. It should be noted that the Chem-Rad group calibrates the 100 R/hr detector after I&C removes the system from its monitoring position.

Procedure AP 305-27, Airborne Radioactivity - Emergency Sampling, has been prepared for the collection and analysis of particulate and radioiodines, using particulate filters and silver zeolite cartridges with either counting room equipment or portable rate meter and GM detector. Supplies of necessary sampling materials and equipment are stored in an emergency locker. A single channel analyzer system with NaI detector has been procured, is operable and calibrated. Procedures and training in the use of the analyzer and NaI detector had not been completed at the time of the Appraisal. The use of an analyzer-scintillation detection system was not specified in the April 11, 1980 letter.

2.1.8.c Improved In-Plant Iodine Instrumentation

The April 11, 1980 letter specifies silver zeolite cartridge sample collection with multichannel gamma analysis if the counting room is available or if unavailable, ratemeter-GM detector analysis. Procedure AP 305-27, Airborne Radioactivity - Emergency Sampling, has been prepared. Equipment and materials necessary for sampling and analysis are available and stored in an emergency locker.

Section 2.2.2.b "Onsite Technical Support Center"

The conference room adjacent to the control room has been designat the Onsite Technical Support Center (TSC). Amendment 9 to the Emergency Plan Manual incorporated the TSC into the emergency plan and implementing procedures. Personnel reporting to the TSC have been identified. The communications equipment in the TSC was also

added to the emergency plan. Amendment 9 did not incorporate into the Emergency Plan a description of the supplies, equipment and instrumentation to be maintained in the TSC for use during an emergency.

11.0 Exit Interview

On October 3, 1980, the members of the Health Physics Appraisal Team met with those members of the SMUD District Office and Station organizations identified in Annex A. The appraisal purpose, scope and preliminary conclusions were discussed. The Team conclusions included the items discussed in Appendix A - Significant Appraisal Findings and substantially all the items identified in the individual conclusion sections of the report details. The licensee was informed that no items of noncompliance had been identified.

None of the items discussed were considered to be of such significance as to require an immediate commitment for corrective action on the part of the licensee.

ANNEX A

Persons Contacted

Rancho Seco Nuclear Station

R. Rodriguez, Manager, Nuclear Operations
*P. Oubre', Plant Superintendent
*R. Columbo, Technical Assistant
*H. Heckert, Nuclear Engineering Technician
*R. Miller, Chemistry and Radiation Supervisor (CRS)
*F. Kellie, Nuclear Chemist (NC)
S. Coats, Health Physicist (HP)
*M. Bua, Senior Chemical and Radiation Assistant (SCRA) (Temporary)
*T. Morrill, SCRA
*B. Rogers, SCRA
*W. Wilson, SCRA
E. Bennett, Chemical and Radiation Assistant (CRA)
*W. Bingston, CRA
J. Bowser, CRA
R. Bowser, CRA
S. Manofsky, CRA
J. Newey, CRA
S. Nicolls, CRA
S. Stinson, CRA
R. Terpstra, CRA
J. Teske, CRA
A. Bulf, Clerk
M. Crocco, Craft Helper (CH)
D. Romero, CH
*R. Blachly, Operations Supervisor
J. Nicholls, Shift Supervisor
N. Zimmerman, Auxiliary Operator
*D. Whitney, Senior Nuclear Engineer
*G. Coward, Supervisor Nuclear Maintenance
R. Wichert, Plant Mechanical Engineer
C. Lang, Mechanical Engineering Foreman
D. Cass, Mechanical Maintenance Supervisor
*T. Tucker, Scheduler
M. Hughes, Mechanical Foreman
A. Littlefield, Plant Mechanic
T. Watson, Plant Mechanic
*J. Jewett, Site Supervisor, QA
J. Lervold, Engineering Technician, QA
J. Elliot, Foreman, Instruments and Controls (I&C)
*D. Wiles, Foreman, I&C
J. Forcier, Technician, I&C
T. Huff, Technician, I&C
H. Humphrey, Technician, I&C
C. Linquist, Technician, I&C

*Denotes those present at the exit interview.

T. Robinson, Technician, I&C
H. Schumacher, Safety Supervisor
B. Thomas, Occupational Health Nurse

Contractor Personnel

M. Blake, Contract Health Physics Technician - Applied Nuclear
J. Hardy, Contract Health Physics Technician - Applied Nuclear
S. Rogers, Contract Health Physics Technician - Allied Nuclear
J. Nash, Monterey Construction Company

Sacramento Municipal Utility District Office

*J. Mattimoe, Assistant General Manager and Chief Engineer
D. Raash, Manager, Generation Engineering, (Gen. Eng.)
*D. Martin, Environmental Specialist, Gen. Eng.
E. Bradley, Corporate Health Physicist, Gen. Eng.
*D. Gardiner, Principal Engineering Technician, Gen. Eng.
J. Field, Mechanical Engineer, Gen. Eng.
E. Gillis, Engineer, Gen. Eng.
*L. Schwieger, Manager, Quality Assurance
J. Sullivan, Quality Assurance

*Denotes those present at the exit interview.

ANNEX B

Documents Reviewed

AP-1	Responsibilities and Authorities, Rev. 5, 5/5/80
AP305	Radiation Control Manual
AP305-1	Restricted Area Access Requirement, Rev. 1
AP305-4	Radiation Work Permit (RWP) Procedure, Rev. 3
AP305-5	Protective Clothing and Equipment Use, Rev. 1
AP305-7	Posting and Barricading Controlled Areas, Rev. 2
AP305-8	Methods for Conducting Radiation Surveys
AP305-9	Removal of Tools and Equipment from Controlled Areas, Rev. 1
AP305-10	Radioactive Waste Disposal In-Plant, Rev. 4
AP305-12A	Shipments of Radioactive Materials Offsite, Rev. 4
AP305-12B	Bulk Radioactive Liquid Shipment
AP305-12C	Radioactive Solidified Waste Shipment
AP305-13	Environmental Releases of Liquid Radioactivity, Rev. 6
AP305-14	Environmental Releases of Airborne Radioactivity, Rev. 4
AP305-18	Radiological Control Duties of Security Personnel
AP305-19A-Z	Instrument Calibration Procedures
Enclosure 4.1	Radiac Calibration Worksheet
Enclosure 4.3	Cs Calibrator Operating Procedure
Enclosure 6.3	Area Monitor Calibration Check, dated 9/29/80
AP305-20	Whole Body Counting
AP305-22	Air Sampling Gland Steam Exhaust, Rev. 1
AP305-24	Reactor Building Air Samples, Rev. 1

AP305-26 Auxiliary Building Air Samples, Rev. 1

AP305-27 Airborne Radioactivity - Emergency Sampling, Rev. 1

AP305-28 Gaseous Effluent Release Rate Estimation, Rev. 1

AP305-29 Emergency Reactor Coolant Sampling - Liquid

Chemistry and Radiochemistry Manual, Volume 1

Chemistry and Radiochemistry Manual, Volume 2

Counting Room Manual

AP306 Section VIII, Quality Control - Secondary Chemistry, Radiochemistry and Counting Room

A-11 Reactor Sampling System

SP300107 Radiation Instrumentation

SP203.09 Decay Heat System Leakage Rate Surveillance Test, Rev. 2

Quality Control Instruction No. 2 Rev. 11, SMUD Nuclear Operations Quality Assurance Audit Program

Audit No. 0-174, 2/28/78, Radiological Safety

Audit No. 0-258, 9/11-14/79, Radiological Safety

Audit No. 0-318, 9/3-5/80, Radiological Safety and Control

Audit No. 0-319, 9/4 & 5-9/80, Housekeeping

Employee Performance Evaluation Report, form SMUD-0214, 4/76

Rancho Seco Work Requests #47018, 47041, 52168 (Installation of remote sample valve for post accident sampling)

SMUD Response to NUREG-0578 on "Increased Range of Radiation Monitor", "Post Accident Radioiodine and Particulate Effluent Monitors", "In Containment Direct Radiation Level Monitor" and Procedure for "In Plant Iodine Instrumentation"

Calculations performed by Bechtel on Interim Effluent Noble Gas Radiation Monitors (File D.02 and D.05) 10/7/80

FSAR Sections 3.6 Radiation Detection Equipment

FSAR Sections 11.3.2.1 Area Monitoring System

FSAR Sections 11.3.2.2 Process Radiation Monitoring System

FSAR Section 3.6.4.1 - Liquid Process Monitor

FSAR - Section 3.6.4.2, Gas and Particulate Monitors

Technical Specifications for the Rancho Seco Nuclear Generating Station, Amendment #24

NUREG-0041

ANSI-N343-1978, American National Standard for Internal Dosimetry for Mixed Fission and Activation Products

ANSI/ANS 3.1-1978 (Revision of N18.1-1971). Selection and Training of Nuclear Plant Personnel

ANSI N13.6-1966 (R1972). Practice for Occupational Radiation Exposure Records Systems

ANSI N18.7-1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants

Regulatory Guide 1.8, R1-R, Personnel Selection and Training

Regulatory Guide 1.33, Revision 2, Quality Assurance Program Requirements (Operations), February 1978