DORF-ENRADMON

PLAN

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ENRADMON PLAN

for

DIAMOND ORDNANCE RADIATION FACILITY
(DORF)

1. PURPOSE. The environmental radiological surveillance program is designed to assure that all ionizing radiation and radioactivity levels existing in unrestricted areas in the vicinity of DORF are within permissible limits and as low as reasonably achievable.

2. SCOPE. The plan consists primarily of the measurement of environmental levels of direct ionizing radiation and radionuclide concentrations. The data is intended to demonstrate compliance with AR 385-80. In addition, the plan includes the estimating of DORF stack activity releases, special studies of environmental conditions and other activities required in support of the plan's objective.

3. RESPONSIBILITY. The Health Physics Office, WRAMC, will initiate all environmental monitoring activities, review and evaluate all environmental monitoring data.

4. GENERAL DATA.

a. The Diamond Ordnance Radiation Facility (DORF) is located in the Forest Glen Section of the Walter Reed Army Medical Center (WRAMC), Washington, D.C. The DORF-TRIGA Mark F Reactor is used as a research tool in the study of neutron and gamma irradiation of electrical and electronic components and systems. Through Host-Tenant Agreement, Health Physics, WRAMC provides Health Physics support to the DORF.

b. Description of facility. The DORF is a TRIGA Mark F Reactor, designed and built by Gulf General Atomics, San Diego, California. It is an inherently safe reactor designed for both steady-state and pulsed operation. The DORF-TRIGA has the capability of steady-state or square-wave operation up to 250 kW for a maximum power generation of 1 MW-hr per day and also pulsed operation resulting in a peak power of 2000 MW with a pulse width of 9.5 milliseconds at half maximum. Additional data concerning this site is contained in the original SAR.

(1) The DORF is located within the metropolitan area of Washington, D.C., at the Forest Glen Section of WRAMC which is eight miles from the center of Washington, D.C. and approximately two miles south of Kensington, MD. The Forest Glen site is an area of approximately 190 acres of rolling, partially wooded and cleared areas, on which are located numerous WRAMC related facilities. The DORF is located near the southern border of the

Forest Glen Section and about 500 feet northwest of Brookville Road, which bounds the property on the southeast. The 4.2 acre DORF site is encircled by an exclusion fence with a radius of approximately 240 feet.

(2) The immediate vicinity of the reactor site is densely populated. Metropolitan Washington has a population of about 3 million people.

c. Meteorological detail. The weather pattern at DORF is highly variable. As the reactor is located on a hill and partially surrounded by trees, a local weather pattern results that is applicable only to the site. The weather pattern above the tree level should be more characteristic of the Metropolitan Washington area but with higher wind speeds, less eddying and different wind prevalencies.

d. Pre-Operational Survey. Reference is made to 1st Ind, letter MEDEC, HQ, WRAMC, dated 7 Nov 60, Subject: Request for a PreOperational Environmental Survey. The cited indorsement was prepared at the Office of The Surgeon General and the following statement from paragraph one is extracted:

"It is considered that there is no compelling reason for the U.S. Army to make a pre-operational study of the radiation background of the environment adjacent to Walter Reed Army Medical Center, including Forest Glen Annex before the nuclear reactors now being constructed at the Center and at Forest Glen begin operations. It is recommended that such studies not be undertaken by the Army."

e. Other significant sources of radiation. The Armed Forces Radiobiology Research Institute (AFRRI) is located at the National Naval Medical Center approximately one and three-fourths mile from the DORF site.

f. The Health Physics Officer, WRAMC, will, when necessitated by a known or suspected uncontrolled release of radioactive effluent in hazardous concentrations, supplement the routine sampling program by collection of appropriate samples (food chain, fallout-washout, air, etc.) from Off-Post areas in order to assure compliance with AR 385-80. Unusual or abnormal observations are immediately investigated.

5. EFFLUENT MONITORING.

a. The primary effluent release considerations are gaseous (Ar-41) and liquid discharges. All gaseous and particulate material is discharged via the "gas-stack monitor" and all liquid material is held in the liquid storage tanks until sampled and determined to be acceptable for release to the sanitary sewage system.

b. Gas Stack Monitor (GSM). This scintillation-type monitor, located in the equipment room samples the exposure room air after it has passed through the absolute filters. When the reactor is operated at the exposure room position, the air in the exposure room is activated. The major fraction of the activity measured by the stack monitor is ^{41}Ar; a smaller contribution may be ^{16}N. The monitor can accommodate up to 10 cubic feet per minute (CFM). The counting rate is recorded on a continuous strip chart recorder. The instrument has an adjustable alarm set point and indicates an alarm condition both locally and at the control console. The alarm set point is 30K CPM which is an operational set point corresponding to 7×10^{-4} Ci/cc. When this set point is reached the reactor building is isolated from the local environment. One remote readout, incorporating a low-level failure alarm, is provided in the control room. A second remote readout is provided adjacent to the exposure room door. The GSM is calibrated at least annually by the Physicist-in-Charge, DORF, and the Health Physics Officer, WRAMC. It is checked each working day by the HP Technician at DORF.

c. Liquid Discharge. The liquid waste system collects all waste from the sinks and floor drains in the warm storage room, decontaminating area, exposure room, lavoratories,and showers. The system has a detention capacity of 15,000 gallons (3 5,000-gallon tanks). The effluent in the tank system is bubbled, sampled and analyzed prior to any discharge in the sanitary sewage system. The quantities and limits imposed by 10 CFR 20.303 will be followed. The following procedure will be utilized for sampling waste tanks:

(1) Under normal conditions only one waste tank will be open at a time; when it has accumulated in excess of 4500 gallons, it will normally be closed and another one opened.

(2) The sludge, in the tank to be sampled, will be put into suspension by forcing compressed air through it for 15 minutes.

(3) Collect a sample of at least 2500 ml through the sampling port, in a container marked DORF Waste Water Tank.

(4) Request an integral gamma assay, X-Y Plot and net Beta and Alpha assay and forward with the sample to the HP Radioactivity Analysis Lab.

(5) The Waste Water will be held in the holdup tank pending receipt of a report of analysis from the HP Radioactivity Analysis Lab.

6. IMPACT ANALYSIS: The primary insult to man from DORF discharges will be Ar-41. For this reason, a TLD program of surveillance in the vicinity of DORF is required to demonstrate and quantitate the impact. Additional analyses of water, soil and vegetation will serve to reinforce any calculated or assumed operational conditions.

a. TLD - (Routine). TLD-200's (supplemented by other TLD's on a special study basis) will be utilized to determine the direct photon contribution of insult. Packages of TLD's for quarterly and yearly (monthly, if required) will be positioned 1 meter above the ground as indicated in Appendix A (TLD Program). The minimum sensitivity above background will be determined yearly and indicated in the operations report. Additional positions will be established, if required.

b. Surface Water (Routine).

(1) Small streams are on three (3) sides of the DORF facility. One sample will be taken from a standing body of water in each stream.

(2) One (1) liter of water, including suspended solids, will be evaporated to dryness on a planchet and counted. Analysis to be performed is given in Appendix B.

c. Soil (Routine).

(1) One sample will be taken from the topsoil downhill of the waste tanks.

(2) Two kilograms of soil will be dried, and stones, vegetation and animal life will be grossly separated out before analysis. A small known sample will be counted on a planchet and the remainder will be counted in a Marinelli beaker (See Appendix B).

d. Vegetation (Routine).

(1) One sample will be taken of vegetation in the downwind direction within 150 feet of DORF.

(2) 400 Grams of vegetation will be washed, dried and counted in a Marinelli beaker (See Appendix B).

e. Silt Sampling (Non-Routine).

(1) Surface Water samples which exceed action levels will be supplemented by at least one (1) silt sample at the locations of the water sample.

(2) The amount of sample, method of handling, counting and reporting will be as described for soil samples.

f. Rainwater (Non-Routine).

(1) Rainwater samples will be collected as directed by HPO-WRAMC for the purpose of gaining ihformation about local fallout levels.

(2) Samples will be analysized in the same manner as surface water samples.

g. Photon Level Studies (Non-Routine).

Special studies concerning the photon fluence will be as directed by PIC-DORF or HPO-WRAMC or when the TLD data exceeds the action level for photon insult.

h. Frequency of Surveillance. See Table I, Frequency of Surveillance. Semi-annual requirements should be completed in March and September of a CY.

TABLE I

FREQUENCY OF SURVEILLANCE

Type of Routine	Frequency
Change of Station Dosimeters	Quarterly (monthly on request)
Surface Water	2 Per year
Soil Samples	2 Per year
Vegetation	2 Per year
Waste Water	As required
Silt Sampling	As required
Rainwater	As required
Photon Fluence	As required

7. ACTION LEVELS.

a. TLD Dosimetry. If any TLD station receives a dose in excess of the amount shown in TABLE II in a CY or 1/3 of the dose in a quarter, given actions will be taken:

TABLE II

TLD ACTION LEVELS

Dose (mrem)	Action Required
50	Investigation and provision of supplementary monitoring as required; written analysis report.
200	Discussion with PIC, DORF, and Reactor Safeguards Committee and review of data, with respect to the question of reducing reactor operations which generate measurable quantities of Ar-41.
400	All reactor operations curtailed and a report of the investigation submitted to ARCHES.

b. Environmental Sampling (See Appendix B).

8. REPORTS. The Annual Operations Report shall contain all data collected, analysis of the data and supporting conclusions. Special reports will be prepared on request.

APPENDIX A (TLD Program) to ENRADMON PLAN for DORF 1 February 1977

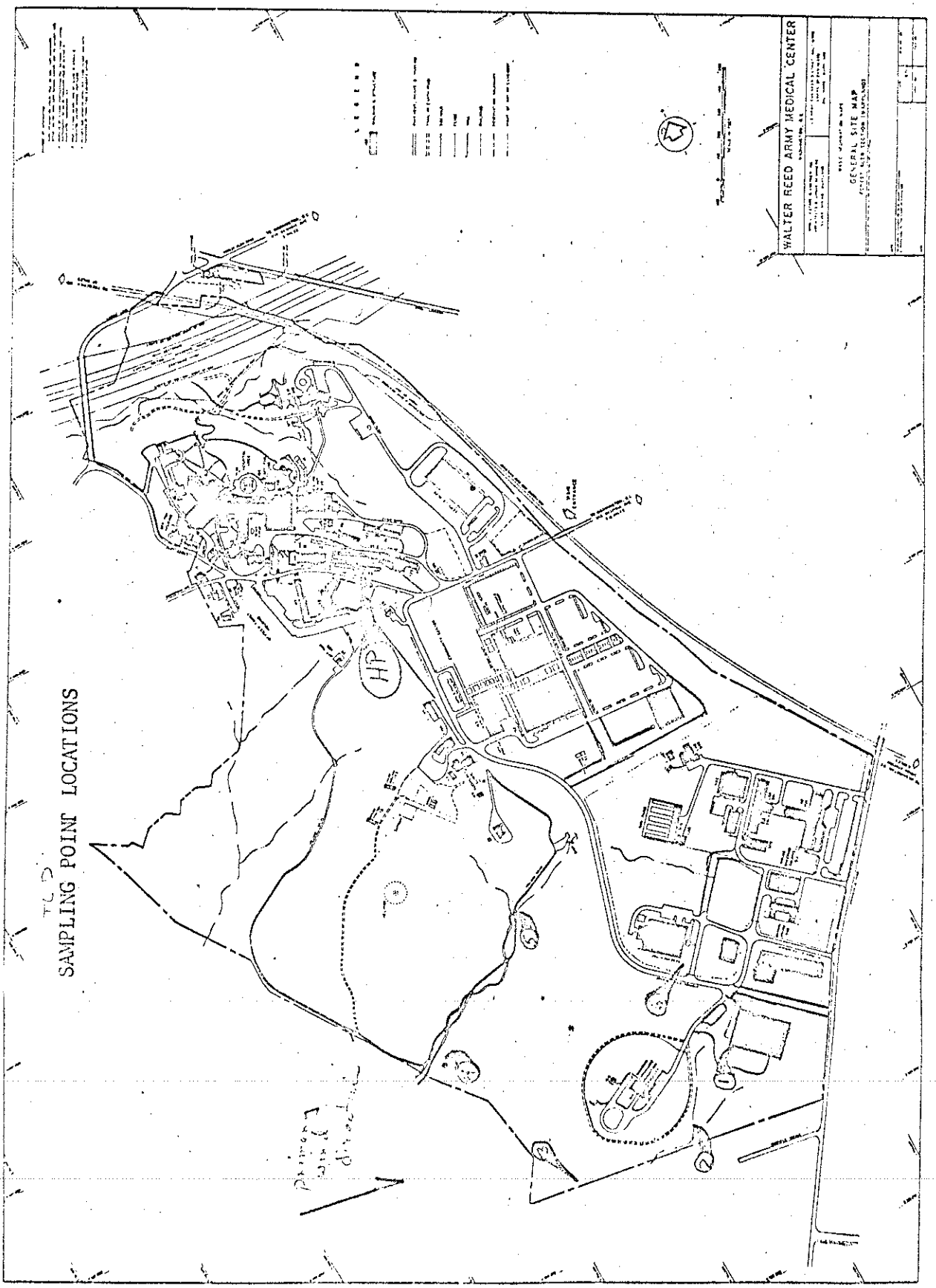
1. GENERAL. TLD's will be utilized to integrate the photon fluence due to DORF operations and natural background. Data will be evaluated in terms of ALARA.

2. SYSTEM DISCRIPTION. Harshaw 3000 TLD Reader will be utilized and maintained by WRAMC-HPO. TLD 200 chips are the primary environmental dosimeters to be used. Packaging, calibration and readout will be as prescribed in the TLD workbook maintained by HPO.

3. QUALITY CONTROL. WRAMC-HPO will participate in a quality control program and will report the results in the Annual Report. When possible, HASL programs will be utilized.

4. LOCATIONS. Attached is the six (6) TLD station outline to be utilized at DORF.

5. MINIMUM SENSITIVITY. The system should be maintained such that a minimum of 5 to 10 mrem/quarter is observable above background.



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RADIOANALYSIS SUMMARY AND ACTION LEVELS

A. Sample Type:	Water		Soil		Vegetation
Size of Sample:	1000 ml	15-1800 ml	20g	1000g	400g
Instrument:	WIDEBETA II	MCA	WIDEBETA II	MCA	MCA
Counting Time:	20 min	10 min	20 min	4000 sec	4000 sec
Activity Type:	gross $\alpha\beta$	specific γ	gross β	specific γ	specific γ
Reporting units:	pCi/cm^3	pCi/cm^3	pCi/gm	cps/gm	cps/gm
Action Level:	3×10^{-7} uCi/cm^3 β 1×10^{-8} uCi/cm^3 α	1/10 $(MPC)_w$	7.5 pCi/gm	7.5 pCi/gm	

B. At the action levels indicated in paragraph A, when confirmed, the Health Physics Officer, WRAMC, will inform the Physicist-in-Charge, DORF, of the contamination. The PIC, DORF, will curtail reactor operations until the Reactor Safeguards Panel has met and made appropriate recommendations. All action levels given are clearly above the normal range.