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Responsible NRC Individual and NRC Office or Division: Donald E. Solberg, Chief, Systems Performance Research Branch, SAFER:RES

This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be sutstantive changes, this document should not be considered final.

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INTERIM REPORT

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July 18, 1980

Dr. Donald E. Solberg
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U. S. Nuclear Regulatory Commission
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Progress Report on "Characterization of Radionuclide Contamination Throughout Light Water Reactor Power Stations," July 18, 1980.

Progress to Date:

Pathfinder Generating Plant, Sioux Falls, South Dakota

The licensing amendment to conduct our field study at Pathfinder has been approved and we will be conducting the field work July 14-23, 1980. A final planning and coordinating meeting was held at the Northern States Power Company (NSP) headquarters in Minneapolis on June 23, 1980. Attending from PNL were myself and Manford Leale, our health physics specialist for this project. Following this meeting, Manford and I visited the Pathfinder site to complete final arrangements for our field trip. The NSP personnel have been extremely cooperative and helpful. The only problem on their part was in supplying the health physics and radiation monitoring support for the field work, since they were short-handed at their operating nuclear plants. So, the inclusion of Manford Leale in our research team has proven to be very beneficial since Manford will be doing the entire monitoring for this project. He has been at Pathfinder since July 9 to supply the monitoring support while NSP personnel are providing access into the fuel storage basin (which had been sealed with a concrete cap) and into the sealed reactor building. Enclosed are the following documents: 1) our letter of approval from NSP giving their final approval; 2) our radiation work procedure; 3) our tentative work schedule at Pathfinder; 4) detailed work procedure for sampling (metal cutting and concrete coring); and 5) our detailed sampling and analysis plan. We feel that we can complete the field work in nine to ten working days.

Preliminary Testing of Equipment and Procedure at the Hanford 100-F Reactor

We felt that it would be a wise practice to field test our portable counting equipment and metal cutting and concrete coring equipment prior to our first field work at Pathfinder. This allowed us to identify any shortcomings in equipment and procedures and permitted us to make any necessary corrective actions prior to our Pathfinder visit. This exercise also gave valuable experience to our project personnel in the use of special anti-contamination clothing, equipment and procedures.

Therefore, we spent three days at the decommissioned 100-F reactor at Hanford evaluating our equipment and procedures. We set up and utilized our portable intrinsic germanium gamma-ray spectrometer and our beta counter. We tested a portable band saw, a circular metal cutting saw, a portable metal cutting jigsaw and our concrete coring apparatus for cutting contaminated stainless steel, carbon steel and aluminum piping. We evaluated various methods of protecting the equipment from becoming contaminated during these operations and were quite successful in this regard. Enclosed are a series of photographs reproduced from Polaroid camera shots showing these operations. During our work at Pathfinder and the following sites we will be using a better camera and will supply pictures to you of our operations. After this exercise and several modifications of equipment and procedures we feel that we are ready to perform efficiently and effectively at the reactor sites.

Indian Point, Unit I Status

All roadblocks appear to be cleared for our work at Indian Point, Unit I. We have set a tentative date for the last two weeks in September to conduct this study. As per our telephone conversation, I will keep you informed of our progress and scheduling for our work there.

Costs Incurred

As of June 29, 1980, the following costs have been incurred.

Direct Labor Costs	$ 59,641
Procurements	22,253
Travel	4,873
Facilities and Equipment	17,661
Other Costs	1,823
Labor Overheads	59,236
Cost Overheads/Fee	5,236
Total Cost	$171,133

Sincerely,

David E. Robertson
Senior Research Scientist
Earth and Planetary Chemistry Section
PHYSICAL SCIENCES DEPARTMENT

DER/cms

Enclosures

DETAILED SAMPLING AND ANALYSIS PLAN FOR PATHFINDER GENERATING PLANT

1. Purpose and Objectives

The purpose of this program is to identify the nature, distribution and inventory of residual radionuclide contamination in and around commercial light water nuclear power reactors to provide a data base for use in formulating policies and strategies for decommissioning retired nuclear power plants. The NRC and the operating utilities are charged with the responsibility of assuring the continued protection of the public from residual radioactivity or other potential hazards during and after decommissioning of the plants. In order to assure the safe and efficient decommissioning of nuclear power plants through appropriate regulations, guides and plans, measured data are needed to generically characterize the inventory and distribution of the radionuclide contamination of reactor systems and of the immediate surrounding environs. Such a knowledge will provide the predictive capability to permit a better assessment of the costs, radiation exposure and technology required for decontaminating and dismantling nuclear power plants, and restoring the reactor sites to an environmentally acceptable condition.

To acquire these data, a comprehensive measurements program is required. This measurement program will seek to characterize the residual radionuclide inventories in virtually all parts of the reactor sites which are known or suspected to contain radioactivity. This study will emphasize, but not be restricted to, the long-lived radionuclides ($t_{1/2} > 1$ yr), including the transuranics and low energy beta and X-ray emitters. We plan to initiate this study at Pathfinder and Indian Point Unit 1 and then extend the measurements program to several operating plants.

The measurements plan will involve both an on-site examination of gamma and beta emitting radionuclides in all components at each reactor site, and the procurement of samples from the reactor sites for analyses at our laboratory in Richland, Washington.

Nondestructive On-site Surveys At Pathfinder

A portable collimated intrinsic germanium gamma-ray spectrometer and a beta detector will be utilized for nondestructive scanning for residual gamma and beta emitting radionuclides at Pathfinder. These instruments will be taken inside the Reactor Building, the Fuel Handling Building, the Turbine Building and auxiliary buildings to nondestructively measure residual radionuclide contamination on floors, walls, piping, equipment, stored scrap materials and any other materials containing contamination. Screening with a collimated G-M counter will first determine what areas will later be gamma-scanned using the intrinsic germanium detector. We will also examine the grounds immediately adjacent to the Pathfinder Generating Plant. It is not anticipated that we will require any maintenance assistance from NSP personnel during this phase of the study, except someone familiar with the plant who can escort us to all points of interest and explain the past operations. This portion of the work is anticipated to take about four days to complete.

Sample Procurement

Because of the potential difficulties of quantifying radionuclide concentrations within piping or on structural materials by the nondestructive scanning techniques, and to measure low energy beta emitters and the alpha-emitting radionuclides, samples of opportunity will be procured and shipped to our laboratory for comprehensive radionuclide analyses. These samples will consist of piping, structural materials, equipment, hardware and any other appropriate samples which would aid in establishing radionuclide inventories at Pathfinder.

We will also be prepared to obtain, when possible, four inch diameter concrete cores from highly contaminated floors and walls. Also, paint surfaces from contaminated areas will be sampled. Replicates of in-plant and environmental samples will simultaneously be collected for decontamination studies being conducted in another department at our laboratory and for archival purposes. The total radioactivity of all of the samples we would remove and ship to our laboratory is not expected to exceed one curie. Soil cores will also be taken around the grounds of the Pathfinder plant to determine if any small amounts of reactor produced radionuclides are present.

It is anticipated that this phase of the work will require about five days and would also require some assistance from NSP in the form of maintenance personnel to assist in pipe cutting and replacement etc. We will be prepared to do our own concrete coring and minor pipe cutting and coring. We are also prepared to do our own radiation monitoring and health physics. We have made arrangements with our radiation monitoring department to permanently assign one of their staff to this project. He will be responsible for assuring that all on-site work is carried out in compliance with safe and legal work practices. He will also arrange to obtain suitable shipping containers and assure that any shipments of materials outside containment to PNL are carried out in full compliance with DOT, NRC and state regulations. The sampling program, for convenience, can be organized on a building basis as described below.

Reactor Building

We would like to make as comprehensive an assessment of the radioactivity associated with all systems in the Reactor Building that is practically possible.

Two phases of sampling in the Reactor Building will be necessary. First, we will require samples of all contaminated materials outside of the bioshield to to determine the extent of residual radionuclide contamination which has been transported from the reactor vessel during plant operations. We would like to obtain sections of contaminated piping or at least four inch diameter cores from this piping. Also, any portions of contaminated pumps, valves and other hardware would be desirable to obtain for analysis. Concrete cores (four inch diameter by four inches deep) from contaminated floors and walls would also be collected from the most contaminated areas. Second, we would like to obtain samples of materials from the reactor vessel and bioshield which have been neutron activated. We will be prepared to take one or more one inch diameter cores through the entire concrete bioshield, hopefully at the midpoint of the reactor vessel. We would also like to obtain drill turnings of activated portions of the reactor vessel. The locations for taking the bioshield cores and reactor vessel steel samples will need to be discussed at greater length and perhaps we can make a preliminary site visit before the actual sampling and analysis work to determine this.

Fuel Handling Building

We would like to obtain samples of all contaminated piping, equipment, hardware and materials in all rooms associated with the Fuel Handling Building. Piping and tanks too large to cut into short segments for samples will be cored with a four inch diameter saw. We also would like to obtain four inch diameter by four inch deep concrete cores of contaminated floors. Since much of the contaminated piping, hardware, etc. from the dismantled portions of the plant have been stored in the fuel storage pool it will be necessary for us to obtain access to inside of the storage pool. Since the pool has been capped with a thick concrete cover it will be necessary for NSP to provide an entrance to the storage pool large enough for a person to enter. It would be convenient and speed the on-site work if this entrance could be provided before our on-site work begins. It is anticipated that the storage pool will have radiation levels too high to permit in-situ direct gamma-scanning so we intend to remove samples from this room for preliminary on-site gamma analysis at a low-background area of the plant.

Turbine Building

All contaminated material and equipment not being used in the fossil system which was removed and stored will be examined and sampled if possible. The "hot spots" in equipment and piping presently used in the fossil plant should be sampled, either by opening pipes and removing the crud or cutting out or coring small sections of the contaminated piping. (This can be optional if NSP does not want to disturb the operational facility.) Concrete cores would also be taken from contaminated floors (such as the sump floor).

Auxiliary Buildings

We would like to make several on-site gamma-spectrometric scans of the auxiliary buildings and structures at the site. We do not expect to find any significant contamination, but would like to verify that such is the case. Included in these buildings would be the Water Treatment Building, the cooling tower and any other structures that NSP would recommend. We would procure samples for comprehensive analysis only if we detected "significant" contamination.

Environmental Samples

We would like to take eight soil core samples in the eight compass directions surrounding the plant. The cores would be 5 cm deep and sectioned into 1 cm thick slabs of 200 cm^2 area. The cores will be collected about ten feet from the building in each direction.

We will make a survey of the grounds surrounding the plant with a G-M counter and also sample any "hot spots" that may be present in the soil. We will sample vegetation only if "significant" contamination is apparent.

Radionuclides To Be Measured

Using a portable intrinsic germanium gamma-ray spectrometer, on-site measurements of the gamma-emitters that are detectable by instrumental gamma-ray spectrometry will be made using nondestructive scanning techniques. A low-level beta counter will also be used in the nondestructive scanning measurements to document the beta activity at the same locations. We will key on the major gamma-emitting radionuclides to serve as indicators of contaminated areas. After the scanning is completed, measurements of selected hardware, structural materials and environmental samples will be performed on-site to allow more intelligent sampling. These rapid surveys will pinpoint the most desirable locations to conduct more intensive sampling and analysis, and will provide a great deal of information early in the program. The major, long-lived gamma-emitters that we expect to measure on-site by this method include ^{54}Mn, ^{65}Zn, ^{60}Co, ^{106}Ru, ^{110m}Ag, ^{134}Cs, ^{137}Cs, ^{144}Ce and possibly ^{125}Sb, ^{152}Eu and ^{154}Eu. Based on the on-site scanning results, extensive sampling will be conducted at all appropriate plant locations, and the instrumental gamma-ray spectrometric analyses of the bulk of these samples will be conducted at our laboratory in Richland. It is anticipated that approximately six to eight soil cores will be collected at each site for analyses at PNL, as well as a few samples of pond and trench sediments, cooling tower sludge and other appropriate environmental samples. Because the radiochemical analysis of the trace gamma-emitters, beta-emitters and the transuranic radionuclides are so time and manpower intensive, we will be very selective in choosing samples from each site for performing these additional difficult measurements. The actual

selection of these samples will be guided by the results of the gamma spectrometric measurements. It is anticipated that only a few (no more than 8-10) in-plant samples at each site will be completely characterized to include the analysis of ^{108m}Ag, ^{94}Nb, ^{126}Sb-Sn, ^{55}Fe, ^{59}Fe, ^{59}Ni, ^{63}Ni, ^{90}Sr, ^{93}Zr-Nb, ^{99}Tc, ^{129}I, ^{147}Pm, and the transuranics ^{238}Pu, ^{239,240}Pu, ^{241}Am, ^{243}Am, ^{242}Cm and ^{244}Cm. Only the most contaminated soil and environmental samples (approximately 4-6) will be analyzed for these radionuclides. However, a few samples from areas considered to be background levels will also be included. If it becomes obvious that some anomalous contamination involving a specific radionuclide has occurred at a site, we will put special emphasis on delineating the extent of this contamination. Special attention will be given to the measurement of accurate isotopic ratios of various radionuclide pairs (e.g., ^{134}Cs/^{137}Cs, ^{238}Pu/$^{239-240}$Pu, ^{244}Cm/$^{239-240}$Pu, etc.) in the in-plant and environmental samples. These ratios can differ by several orders of magnitude when comparing reactor-generated radionuclides with those observed in weapons testing fallout. It is therefore possible to identify as little as a 2-3% contribution to the fallout radionuclide inventory from radionuclides of reactor origin. Since easily measurable fallout radionuclide concentrations will be present in the environmental samples, it will be important to document the fallout contribution relative to that coming from reactor contamination at each reactor site. These data will be greatly complemented by EPRI sponsored studies of the nature and distribution of radionuclides outside the boundaries of four nuclear power stations.

It is recognized that a number of intermediate-lived radionuclides will also be present in reactor contamination residues, including ^{46}Sc, ^{51}Cr, ^{57}Co, ^{58}Co, ^{59}Fe, ^{95}Zr-Nb, ^{103}Ru and ^{124}Sb. When these radionuclides are detectable by instrumental gamma-ray spectrometry they will be automatically measured by our counting equipment. However, we will make no special attempt at measuring them if their concentrations are below the instrumental (nondestructive) detection limits.

POTENTIAL RADIONUCLIDES TO BE MEASURED

Isotope	Half-Life	Decay Mode	Energy (KeV)
	Gamma-Emitters		
^{22}Na	2.6 y	$\beta^+ - \gamma$	1275
^{54}Mn	312 d	EC - γ	834
^{60}Co	5.27 y	$\beta - \gamma$	1332
^{65}Zn	244 d	EC - $\beta^+ - \gamma$	1115
^{94}Nb	2.0×10^4 y	$\beta - \gamma$	871
^{106}Ru-Rh	369 d	$\beta - \gamma$	622
^{108m}Ag	130 y	EC - IT	434
^{110m}Ag	250 d	β - IT	658
^{125}Sb	2.77 y	$\beta - \gamma$	438
^{126}Sb-Sn	10^5 y	$\beta - \gamma$	414
^{134}Cs	2.06 y	$\beta - \gamma$	796
^{137}Cs	30.17 y	$\beta - \gamma$	662
^{144}Ce	284 d	$\beta - \gamma$	134
^{152}Eu	13.6 yr	EC - $\beta - \gamma$	344
^{154}Eu	8.6 yr	$\beta - \gamma$	723
^{155}Eu	4.96 yr	$\beta - \gamma$	105
^{166m}Ho	1200 y	$\beta - \gamma$	184

POTENTIAL RADIONUCLIDES TO BE MEASURED

Isotope	Half-Life	Decay Mode	Energy (KeV)
	Beta and X-ray Emitters		
^{55}Fe	2.7 y	EC	5.9 X-ray
^{59}Ni	7.5×10^4 y	EC	6.9 X-ray
^{63}Ni	96 y	β	17 β^- avg.
^{90}Sr-Y	28.5 y	β	931 β^- avg. (from ^{90}Y)
^{93}Zr-Nb	9.5×10^5 y	β	19.6 β^- avg.
^{99}Tc	2.13×10^5 y	β	84 β^- avg.
^{129}I	1.57×10^7	β	29.8 X-ray
^{135}Cs	2.3×10^6	β	210 KeV
^{147}Pm	2.62	β	62 β^- avg.
^{151}Sm	90 y	β	19.6 β^- avg.
		Transuranics	
^{237}Np	2.14×10^6 y	α	4788
^{238}Pu	87.8 y	α	5499
$^{239\text{-}240}Pu$	2.44×10^4 y	α	5155
^{241}Pu	14.4 y	β	5.2 β^- avg.
^{241}Am	433 y	α	5485 (also 59.5 X-ray)
^{243}Am	7380 y	α	5275
^{242}Cm	163 d	α	6113
^{244}Cm	18.1 y	α	5805

DETAILED WORK PROCEDURE FOR SAMPLING AT PATHFINDER

July 14-23, 1980

PIPE AND METALS CUTTING

Introduction

All existing piping and metals in this plant are considered to be potentially contaminated internally and/or externally. This contamination must not be spread in an uncontrolled manner.

This specification describes the methods and protective measures to be employed during the cutting of pipe and other metals which are to be processed during sample procurement at Pathfinder.

This specification may be revised to suit special situations with the prior approval of the Plant Manager.

Prerequisites

1. A work permit has been prepared by Health Physics and approved by Health Physics, Battelle Project Manager and Pathfinder plant superintendent.
2. The work area has been surveyed and defined by Radiation Monitoring and a radiation work procedure (RWP) has been posted at the entrance to the work area.

Protective Equipment Requirements, Furnished by Battelle

1. Personal monitoring devices as specified on the RWP.
2. Continuous air monitor.
3. Other air and area monitoring equipment as specified on the RWP.
4. Respirators, goggles, anti-C clothing, etc. as shown on RWP.

Equipment Requirements, Furnished by Battelle

1. Waste catch and storage materials (polyethylene sheets--6 mils minimum thickness, drums, duct tape, blotter paper, hand rags, masking tape, etc.).
2. Cutters. Roller cutters, chain-type cutters, hack saw, sabre saws, tin snips, powered hand-held saws and guillotine saws, according to the need. Flame and arc cutting devices and abrasive cutting wheels are not acceptable since they promote the spread of contamination.
3. Scaffolding, chain falls, etc.

Work Method

1. Insure that the foregoing prerequisites have been met and that Radiation Monitoring is present at the start of the work. The degree of his continued presence will depend on the particular case. This need will be recorded on the RWP.
2. Install scaffolding and chain falls according to the need. Install restraints to prevent significant movement when the cut is made.
3. For pipe cutting, check adjacent valves to insure the line is properly isolated, drained, and vented. If draining cannot be clearly established, a hole will be drilled in the pipe immediately prior to the

start of cutting operations. Drilling and draining shall be accomplished in a manner in which no liquid is spilled on the floor. Rubber gloves and a face shield are the minimum wet protection requirements when drilling pipe. Radiation Monitoring will specify other items as needed.

4. Install a catch basin of polyethylene sheet or other suitable device under the work piece to catch falling insulation, pipe cuttings, lubricants, etc.
5. Where appropriate, locate air sampler to monitor the cut. If the air sampler indicates mobilized contamination at any time during the work, all work is to be stopped, the work piece openings are to be covered, the area is to be evacuated and Radiation Monitoring is to be notified. Radiation Monitoring will direct the remedial effort and advise when normal work can be resumed.
6. Remove insulation as necessary to the work and deposit in storage drum.
7. Wipe the work piece thoroughly with a damp rag and deposit rag in radioactive material disposal drum.
8. Smear the work piece to a point one foot either side of the planned cut. Decontaminate same as needed by scrubbing or as otherwise instructed by Radiation Monitoring. Repeat this step until smear counts are acceptable to Radiation Monitoring.
9. Make the cut with the chosen tool.
10. Cap the open ends of piping and equipment cavities with two separate applications of polyethylene sheet and duct tape, immediately after completion of the cut. If the space between the cut ends is not sufficient for capping, apply a double layer of polyethylene in a sleeve-type wrapping.
11. Make required additional cuts in accordance with all of the foregoing.

12. When the pipe or other device is to be removed, all open ends shall be capped as soon as possible during the removal in accordance with item 11 above.

13. The removed pieces will be surveyed by Radiation Monitoring who will specify any additional protection required prior to removal to the place of disposition.

14. Wrap all tools, power equipment, chain falls, etc. in polyethylene sheet or bags and leave inside the work area until Radiation Monitoring has surveyed and released each item. If the tools and equipment are contaminated, they will be decontaminated by Battelle personnel and cleared for removal by Radiation Monitoring before they can be taken from the work area.

15. Uncleared tools and equipment used in the dismantling may be transferred from one work area to another or prepared for shipment when they are contained within a polyethylene bag (5) which has been approved by Radiation Monitoring.

16. Clean and decontaminate the work area as specified by Radiation Monitoring.

17. Advise the Health Physics and Project Manager when the work is completed and return work permit.

CONCRETE CORING

Prerequisites

1. All prerequisites stated in the above section on pipe and metals cutting will be applicable.

Equipment Requirements, Furnished by Battelle

1. Concrete coring equipment--recirculating water type.
2. Waste catch and storage materials.

Work Method

1. Set up concrete coring apparatus over desired area and spread out absorbent paper over surrounding area to catch any water spray.
2. Obtain concrete core. Wipe dry and double package in plastic bags.
3. Wipe up any liquid around the core hole and fill core hole with rapid curing epoxy concrete.
4. Restore area to previous conditions.

NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

July 9, 1980

Mr. David E. Robertson
Battelle Pacific Northwest Laboratories
P. O. Box 999
Richland, Washington 99352

Dear Dave:

The purpose of this letter is to document understandings between Northern States Power Company (NSP) and Battelle Pacific Northwest Laboratories (BNW) concerning BNW's project to study the dismantled facility at NSP's Pathfinder Generating Plant. Also, this letter constitutes NSP's approval to BNW to go ahead with the study as per the requirements and understandings set forth herein.

It is our understanding you (David E. Robertson) are the BNW Project Manager for this study and thereby are the authorized representative for BNW. For matters requiring BNW approval, judgment or clearance, NSP shall look to you. Likewise, Robert (Bob) T. McKaughan, the Pathfinder Plant Superintendent, is NSP's authorized representative for the effort. For matters requiring approval, judgment or clearance from NSP, Bob McKaughan shall be contacted.

All work conducted as part of this study shall be done in accordance with the below listed documents:

Pathfinder NRC Part 30 Byproduct Material License No. 22-08799-02 and associated application.

Amendment No. 07 to License No. 22-08799-02 and associated amendment request.

10 CFR Part 20 "Standard for Protection Against Radiation".

BNW's "Detailed Sampling and Analysis Plan for Pathfinder Generating Plant" submitted to NSP February 26, 1980.

NSP's "Pathfinder Dismantled Facility Entrance Control Program", Revision 1, dated April 1, 1980.

NSP's "Procedure for Use of the Radiation Survey Form during the Battelle DF Survey", Revision 0, dated July 7, 1980.

NSP's "Procedure for use of the RWP (Radiation Work Permit) during the Batelle DF Survey", Revision 0, dated July 7, 1980.

NSP's Emergency and Hospital Assistance Plan for the Battelle DF Survey Project", Revision 0, dated July 7, 1980.

NSP's "Pathfinder Dismantled Facility Special Entrance Procedure for the Fuel Storage Pool", Revision 0, dated July 7, 1980.

BNW's Radiation Work Procedure Number "Offsite-7" as approved by BNW and NSP.

BNW's "Detailed Work Procedures for Sampling at Pathfinder July 14-23, 1980", received by NSP dated July 2, 1980.

However, deviations from the requirements and specifications of these above documents, to the extent that they do not affect NSP's NRC license responsibilities and to the extent that they are determined practical and necessary, will be allowed as mutually agreed to and approved by BNW and NSP. All such deviations and associated approvals shall be documented.

Though NSP as the Licensee is ultimately responsible to the NRC for the conduct of the study, NSP holds BNW responsible to conduct its activities in compliance with NSP's NRC license requirements and to provide to NSP the information, documentation and records it needs to satisfy NRC license obligations and inquiries.

Further, in regard to this project, it is our understanding that:

BNW will provide their own HP support including HP coverage for any activities within and associated with the dismantled facility. This coverage will include installation of the hatchway into the fuel storage pool. To assist BNW in providing adequate coverage, NSP will provide, to the extent practical, HP supplies it has on hand at its other nuclear facilities for use by BNW and will make its own HP personnel available for consultation with BNW as needed.

BNW will monitor the radiation exposure as appropriate of all personnel associated with the project and shall submit upon completion of the project in a timely and appropriate format exposure records to NSP for forwarding to the NRC. NSP will provide TLD badges and dosimeters for use by BNW if needed.

For purposes of compliance with the "Pathfinder Dismantled Facility Entrance Control Program", BNW will assume the responsibilities and duties of the "Lead Entrance Team Member" except the responsibility to submit required exposure information to the proper agencies will be retained by NSP.

Radiation protection controls utilized during the effort shall to the extent possible avoid generation of liquid waste. All waste generated as a result of the project unless otherwise approved by NSP shall be appropriately "tied up" and drummed in LSA 55 gallon containers. NSP will provide the containers. BNW will be responsible for drum filling, contents recording, labeling and verification of clean exterior surfaces. NSP will assume responsibility for disposal of the drummed waste.

BNW will conduct the radiation surveys necessary to establish both before and after contamination conditions in all work areas. To the extent possible, BNW is to leave work areas in no worse a contaminated condition than found. If during the course of work BNW substantially increases the contamination level of the work area, NSP shall be notified and the areas shall be cleaned by BNW to the extent practical as required by NSP.

BNW shall maintain a log of all samples taken or systems opened or disturbed. This log shall identify to the extent determinable the sampling location and/or system or component affected. NSP will provide consultation as to proper identification of pipe or components to the extent they are able. Upon completion of the project a copy of the sample log shall be submitted to NSP for their records.

BNW shall survey, package and label for shipment all samples taken for offsite analysis.

Prior to leaving the site BNW shall perform appropriate surveys to demonstrate that all accessible areas of the Pathfinder Fossil Plant affected by the study effort are returned or were maintained in the same condition insofar as radiation protection goes as found. This demonstration shall not be considered adequate until it is reviewed and approved by NSP.

BNW shall provide to NSP copies of all records, reports and related documents it generates as a result of its study efforts at Pathfinder including copies of the results of analyses performed on any samples taken offsite.

BNW agrees to be liable for all damages for injuries or death to their own employees and agents, regardless of causation or negligence by either party, and agrees to maintain Workers Compensation Insurance upon their own employees, and shall look solely to said insurance for all recovery of all claims for injury or death to said employees or agents of theirs who may be in, on, or about the NSP Pathfinder Generating Plant. BNW also agrees to defend, indemnify, and hold NSP harmless on any and all claims or actions brought by BNW employees or agents, their relatives, heirs or beneficiaries, arising out of or resulting from the execution of the work provided for in this agreement.

Yours truly,

D. E. Gilberts
Vice President
Power Production

cc: L. R. Eliason
R. T. McKaughan
C. B. Neils
J. M. Pappenfus
E. C. Ward

DEGink

AB-1

CONTRACTOR

PACIFIC NORTHWEST LABS

RADIATION PROTECTION RECORDS

RADIATION WORK PROCEDURE

NUMBER	SUPERSEDES NO.	VALID	REQUESTED BY
Offsite-7	New	FROM 7-1-80 TO 9-1-80	7HA0 Physical Sciences

LOCATION

Pathfinder Generating Plant, Sioux Falls, South Dakota

DESCRIPTION OF JOB

Identify the nature, distribution and inventory of residual radionuclide contamination in and around the Reactor. Measurements will involve on-site examination of gamma and beta emitting radionuclides and procurement of samples for analyses at the Laboratory, Richland, WA.

RADIATION CONDITIONS

SURFACE CONTAMINATION	AIRBORNE CONTAMINATION	PERSONNEL DOSE RATES
TYPE: Alpha-Beta-Gamma	TYPE: Alpha-Beta-Gamma	TYPE: [X] γ [X] β [ ] η
POTENTIAL: [X] LOW [ ] MEDIUM [X] HIGH	POTENTIAL: [X] LOW [X] MEDIUM [ ] HIGH	ESTIMATED MAX.: varied
OTHER:		

PROTECTIVE EQUIPMENT REQUIREMENTS

PERSONNEL DOSIMETERS	BODY	FEET	HANDS	HEAD	RESPIRATORY
[X] MP	[X] NO PERSONAL OUTER CLOTHING	[ ] SHOE COVERS	[X] CANVAS GLOVES	[XX] CAP or	[ ] HALF MASK
[ ] NEUTRON BADGE	[X] ONE PAIR COVERALLS	[X] CANVAS BOOTS	[X] SURGEONS GLOVES	[XX] HOOD	[X] ASSAULT MASK See #6
[ ] GAMMA PENCILS	[ ] TWO PAIR COVERALLS	[X] RUBBERS	[ ] WATERPROOF GLOVES	[ ] WATERPROOF HOOD	[ ] CHEMOX
[X] SELF READING PENCILS	[ ] WATERPROOF OUTER LAYER	[ ] BRITISH LEGGINGS	[ ] WATERPROOF GAUNTLET	[ ]	[ ] FRESH AIR
[ ] FINGER RINGS	[ ] LAB COAT	[ ] HIP BOOTS	[ ] LEATHER GLOVES	[ ]	[ ] RESPIRATOR

RADIATION MONITORING REQUIREMENTS

[X] INTERMITTENT BY RM — CONTACT RM FOR MONITORING [redacted] prior to starting work at new sample site or any changes in radiological conditions.

[X] CONTINUOUS MONITORING BY RM — CONTINUOUS MONITORING REQUIRED UNTIL: intermittent status established by H.P.

[X] RELEASE SURVEY ON AREA OR EQUIPMENT REQUIRED

[X] OTHER: Item #14 under Special Instructions.

SPECIAL INSTRUCTIONS

[ ] HAND COUNT WHEN LEAVING ZONE
[X] PERSONAL SURVEY WHEN LEAVING ZONE
[X] OBSERVE [redacted] STEPOFF PAD PROCEDURE
[X] OBSERVE GENERAL FACILITY RADIATION WORK PROCEDURE
[X] PROTECTIVE CLOTHING TO BE SURVEYED PERIODICALLY
[X] SPECIAL PROTECTION FOR CUTS, ABRASIONS, IRRITATIONS OR INFECTIONS
[X] MASKS TO BE WORN AS REQUIRED BY RM
[X] IN CASE OF INJURY, FLUSH WOUND WITH CLEAN RUNNING WATER, NOTIFY RM IMMEDIATELY

1. Responsible Northern States Power (NSP) Management shall be in concurrence with this procedure.
2. All PNL Staff members associated with the Project shall adhere to the requirements of this procedure, NSP issued RWP's, and the Northern States Power NRC Radioactive Material License as amended.
3. All staff members shall complete the following prior to starting the work at Pathfinder: radiation orientation, mask fit, mask training, whole body count, procure offsite dosimeter and current occupational external radiation exposure history.
4. Baseline dose rates, contamination status and air concentrations shall be established prior to commencement of sample procurement and non-destructive surveys.
5. Posting shall meet the requirements of the Northern States Power NRC License as amended.

APPROVALS

OPERATIONS (PNL-Battelle)	Operations - Northern States Power
Health Physics (PNL-Battelle) Crawford H. Beale	Health Physics - Northern States Power

Special Instructions, Cont'd.

6. Respiratory protection shall be worn as recommended by the H.P.

7. Protective equipment requirements shall be changed when recommended by the H.P., e.g., waterproof clothing, respiratory protection, two pair coveralls, etc.

8. A lab coat may be worn over personal clothing if entry is for observation and if approved by the H.P.

9. Any radiation area injury, skin contamination or unusual radiological event shall be reported to the H.P. and P.M. immediately.

10. The staff member is required to notify the H.P. when he completes radiation work that has been set up at a specific location. No other radiation work shall begin without H.P. approval.

11. Samples removed from the site shall meet releasable criteria or shall be packaged to meet DOT requirements. Shipments of radioactive samples from the site shall be made in accord with DOT requirements.

12. Necessary changes to this RWP shall be made & approved by the Site Health Physicist (HP) and Project Manager (PM), and Pathfinder Plant Superintendent.

13. The facilities shall meet the restoration requirements of NSP & NRC, i.e., entombment, sealing, etc., of sample sites at the completion of the work.

14. In the event of an incident, as described in CFR 10, Chapter 1-20.403, one or more of the following Battelle Staff shall be notified:

Name	Work Phone	Home Phone
C.R. Richey, Mgr., RS&E	(509) 373-2566	(509) 882-4375
J.B. Martin, Mgr., Radiation Monitoring	(509) 376-3057	(509) 375-0461
N.P. Nisick, Sr., Research Scientist	(509) 373-2521	(509) 946-6202
B.J. McMurray, Sr., Development Engr.	(509) 376-0345	(509) 943-9821

Additionally, Northern States Power shall be notified, who in turn shall notify NRC Region Three.

15. An additional RWP will be prepared by Health Physics and posted at all entrances to any area that requires greater controls than the general radiation work permit. This procedure will be approved by Health Physics, Project Manager and Pathfinder Plant Superintendent.

TENTATIVE WORK SCHEDULE AT PATHFINDER

July 14-23, 1980

Friday, July 11 -- Abel leaves Richland with van.

Sunday, July 13 -- Robertson, Evans and Leale fly to Sioux Falls; unpack and set up equipment to begin Monday morning

Monday, July 14 -- start survey of environs

1) Evans and Abel -- set up intrinsic Ge and beta counting systems in chem. lab or administration building and begin counting soils

2) Leale -- begin GM survey of grounds around Pathfinder

3) Robertson -- begin soil core sampling

Tuesday, July 15 -- start survey of auxiliary buildings

1) Evans and Abel -- take Ge detector into cooling tower, water treatment building and other external structures to perform in situ counting

2) Leale -- perform GM survey of auxiliary buildings and structures

3) Robertson -- assist Evans, Abel and Leale and check out fossil plant for available contaminated hardware and locations for in situ gamma analysis

Wednesday, July 16 -- begin in-plant survey

1) Evans and Abel -- perform gamma scanning with Ge detector starting in fossil plant and working towards fuel handling building and reactor building

2) Leale -- perform GM scanning beginning at the fossil plant and working towards the fuel handling and reactor building

3) Robertson -- begin concrete coring in fossil side of plant and procurement of any hardware samples from this area

Thursday, July 17 -- all continue with in-plant survey and samples procurement, working towards fuel handling building and reactor building

Friday, July 18 -- enter fuel handling building and reactor building

1) Evans and Abel -- determine if background is low enough to permit in situ gamma counting with Ge system. If low enough, perform in situ gamma counting--if too high, set up counting system in chem. lab or administration building to count samples obtained from fuel handling and reactor buildings

2) Leale -- perform GM surveys of fuel handling and reactor buildings

3) Robertson -- obtain concrete cores and available piping and hardware from fuel handling and reactor buildings

Saturday, July 19 -- catch up on counting of samples and procuring concrete cores and hardware and piping samples

Sunday, July 20 -- R and R

Monday, July 21 -- enter fuel storage basin to procure contaminated hardware and piping

1) Robertson, Leale and Abel -- enter fuel storage basin and cut and package piping and hardware

2) Evans -- count samples from fuel storage basin on Ge system and some beta counting of smears

Tuesday, July 22 -- continue with previous days tasks; John Taylor arrives to check out shipping procedures

Wednesday, July 23 -- finish up with fuel storage basin and core concrete bioshield

1) Robertson and Evans -- core concrete bioshield

2) Abel and Leale -- finish procurement of samples from fuel storage basin and packaging for shipping back to Richland

3) Pack up and prepare to leave for Richland

4) Evans, Abel and Leale -- fly home Wednesday evening

Thursday, July 24 -- Robertson drives van back to Richland