70-364

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 27, 1998

MEMORANDUM TO: Robert A. Nelson, Chief
Low-Level Waste and Regulatory
Issues Section
Low-Level Waste and Decommissioning
Projects Branch, DWM, NMSS

FROM: Dominick A. Orlando, Project Manager
Low-Level Waste and Regulatory
Issues Section
Low-Level Waste and Decommissioning
Projects Branch, DWM, NMSS

SUBJECT: MEETING SUMMARY - MEETING WITH BWX TECHNOLOGIES TO DISCUSS THE DECOMMISSIONING OF THE PARKS TOWNSHIP FACILITY

On April 15, 1998, staff of the U.S. Nuclear Regulatory Commission (NRC) met with staff of BWX Technologies (BWXT) at NRC headquarters in Rockville, Md. The purpose of this meeting, which was requested by BWXT, was to discuss the decommissioning of BWXT's operating facility in Parks Township, PA (PTS). The meeting was noticed in accordance with NRC's requirements for offering members of the public the opportunity to observe meetings between NRC staff and NRC licensees. Ms. Patricia Ameno, representing Citizen's Action for a Safe Environment, participated in the meeting via telephone. An attendance list is attached (Attachment 1).

The meeting began with an overview of the BWXT corporate and management structure and the reasons why Babcock and Wilcox, Nuclear Environmental Services, Inc. was reorganized. BWXT staff then discussed the resolutions to the issues raised by NRC staff concerning the decommissioning plan for the PTS. Attachment 2 contains the briefing slides prepared by BWXT for the meeting summarizing the BWXT reorganization, the issues associated with the decommissioning plan and BWXT's resolutions to the issues. Attachment 2 also contains BWXT's proposed schedule for decommissioning the PTS. BWXT staff then provided NRC staff with the revisions to the decommissioning plan for the PTS that incorporated the proposed revisions. Attachment 3 is a copy of the decommissioning plan revisions.

BWXT staff indicated that its goal was to increase communication with NRC staff in order to facilitate the completion of the decommissioning of the PTS. BWXT staff also indicated it was planning to establish a community information center near the site to allow interested citizens to review the decommissioning of the PTS. NRC staff indicated that, based on the information presented during the overview, it was pleased with the resolutions offered by BWXT and was willing to meet with BWXT staff at any time to discuss the decommissioning. In addition, NRC staff indicated that it would try to meet the milestones in the proposed schedule to the maximum extent possible.

1/1
NL17

Delete: ACNW

At the conclusion of the discussions with BWXT staff, NRC staff offered Ms. Ameno the opportunity to ask questions concerning the decommissioning of the PTS. Ms. Ameno's questions, and the responses by NRC and BWXT staff, are summarized in Attachment 4.

Attachments: As stated

License No.: SNM-414
Docket No.: 70-364

cc: B&W Distribution List

TICKET: N/A
DISTRIBUTION: File Center LLDP r/f NMSS r/f RFonner
JCopeland TJackson, RI PUBLIC

*See previous concurrence
Path & File Name: S:\DWM\LLDP\DAO\BNWMTSM.WPD

OFC	LLDP	LLDP									
NAME	DOrlando/cv	RNelson									
DATE	4/27/98	4/27/98									

OFFICIAL RECORD COPY

ACNW: YES __ NO X Category: Proprietary __ or CF Only __
IG: YES __ NO X
LSS: YES __ NO X Delete file after distribution: Yes __ No X

At the conclusion of the discussions with BWXT staff, NRC staff offered Ms. Ameno the opportunity to ask questions concerning the decommissioning of the PTS. Ms. Ameno's questions, and the responses by NRC and BWXT staff, are summarized in Attachment 4.

Attachments: As stated

License No.: SNM-414
Docket No.: 70-366

cc: B&W Distribution List

PARTICIPANTS LIST
MEETING BETWEEN BWXT AND NRC STAFF
April 15, 1998

NRC

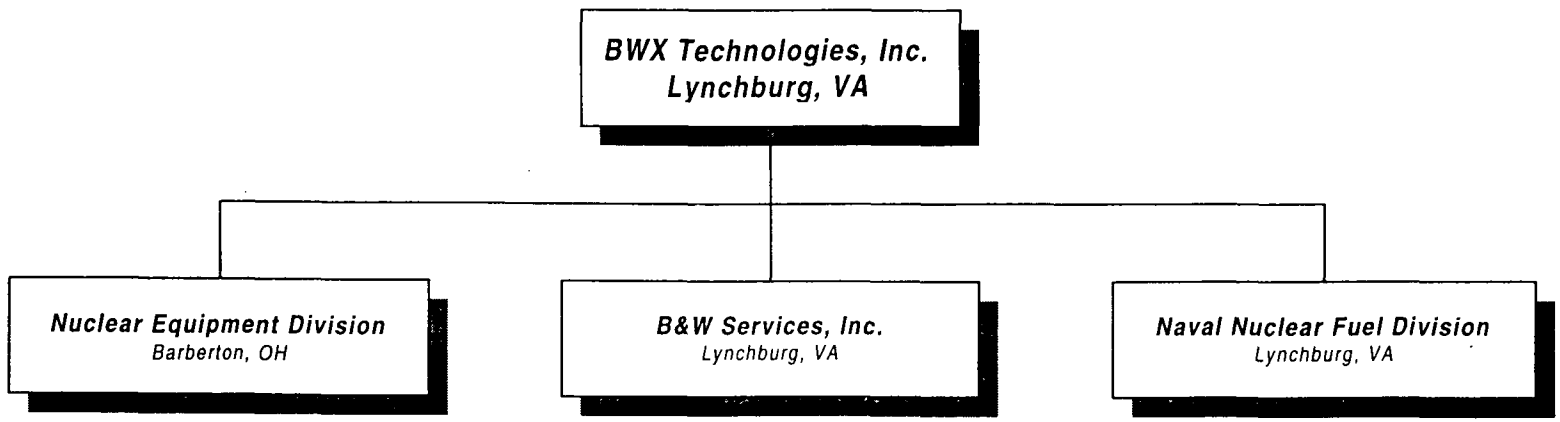
John T. Greeves, Director, Division of Waste Management (DWM)
John W. N. Hickey, Chief Low-Level Waste and Decommissioning Projects Branch (LLDP), DWM
Robert A. Nelson Section Leader, Low-Level Waste and Regulatory Issues Section, LLDP/DWM
Robert Fonner, Special Counsel for Fuel Cycle and Safeguards Regulations, Office of the General Counsel
Dominick A. Orlando, Project Manager, Low-Level Waste and Regulatory Issues Section, LLDP/DWM

BWXT

William M. Farrell, Vice President of Operations, B&W Services, Inc.
William F. Heer, General Manager, Parks Restoration Project
David W. Zeff, Manager ESH&Q, B&W Services, Inc.
Richard Bartosik, Licensing, Parks Restoration Project
David M. Fogel, Engineering Manager, Parks Restoration Project
Douglas W. Craig, ESH&Q Manager, Parks Restoration Project
Philip R. Rosenthal, Licensing, Parks Restoration Project

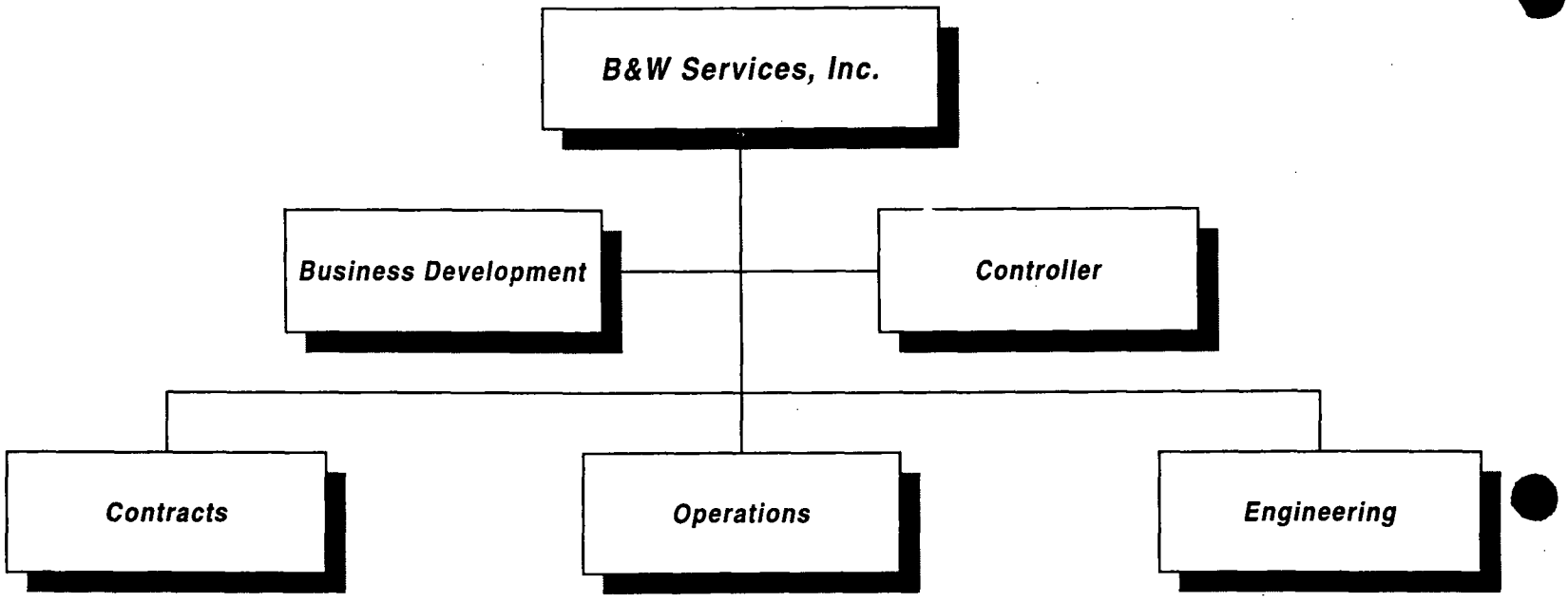
Attachment 1

BWXT Organization Chart



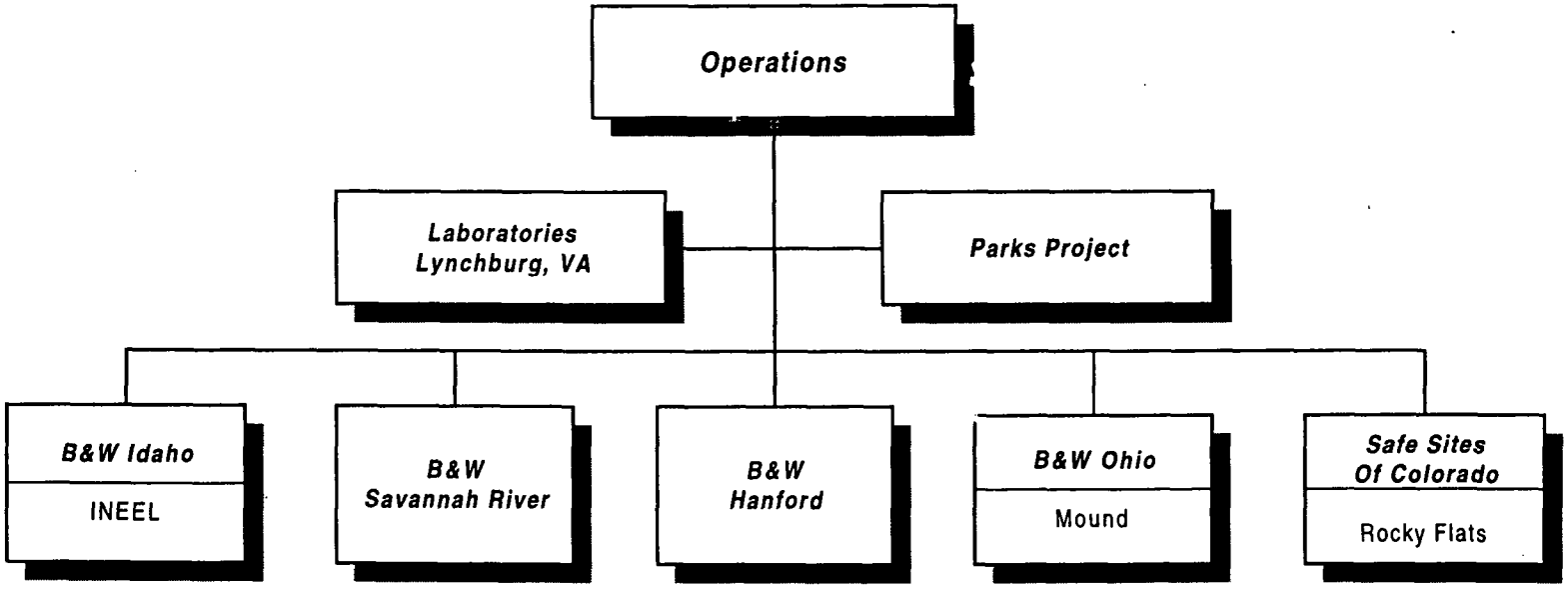
B&W Services, Inc.

BWXT Organization Chart



B&W Services, Inc.

BWXT Organization Chart



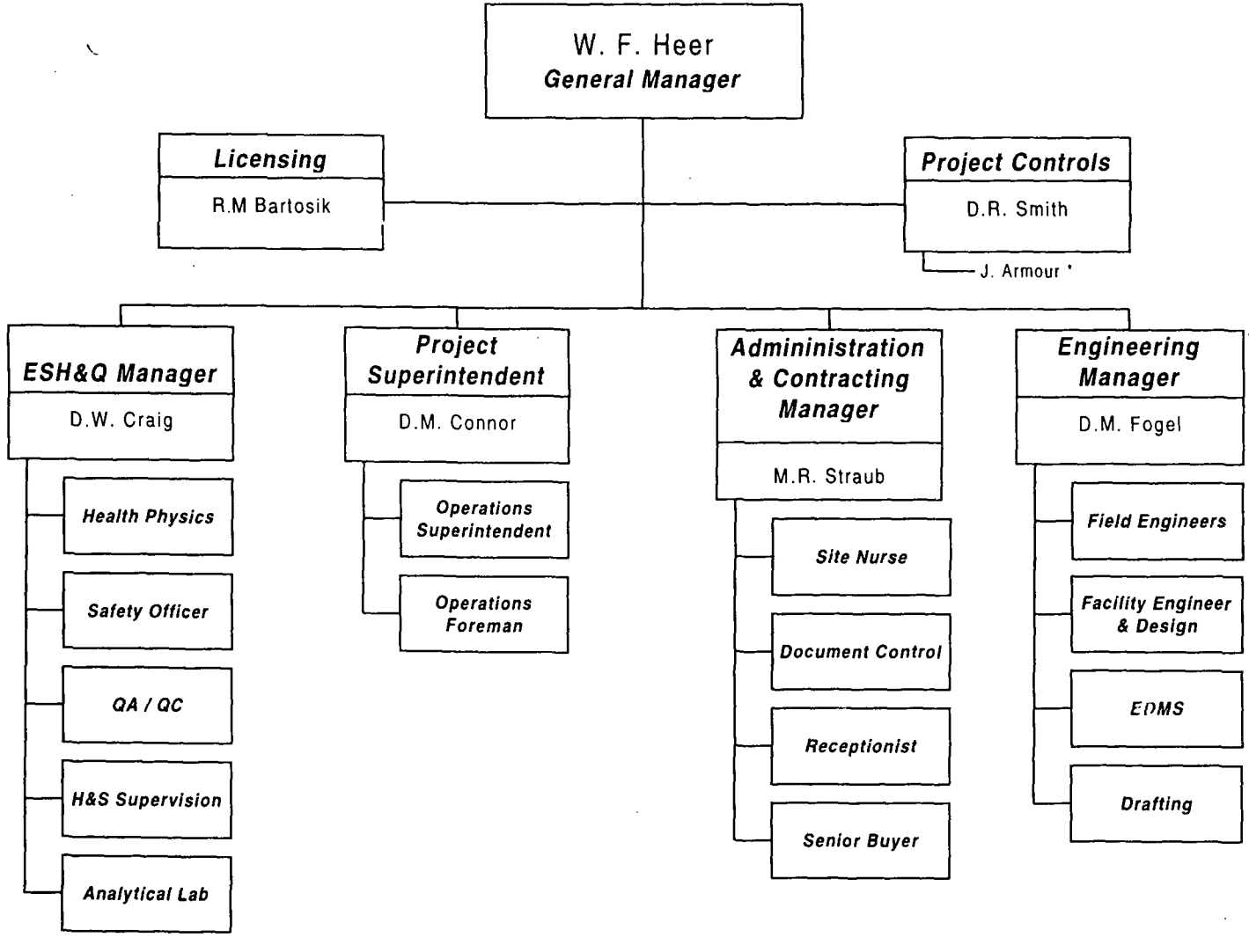
B&W Services, Inc.

BWSI Reorganization

- Recognized Business Growth
- Identified Need for Operational Focus
- Nuclear Environmental Services, Inc. (NESI) Consolidated
- Linked Laboratories to Operating Needs
- Transfer Best Practices Across Organization
  - DOE Sites
  - Lynchburg Home Office

B&W Services, Inc.

Parks Project Organization Chart



B&W Services, Inc.

* Contractor

Management Background

- Bill Heer
  - B&W Hanford–2 Years
  - Heavy Equipment Manufacturing–6 Years
  - Nuclear Equipment Division–8 Years
  - Naval Nuclear Fuel Division–8 Years
  - Apollo / Parks Operations–7 Years
  - BS–Metallurgical Engineering
- Doug Craig
  - Westinghouse / B&W Hanford–5 Years
  - Nuclear Ship Repair–3 Years
  - Nuclear Submarine Officer–12 Years
  - Prototype Reactor Training Officer–2 Years
  - BS–Physics & MS–Mechanical Engineering

Management Background *(cont)*

- Dave Fogel
  - Apollo / Parks Decommissioning–13 Years
  - Commercial Nuclear Consultant–2 Years
  - Nuclear Chemical Processing–3 Years
  - Apollo / Parks Operations–8 Years
  - BS–Chemical Engineering
- Rich Bartosik
  - Apollo / Parks Decommissioning–8 Years
  - Army Nuclear & Chemical Operations–4 Years
  - Army Nuclear & Chemical Combat Operations–3 Years
  - Army Nuclear & Chemical Decontamination–5 Years
  - BS–Chemistry

B&W Services, Inc.

Recent Management Emphasis

- Establish Stand-Alone Fully Staffed Organization
- Review Basic D&D Approach
- Value Engineering Peer Review
- Fab 6 Path Forward Review
- Realistic Re-Baseline of Remaining Work Scope

B&W Services, Inc.

Increased Emphasis on NRC Interface

- Assigned In-House Licensing Manager
- Revised Schedule to Sequence Submittals
- In-Depth Review of NRC Decommissioning Comments
- In-Depth Planning for Building C Demolition
- More Frequent Review Meetings Suggested

B&W Services, Inc.

NRC Requested Modifications

- Beta-Gamma Emitters @ 5,000 dpm/100 cm^2–*Agree*
- Approved Decommissioning Plan as a License Amendment–*Agree*
- Within 6 Months Submit Outfall 2/3 Drainpipe Characterization Method–*Agree*
- Within 6 Months Submit Outfall 3 Remediation Plan–*Agree*
- Collect Soil Sample in Project Unit E (Old Unit F)–*Agree*
- Reclassification of "Affected" to "Unaffected" Area Requires NRC Approval–*Agree*
- Reclassification of "Unaffected" to "Affected" Area Requires Justification–*Agree*
- Within 30 Days of Decommissioning Plan Approval Submit Resumes–*Agree*
- Soil Definition Excludes "Bulk" Material–*Agree*

Soil Pile Sampling

- One Sample per 25 m^3–*Agree*
- Replaced ASTM with New Methodology
- Methodology Identical to Former Brooks & Perkins Site

B&W Services, Inc.

Groundwater

- Utilize PaDEP & EPA Drinking Water Standard
- Notify NRC of Well Abandonment with Rationale
- Project Will Comply with PaDEP Abandonment Regulations
- Following Licensing Termination, Compliance with PaDEP Regulations Will Continue

B&W Services, Inc.

Subsurface Soil Samples

- Bottom of Hole Samples One Meter Greater Than Max Depth
- Subsurface Sample Plan Included in Decommissioning Plan Rev-2
- Minimum One Sample Per 1000 Sq. Meters Affected Area, With at Least One Sample Per Affected Survey Unit

B&W Services, Inc.

Scaling Factors

- Methodology Described in Decommissioning Plan Rev-2
- Building / Equipment Scaling Factors–FFTF Based Providing Conservatism
  - Isotopic Analysis Already Performed
  - Correlation Validated
- Outfalls Scaling Factors to Be Resolved With NRC Region 1 and Submitted With Outfalls Plan
- Soil Scaling Factors to be Validated
  - Isotopic Analysis Plan Presented
  - Methodology Consistent With Building / Equipment Program

B&W Services, Inc.

Project Overview Schedule

Building C FSSR Submitted by B&W	01/20/98
Decommissioning Plan Rev-2 Submitted	04/15/98
Building C FSSR Approval	05/04/98
Decommissioning Plan Approval	05/26/98
Building B FSSR Submitted by B&W	10/01/98
Building B FSSR Approval	12/01/98
Building A FSSR Submitted by B&W	01/01/99
Building A FSSR Approval	03/01/99
All Radiological Contaminated Soils Shipped Offsite	01/01/00
Post Remediation Ground Water Monitoring Completed	06/01/01
B&W Submits Request for License Termination	07/01/01
License Termination Approval	01/01/02

B&W Services, Inc.

Management Oversight Planning

- B&W Quarterly Management Performance Meetings
- Frequent B&W Updates to NRC by Telecons Encouraged
- NRC /B&W Operations Meetings Every 4 to 6 Weeks
- Semiannual Management Meeting with NRC HQ

B&W Services, Inc.

BWX Technologies, Inc.
Babcock & Wilcox, a McDermott company

B&W Services, Inc.

R.D. 1, Box 355
Vandergrift, PA 15690
(724) 845-2808
Fax: (724) 842-1478

April 15, 1998

Mr. John W. N. Hickey, Chief
Low Level Waste and Decommissioning
Projects Branch MS T8F-37
Division of Waste Management
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SNM-414
Docket No. 70-364

Subject: Parks Facility - Decommissioning Plan

Reference: (a) NRC Letter (J.W.N. Hickey) to B&W Services, Inc. (P.R. Rosenthal), dated April 1, 1998
(b) Parks Facilities Decommissioning Plan, Revision 1, dated May 23, 1997
(c) Federal Register Notice; Vol. 61, No. 198, 61 FR 53240, dated Thursday, October 10, 1996

Dear Mr. Hickey:

This is in response to your letter of April 1, 1998, Reference (a), and concerns NRC approval of the Parks Township Facility Decommissioning Plan, Reference (b).

Reference (a) effectively states that in order for the NRC to approve the Parks Facility Decommissioning Plan it will be necessary for BWSI to revise the Plan to reflect certain proposed draft license conditions and specifically requests that the Decommissioning Plan be approved as an amendment to the facility license.

Accordingly, the Parks Facility Decommissioning Plan has been revised as follows:

1. Section 1.1 has been revised to reflect the current name and address of the licensee.

2. Section 2.2.5 has been revised to reflect that a soil sample will be taken from one gridblock in the area of Project Unit E that was previously Project Unit F.

3. Section 3.2 - reference to "bulk material" has been deleted and revised to more accurately define soil and gravel.

Attachment 3

4. The Table in Section 3 which presents Maximum Soil Concentrations values have been revised to delete reference to "bulk materials".

5. The radiological release limits for surface activity in the Section 3 guideline table has been changed from 15,000 dpm/100 cm^2 to 5,000 dpm/100 cm^2.

6. Section 3.2 and 5.6.7 addresses the point-of-reference values for groundwater activity levels.

7. Figure 3-3 which depicts the summary level schedule has been deleted. The current summary level schedule is included in the revised Section 3.7.

8. Section 3.6 has been revised to reflect the Parks Environmental Restoration Project management structure, duties, and responsibilities.

9. Section 3.8 has been changed to reflect current estimated soil and debris volumes.

10. Section 3 9 has been added to address plans for remediation of outfalls 2 & 3 (a new section).

11. Section 4.1 and 4.2 have been revised to reflect the correct title of the Manager, Environment, Safety, Health, and Quality.

12. Section 5.1.1 has been revised to address "Affected" and "Unaffected" areas.

13. Section 5.1.4 has been revised to address subsurface sampling.

14. Section 5.2. has been revised to reflect soil pile sampling at the rate of one sample per 25 cubic meters. The table presented in this section was prepared with the aid of computer code RESRAD. Due to the large volume of data associated with the RESRAD computer run, the data will be forwarded to the NRC staff under separate cover.

15. Revised Section 5.6.3 and new Appendix E presents the development and use of scaling factors to determine isotopic distribution and radioactivity.

The revisions to the Parks Facility Decommissioning Plan have been made on a page revision basis. Please note that the page revisions are controlled by a revision number in the lower right hand corner. Enclosed please find seven copies of the revised pages, a change summary for revision 2 pages, and a list of effective pages.

It is hereby requested that Reference (b) as revised by this submittal be approved as an amendment to license SNM-414. It is our understanding that this request for an amendment does not provide an opportunity to request a hearing under provisions of 10CFR2, Subpart L as that opportunity was afforded by Reference (c). If this is not the case, please notify the undersigned as soon as possible.

If there are any questions concerning this submittal, please contact me at (724) 842-1472.

Sincerely,

Richard M. Bartosik
Manager, Licensing

Enclosures

cc: T. Jackson - NRC Region I
J. J. Matviya - PADEP
P. R. Rosenthal

klg/RMB1:PA98-006

REV. 2
CHANGE SUMMARY

Several changes were made to Rev. 1 in creating Rev. 2. Wherever practical, the changes are made by vertical bars in the right hand margins. The changes are listed below by section and page number:

Section 1 *{Replace Pages 1-1 and 1-2}*

- Pages 1-1 and 1-2. Section 1.1 has been revised to reflect current licensee information.

Section 2 *{Replace Page 2-6 Only}*

- Page 2-6. Section 2.2.5 reflects an additional sample to be collected in Project Unit E.

Section 3 *{Replace Entire Section}*

- Page 3-2. References to bulk material have been deleted for clarification.
- Page 3-3. The table title has changed to remove the reference to bulk material.
- Page 3-4. The ^{241}Pu/beta gamma emitter average activity level has been corrected to reflect 5,000 dpm$\beta\gamma$/100 cm^2.
- Page 3-5. Groundwater discussion now references applicable sections of the Environmental Protection Agency regulations and the Pennsylvania Code. Table has been updated to include Pennsylvania Code reference.
- Pages 3-10 and 3-11. The project organization section has been changed to reflect current BWSI organization.
- Pages 3-12 and 3-13. The schedule section has been changed to incorporate major milestones based on the current schedule as of March 1998.
- Page 3-14. The table title has changed to remove the reference to bulk material. The estimated soil volumes have been changed to reflect the current estimates in the March 1998 schedule.
- Page 3-15. Section 3.9 has been added to include specifics on the Outfall 2 and 3 Remediation Plans.
- Figure 3-2. Revised to reflect current organization.
- Figure 3-3. Deleted. Schedule specifics now in section 3.7.

Section 4 *{Replace Pages 4-1 and 4-2}*

- Pages 4-1 and 4-2. General Manager, ES&H has been replaced with Manager, ESH&Q.

Section 5 *{Replace Entire Section}*

- Page 5-2. Reworded "Affected" and "Unaffected" area reclassification to reflect NRC draft conditions.
- Page 5-5 and 5-6. Replaced Section 5.1.4 to clarify location of one-meter deep samples (at the bottom-of-the hole) and density of samples.

- Page 5-6 through 5-10. Replaced Section 5.2 with new section which addresses the mechanics of collecting one sample per every 25 m^3 as requested by the NRC in the draft conditions.
- Page 5-13 through 5-14. Replaced Section 5.6.3 with new isotopic ratio section which refers to Appendix E for the plan on collecting additional isotopic verification sampling.
- Page 5-17. Replaced Section 5.6.7 to commit to meeting both EPA and Pennsylvania point-of-reference values.

Section 6 *{Replace Entire Section}*

- Page 6-1 replaces Pages 6-1 and 6-2. Changed to reflect current estimate to complete.

Appendix E *{Add New Appendix}*

- This appendix contains the documentation for the scaling factors discussion.

LIST OF EFFECTIVE PAGES

Section 1

• Pages 1-1, 1-2	Rev. 2
• Pages 1-3 through 1-16	Rev. 1
• Figures 1-1 through 1-5	Rev. 1

Section 2

• Pages 2-1 through 2-5	Rev. 1
• Page 2-6	Rev. 2
• Page 2-7 through 2-17	Rev. 1
• Figures 2-1 through 2-18	Rev. 1

Section 3

• Pages 3-1 through 3-15	Rev. 2
• Figure 3-1	Rev. 1
• Figure 3-2	Rev. 2
• Figure 3-3	DELETED

Section 4

• Pages 4-1 and 4-2	Rev. 2
• Page 4-3	Rev. 1

Section 5

• Pages 5-1 through 5-21	Rev. 2
• Figure 5-1	Rev. 1

Section 6

Page 6-1	Rev. 2

Section 7

Pages 7-1 through 7-5	Rev. 1

Appendices

- Appendix A — Rev. 1
- Appendix B — Rev. 1
- Appendix C — Rev. 1
- Appendix D — Rev. 1
- Appendix E — Rev. 2

1.0 BACKGROUND

The Parks Project is designed to decontaminate and decommission the B&W Parks Facilities. Activities and property at the adjacent Shallow Land Disposal Area are covered under a separate NRC license, and hence are not included in this plan. The objective of this decommissioning plan is to remediate radiological constituents at the Parks Facilities to the extent required by applicable governmental directives, standards and regulations in order to allow the NRC to (a) release the property for unrestricted use and (b) terminate license SNM-414. In view of the results of the characterization of the Undeveloped Area (see Section 2.2.5), no radiological remediation is needed.

Submittal of this Parks Facilities Decommissioning Plan was preceded by more than eight months of planning and site characterization, budgeted in excess of $3 million. This effort significantly enhanced B&W's knowledge regarding conditions at the Parks Facilities. The field activity and laboratory analysis of the comprehensive radiological and chemical characterization is complete. The B&W NESI evaluation of the results was documented in a Site Characterization Report transmitted to the NRC and PaDEP on April 30, 1996. This decommissioning plan summarizes the complete set of radiological data from the historical characterization activities and the recently completed site characterization effort.

Planning and characterization also served to identify key issues which may affect the overall feasibility of the project. While these issues are outside of B&W's direct control, they must nevertheless be resolved under terms and conditions acceptable to B&W in order for the decommissioning effort to proceed. B&W is working towards resolution, and firmly believes that the following items will in fact be satisfactorily resolved, in which case B&W is committed to proceeding with decommissioning the Parks Facilities:

1. Envirocare of Utah can continue to dispose of Parks Facilities waste for the duration of the project;

2. Necessary permits and/or approvals for B&W's activities, including the residual acceptance criteria specified in the plan, are received from the appropriate agencies in a timely manner, and;

3. Waste materials continue to be classified as low-level radioactive waste, or if any of the materials are classified as mixed waste, an acceptable disposal option is available.

1.1 LICENSE INFORMATION

This Decommissioning Plan pertains to Nuclear Regulatory Commission (NRC) license number SNM-414, Docket No. 70-364. The name of the licensee is BWX Technologies Inc (BWXT). BWXT is a subsidiary of The Babcock & Wilcox Company (B&W). B&W is a subsidiary of The Babcock & Wilcox Investment Company (BWICO). B&W Services Inc. (BWSI), formerly B&W Nuclear Environmental Services Inc. (B&W NESI), an affiliate of BWXT and itself a subsidiary of BWICO, is responsible for site operations at the Parks Facilities. BWSI has established the Parks Environmental Restoration Project, to manage these site operations. The full mailing address is B&W Services Inc., Parks Environmental Restoration Project, R.D. #1, Box 355, Vandergrift, PA 15690.

For purposes of this Decommissioning Plan, The Babcock & Wilcox Company (B&W) shall mean BWX Technologies Inc. (BWXT) and B&W Nuclear Environmental Services (B&W NESI) shall mean B&W Services Inc.

BWXT recognizes that this Decommissioning Plan, when approved, will become an amendment to license SNM-414 and, as such, may change, delete, or be an addition to conditions specified by the license.

1.2 SITE AND FACILITY DESCRIPTION

B&W owns approximately 115 acres of land located in Parks Township, Armstrong County, Pennsylvania. The location of this land relative to surrounding features is shown in Figure 1-1. For purposes of decommissioning, the B&W Property is subdivided into three principal areas:

- an area known as the "Parks Facilities where three major facilities that have been used for nuclear activities, known as Buildings A, B and C, are located;

- an area containing the "Shallow Land Disposal Area I (the SLDA, where low level waste from Apollo was buried), which is licensed separately under SNM-2001 (Docket No. 70-3085) and is not subject to license termination under this decommissioning plan; and,

- an "Undeveloped Area" where nuclear materials were never processed or stored.

The location of these three areas is shown in Figure 1-2. The balance of the property owned by B&W is discussed in Section 2 and shown on Figure 2-2 where it is identified as Project Unit D.

1.2.1 Site Description

The land around the B&W Property is a mixture of rough terrain (steep hills and narrow valleys) and flat rolling country, having trailing divides, flat saddles, and rounded hills. Ground surface elevations range from about 740 feet to 1,740 feet above mean sea level. The land generally slopes to the south and west.

The B&W Property adjoins the Kiskiminetas River about 7.7 miles from its confluence with the Allegheny River. These two major rivers drain Armstrong County. The Kiskiminetas River, which forms the County's southwestern boundary, is not currently being used for drinking or irrigation downstream from the Parks Facilities. Recreational use of the Kiskiminetas River for boating and fishing is increasing because of reduced drainage of coal mining waste which led to historically high acidity of the river.

The B&W Property is surrounded by a mix of small farms with croplands and pastures, idle farmland, forest lands, light industry, medium-sized residential communities, and individual rural residences, as shown in Figure 1-1. A restaurant is located adjacent to the property on the north side, and a small industrial complex is located within a mile. The nearest residence is located along Kiskimere Road,

2.2.5 Project Unit E

Project Unit E is classified as an unaffected area and thus subject to NUREG/CR-5849 Unaffected Area characterization criterion. Figure 2-17 shows the grid pattern, soil sample locations, and final walkover surveys grids of Project Unit E where random radiological surveying and sampling were conducted. Thirty of the 105, 50 meter by 50 meter grids in this Project Unit were randomly selected for radiological soil characterization. Soil samples were collected from surface locations (i.e., a zero to two foot interval) from the 30 grids. The soil samples collected from the Project Unit E area did not contain radionuclide concentrations above the guideline values specified in Section 3.2. In addition, one sample will be collected from the grid block that was formerly assigned to Project Unit F to complete the NUREG/CR-5849 Unaffected Area Survey. This sample will be analyzed and used as part of the data set for the final status survey report for Project Unit E.

In addition to soil sampling, a 100% walkover radiological survey, including fixed one meter exposure rate measurements, was conducted on 11 randomly selected grids (approximately 10% of the surface area). Existing procedures require surface locations with radiological surface readings exceeding two times background to be radiologically characterized through biased soil sampling. The radiological walkover survey did not identify any locations of Project Unit E exceeding twice background radiation levels. Based on the surveying and sampling results, Project Unit E is expected to meet the criteria for an unaffected area upon completion of the analysis of the additional soil sample.

2.2.6 Groundwater

Groundwater sampling at the Parks Facilities was initiated in Project Unit A in the early 1990s. Historical groundwater sampling of the Project Unit A monitoring wells did not reveal elevated groundwater radionuclide concentrations in excess of the EPA point-of-reference values in Section 3.2. During the 1995 site characterization program, the groundwater monitoring network was significantly expanded to include Project Units B, C, and D. Currently, 34 monitoring wells and 6 piezometers are installed in the vicinity of the former processing buildings (see Figure 2-18). Sampling of the groundwater has been performed for four consecutive calendar quarters in accordance with the Parks Facilities Characterization Plan. Table 2-3 is a compilation of all existing groundwater radiological characterization data.

Five of the wells at the Parks Facilities have exhibited gross alpha concentrations in excess of 15 pCi/l in *one sampling event*, and one additional monitoring well has shown gross alpha concentrations in excess of 15 pCi/l in *more than one event*. B&W NESI believes tnat interpreting sampling data that is collected over a long period of time should be done with due consideration to the data set as a whole. Several factors can influence the results from one sampling event: naturally occurring radon and other radionuclides, seasonal variance, field sampling conditions, sample residue, laboratory analysis, etc. Part of the reason for conducting a long term monitoring program is to determine the average concentrations over a period of time. If one particular sampling event is much higher than the others that one set of sampling data should be considered suspect for any number of reasons.

B&W NESI's position is consistent with the promulgated EPA Regulation 40 CFR 141.25(d) and 40 CFR 141.26(a)(4). 40 CFR 141.25(d) states that the method of demonstrating compliance for gross alpha is based on the overall average concentration. 40 CFR 141.26(a)(4) states that annual averages are used for community water systems for demonstrating compliance. More recent EPA guidance (FR, July 18, 1991, pp 33102-33110) also demonstrates that B&W NESI's position remains consistent with current EPA strategy.

3.0 PLANNED DECOMMISSIONING ACTIVITIES

Decommissioning has been preceded by many individual characterization. deactivation, decontamination and remediation projects, as discussed in Section 1.3. Alternative decommissioning activities were also evaluated during preparation of this decommissioning plan, and analysis of the major alternative is included in Appendix A. While it is anticipated that most of the radioactive materials and buildings will have been removed from the site prior to approval of the Decommissioning Plan, the foundations, grade-level concrete floors and basements of the three major building complexes will still remain, as will most of the below-grade man-made structures including septic fields, septic tanks, distribution boxes, catch basins, storm sewer lines, water pipes, septic system piping, and underground electric, gas and telephone lines, and paved areas. There will also be regions of soil which were identified during the site characterization activities as containing radioactivity above the guideline values indicated in Section 3.2. These regions of soil with elevated radioactivity levels were previously discussed in Section 2.2.

B&W's decommissioning objective is stated in Section 3.1. The decommissioning criteria it will meet are described in Section 3.2. An overall view of the proposed decommissioning activities is presented in Section 3.3. Details of the major activities and tasks necessary to accomplish the objective is discussed in Section 3.4. The planned methodology to be followed during soil excavation is discussed in Section 3.5. The organization and control procedures necessary to safely accomplish the work are detailed in Section 3.6. The schedule for completing decommissioning activities is provided in Section 3.7. A discussion of radioactive waste management issues is provided in Section 3.8.

3.1 OBJECTIVE

B&W's decommissioning objective is to remediate the Parks Facilities to the extent required by applicable governmental directives, standards and regulations in order to allow the NRC to (a) release the property for unrestricted use, and (b) terminate license SNM-414. In view of the results of the characterization, no radiological remediation of the Undeveloped Area (see Section 2.2.5) is needed.

3.2 DECOMMISSIONING CRITERIA

The principal radiological constituents identified during site characterization or known to be present through knowledge of site history and processes are:

- Alpha emitting Pu isotopes
- Am-241
- Pu-241
- High Enriched Uranium (HEU)
- Depleted Uranium (DU)
- Fission and activation products, predominantly Cs-137 and Co-60

The radiological constituents will primarily exist in a dispersed form associated with soil, as defined in 40CFR192.11. Smaller amounts may be contained on surfaces of grade level or below-grade man-made appurtenances. The residual radioactivity levels that will be considered acceptable for release of the facilities and site for unconditional use are given below in separate tables for soils and surfaces. The limits or guideline values in the following tables will be applied independently except in areas with mixed radionuclides where the sum-of-ratios approach will be used as described in NUREG/CR-5849.

GUIDELINE SOIL ACTIVITY LEVELS

Kind of Material	Maximum Soil Concentration (in pCi/g)	Reference
Plutonium compounds, (soluble and insoluble) (excluding Pu-241)	25	1
Am-241 compounds, (insoluble)	30	1
Pu-241	1,250	2
Enriched Uranium	30	1
Depleted Uranium	35	1
Co-60	8	3
Cs-137	15	3
Sr-90	5	4

References:

(1) "Policy and Guidance Directive FC 83-23: Termination of Byproduct, Source, and Special Nuclear Material Licenses", from Richard E. Cunningham to Regional Administrators, Branch Chiefs and Division of Fuel Cycle and Materials Safety, November 4, 1983

(2) See Appendix B

(3) "Medical, Academic, and Commercial Use Safety: Evaluation of Acceptability of Proposed Decommissioning Activities", memorandum from J. W. N. Hickey, Chief Operations Branch, Division of Fuel Cycle to W. E. Cline, Chief, Nuclear Materials Safety and Safeguards Branch, NRC, Region III, May, 6, 1987

(4) Memo from Mr. Jerry Swift (NRC Section Leader) to Mr. Berne Haertjens (B&W NESI), dated March 31, 1992, which included a table of maximum soil concentrations considered acceptable by the NRC for release for unrestricted use.

GUIDELINE SURFACE ACTIVITY LEVELS

NUCLIDE [a]	AVERAGE [b c f]	MAXIMUM [b d f]	REMOVABLE [b e f]
^{nat}U, ^{235}U, ^{238}U, and associated decay products	5,000 dpmα/100 cm^2	15,000 dpmα/100 cm^2	1,000 dpmα/100 cm^2
Transuranics (excluding ^{241}Pu), ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{133}I	100 dpm/l00 cm^2	300 dpm/l00 cm^2	20 dpm/100 cm^2
^{nat}Th, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra ^{232}U, ^{126}I, ^{131}I, ^{133}I	1,000 dpm/100 cm^2	3,000 dpm/l00 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and others noted above, but including ^{241}Pu	5,000 dpm$\beta\gamma$/100 cm^2	15,000 dpm$\beta\gamma$/100 cm^2	1,000 dpm$\beta\gamma$/100 cm^2

[a] Where surface activity by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha and beta-gamma emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average activity should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum activity level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable activity on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface activity resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 10 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

[*] From NRC "Policy and Guidance Directive FC 83-23: Termination of Byproduct, Source, and Special Nuclear Material Licenses", from Richard E. Cunningham to Regional Administrators, Branch Chiefs and Division of Fuel Cycle and Materials Safety, November 4, 1983

As previously discussed in Section 2.2.8, significant radioactivity is not expected in the groundwater based on the site characterization results, but a post-remediation sampling program from wells which are located upgradient, downgradient and within the boundaries of the Parks Facilities will be conducted to confirm this expectation. At the end of the one year radiological sampling period, the data from the wells will be analyzed and evaluated. If the results of this evaluation confirm that the site-wide radionuclide concentrations do not exceed the following point-of-reference values, then the program objective will have been satisfied. These point-of-reference values are consistent with the radiological requirements of the Environmental Protection Agency as specified in the National Primary Drinking Water Regulations (40 CFR Part 141) while, at the same time, consistent with the requirements of the State of Pennsylvania which incorporates, by reference, the same 40 CFR Part 141 regulations in 25 PA Code 109.202.

POINT-OF-REFERENCE GROUNDWATER ACTIVITY LEVELS

Radionuclide	Concentration Level	Reference
Man-made beta-photon emitters	4 mrem per year	1,3
Gross alpha particle activity (including Ra-226 but excluding radon and uranium)	15 pCi/l	1,3
Combined Ra-226 and Ra-228	5 pCi/l	1,3
Uranium	20 µgrams/l	2,3

References:

(1) 40 CFR 141. National Primary Drinking Water Regulations,. 1976

(2) 40 CFR 141 and 142, National Primary Drinking Water Regulations; Radionuclides; Proposed Rule," July 1991

(3) 25 PA Code 109.202, State MCLs and Treatment Technique Requirements

3.3 OVERVIEW OF PROPOSED DECOMMISSIONING ACTIVITIES

The objective of the Parks Project is to decontaminate and decommission the Parks Facilities to permit release for unrestricted use and termination of NRC license SNM-414. To accomplish the goal, a decommissioning approach has been developed and integrated with ongoing decontamination activities which are authorized under the existing SNM-414 license. This integration supports the goal of releasing the Parks Facilities for unrestricted use in a timely and effective manner.

The distinction between decontamination activities being performed under the existing NRC license, SNM-414, and decommissioning activities to be authorized by NRC approval of the Parks Facilities Decommissioning Plan is briefly outlined below and shown graphically in Figure 3-1. A summary level schedule is provided in Section 3.7 of this plan showing the timing of the decommissioning activities.

Under the Existing NRC License SNM-414

The buildings will be decontaminated, and final surveys will be performed and documented. Following NRC review and approval of the final survey report for each building in accordance with license condition 11 of SNM-414, the buildings will be demolished down to, but excluding, the grade level concrete slabs and the basements.

Debris from decontamination of the buildings or building utility systems which exceeds the guideline values in Section 3.2 will be shipped to a licensed LLRW disposal site which can also accept whatever chemical constituents are contained in the waste.

Debris from decontamination of the buildings or building utility systems which is less than the guideline values in Section 3.2 will be interred at an approved landfill, if necessary due to chemical constituents, or retained on-site.

Localized areas of soil outside the security fence may be remediated as decontamination activities under the existing authority already granted in SNM-414 if proper notice is given to the NRC for their review prior to commencing remediation. At the time of submission of this revision to the Parks Facilities Decommissioning Plan, a localized area of soil contamination near Outfall 3 and an even smaller area near Outfall 2 are the only known sources of contamination outside the security fence. [B&W NESI had previously briefed the NRC staff regarding its findings and action plans for the limited area near Outfall 3, and agreement was reached that expedited work along the riverbank near Outfall 3 should be performed under the existing SNM-414 license.]

Under an Approved Decommissioning Plan

Building slabs, basements, and sub-surface utilities and structures will be removed.

Soil from under the buildings and other locations on the site will be excavated as required. Excavated soil which exceeds the guideline values in Section 3.2 will be shipped to a LLRW disposal site which can also accept whatever chemical constituents are contained in the waste. Excavations will be surveyed in accordance with NRC and PaDEP requirements and backfilled after concurrence from NRC and PaDEP.

A Final Status Survey of the site will be performed. A post-remediation groundwater monitoring program will be conducted in conformance with NRC and PaDEP requirements.

Dealing with Coexisting Chemical and Radiological Constituents

A detailed evaluation of the radiological and chemical data from a comprehensive radiological and chemical characterization of the Parks Facilities was performed, and documented in a Site Characterization Report that was transmitted to PaDEP and the NRC in April 1996. The radiological conditions at the Parks Facilities are summarized in Section 2.2 of this Decommissioning Plan.

The Site Characterization Report identified areas that may contain coexisting radiological and chemical constituents, and those areas where actions taken to remediate one type of constituent (i.e., radiological or chemical) may reasonably be anticipated to affect the other. Recognizing the potential for overlapping regulatory jurisdiction, those areas may require special consideration prior to initiating remedial action of those areas.

Based on the characterization data, areas requiring this special consideration are believed to be limited. However, prior to initiating remediation of such an area, B&W NESI will carefully evaluate the data and develop an approach for remediation based on that evaluation. In cases where it is impractical or impossible to fully comply with the regulations of both NRC and PaDEP, B&W NESI will propose a resolution. The time required to develop such a resolution and to achieve regulatory concurrence could impact the schedule provided in Section 3.7.

3.4 DECOMMISSIONING ACTIVITIES AND TASKS

The work required to decommission the Parks Facilities can be divided into six major activities. A brief description of the activities is provided below.

Activity 1 Removing portions of the building concrete slabs to expose inaccessible areas or to gain access to underslab drain lines and other utilities, including excavating and dispositioning the soil overburden and soil identified by in-process monitoring as containing radiological constituents above the guideline values in Section 3.2.

Description Several inaccessible areas below the top surface of the concrete floor slabs will need to be evaluated to determine if additional remediation is necessary. Some of these areas are crevices, such as the expansion joints in the concrete slabs and the wall-to-floor intersections. Other areas include below-grade utility services such as electrical conduit, floor drains, and sanitary lines, which were installed before the building slabs were poured.

These inaccessible areas will be made accessible by removing a portion of the floor slab to create a large enough opening to perform an adequate survey. The pieces of concrete slab will be surveyed after removal, and the soil in the exposed excavation will be surveyed and sampled. If the soil is found to have radioactivity above the release criteria, the soil will be excavated to a depth and areal extent whereby the remaining in-place soil meets the release criteria.

Activity 2 Excavating and dispositioning soil which contains or potentially contains radiological constituents above the guideline values in Section 3.2.

Description The remnants of the building slabs and the basement walls will be excavated using conventional techniques. Any soil identified during site characterization or by in-process sampling and

analysis as having radioactivity exceeding the guideline values in Section 3.2 will be excavated. Soil will also be excavated to access man-made structures (such as piping leading to or from existing or former underground holdup/monitoring tanks, storm sewer lines, septic tanks and drain fields, catch basins, and piping connecting sanitary waste or process water lines) which appeared to exceed guideline values based on site characterization data. Structural components will be surveyed after they are removed from the ground to determine if they meet the guideline values for surfaces in Section 3.2. Soil excavation methodology is discussed in Section 3.5.

Activity 3 Surveying of exposed soil surfaces, including excavations, in the affected areas (see Section 5.1) and preparation of Final Status Survey Reports. Final grading of any excavations will occur following concurrence from NRC and PaDEP.

Description The bottom of each excavation will undergo a survey as described in Section 5.1.3. After concurrence from NRC and PaDEP, the excavations will be backfilled with clean soil meeting the sampling and analysis protocol described in Section 5.2. Access *to* the released areas will be controlled to prevent the influx of constituents from other site remediation activities. In addition, a site final radiological survey will be performed according to the protocols described in Section 5.1. The site will be divided into several survey units for the final survey and each such unit will be reported separately.

Activity 4 Final walkover survey of site.

Description After all excavations on the site have been backfilled and the final grading of the site completed, a walkover survey will be performed (excluding Project Unit E).

Activity 5 Quarterly groundwater sampling and reporting for one year.

Description A quarterly post-remediation ground water monitoring program for radiological constituents will be conducted for one year following completion of site remediation, using the protocols described in Section 5.3 of this Decommissioning Plan. The completion of site remediation is defined as that point in time when all radiologically contaminated soil has been packaged for disposal and all excavated areas have been backfilled. Quarterly Reports and one Final Report will be submitted to the NRC.

Activity 6 Preparing a Final Report to the NRC, summarizing the individual Final Status Survey Reports.

Description The final activity is preparing a Final Report and submitting it to the NRC along with a request for termination of License SNM-414. The Final Report will summarize the total residual activity remaining on-site, the findings in the individual Final Status Survey Reports, the final walkover survey, and the groundwater monitoring program.

3.5 SOIL EXCAVATION

The purpose of this section is to provide the methodologies to be used for (a) excavating, such that intermixing of soils having radioactivity above and below the Section 3.2 guideline levels is minimized, (b) surveying the bottom of each excavation. (c) dispositioning soil piles, and (d) backfilling of excavated areas.

3.5.1 Excavation Methodology

Soil excavation will be performed using conventional earth moving equipment. However, control over the excavation activity is designed not only to maximize removal of soil with radioactivity above the Section 3.2 guideline levels, but also to minimize intermixing of such soil with soil below the guideline levels. Due to (a) the inhomogeneity of soil at the site, (b) measurement uncertainties, and (c) the inherently non-surgical nature of excavation operations, a limited amount of intermixing is unavoidable.

Excavation will generally be performed in three phases: (1) removal of "overburden," containing radioactivity below the Section 3.2 guideline levels, (2) removal of soil containing radioactivity approximately three times the guideline levels, and (3) removal of soil containing radioactivity levels between those of phases 1 and 2. Soil from each of these three phases will be placed in a separate, identified pile. Excavation drawings based on the results of the site characterization program will be prepared to provide general guidance on the depth and areal extent of excavation required for each phase. However in-process measurements (see Section 5.4) will be used to more precisely define the end of each phase and, thus, to minimize intermixing.

3.5.2 Soil Pile Dispositioning

Each soil pile, including those containing "overburden," will be subjected to a volumetric survey as described in Section 5.2 under Site Excavated Soils.. Soil piles that meet the protocol requirements described in Section 5.2 and the chemical requirements established by PaDEP will be retained on-site for use as backfill or cover. Soil piles that do not meet these requirements will be either packaged and shipped to a LLRW disposal site or split into two or more smaller soil piles in an attempt to segregate the soil that contains radioactivity above the guideline values in Section 3.2 from the soil with lower radioactivity levels. All soil piles will be covered until they can be sampled and evaluated. The cover will be maintained until such time that: (a) the soil pile is determined to meet the criteria for unrestricted use; or (b) the soil in the pile is packaged for disposal as LLRW.

The volumetric survey data will be provided to the NRC for review. None of these soil piles will be used for backfill or cover until concurrence has been received from NRC and PaDEP.

3.5.3 Surveying of Excavations

Following the excavation of the contaminated area as described in Section 3.5.1, the Bottom of the hole. will undergo in-process sampling to verify that all soil above the acceptable soil guideline values in Section 3.2 has been excavated. Any additional soil with activity above the guideline values will be dispositioned as described in Section 3.5.2.

If an excavated area fails to meet the criteria listed in Sections 5.1.2 or 5.1.3 during the final status survey or during any NRC confirmatory survey, the area will be re-excavated and any resultant soil pile generated from the re-excavation will be dispositioned as explained in Section 3.5.2. The excavated area may be subdivided for remediation purposes as detailed in NUREG/CR-5849. especially if the final survey data indicates that the soil above the guideline values is localized.

3.5.4 Backfilling Excavations

Open excavation areas will be backfilled after receiving concurrence from NRC and PaDEP. The backfill material may originate from off-site and/or on-site sources; see Section 5.2 for characterization and data evaluation requirements. The backfilling operation will be performed using standard construction techniques and equipment.

3.6 PROJECT ORGANIZATION AND WORK CONTROL

This section describes the project organization that has been established by BWSI to manage the Parks Environmental Restoration Project. This project organization replaces the organization specified in Sections 2 and 11 of SNM-414. As the project moves forward, changes to the project organization may be needed in response to the reduced level of site activities and reduced hazards. Effective with NRC's approval of this plan, the licensee may make changes to the organizational structure in accordance with the process described in Section 4 of this plan, provided the safety function maintains an independent reporting relationship from that of operations, and the positions responsible for the safety functions are held by individuals which satisfy the educational and experience qualifications described in Section 3.6.3 for such functions.

3.6.1 Project Organization Structure

Overall program direction for the Parks Project, including cost and schedule control, is provided by a dedicated General Manager. The Parks Project is organized by major functional activity with a designated organization to implement health, safety and regulatory requirements. Functional departments of the Parks Project organization are: Environment, Safety, Health & Quality Assurance, Engineering, NRC License Administration, Administration & Contracting, Project Superintendent and Project Controls Functional managers assist the General Manager on technical matters, provide resources to the project from their staffs in response to tasks assigned by the General Manager, and provide day-to-day management of personnel. The Parks Project organization is illustrated in Figure 3-2. Additional support may be provided by B&W personnel from other sites.

3.6.2 Managerial Responsiblities

General Manager, Parks Project is ultimately responsible for ensuring the safe operations of all activities conducted under license SNM-414. He is responsible for the overall project planning and execution of all activities at the Parks Facilities in accordance with applicable health, safety, quality and technical requirements. The General Manager has full authority to stop any activity when he believes these requirements are not being met.

Manager, Environment, Safety, Health and Quality Assurance (ESH&Q) reports to the General Manager, Parks Project and is responsible for establishing and ensuring implementation of the necessary quality assurance, environmental and safety programs, and compliance assessment programs. He shall provide technical direction and approval of safety and environmental compliance programs and shall arrange for audits to ensure that project activities are conducted in full compliance with NRC and other applicable regulatory requirements. The Manager, ESH&Q has authority to stop work on any decommissioning operation based on ESH&Q concerns, provides technical guidance on all elements of radiological and

occupational safety for the project, approves procedures and instructions implementing the safety program, and is responsible for radiological and industrial safety training for the Parks Project.

Manager, Licensing reports to the General Manager, Parks Project and is responsible for administering license SNM-414 and is the designated contact point with the NRC.

Manager, Engineering reports to the General Manager and is responsible for establishing the characterization programs and for development of remedial designs for site environmental restoration. The Manager, Engineering is also responsible for Parks Facilities general engineering tasks and for site security.

Project Superintendent reports to the General Manager and is responsible for nuclear material accountability, transportation, daily work assignments for Health & Safety technicians, and the supervision of the operations personnel responsible for the physical execution of decontamination and decommissioning activities at the Parks Facilities.

Manager, Administration & Contracting reports to the General Manager and is responsible for all procurement activities and human resource activities at the Parks Facilities.

Manager, Project Controls reports to the General Manager and is responsible for the all the schedule planning and control functions at the Parks Facilities.

3.6.3 Minimum Qualification for Safety Related Positions

General Manager, Parks Project must hold a baccalaureate degree and have a minimum of twelve years of experience in the nuclear industry, including five years of general management experience.

Manager, ESH&Q must hold a baccalaureate degree in engineering or science and have a minimum of twelve years of nuclear industry experience including three years in nuclear safety, health physics, quality assurance, industrial safety, or environmental safety, and five years of management experience.

Manager, Licensing must hold a baccalaureate degree in engineering or science and have a minimum of ten years experience in the nuclear industry.

Manager, Engineering must hold a baccalaureate degree in engineering or science and have a minimum of twelve years experience in the nuclear industry including five years of management experience.

Quality Assurance Engineer must hold (a) a baccalaureate degree, or (b) a high school diploma with at least five years experience in quality assurance or quality control.

3.6.4 Work Control

Operations with nuclear materials at the Parks Facilities are performed in accordance with written instructions. Written instructions were used to safely control the previous decontamination, deactivation and remediation activities described in Section 1.3, and will continue to be used during the decommissioning activities described in Section 3.4. There are four general types of written instructions in use at the Parks Facilities: Programs, Procedures, Engineering Releases, and Radiation Work Permits. These written instructions are reviewed and approved by key management individuals in the Parks Project organization.

Programs are broad-based management policies affecting the health, safety and quality of work activities. Existing program documents include the Health and Safety Plan, ALARA Program, Industrial Safety Instructions, and the Quality Assurance Plan. These programs and plans are implemented by specific Procedures, Engineering Releases, and Radiation Work Permits, as discussed below.

Procedures are written instructions defining how to operate equipment, calibration methods, or guidance for completing routine work activities. General Procedure GP-61 defines how procedures are prepared and controlled *to* ensure work is performed using only approved procedures.

Engineering Releases (ERs) are the primary written instruction for both decontamination and decommissioning work at the Parks Facilities. ERs provide specific instructions in a logical and sequenced manner for one time or short duration activities requiring a disciplined approach to ensure that health and safety requirements are met. Quality Implementing procedure QIP-15 defines how ERs are prepared, implemented and closed-out. Quality Implementing procedure QIP-19 defines how interim changes to an ER are authorized pending formal revision of the ER.

Radiation Work Permits (RWPs) specify necessary radiation safety controls, including personnel monitoring, monitoring devices, protective clothing, respiratory protection equipment, special air sampling, and additional precautionary measures RWPs are issued for non-routine activities where there is a need to prescribe the conditions under which the work may be done in order to assure adequate protection of workers and the public from the potential radiological hazards that may be encountered. RWPs required for decommissioning activities are usually identified during the preparation and review of ERs. Health and Safety personnel specify the necessary radiation safety controls and approve the RWP. The radiological safety evaluation of the RWP invokes use of the ALARA Plan when required. Information taken into account in issuing the RWP includes: type and location of work to be performed, radiation and contamination types and levels, and effects on work being performed simultaneously in other areas, including environmental effects. All RWPs have expiration dates. and the status of issued RWPs is reviewed on a routine basis by Health and Safety personnel. Upon completion of the work under the RWP, the requester is responsible for ensuring that the RWP is terminated and that the work area is returned to acceptable conditions, as determined by Health and Safety personnel.

3.7 SCHEDULE

A comprehensive schedule has been prepared for the Parks project. The schedule is fully integrated to effectively manage both the decontamination activity currently permitted under the existing SNM-414 license and the planned decommissioning activities described in this Decommissioning Plan.

The establishment of a decommissioning approach is based upon an extensive characterization program which has been supplemented by the information gained through the decontamination activities completed to date.

The initiation of the activities under this decommissioning plan are dependent upon the demolition of Buildings A, B, and C which will then permit the commencement of Activity 1 as defined in Section 3.4 (e.g. removal of portions of the building concrete slabs). The commencement of these activities is further dependent upon B&W submittal and the NRC's approval of the Final Survey Status Reports for each of these buildings. As such, the integrated Parks Target Project schedule as detailed below, which is current

as of the date of this submittal, represents best estimates of when the critical schedule milestone activities will be completed.

Activity	Completion
Building C FSSR Approved By NRC	05-04-98
Decommissioning Plan Approved by NRC	05-26-98
Building B FSSR Submitted By B&W	10-01-98
Building B FSSR Approved By NRC	12-01-98
Building A FSSR Submitted By B&W	01-01-99
Building A FSSR Approved By NRC	03-01-99
All Radiological Contaminated Soils Shipped Offsite	01-01-00
Post Remediation Ground Water Monitoring Completed	06-01-01
B&W Submits Request For License Termination	07-01-01
NRC Approves License Termination	01-01-02

Note that the above schedule includes an anticipated NRC approval cycle time of two months for interim submittals and six months for the final decommissioning report and license termination. Please also note that provision has not been made to account for potential schedule perturbations, some of which may not be under the direct control of B&W (e.g., unavailability of disposal sites, unanticipated or extended delays in receiving necessary approvals from local, State and other Federal agencies, labor disputes, weather delays, equipment breakdown etc.). Actual performance of the work may occur earlier or later than shown based on such factors, and the schedule will be revised accordingly.

3.8 RADIOACTIVE WASTE MANAGEMENT

Low Level Radioactive Waste

B&W NESI may decontaminate the surfaces of structures or structural components, to the extent practical, to reduce the volume of radioactive waste requiring disposal. Material that does not meet the guideline values in Section 3.2 will be transferred to a licensed Low Level Radioactive Waste (LLRW) disposal facility.

The following table provides a summary level breakdown of the estimated volume of low level radioactive waste that is expected to be generated during decommissioning the Parks Facilities. The table does not include LLRW generated during decontamination of the buildings, since that work is being performed under the existing SNM license and is not a decommissioning activity.

Estimated Low-Level Radioactive Waste Volume From Decommissioning the Parks Facilities (volume in cubic feet)	
Project Unit	Soil and Debris Volume
A	53,000
B	3,000
C	18,000
Total	74,000

In general, soil that potentially exceeds the criteria for release for unrestricted use will be excavated and placed in covered piles. The piles will be sampled in accordance with Section 3.5.2. Soil from piles failing the requirements in Section 5.2 will be classified as LLRW and loaded into lined dump trailers, metal boxes, bags, triwall boxes, or other equivalent storage/shipping containers. After manifesting, the majority of this soil will be expediently shipped to a LLRW disposal site to minimize the amount of time it is stored on-site.

While decommissioning activities are in progress, LLRW will also be generated from decontamination activities conducted in Buildings A, B. and C. This decontamination waste will be placed into various sized metal boxes, bags, triwall boxes, or other equivalent storage/shipping containers, or loaded directly into seavans or lined dump trailers. Each radwaste container will be appropriately labeled in accordance with written procedures. The containers may be temporarily stored on-site, until the containers can be efficiently shipped to a LLRW disposal site. The short term, on-site storage will be within existing buildings, in designated outside storage areas, in trailers or seavans, or in an auxiliary storage facility to be erected in early 1997. The auxiliary storage facility will be a 40' x 80' x 16' high postframe building. The storage facility will be located in the parking lot to the north of Building A, and will comply with current regulations and guidance regarding storage of low level radioactive waste. The waste will only be stored until it can be efficiently transported to a LLRW disposal site.

Greater than Class C Radioactive Waste

It is anticipated that decontamination and decommissioning activities may identify small quantities of Greater than Class C radioactive waste. Disposal of Greater than Class C low-level radioactive waste is the responsibility of the U.S. Department of Energy (DOE). Greater than Class C waste generated during decommissioning of the Parks Facilities will be stored on-site in accordance with all applicable NRC requirements until such time as the DOE is prepared to accept the waste for disposal. If the DOE is not ready to accept the Greater than Class C waste by the time that B&W NESI completes the decommissioning activities, the waste will be transferred to another facility authorized to accept Greater than Class C material for interim storage.

Mixed Low Level Radioactive Waste

Based upon a preliminary evaluation of site characterization results, B&W NESI anticipates that a limited amount of soil containing both radiological and chemical constituents may be identified during decommissioning. Management and disposal of mixed waste generated during decommissioning the Parks Facilities will be performed in accordance with all applicable Federal and Commonwealth of Pennsylvania regulations. B&W NESI will pursue environmentally responsible management of such small quantities of mixed waste, and will explore viable treatment and disposal alternatives for mixed waste during the decommissioning period. (See EPA Policy Statement, "Extension of the Policy on Enforcement of RCRA Sec. 3004(j) Storage Prohibition at Facilities Generating Mixed Radioactive/Hazardous Waste.")

Two final disposal options for mixed waste generated during decommissioning currently exist: (1) stabilization followed by burial at a licensed and permitted mixed waste disposal site; or, (2) treatment at an authorized facility to destroy the hazardous component in the mixed waste, transforming it into a low level radioactive waste. B&W NESI will evaluate both options as more information becomes available on the exact content of the material expected to be mixed waste. Mixed waste remaining on site at the time that B&W NESI has completed the decommissioning activities will be transferred to another facility authorized for interim storage of such material until a disposal option becomes available.

Adequate resources are available at the Parks Facilities to properly manage the mixed waste. These resources include: laborers, technicians, supervisors, engineers, and managers qualified as both Radiation Workers and Hazardous Waste Operations and Emergency Response (HAZWOPER) workers; routine use of surveillance equipment adequate to determine the presence of hazardous volatile materials, flammable materials, or harmful oxygen levels; knowledgeable engineering staff to write and revise work procedures to ensure proper work techniques when hazardous materials are expected; and, an adequate supply of personal protective equipment. In addition, B&W NESI currently works, and will continue to work, during decommissioning, under control of our Hazardous Waste Manual. The B&W NESI Hazardous Waste Manual controls how hazardous wastes are identified, accumulated, and transported, and how the records are maintained.

3.9 OUTFALL 2 AND 3 REMEDIATION PLANS

The Parks Project will submit a Remediation Plan for Outfalls 2 and 3 to the NRC by October 15, 1998. This remediation plan will include a description of:

- the methods used to characterize the drainpipes for Outfalls 2 and 3.
- the remediation completed to stabilize the soil around Outfall 3.
- additional remediation to be performed (if any). The Parks Project will not perform this remediation without prior NRC approval.
- the scaling factors used to guide remediation and final survey (see Appendix E).

BWX Technologies, Inc.
Babcock & Wilcox, a McDermott Company

B&W Services, Inc.
Parks Environmental Restoration Project
April 13, 1998

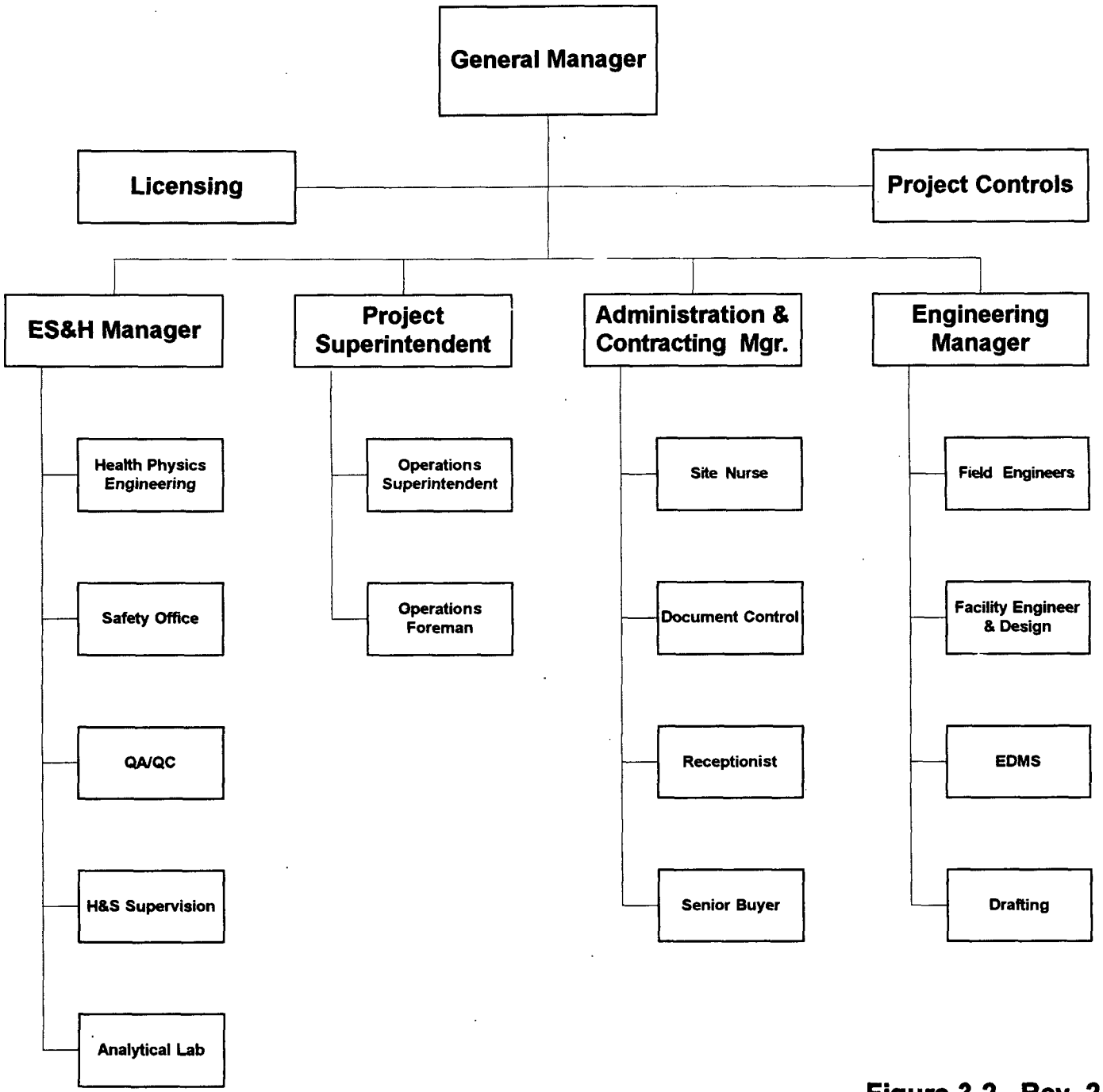


Figure 3-2, Rev. 2
Parks Environmental Restoration Project Organization

4.0 HEALTH & SAFETY

B&W has maintained a Health & Safety program applicable to activities authorized under SNM-414 since 1971. The Health & Safety program is designed to ensure the safety and health of employees, visitors, and members of the public during all operations authorized under the license. Since 1971, the Health & Safety program has been revised from time to time with approval of the NRC to be commensurate with authorized activities in effect at the time. The effectiveness of the Health & Safety program, which includes a firm management commitment to ALARA, has been well demonstrated over the past 25 years.

4.1 RADIOLOGICAL SAFETY

To support development of this decommissioning plan, analyses were performed to assess the radiological impacts of performing the selected decommissioning activities on the workers and the public. These analyses included transportation impacts under both normal and accident conditions. These supporting analyses are included in Appendix C.

This decommissioning plan, when approved, authorizes the remediation of soil, groundwater, below grade structures and building utilities such as retention tanks, buried pipes, etc. Upon approval of this plan, B&W NESI will use the existing Health & Safety program as described in SNM-414 License Renewal Application, Revision 6, dated March 17, 1995 and approved by an NRC Letter (Weber/Pierson) to B&W (Sgarlata), dated October 24, 1995. Also upon approval of this decommissioning plan, in recognition that both the amount of radioactivity and general safety hazards will be reduced, the Health & Safety program may be modified from time to time such that the Health & Safety program is maintained commensurate with the activities being performed.

The Manager - Environment, Safety, Health and Quality Assurance (ESH&Q) may authorize modifications to the Health & Safety program under the following conditions:

1. The modifications or changes will not reduce the effectiveness of the Health & Safety Program for the activities being performed.

2. The requirements of Chapter 4 of SNM-414 License Renewal Application, Revision 6, dated March 17, 1995 shall not be modified or changed without prior approval of the NRC.

3. A Safety Evaluation for the safety area to be modified or changed has been performed and documented with recommendations submitted to the General Manager, Parks Project. The Manager, ESH&Q may utilize site resources or qualified resources from other units of BWSI or its affiliate, BWXT, or other Babcock & Wilcox affiliates to perform the Safety Evaluations.

4. The changes will satisfy the provisions of clauses (i) through (iv) of 10 CFR 51.22(c)(11).

5. Copies of the Safety Evaluations and safety program directives from the Manager ESH&Q will be maintained on-site for review by representatives of the NRC.

With the approval of this decommissioning plan, the Safety Advisory Board is not required and approval authority for items previously addressed by the Safety Advisory Board is transferred to the Manager ESH&Q.

4.2 INDUSTRIAL SAFETY

To support development of this decommissioning plan, analyses were performed to assess the non-radiological impact of performing the selected decommissioning activities. These supporting analyses are included in Appendix D.

It is recognized that the remediation of radionuclides from soil, groundwater, and below grade structures & services will require the use of construction equipment such as mechanical shovels, cranes, etc. B&W NESI maintains in effect an Industrial Safety program to ensure worker safety during construction type activities. This program is designed to meet the industrial and construction safety requirements of the Occupational Safety and Health Act (OSHA). The Manager ESH&Q has the authority to modify or change the Industrial Safety program such that the requirements for this area of safety are commensurate with the activities being performed.

4.3 ENVIRONMENTAL MONITORING

B&W NESI presently maintains an Environmental Monitoring program for the Parks Facilities as described in SNM-414 License Renewal Application, Revision 6, dated March 17,1995. This program was designed to monitor air and water effluents during plant operations.

4.3.1 Program Changes to be Implemented After NRC Approval of the Parks Facilities Decommissioning Plan

With the approval of this decommissioning plan, some of the monitoring parameters and sampling points will no longer be needed since the site source term will have been greatly reduced. It is estimated that the current site source term is less than one percent of the source term at the time fuel was being produced at the Parks Facilities. In addition, the building exhausts and associated stacks will progressively be phased out, thereby eliminating a potential mechanism for airborne dispersal. Any future airborne releases (none are expected) will be at grade level. Because of these reasons, the only environmental monitoring stations that remain appropriate are Stations 7, 8 and T3, which are located near the fence line, and the background station, Station 5. B&W NESI will operate the four environmental monitoring stations shown in Table 4-1 after NRC approval of this decommissioning plan. In addition, the number of Kiskiminetas River grab samples will be reduced from three to two, with the remaining two taken from locations near the Vandergrift bridge and the Leechburg foot bridge.

4.3.2 Program Changes to be Implemented After the Final Site Survey is Completed

B&W NESI will terminate operation of Station 7 once the site-wide Final Status Survey is completed and no further soil remediation is anticipated. Stations 5, 8 and T3 will continue to be operated but without soil sampling or the use of thermoluminescent dosimeters. In addition, the quarterly sampling of Kiskiminetas River water will be changed to an annual event. Environmental monitoring will be continued at this reduced level until all activities at the Parks Facilities site are completed. At that time, with the concurrence of the NRC, the remaining environmental monitoring program will be terminated.

5.0 FINAL STATUS SURVEYS

A series of Final Status Surveys is required to demonstrate that the site has been remediated and that the residual radioactivity is within the acceptable limits discussed in Section 3.2. These Final Status Surveys form the basis for Activity 3 in Section 3.4 of this decommissioning plan. The Final Status Surveys will be designed, conducted, and evaluated utilizing guidance provided in NUREG/CR-5849 titled Manual for Conducting Radiological Surveys in Support of License Terminations. This section describes the protocols to be used during Final Status Surveys.

5.1 SOIL SURVEYS AND SOIL ANALYSIS

A metric rectangular grid system shall be used to delineate grid blocks for the Final Status Surveys at the Parks Facilities site. The grid system shall be indexed to a U. S. Geological Survey benchmark to permit sample locations to be identified. All sample locations will be referenced to the suite grid system.

5.1.1 Classification of Areas

All ground area at the Parks Facilities will be classified as either an affected area or an unaffected area in accordance with the following definitions of NUREG/CR-5849:

Affected areas are those areas that have potential radioactive contamination (based on plant operating history) or known radioactive contamination (based on past or preliminary radiological surveillance). This includes areas where radioactive materials were used and stored, where records indicate spills or other unusual occurrences that would have resulted in spread of contamination, and where radioactive materials were buried. Areas immediately surrounding or adjacent to locations where radioactive materials were used, stored, spilled or buried are included in this classification because of the potential for inadvertent spread of contamination.

Unaffected areas are those areas of the site which were not classified as affected areas. These areas are not expected to contain residual activity, based on knowledge of site history and previous survey information.

All available information was used to design the Project Units boundaries in the Parks Facilities Characterization Plan. This information included plant operating history, known radioactive spills or contamination incidents, and past characterization data. Section 4.3.1 of the Parks Facilities Characterization Plan reviewed the radiological characterization programs performed in the years prior to 1995, and Section 6.0 described the extensive sampling and analysis program which was implemented in 1995. The location and extent of radioactivity at the site, based on both historical and 1995 characterization results, were previously discussed in Section 2.2 of this Decommissioning Plan. The detailed 1995 site characterization data was presented in the Parks Facilities Characterization Report which was submitted to the NRC in April 1996.

For conducting the Final Status Surveys, Project Units A through E will be further subdivided into one or more survey units. Survey unit sizes will be adjusted as necessary in each Project Unit such that no affected area survey unit will be larger than 10,000 of. The initial classification of each survey unit will be based on plant operating history, known radioactive spills or contamination incidents. The extensive amount of data obtained during the 1995 site characterization will be used to augment and validate the historical data.

Additional characterization data obtained during site remediation will also be considered. Final classification of a survey unit as affected or unaffected shall include the full use of all characterization and site historical data. Based on this extensive informational database, each survey unit will be classified as either an affected area survey unit or an unaffected area survey unit, for purposes of conducting the final radiological surveys. In addition, the final setting of survey unit boundaries will reflect all available characterization and site history data.

The following table is the classification break-down of the five Project Units by area based on the current informational database. The stated areas are approximate and may change somewhat based on additional sampling and surveying during the remediation process. B&W will not reclassify any area as "Affected" or "Unaffected" at the site without providing notice to the NRC. If an "Unaffected" area is reclassified as an "Affected" area, the reasons for the reclassification, as well as the impact that this has on B&W's basis for initially classifying the area as an "Unaffected" area will be evaluated and submitted to the NRC for review as part of the Final Status Survey for the Parks Township Facility.

Project Unit	Affected Area* (m^2)	Unaffected Area (m^2)
A	15,500	30,100
B	6,80	6,60
C	8,80	12,60
D	6	8,90
E		243,300
Total	32,000	301,500

* Survey unit sizes will be adjusted as necessary in each Project Unit such that no affected area survey unit will be larger than 10,000 m^2.

Figure 5-1 shows the currently projected locations of the affected area grid blocks within the Project Units. The yellow colored grid blocks were classified as affected area grid blocks based on historical knowledge or pre-1995 characterization data. The blue colored grid blocks were classified as affected area grid blocks based on the 1995 site characterization data, and includes a sufficient number of adjacent grid blocks to create a buffer zone as required in NUREG/CR-5849. Project Unit E contains only unaffected area grid blocks while Project Units A, B. C and D contain both affected area and unaffected area grid blocks.

5.1.2 Soil and Paved Surface Scanning

The predominant radioactive constituents are isotopes of uranium, plutonium and americium, although there are limited areas where activation and fission products are present. TRU and uranium isotopes decay primarily by alpha emission with a few weak beta-gamma emissions. It is impossible to detect concentrations of these isotopes that approach the guideline values in section 3.2 with hand-held survey instruments commonly used for seaming. The purpose, then, of direct measurements is twofold: (1) establish a record of the site background radiation dose, and (2) place an upper bound on the activity limits that could be present in non-sampled locations to demonstrate that the quantities of fission and activation

products, where present, do not cause exposure rates in a grid block in excess of 10 μR/hr above background at 1 meter from the surface.

Gamma exposure rates will be measured approximately one meter above the ground surface using either a pressurized ionization chamber (PIC), a NaI (T1) scintillation meter, or a μR-meter or equivalent gamma-scintillator instrument that has been cross-calibrated against a PIC at the site. Measurements will also be made in a systematic pattern at the following levels:

Affected areas - A 100% walkover survey will be done of each-affected area grid block. Affected area grid blocks shall be 100 m^2 or less in area. The walkover survey shall be done using a NaI (T1) scintillation meter or equivalent instrument to measure the radiation level at approximately 1 cm above the soil surface. In addition, a gamma measurement, using a PIC, μR-meter or equivalent, will be made above the locations where soil samples will be taken for final survey, and at any location where the walkover survey radiation level measured at 1 cm exceeded twice the background. These measurements will also be made at the bottom of excavated areas prior to the systematic soil sampling. Paved surfaces (not including the concrete building floor slabs) such as parking lots may be scanned as structural surfaces using alpha and beta monitoring equipment in lieu of samples. If the paved surface is covered in a manner that precludes the collection of valid data, samples will be taken for laboratory analysis. Direct surface activity measurements and removable activity measurements shall be taken at locations on a paved surface that a soil sample would normally be taken in an affected area grounds survey.

Any grid block containing a location with a 1 meter exposure rate exceeding 10 μR/hr above background during a final survey shall be remediated and resurveyed.

Unaffected areas - Measurements will be made in at least 30 randomly selected grid blocks throughout the unaffected area. The surface areas of these grid blocks will represent at least 10% of the unaffected area of the site. A 100% walkover will be done for each selected grid block using a NaI (T1) scintillation meter or equivalent instrument to measure the radiation level at approximately 1 cm above the soil surface. In addition, a gamma measurement, using a PIC, μR-meter or equivalent, will be made approximately 1 meter above any location where a soil sample is taken and at any other locations where the radiation level measured at 1 cm exceeded twice the background.

Exterior paved surfaces such as parking lots may be scanned as structural surfaces using alpha and beta monitoring equipment in lieu of samples, if there is no covering over the paved surfaces that would prevent the collection of valid data. Direct surface activity measurements and removable activity measurements shall be taken at locations on a paved surface that a soil sample would be taken in an unaffected area grounds survey. If a 1 meter exposure rate of >7.5μR/hr (i.e., 75% of the NRC criteria for 1 meter direct readings) above background is detected, a soil sample, or direct and loose activity measurements on paved surfaces shall be taken at the location of the reading and the classification of the area as an unaffected area shall be re-evaluated.

5.1.3 Soil Sampling and Paved Surface Monitoring

Affected areas - Soil samples will be taken at the bottom of each excavation based upon a systematic grid pattern which has been projected from well-defined reference benchmarks located on the unexcavated surface. Soil, as defined in 40 CFR192.11, is all unconsolidated material normally found on or near the surface including, but not limited to, silt, sand, clay, and small rocks (nominally, 1/2 to 1 inch in diameter)

or gravel. Samples will be collected at the center and at the locations within the grid block that are approximately equidistant from the center and each of the four corners of the grid block, for a total of five samples per grid block. The addition of the sample at the center of the grid block is an allowance for scanning sensitivity that was used in the sample problem of in Appendices C and D of NUREG/CR-5849. This sampling density of five samples per grid block meets the intent (when compared using a square survey unit with ten 100 m^2 grid blocks, or 10,000 m^2) of the EPA recommended sampling procedure (described on page 4.16 of NUREG/CR-5849) that uses a triangular grid with a sampling interval of 5 m on a side. Soil samples shall also be taken at any point identified in the walkover survey as being two or more times the background exposure rate at 1 cm from the surface of the ground. Each sample will be analyzed by gamma spectroscopy. Some individual samples or composite samples will be analyzed by alpha spectroscopy to confirm the relationship between isotopes that are readily detectable, such as Am-241 and U-235, and related radionuclides that are difficult to detect but were identified during site characterization. Composite samples are prepared by taking uniform amounts of the soil to be composited, homogenizing the samples by ball milling or similar methods, and then taking a representative sample for analysis. These composite samples will not be compared to any NRC criteria. They are used solely to determine the suite of isotopes present in those survey units to evaluate the validity of the scaling factors being used for the Final Status Surveys. Once a predictable relationship (i.e., scaling factor) has been established between the concentrations of two or more isotopes, measurements of the gamma emitting members of these groups of related nuclides will be used to determine the activity of the remaining radionuclides in the group.

Paved surface monitoring shall be done on the same systematic pattern as the soil sampling of grounds. Monitoring for direct and removable, alpha, beta and gamma activity shall be conducted at each systematic survey point.

If, as a result of a final or confirmatory survey, additional remediation (e.g., additional excavation) is required in a grid block, a new set of soil samples for final survey shall be collected after the additional remediation has been completed. Locations previously used for final survey sampling shall not be resampled as part of the systematic survey; instead, new systematic sample locations within the grid block shall be determined. The instrument survey shall be repeated, with the 1 meter exposure rate measurements being taken at the new final survey soil sampling locations.

If, as a result of a final or confirmatory survey, additional remediation is required in a paved surface grid block, a new set of direct and removable activity measurements for final survey shall be collected after the additional remediation has been completed. Locations previously used for final survey sampling shall not be remeasured as part of the systematic survey; instead new systematic survey locations within the grid block shall be determined. The 1 meter exposure rate measurements shall be taken at the new final survey systematic measurement locations.

Additional remediation will be required if a grid block or survey unit does not meet the requirements of Section 5.6 or if a soil sample or direct surface measurement exceeds three times a release limit or the removable activity exceeds the guideline values in Section 3.2. Section 5.6.4 addresses the treatment of "elevated activity areas", that are less than three times the applicable release limit.

If residual radioactive material, attributable to licensed operations, is identified during a final status survey, and the activity or concentration of this material is sufficient to require additional remediation, an evaluation will be performed to determine:

1. the source of the contamination;

2. why the material was not identified remediated prior to the final survey; and,

3. the effect that the identification of this material has on the conclusion that the facility is suitable for unrestricted use.

The results of this evaluation will be discussed with the NRC when the evaluation is completed. A discussion of the identification of additional areas requiring remediation and the evaluation discussed above will be included in the Final Status Survey Report

No excavation will be backfilled until quality control certifies the exposed surface meets the NRC criteria Nor release for unrestricted use and the NRC and PaDEP concur that the excavation may be backfilled. Material used to backfill excavations, or boreholes, will be sampled according to the protocols based on ASTM E105-58 (1989) and ASTM E122-89, as specified in Section 5.2. Each sample will be analyzed by gamma spectroscopy.

Unaffected areas - The grid blocks chosen for survey shall be selected on a random basis. Soil samples shall be taken at any point identified in the walkover survey as being two or more times the background exposure rate at 1 cm from the surface of the ground and at one or more locations within each grid block which had the elevated exposure rate. If a soil sample from such a grid block exceeds 75% of a release limit, the grid block shall be reclassified as an affected area grid block. Both this grid block and the contiguous grid blocks shall be surveyed and sampled, if they have not already been surveyed, to determine if additional remediation is warranted. Classification of the unaffected area, which contains the grid block shall be evaluated using the data analysis procedures described in Section 5.6.

Paved surface grids chosen for survey shall be selected on a random basis. Direct alpha and beta measurements, and removable activity measurements shall be taken at any point identified in the walkover survey as being two or more times the background exposure rate at 1 cm Mom the surface of the ground and at one or more locations within the each selected grid. If a direct measurement in a grid block exceeds 25% of a guideline value in Section 3.2, the grid block shall be reclassified as an affected area grid block and contiguous grid blocks shall be surveyed. Classification of the unaffected area which contains the grid block shall be evaluated using the data analysis procedures described in Section 5.6.

If an unaffected area of pavement or ground is re-classified as an affected area, the reasons for the re-classification, and the impact that the reclassification has on the bases for classifying the area as an unaffected area, will be evaluated. The NRC will be informed when an unaffected area is re-classified as an affected area, and a discussion of the evaluation will be included in the Final Status Survey Report.

5.1.4 Sub-Surface Sampling

Extensive subsurface sampling was performed in the years prior to 1995, as described in Section 5.2.1 of the Parks Facilities Characterization Plan, and also during the site characterization performed in 1995, as described in the April 1996 Parks Facilities Characterization Report. This soil data will be used to develop the excavation plan for the site soils. Following the excavation of the soils that exceed the site cleanup criteria, sampling will be performed at the bottom of the excavation as decribed in Section 3.5.3 of this document.

To verify that no radioactive material greater than the site cleanup criteria exists in the subsurface soils at the bottom of the excavation, subsurface soil samples will be collected at a depth of one meter greater than the maximum depth that residual radioactive material in excess of the site cleanup criteria was detected and/or remediated. The selection of the sample locations will be biased to those regions having the highest potential for subsurface contamination. Generally, the region having the highest potential for subsurface contamination will be the area excavated to the greatest depth in that survey unit. Other criteria that will be considered in selecting the locations for the 1-meter deep samples will be high surface contamination (based on the initial site characterization), and/or the presence of subsurface drainlines.

The 1-meter deep samples will be extracted at a density of one per 1,000 square meters of affected area (or one per 10 affected area survey grids). At least one, 1-meter deep sample will be taken per affected survey unit during the Final Status Survey of that survey unit with a minimum of 30 samples extracted for the entire project. This sampling density meets the intent of the protocol recommended in Section 4.2.4 of NUREG/CR-5849. The samples will be analyzed by gamma spectroscopy and the results evaluated in accordance with Section 5.6 of this document. If the sample results indicate that subsurface contamination is present, additional, bounding characterization and/or remediation will be performed. If further remediation is required based on a finding from a 1-meter deep sample, another 1-meter deep sample will be extracted from the same area following the additional remediation. The results and locations (x,y coordinates) of all of the 1-meter deep samples will be included in the Final Status Survey Report for the specific survey units.

5.1.5 Additional Remediation

Soil containing radionuclide concentrations the guideline values, as determined during a Final Radiological Survey or NRC Confirmatory Survey, will be excavated to the extent required to assure compliance with the requirements of Sections 5.1 and 5.6. The completion of an excavation will be determined using in-process sampling and surveying. All grid blocks requiring such additional excavation will be resurveyed in accordance with Section 5.1.

5.2 VOLUMETRIC SURVEYS

Soil pile activity determinations will be required for: soils excavated as part of the remediation process ; fill of off-site origin; and fill excavated from the Parks Facilities "Undeveloped Area" or other unaffected areas. This section provides the details of how volumetric surveys will be performed during the Parks decommissioning effort.

5.2.1 Soils Excavated as Part of the Remediation Effort

The average activity levels for the soils excavated as part of the remediation process shall be determined by protocols based upon an NRC Staff method for surveying and averaging concentrations of thorium in contaminated subsurface soil, Docket #040-00235.

Soils excavated as part of the remediation effort or to gain access to areas requiring remediation (includes overburden and side slope soils) will generally be segregated in separate piles for dispositioin as discussed in Section 3.5.2 of the Parks Facility Decommissioning Plan, Revision 1. Soil piles will be sampled to determine the average radiological concentration prior to final disposition at a rate of no less than one sample per 25 m^3.

The final survey method for site excavated soils that will remain on site ensures that the number and location of samples are sufficient to: 1) demonstrate with reasonable confidence that a significant volume of soil pile is identified by one of the samples; and 2) demonstrate that the average contamination level in the identified volume would not result in a significant dose once the soil pile is placed as backfill. The survey method described below will be used to satisfy these two objectives.

5.2.1.1 Survey Methodology

The survey methodology is described below:

- Soil piles will be gridded into 5 meter square grids.

- Soil samples will be collected at the rate of one sample per 25 m^3. In each grid, soil samples shall be taken at a randomly chosen location to ensure that the samples are distributed throughout the entire soil volume and are representative of the entire volume of soil present in the soil pile. The samples shall be taken through the depth of the pile. Each one meter layer of soil shall be composited and shall comprise an individual sample. In general if a soil pile is 2 meters deep, then 2 samples (one meter each) will be collected for each 5 meter square grid.

- Each sample is then assumed to represent 25 m^3.

- Samples will be analyzed using gamma spectroscopy. The results will be interpreted in accordance with Section 1.1.2 of this enclosure.

5.2.1.2 Evaluation of Soil Pile (Volumetric Survey) Data

Volumetric survey data from soil piles resulting from the excavation of affected areas will be interpreted as follows:

Individual sample results will be compared to the applicable guideline value in section 3.2 of the Parks Facility Decommissioning Plan. In areas with mixed radionuclides, the sum-of-ratios approach will be used as described in NUREG/CR-5849. If all of the individual sample results are below the applicable guideline values (or below 1.0 using the sum-of-ratios approach) then the pile is released for unrestricted use.

However, if any of the individual sample results exceed the applicable guideline values or is greater than or equal to 1.0 for the sum-of-ratios approach, then the allowable concentration in an given volume must be calculated. The calculation is based on the allowable concentration in elevated area equation in NUREG/CR-5849 as refined by the approach prepared by the NRC Staff as a method for surveying and averaging concentrations of thorium in contaminated subsurface soil, Docket #040-00235.

The Parks Facility will use the NRC developed methodology to determine the averaging volume for the pile contamination, and the acceptable concentration as a function of volume. The methodology is described below:

- The five excavation scenarios presented in the NRC staff method were determined to be applicable to the soil pile once it is used as backfill. These scenarios were then used in determining the volume of soils to be excavated.

- The dose from the excavated soil was then estimated and compared to the dose from widespread, uniform contamination. To estimate the dose, the pile volumes were assumed to be brought to the surface and spread over a 1 foot depth. Using the resulting calculated surface area as input to the RESRAD code, the dose from the excavated soil was estimated using the resident farmer scenario and the input parameters from Policy and Guidance Directive PG-8-08 "Scenarios for Assessing Potential Doses Associated with Residual Radioactivity," May 1994. A second RESRAD run was then made, using the same concentration, and assuming the default area of 10,000 m^2. The ratio of the dose from the 10,000 m^2 area to the dose from the calculated area was then multiplied by the unrestricted use criteria to determine the acceptable concentration in the elevated area, and hence the corresponding concentration in the elevated area in the soil pile. This concentration is considered acceptable since the dose from the elevated area containing this concentration will deliver the same dose as a large area contaminated at the unrestricted use level. To determine compliance with the volumetric averaging criteria, the average concentration over the in-situ volume of soil defined in the scenario must be less than the above ratio times the guideline.

- The same calculations were performed for the other four NRC excavation scenarios as well as a scenario for 50 m^3 for use in performing the volumetric averaging. The results are summarized in the table 1 below. If necessary, other averaging volumes and the corresponding concentrations (such as 125 m^3) could be calculated using the same methodology.

- The excavation scenarios described in the NRC staff method and therefore for the soil pile methodology are inherently conservative since excavations for larger structures should result in larger excavated volumes and a correspondingly greater degree of mixing with the surrounding soil.

- The final step is to ensure that the volumetric averaging does not result in a layer of exposed soil with excessive concentrations. In the NRC staff method, this was accomplished by looking at the 0-1 meter and the 3-4 meter scenario intervals. To control these intervals, the average over the 0-1 meter intervals and the 3-4 meter intervals is limited to the 100 m^3 averaging criteria. To ensure that any one particular layer in a soil pile does not result in exposed soil with excessive concentrations, the average over all vertical intervals will be limited to the 100 m^3 averaging criteria

The following table contains the calculated concentrations:

Averaging Criteria for Various Radionuclides in Soil Piles
(all values in pCi/g):

	Concentrations in pCi/g				
Radionuclide	Maximum Concentration in a 25 m^3 volume (Individual Sample)	Average Concentration in a 50 m^3 volume	Average Concentration in a 75 m^3 volume	Average Concentration in a 100 m^3 volume	Average Concentration in the Entire Soil Pile (Survey Unit)
Plutonium compounds, (soluble or insoluble) (excluding Pu-241)	43	38	36	34	<25
Am-241 compounds, (insoluble)	485	261	172	127	< 30
Pu-241	22080	10858	7152	5292	<1250
Enriched Uranium	60	54	52	50	< 30
Depleted Uranium	51	49	47	45	< 35
Co-60	10	9	9	9	< 8
Cs-137	21	19	19	18	< 15
Sr-90	69	36	24	18	< 5

A soil pile will be considered acceptable for retention on site if it is shown to meet the averaging volumes and the corresponding concentrations listed above. Any soil pile or container shown to contain activity in excess of the applicable soil concentration limit shall either be removed from consideration for on-site retention or remediated and resampled.

5.2.2 Fill Material of Off-site Origin

Off site soils intended for use as on-site fill will be characterized in-situ. The purpose of the sampling program is to establish the background radionuclide activity levels of the soil for record, and to confirm the assumption that the radionuclide activity levels present are those typically present in the environment. The average activity levels for radionuclides will be determined (by ASTM E105-58 (1989), and ASTM E122-89) to plus or minus 20% at the 95% confidence level, unless the activity is present at levels less than 10% of the applicable guideline value in section 3.2 of the Parks Facility Decommissioning Plan. Stone, gravel, and crushed rock obtained from local quarries and used on-site for constructing/maintaining haul roads or for backfilling of designated areas will not generally be radiologically sampled.

5.2.3 Fill Material from Unaffected Areas

Soils from unaffected areas of the site that were not used for site operations may be used as fill for site excavations. Prior to any fill material being excavated from these areas, the area will first satisfy the requirements for an unaffected area as defined in NUREG/CR-5849. Once the specific area to be excavated for use as fill is identified, an overcheck of the specific excavation area will be performed (a biased scan and survey over 100% of the soils). This 100% scan and survey must also satisfy the

requirements for an unaffected area as defined in NUREG/CR-5849. The soil will then be characterized at depth in-situ. The purpose of the sampling program is to establish the background radionuclide activity levels of the soil for record, and to confirm the assumption that the radionuclide activity levels present are those typically present in the environment. The average activity levels for radionuclides will be determined (by ASTM E105-58 (1989), and ASTM E122-89) to plus or minus 20% at the 95% confidence level, unless the activity is present at levels less than 10% of the applicable guideline value in section 3.2 of the Parks Facility Decommissioning Plan.

5.3 WATER

The hydrogeologic features of a site significantly affect the design of a post-remediation groundwater monitoring program. A summary of the hydrogeology of the Parks Facilities site was presented earlier in Section 1.2.1. Details of the site hydrogeology were presented in the Parks Facilities Characterization Report transmitted to the NRC on April 30, 1996.

5.3.1 Post-Remediation Groundwater Monitoring

The post-remediation groundwater monitoring program is designed to confirm that there are no radionuclides in the shallow aquifer exceeding the point-of-reference values in Section 3.2. The monitoring program will be confined to the shallow aquifer. If post-closure concentrations of radionuclides in groundwater in the shallow aquifer are acceptably low, it will be assumed that the deeper aquifer will also be acceptably low. NUREG/CR-5512 Water-Use Model assumptions will be used in evaluating the results, as discussed later in Section 5.8. The plan for monitoring of groundwater at the Parks Facilities site is described below.

- **There will be at least three upgradient wells.** The existing wells remaining from the characterization effort will be used if they are usable following the remediation process and are suitably located.

- **There will be at least four downgradient wells.** These wells will be located outside the security fence near the Kiskiminetas riverbank. Four wells are currently installed in adequate locations; MW-54, MW-55, MW-56, and MW-57, as shown in Figure 2-18. Those four wells will be used for post-remediation groundwater monitoring if they remain in useable condition and are still judged to be in adequate downgradient locations after site remediation is complete.

- **There will be at least two wells located on the Parks Facilities site.** Existing wells from the site characterization will be used if they are usable following the remediation process and are in suitable locations.

- **Groundwater monitoring wells will be radiologically sampled each calendar quarter for a period of one year following remediation.** Monitoring of the wells for one year is considered adequate on the basis that the infiltration of any radionuclides from the soil into the shallow aquifer will have stabilized within this period and the sample data will be representative of the radionuclide concentrations that would be expected over a relatively long period of time. Also, taking quarterly samples will ensure obtaining seasonal data. The data analysis procedures, described in Section 5.8, will be used to demonstrate that the point-of-reference criteria are satisfied.

5.3.2 Distribution Coefficient (K_d) Evaluation

In addition to conducting the groundwater monitoring program described above, B&W NESI may perform studies to evaluate the distribution coefficient (K_d) for the remediated site and the principal isotopes. The evaluation would be based on ASTM Procedure D4319-93, "Standard Test Method for Distribution Ratios by the Short-Term Batch Method Distribution". Coefficients measured for soils remaining on-site could be used to demonstrate that the rate of migration of isotopes at the site is sufficiently low such that the radionuclide concentration in groundwater will, in the distant future, remain below the point-of-reference values discussed in Section 3.2.

An alternative concept for assessing the availability of uranium compounds which could migrate to ground water is given in NUREG/CR-6232 "Assessing the Environmental Availability of Uranium in Soils and Sediments".

Determining the distribution coefficient or uranium environmental availability does not replace demonstrating that the site meets the decommissioning criteria defined in Section 3.2 of the Parks facilities Decommissioning Plan. B&W NESI will demonstrate that the site meets the decommissioning criteria in Section 3.2 for release of the site for unrestricted use, at the time of license termination. The possible evaluation of the distribution coefficient (K_d) or assessment of uranium compound environmental availability is intended solely to supplement the information gained from post-remediation groundwater monitoring which was described in Section 5.3.1.

5.4 IN-PROCESS MEASUREMENTS

Radiation survey instrument measurements, gamma and alpha spectroscopy and beta liquid scintillation counting may be augmented by in-process measurements. The in-process measurements will be performed using a NaI(T1) scintillation counter to obtain approximate activity levels. These results will be cross calibrated to gamma spectroscopy measurements performed in a laboratory to ensure that sufficient accuracy was obtained. In-process measurements may be used for:

- Tracking the progress of excavations to provide measurements will can result in more rapid decision making on (a) the need for and extent of continued excavation, and (b) how to minimize intermixing soils having radionuclide concentrations above and below the guideline values in Section 3.2.

- Establishing the lateral and vertical extent of elevated activity areas on soil surfaces or in soil piles, thereby providing an economical and rapid determination of whether a grid block or soil pile meets the concentration guideline values for the radioisotopes which are present.

- Detecting surface elevated activity area. Systematic surface sampling for the record may be augmented by either a systematic or random in-process sampling of a grid block or survey unit. Samples that are three or more times a guideline value will be analyzed using gamma spectroscopy unless additional remediation of the grid block or survey unit is performed

- Volumetric elevated activity area detection. Soil pile core samples shall be subdivided into 2 to 3 foot lengths and each length shall be analyzed. Samples with in-process results exceeding a release limit will be analyzed using gamma spectroscopy unless the soil pile is remediated or disposed of as radioactive waste.

5.5 BACKGROUND

Grounds To determine background radioactivity levels, surface soil samples and available vegetation samples from twelve off-site locations were collected. The locations were on concentric rings from the site at radial distances of 0.5, 1.5 and 3.0 km. Locations on the inner ring were due north, south, east, and west of the site; locations on successive rings were offset 45 degrees from those of the previous ring. Specific locations were determined in the field by the sampling team according to the following criteria: sample areas should appear to have been undisturbed for several years; they should have moderately good permeability; they should not be near buildings, trees, or other sheltering structures; and, they should not be subject to fertilization. Permission was obtained from property owners prior to sampling.

Two 1 meter square areas were measured and marked, about 3 meters apart, at each of the twelve sampling locations. All vegetation was removed from these areas to a height of 10 to 20 cm above the soil and a portion was collected in a plastic bag for analysis. No vegetation was present at five of the locations, so vegetation samples could not be obtained from those locations. Soil plugs were taken at the center and corners of each pair of one meter square areas. These soil plugs were examined and described by a geologist and then composited to provide a sample at each location for analysis. Soil and vegetation results were analyzed by gamma spectroscopy. The average concentration of total uranium in the soil is 4.0 pCi/g, and the average concentration of Cs-137 in the soil is 0.2 pCi/g. The soil Co-60 and Am-241 activity levels did not exceed their respective Lower Limit of Detection (see Section 5.8.1 for LLD values). The vegetation samples did not exhibit any radionuclide concentrations above their respective Lower Limit of Detection.

Exposure rate measurements were taken at each location at one meter above the ground surface using a Reuter Stokes RSS-112 PIC, an Eberline PRM-6 rate meter, and a Victoreen NaI(Tl) scintillation detector. Readings from the PRM-6 and NaI(Tl) detector were cross calibrated to the RSS-112 PIC. The average 1 meter exposure rate is 9.8 μR/hr.

The determination of background was conducted in accordance with NUREG/CR-5849.

Paved Surfaces The background radioactivity levels for paved surfaces shall be determined by direct instrument measurements of representative surfaces (e.g., steel, concrete, brick etc.), known to be free of contamination. Direct and removable alpha and beta measurements shall be taken using the instruments which are used for final surveys of structures. The minimum detectable activities (MDAs) for scanning shall be determined in accordance with NUREG/CR-5849 methodologies.

5.6 DATA INTERPRETATION

5.6.1 Data Presentation

All data will be presented in a format which provides the calculated activity, in the appropriate units for the measurement, and the estimated uncertainty of the measurements at the 95% confidence level. All sources of error affecting the data will be included. An error range may be specified for a table of data if it is unwieldy to calculate the error for each measurement.

5.6.2 Background Corrections

Final survey sample results will normally be corrected for background activity. Data which has not been corrected for background will be specifically identified in all reports.

Gross surface activity shall be corrected by subtracting appropriate background values, taken from similar structures and/or materials that contain only naturally occurring radionuclides. Gross soil activity and exposure rates will be corrected by subtracting appropriate background values. The methodology used to determine the background radioactivity at the Parks Facilities site was consistent with NUREG/CR-5849 guidelines, as discussed in Section 5.5.

5.6.3 Isotopic Ratios

Isotopes are present at the Parks Facilities site that cannot be directly detected by routine measurement methods such as gamma spectroscopy and field monitoring instruments. In such cases, measurement of a closely associated radionuclide (a surrogate radiation) is preferred because it is more reliable, accurate, and cost effective. Once a stable association between the radionuclide of interest and its surrogate radiation is demonstrated and quantified, the resulting ratio can be used as a "scaling factor" to properly quantify the radionuclide of interest from field measurement(s) of the surrogate radiation. This is a standard practice throughout the nuclear industry. Scaling factors are used in conjunction with the actual measurements to determine the total activity and isotopic distribution. Knowledge of site history and use, together with the site characterization data, are used to define area-specific isotopic compositions, and area-specific isotopic ratios.

Appendix E, "Parks Facility Scaling Factors", is included in this decommissioning plan in order to: (1) describe the technical basis for BWSI's historic and ongoing use of scaling factors for buildings and equipment; and (2) describe the plan for developing scaling factors to be used for soils at the Parks Facilities. This document is intended to be used as a basis for demonstrating compliance with decommissioning criteria in preparation to terminate SNM-414.

Of particular interest at the Parks Facilities are transuranics, which consist of plutonium isotopes and their decay products. Alpha limits for plutonium are very low, making it difficult, if not impossible to obtain sufficiently accurate results by directly measuring such materials in the presence of natural background and other field conditions. Therefore, site-specific scaling factors have been developed to ensure that transuranic measurements are accurate and reliable.

The TRU scaling factors are applied at the Parks Facilities to:

- Estimate the presence of hard-to-measure radioactivity on surfaces to confirm that their undetected presence would not result in failure to comply with unrestricted release guidelines.

- Provide a more sensitive and reliable estimate of plutonium isotopic activity and its distribution in volumetric samples.

Other ratios are used to assist in determining isotopic contents of materials at the Parks Facilities uranium use areas. These ratios are not considered to be scaling factors, but they can be used to describe uranium activity in cases where the distribution is naturally occurring and/or the enrichment (or depletion) is well known. Appendix E also describes the basis for using uranium enrichment values at the site.

- The isotopic ratios for uranium in Project Units A and B, where depleted and low enriched uranium fuel or products were produced, are derived from mass spectrographic analysis of the low enriched fuel produced at B&W's Apollo Fuel Plant. The use of these ratios is slightly conservative when applied to the depleted uranium product that was the primary product fabricated in Building B and in most of the mixed oxide, FFTF fuel, produced in Building A.

- The enrichment ratios for Project Unit C are based on mass spectrographic analysis of the single composition, high enriched fuel form processed in Building C. The detailed mass spectrographic data used to calculate the isotopic ratios for Project Unit C were submitted to the NRC on November 18, 1996 in the B&W NESI responses to the October 3, 1996 NRC comments on Rev. 0 of the Parks Facilities Decommissioning Plan.

The applicability, validity and conservatism of the scaling factors will be confirmed throughout the remediation process, by sampling and isotopic analysis. If this confirmation process reveals that higher scaling factors are required for a specific area, that area will be bounded, and the higher scaling factors will be applied to that area. No survey unit will contain areas with different scaling factors. The most conservative set of scaling factors required for use within a survey unit will be applied to all areas within that survey unit. This process shall be applied to all project units and sets of scaling factors including those for the high enriched uranium and depleted uranium areas. The isotopic data and the historical use data used to generate the scaling factors for the various survey units will be provided in the Final Status Survey Report for each survey unit.

5.6.4 Evaluation of Survey Results by Grid Block

Upon the completion of the surface activity measurements, survey results shall be evaluated on a grid block by grid block basis. In order for a grid block to be considered acceptable, the average of all of the measurements in the grid block shall be less than the applicable limits; no measurement shall exceed three times an applicable limit; and any measurement that is greater than one times and no more than three times an applicable limit shall be tested to see if it can be accepted as an elevated activity area within the grid block using the formula:

$$(GA/A)^{0.5} = R \qquad \text{[Eq. 5.1]}$$

where GA = the area of the grid block,

A = the area with elevated activity, and

R = the ratio.

If the activity of the elevated area divided by the applicable limit is less than or equal to the ratio, R. the elevated activity area is acceptable. If the activity of the elevated area divided by the applicable limit is greater than R. the grid block shall be identified for additional remediation.

If activity levels in excess of 25% of an applicable limit are found in a paved surface classified as an unaffected area, the area shall be reclassified as an affected area and an affected area survey shall be

performed. If activity levels in excess of 75% of an applicable limit are found in a soil survey, the area shall be reclassified as an affected area.

5.6.5 Determination of Grid Block Average Survey Results

Grid block average activity levels shall be calculated using data from systematic and random (if any) activity measurements and weighted activity measurements for areas where elevated activity is present as described below. This method is consistent with the guidance in Section 8.5.2 of NUREG/CR-5849. If the measurements do not exceed the applicable activity concentration limit, the grid block average shall be calculated using equation 5.2. If the measurements exceed the applicable activity concentration limit, the grid block average shall be calculated using equation 5.3. The grid block is acceptable if the grid block average net activity level (the actual measurement minus background) is less than the acceptable limits for each type of activity present; surface (removable alpha, beta and gamma, and direct alpha, beta and gamma) or soil.

The grid block average 1 meter exposure rate levels shall be determined using equation 5.2. Exposure rate measurements are not required for all building surface grid blocks or measurement locations.

$$\overline{X} = \frac{1}{n_s}\sum_{i=1}^{n_s} X_i \qquad \text{[Eq. 5.2]}$$

where x = mean of the measurements

n_s = number of measurements, and

x_i = any particular measurement.

Weighted averages (as is necessary when an area of elevated activity is present) will be calculated using equation 5.3.

$$\overline{X}_W = \frac{1}{n_s}\sum_{i=1}^{n_s} X_i\left[1-\sum_{k=1}^{n_k} A_k\right] + \sum_{k=1}^{n_x} Y_k A_k \qquad \text{[Eq. 5.3]}$$

where x_w = weighted mean including elevated area(s)

x_i = systematic and random measurements at point i

n_s = number of systematic and random measurements

Y_k = elevated area activity in area k

A_k = fraction of 100 m^2 grid blocks occupied by elevated area k

n_k = number of elevated areas

5.6.6 Evaluation of Activity Measurement Results by Survey Unit

When all grid blocks within a given survey unit have been found acceptable on a grid block by grid block basis, the activity measurements and exposure rate results for the survey unit will be evaluated. A survey unit will be considered to pass this step if: the average of all net activity level measurements in the area is less than the applicable limits at the 95% confidence level; no net 1 meter exposure measurement is greater than 10 μR/hr and removable activity does not exceed the guideline values in Section 3.2.

Survey unit activity level averages shall be calculated using equation 5.2. All measurements from systematic and random locations will be used to calculate the average activity level of a survey unit. In addition, an "extra sample/measurement" will be calculated for every 100 m^2 grid block that contained an area of elevated activity. The "extra sample/measurement" will be the grid block weighted average calculated using equation 5.3, and will be used as one of the systematic and random measurements in determining the average activity in that survey unit.

The survey unit 1 meter net exposure rate average shall be calculated using equation 5.2. All 1 meter exposure rate measurements made in the survey unit (systematic and biased) shall be used. The survey unit's net exposure rates are acceptable if no single net exposure rate measurement is greater than 10 μR/hr. The standard deviation of the measurements (s_x) is calculated using equation 5.4:

$$S_x = \frac{\sqrt{\sum_{i=1}^{n}(\overline{X}-X_i)^2}}{n-1} \qquad \text{[Eq. 5.4]}$$

where $\overline{X}$ = the mean of the measurements,

x_i = any particular value, and

n = the number of measurements.

Demonstration that the survey unit meets the NRC criteria for release for unrestricted use shall be by the use of the equation 5.5 for all survey results except exposure rate results.

$$\mu a = \overline{X} + \tau_{1-a,df} S_x/\sqrt{n} \qquad \text{[Eq. 5.5]}$$

where μa = calculated parameter to compare to guideline value

$\overline{X}$ = mean of a set of values,

n = number of values measured or calculated,

S_x = standard deviation, and

$\tau_{1-a,df}$ = the 95% confidence level obtained from the student's t-test with n-1 degrees of freedom (df) and " a " being the false positive probability (0.05 for the Parks Facilities).

In order for an area to be considered acceptable to pass this step, μa must be less than the guideline value.

5.6.7 Water

At the end of the one year radiological sampling period, the data from the wells will be analyzed and evaluated. If the results of this evaluation confirm that the site-wide radionuclide concentrations do not exceed the point-of-reference values in Section 3.2, the program objective will have been satisfied. These point-of-reference values are consistent with the radiological requirements of the Environmental Protection Agency as specified in the National Primary Drinking Water Regulations (40 CFR Part 141) while, at the same time, consistent with the requirements of the State of Pennsylvania which incorporates by reference the same 40 CFR Part 141 in Article 109.202 of the 25 PA Code.

Prior to the termination of the license, BWSI will notify the NRC in writing of its intent to abandon any groundwater monitoring wells. Such notification shall identify the well and justify the reasons for abandoning the well. BWSI will abandon the wells in accordance with the current revision of the PaDEP Groundwater Monitoring Guidance Manual. Upon completion of the well abandonment, BWSI shall provide copies of the well abandonment certification to the NRC. Subsequent to license termination, B&W anticipates that some monitoring wells will continue to be monitored for non-radiological constituents (i.e. similar to the ongoing well sampling at our former Apollo facility). For these wells, BWSI will provide certification to the PaDEP.

5.7 INSTRUMENTATION

Two categories of instrumentation will be used by B&W NESI in conducting final status surveys and sample analysis. They are direct measuring instruments and laboratory equipment. All instruments will be appropriate for the measurements being made. Typical instrumentation is listed in Tables 5-1 and 5-2.

Measurements of the gamma exposure rate over the Parks Facilities site will be made with μR-meters or other scintillation instruments. The instruments will be cross-calibrated at the site against a PIC to ensure that the instruments are calibrated for the gamma-emitting isotopes which are found on-site.

Surface exposure rate measurements will be used only as indicators of undiscovered radiological constituents. These measurements will not be used to demonstrate attainment of the site release criteria.

Direct surface measurements for gross alpha and beta activity levels will be performed using 100 cm^2 scintillation probes or gas proportional probes, such as the Bicron Surveyor M with A100 or B100, alpha or beta probes. Scanning shall be performed using scintillation probes or gas proportional probes, such as the Bicron Surveyor M with A100 or B100 probes, and Eberline gas proportional floor monitors for alpha and beta activity. Removable activity measurements shall be performed using a low background gas flow proportional counter such as the Tennelec LB 5100.

As appropriate, dedicated check sources will be read by each field instrument at the time of calibration and the instrument response recorded. Each day that an instrument is used, a calibration source will be read by the instrument to determine that the original response is duplicated. Daily checks will be logged for each instrument. If the response is not duplicated to within three standard deviations of the measurement, the instrument will be tagged and taken out of service pending recalibration. Instruments which are in continuous use during the day will be periodically exposed to a check source to be sure that the proper response is being obtained.

5.8 LABORATORY ANALYSIS

5.8.1 Soil

All soil samples will be analyzed by gamma spectroscopy using solid-state detectors. Each gamma spectrum will be reviewed by an experienced gamma spectroscopist to identify interferences or other artifacts not identified by the computer program. The lower limits of detection (LLD) for critical isotopes are:

U-235	0.1	pCi/g
Am-241	0.06	pCi/g
Cs-137	0.04	pCi/g
Co-60	0.1	pCi/g

During previous site characterization activities, numerous representative samples from Project Units A, B. and D were analyzed for isotopic activity by alpha and gamma spectroscopy and beta liquid scintillation counting to determine the ratios of readily detectable isotopes such as U-235 and Am-241 to related isotopes that are not readily detectable. Historical isotopic data will be used for Project Unit C since isotopic distribution was a requirement of the Type II fuel specification. Prior to requesting a confirmatory survey, B&W NESI will provide the NRC with the applicable data.

5.8.2 Water

Each water sample will be analyzed for gross alpha, beta and gamma concentrations utilizing EPA method 900.0. Alpha and gamma spectroscopy and beta liquid scintillation counting will be performed using the assumption that the activity present is due to selected representative and conservative isotopes.

5.9 FINAL REPORT

The results of the final status surveys of the site (reference Activity 6 in Section 3.4) will be submitted to the NRC in a report that will be prepared in accordance with Chapter 4 of NUREG/CR-5849. The report will summarize the survey results and demonstrate that the site meets the NRC criteria for release for unrestricted release use with the requisite level of certainty. Copies or summaries of procedures used and supporting calculations and tables showing the average and maximum radionuclide concentrations in soil in each grid block and soil pile which was sampled will either be included in the report or a table will be provided indicating the letters in which the procedures, calculations, and data were previously submitted to the NRC. Similar data will be provided for the groundwater monitoring wells. The raw data will not be provided in the report because of the volume of this documentation. However, this information will be available for NRC review.

In cases where activity levels exceed a guideline value, appropriate alpha or beta isotopic analysis will be performed to determine the specific isotopic distribution to allow a detailed analysis in support of release.

Table 5-1

TYPICAL DIRECT MEASUREMENT INSTRUMENTS FOR PERFORMING FINAL RADIOLOGICAL SURVEYS AT THE PARKS FACILITIES

Instrument/Method	Radiation Type	Application	Sensitivity
End Window Or Pancake Probe	Beta	Surface Surveying	500 dpm/100 cm^2
NaI(T1) Scintillator (Eberline PRM6)	Gamma	Scanning Exposure Ratemeter	2-5 μR/hr
TLD	Gamma	Integral Dose	10 mrem
Pressurized Ion Chamber Reuter Stokes RSS-112	Gamma, X-ray	Exposure Rate Integral	<1 μR /hr
ZnS Scintillator Bicron Surveyor M	Alpha	Static Count	54 dpm/100 cm^2
ZnS Scintillator Bicron Surveyor M	Alpha	Scanning	57 dpm/100 cm^2
ZnS Scintillator Bicron Surveyor M	Beta	Static Count	580 dpm/100 cm^2
ZnS Scintillator Bicron Surveyor M	Beta	Scanning	2500 dpm/100 cm^2
Eberline E600 Gas Proportional	Alpha	Static Count	14-40 dpm/100 cm^2 *
Eberline E600 Gas Proportional	Alpha	Static Count	14-40 dpm/100 cm^2 *
Eberline E600 Gas Proportional	Beta	Scanning	1350-4550 dpm/100 cm^2 *
Eberline E600 Gas Proportional	Beta	Static Count	200-400 dpm/100 cm^2 *

* The sensitivity of the Eberline E600 varies with material background and count time.

Table 5-2

TYPICAL LABORATORY INSTRUMENTS FOR PERFORMING FINAL RADIOLOGICAL SURVEYS AT THE PARKS FACILITIES

Instrument/Method	Radiation Type	Application	Sensitivity
HPGe Spectrometer	Gamma	Sample Analysis	< 0.1 pCi/g*
Gas Proportional Counter	Beta, Alpha	Gross Radioactivity	1-3 dpm Beta or Alpha
NaI Scintillator	Gamma	Sample Analysis	Variable
Radiochemical Separations	Specific Radionuclides	Low Level Measurements	Variable

* For the majority of gamma emitting isotopes; e.g., the sensitivity for U-235 is 0.03, Am-241 is 0.06, and Cs-137 is 0.04 pCi/g.

6.0 FINANCIAL ASSURANCE

The work required to reduce the level of radiological materials at the Parks Facilities to the level at which the site can be released for unrestricted use and the NRC license terminated can be grouped into two categories: ***decontamination*** activities and ***decommissioning*** activities. Section 3.3 provided an overview of the two categories of activities, and they are summarized below.

- ***Decontamination*** activities are defined those licensed activities that are currently authorized as specified in Condition 10 of SNM-414. The primary ***decontamination*** activities at the Parks Facilities involve the decontamination of the building surfaces, followed by final radiological surveys, NRC review and approval of the few survey report, and dismantlement of the buildings down to, but not including, the grade level floor slabs.

- ***Decommissioning*** activities are defined as those activities beyond decontamination that are described in this decommissioning plan. They cannot be performed until this decommissioning plan is approved by the NRC and license SNM-414 is amended to authorize the ***decommissioning*** activities. The primary ***decommissioning*** activities are removal of the build floor slabs, basements, below-grade drains and utilities, excavation of the soil where needed, and final surveying of the site.

A summary of the cost to decommission the Parks Facilities is presented in the table below. The cost estimate includes all the activities directly associated with decommissioning (e.g. excavation and final surveys) and prorates those activities which support both decommissioning and decontamination (e.g. project management, regulatory interface, and engineering).

	Labor	Material	Subcontractor	Transportation	Burial	Totals
Activity 1: Inaccessible Area Evaluation and Decontamination	72,984	0	1,050	0	0	74,034
Activity 2: Soil Excavation and Floor Slab Removal	809,112	72,680	454,672	690,350	3,145,553	5,172,367
Activity 3: Soil Surveys and Individual Reports	540,460	1,500	580,988	0	0	1,122,948
Activity 4: Final Walkover of Site	50,371	8,170	17,920	0	0	76,461
Activity 5: Quarterly Groundwater Monitoring	32,468	1,896	123,918	0	1,800	160,082
Activity 6: final Survey Report	36,945	0	47,531	0	0	84,476
Project Management	1,053,766	18,936	40,221	0	0	1,112,923
Regulatory Interface	159,249	0	359,944	0	0	519,193
General	461,084	354,359	60,948	0	0	876,391
Totals	3,216,439	457,541	1,687,192	690,350	3,147,353	9,198,875

The total cost of decommissioning is now estimated (April, 1998) at $ 9,198,875. BWX Technologies Inc, currently, has placed into effect financial assurance in the amount of $8,000,000. To meet this higher cost estimated for decommissioning, BWX Technologies Inc. will increase the total decommissioning amount to $ 10,000,000 by obtaining an additional line of credit for $ 2,000,000."

APPENDIX E

PARKS FACILITIES SCALING FACTORS

PART I: Technical Basis for Scaling Factors for Buildings and Equipment

1.0 INTRODUCTION

The radioactive materials determined to be present at the Parks Facility based on extensive characterization of the site are: Co-60/Cs-137, uranium, and transuranics (TRU). Their locations may be summarized as follows:

- Co-60 and Cs-137 are activation/fission products from work on nuclear power plant components, and are found in the northeast part of Building A and the Central Highbay area of Building B.
- Uranium is present in Building B, Building A, and throughout Building C.
- TRU is present throughout Building A and in the western wing of Building B. The TRU and uranium are mixed oxide fuel components. Trace amounts of uranium are present in the site transuranics use areas.

2.0 Co-60 and Cs-137

The presence of Co-60 and Cs-137 as activation/fission products from handling of components and equipment from nuclear power plants is limited to specific well defined areas within the Parks facility. These radionuclides are readily detected and measured without using scaling factors, and hence they are not described further in this report.

3.0 URANIUM

Uranium use at the Parks Facilities is described below:

- Building A was used to produce FFTF fuel (a mixed oxide fuel), which used both depleted and natural uranium. Hence, the building contains residuals of both of these materials (transuranics are discussed in the next section) .
- Building B was used to machine depleted uranium, and specific areas in the western wing of the building were used as a laboratory for samples containing low enriched uranium from B&W's Apollo Decommissioning Project.
- Building C was used exclusively for the manufacture of high enriched uranium fuel.

Site-specific scaling factors are not used for uranium. Instead, the uranium enrichments associated with specific products are used in conjunction with either a gamma spec isotopic measurement or a direct alpha or beta surface measurement. The total activity results are then compared to decommissioning criteria.

It is appropriate to use known enrichment values in this manner due to the extensive sets of controls that were exercised during manufacturing of the uranium fuels. There is no chemical or physical mechanism that would change the enrichment. Separate buildings, bays, rooms, or enclosures were used to isolate different materials, and there remains good institutional knowledge of the history of material use at the facilities. Strict physical and administrative / regulatory control systems were exercised during processing to maintain enrichment control, maintain criticality safety controls, achieve exacting product quality specifications, maintain QA controls, maintain radiological controls, and maintain materials control and accountability. These systems enabled the facility to avoid cross-contamination of product materials. In addition, the material types (depleted, natural , low-enriched, and high-enriched uranium) each have distinctly different documented radiological properties that are well established based on product specifications and measurements of pure product materials. There is no meaningful potential for change to isotopic abundance due to radiological decay since uranium isotopes are stable over extremely long time periods.

Thus, the use of uranium enrichment values for materials from these facilities yields results that are highly reliable.

4.0 TRANSURANICS

4.1 General

Site specific scaling factors developed for use with transuranics are based on the isotopic mix of FFTF fuel processed at the facility, with correction for radioactive decay to 1994. Active decommissioning of the Parks Facility began in 1994. The ratios established for 1994 will decrease continually overtime. These factors have been verified through isotopic analyses. This section describes the rationale for development of transuranic scaling factors.

Building A was used for manufacturing plutonium fuels (predominantly FFTF fuel), and included scrap recovery activities. An early use included a small campaign to produce another mixed oxide fuel. Fuel work was conducted from the 1970's until shutdown in early 1980. The Building A laboratory had been used to make neutron sources from americium and plutonium.

An area in the western wing of Building B was used to process Pu-238 in the 1960's. The area was also used as an analytical lab in the 1990's, involving samples from Building A and the surrounding grounds.

4.2 Need for Scaling Factors

The transuranic isotopes present at the site exist in the form of residual contamination from former operations. These isotopes include Pu-238, Pu-239, Pu-240, Pu-241, Pu-242, and Am-241. It is either impracticable or virtually impossible to measure all isotopes with field instrumentation at the low levels needed to demonstrate compliance with decommissioning criteria. For example, Pu-241 emits only a very weak beta that is difficult to detect by alpha, beta, or gamma measurement. Instead, Am-241 which is a gamma emitter can be directly measured as a surrogate for Pu-241 and other plutonium isotopes, because there is a solid relationship between the isotopes, as demonstrated herein. Similarly, total alpha can be readily measured, and the results are translated by means of scaling factors.

4.3 Need for Consistency

The different activities involving transuranics over broad time frames at the site could lead to having several sets of scaling factors that apply to different areas of the facilities, without a clear delineation of area borders. In a decommissioning project where tens of thousands of measurements are made, the task of assigning the proper set of factors would quickly become unwieldy, and the paperwork associated with this task would similarly become voluminous. As a result, B&W elected to establish a single set of scaling factors that would be highly accurate for the most predominant activity (FFTF fuel), yet conservative for all other transuranics activities.

4.4 Derivation of Scaling Factors

4.4.1 Concentration of FFTF Fuel

Following the principle that scaling factors must be reliable for the most predominant activity while being conservative for all other transuranic activities, B&W selected FFTF fuel as a model because it contains the highest concentration of plutonium per amount of Am-241. Since Am-241 is readily measurable, then a factor based on the ratio of plutonium to Am-241 in FFTF fuel would achieve the desired conservatism. The typical isotopic composition of FFTF plutonium handled at the Parks Facility is shown below in Table 1.

TABLE 1: Isotopic Composition of FFTF Fuel at Parks Facility

Radionuclide	Weight Percent	Specific Activity Ci/g (Isotope)		Specific Activity Ci/g (Mixture)	
		Alpha	Beta	Alpha	Beta
Pu-238	0.060	17.4		0.0104	
Pu-239	86.675	0.062		0.0537	
Pu-240	11.6	0.23		0.0267	
Pu-241	1.45		111.5		1.6167
Pu-242	0.20	0.004		.000008	
Am-241	0.015	3.24		0.0005	
Total Alpha				0.0913	
Total Beta					1.6167
Total Activity				1.7080	

Attachment 1 is a typical example of isotopic content in a shipment of FFTF fuel.

4.4.2 Correction for Radioactive Decay

With fuel production activities occurring from the early 1970's until shutdown in early 1980, it was necessary to establish a consistent decay time for determining scaling factors. In June of 1993 when decontamination efforts were getting underway, the transuranics had been at the site between 13 and 21 years.

Nine scabble samples from FFTF processing areas were analyzed to focus in on a more exact decay time, which affects the isotopic ratios. The results are shown in Table 2.

TABLE 2: Building A Scabble Sample Results & Ratios (1993)

Sample I.D.	Am-241 [1] pCi/g	Am-241 [2] pCi/g	Am-241 [3] (used for ratio)	Ratio of Pu alpha to Am-241
03.P0033+020	(4)	2.31	2.31	3.1
08.P0729+000	(4)	36	36	4.6
06.P0043+000	12.0	10.1	12.0	2.5
07.P0198+090	22.4	38	22.4	2.6
03.P0052+080	63.5	60	63.5	3.0
06.P0011-001	379.0	402	379	4.1
06.P0017-001	10.2	9.3	10.2	3.3
06.P0015-001	5.7	7.4	5.73	3.7
06.P0012-001	364.0	345	364	3.1
AVERAGE	NA	NA	NA	**3.3**

(1) Determined by alpha spectroscopy.
(2) Determined by gamma spectroscopy.
(3) Alpha spectroscopy values are used for Am-241 when available; otherwise the gamma spectroscopy values are used
(4) Iron matrix interference invalidated the Am-241 analysis.

The average Pu Alpha to Am-241 ratio for the nine samples on June 10, 1993 was 3.3 ± 0.46 at the 95% confidence interval. This result was compared to Table 3 below that shows the isotopic composition and the Pu Alpha to Am-241 ratio for FFTF fuel as a function of time.

TABLE 3: FFTF Fuel Composition as a Function of Time [1] [2]

TIME	Pu-238	Pu-239	Pu-240	Pu-241	Am-241	Pu-242	Pu ALPHA/Am-241
0	1.04E-02	5.37E-02	2.67E-02	1.62E+00	4.63E-05	8.00E-06	1961.30
5	1.00E-02	5.40E-02	2.67E-02	1.27E+00	1.20E-02	8.00E-06	7.58
10	9.61E-03	5.37E-02	2.67E-02	9.99E-01	2.09E-02	8.00E-06	4.31
11	9.53E-04	5.37E-02	2.67E-02	9.52E-01	2.24E-02	8.00E-06	3.63
12	9.46E-03	5.37E-02	2.67E-02	9.07E-01	2.39E-02	8.00E-06	3.76
13	9.39E-03	5.37E-02	2.67E-02	8.65E-01	2.52E-02	8.00E-06	3.55
14	9.31E-03	5.37E-02	2.67E-02	8.24E-01	2.66E-02	8.00E-06	3.38
[3]15	**9.24E-03**	**5.37E-02**	**2.67E-02**	**7.85E-01**	**2.78E-02**	**8.00E-06**	**3.22**
16	9.17E-03	5.37E-02	2.67E-02	7.48E-01	2.90E-02	8.00E-06	3.09
17	9.09E-03	5.37E-02	2.67E-02	7.13E-01	3.01E-02	8.00E-06	2.97
18	9.02E-03	5.37E-02	2.66E-02	6.80E-01	3.12E-02	8.00E-06	2.87
19	8.95E-03	5.37E-02	2.66E-02	6.48E-01	3.22E-02	8.00E-06	2.77
20	8.88E-03	5.37E-02	2.66E-02	6.17E-01	3.32E-02	8.00E-06	2.69
25	8.54E-03	5.37E-02	2.66E-02	4.85E-01	3.73E-02	8.00E-06	2.38
30	8.21E-03	5.37E-02	2.66E-02	3.81E-01	4.04E-02	8.00E-06	2.19
35	7.89E-03	5.36E-02	2.66E-02	3.00E-01	4.28E-02	8.00E-06	2.06

(1) The Original FFTF Fuel composition showing decay results over a 35 year period using *MICROSHIELD*. Time zero is the original freshly separated fuel composition (1 week decay).
(2) Values are curies per gram of fuel mixtures.
(3) Decay time equivalent to 1994. The date from which the site TRU scaling factors are drawn.

The 3.3 ratio of Pu alpha to Am-241 is equivalent to an average effective decay time of approximately 14.5 years as of the time of the analysis. Over the 95% confidence interval, the effective decay time

ranges from 12 to 19 years, based on a June 1993 measurement. This is consistent with earlier predictions and with plutonium usage during the latter stages of production at the Facility. It is also conservative in that the calculation predicts that material was deposited 14.5 years earlier (i.e. January 1, 1979), when in reality the material was deposited from the early 1970's, ending in early 1980. An earlier assumed deposition would result in a lower ratio since the radioactivity and the associated scaling factors decreases with time, hence scaling factors based on 14.5 years are conservative.

The transuranic scaling factors after a 15 year decay period to January 1994 were thus determined to be:

Pu Alpha/Am-241	**3.22**
TRU Alpha/Am-241	**4.22**
Pu-241/TRU Alpha	**6.69**
Pu-241/Am-241	**28.25**

4.5 Conservatism to the Present Time

The ratios of the plutonium isotopes to Am-241, the marker isotope, steadily decrease with time due to ingrowth of Am-241 (from the decay of Pu-241), and the decay of Pu-238. The scaling factors established in 1994 at the beginning of the Parks decontamination efforts could thus be further decay-corrected to the time of performance. Table 4 below shows additional reductions in radioactivity, ranging from 10.7 to 28.8 percent, simply due to additional decay from 1994 to 1998.

TABLE 4: Conservative Effect of Additional Radioactive Decay

Scaling Factor	1994	1998	% Decrease
Pu Alpha to Am-241	3.22	2.77	13.9
TRU Alpha to Am-241	4.22	3.77	10.7
Pu-241 to TRU Alpha	6.69	5.33	20.3
Pu-241 to Am-241	28.25	20.12	28.8

4.6 Use of Scaling Factors

Release surveys consist of three types of measurements:

- Direct measurements with instruments
- Smears for removable activity that are analyzed on smear counters
- Samples that are analyzed by gamma spectroscopy

Direct measurements and smears detect TRU alpha emissions and beta emissions from all isotopes except the weak beta emissions from Pu-241. The Pu-241 beta contribution is determined by multiplying the net alpha activity by the "Pu-241/TRU alpha" scaling factor. The result is added to the net beta activity determined by instrument measurement to determine the total residual beta activity present. The total beta activity is then compared to the release criteria.

Gamma spectroscopy is used on samples when matrix materials such as paint may interfere with direct instrument readings. Am-241 is detectable by gamma spectroscopy, then the total plutonium alpha activity and the Pu-241 activity in each sample are determined by multiplying by the appropriate scaling factors. The Am-241 activity is combined with the total plutonium alpha activity for comparison with

the alpha surface limit. The Pu-241 activity is also combined with the activity of any other beta emitters that are present.. The resulting total TRU alpha and total beta activity are then expressed as surface activity over the known surface sample area. The results in dpm/100 cm^2 alpha and beta are compared to the applicable site release criteria.

4.7 Conservatism with Respect to Other Program Materials

Section 4.1 of this report identifies uses of transuranics that have different isotopic compositions than the FFTF fuels which form the basis for the scaling factors. Section 4.7 demonstrates that the factors derived from FFTF fuel remain conservative when applied to residual materials from these other programs.

4.7.1 Mixed Oxide Fuel

In the 1960's, there were precursor mixed oxide fuels that were similar in nature to FFTF, but involved developmental programs which led to the formulation of FFTF fuels. Since scaling factors decrease considerably over time, the older material would be expected to have lower scaling factors than for FFTF. A cross check was made with NUREG/CR 0129 Technology, Safety, and Costs of Decommissioning A Reference Small Mixed Oxide Fuel Fabrication Plant to assess whether FFTF ratios are conservative with respect to the older material. FFTF ratios were found to be clearly conservative as shown in Table 4 below.

TABLE 4: Comparison with NUREG/CR 0129 Mixed Oxide Ratios

Ratio	NUREG (30 yr decay)	Bldg. A 1994 FFTF
TRU alpha/Am-241	2.84	4.2
Pu-241/Am-241	7.1	28.25
Pu-241/TRU alpha	2.5	6.69

The conservatism of scaling factors based on FFTF fuel, is confirmed by mass spectroscopic data for plutonium and sample analysis data. This data represents the pre FFTF fuels. The mass spectroscopic data was determined by Los Alamos on pre-1970 soils. The sample analysis for Am-241 and Pu-239 was performed by DOE INEL for the Nuclear Regulatory Commission. The ratios from the measurements are compared to the FFTF fuel ratios in Table 5.

TABLE 5: Comparison of 1994 Pre-FFTF Isotopic Ratios with FFTF Ratios

Sample ID	TRU alpha/ Am-241	Pu alpha/ Am-242	Pu-241/ Am-241	Pu-241/ TRU alpha	Comment
FFTF	4.2	3.2	28.2	6.7	None
SA-1	3.9	2.9	7.7	2.0	<FFTF
H-3	2.8	1.8	4.7	1.7	<FFTF

4.7.2 Conversion of Pu-238 to Oxide

Scabble samples taken in the Building B area where the Pu-238 operation was conducted yielded the following results which demonstrate that the 1994 scaling factors for FFTF are conservative.

TABLE 6: Conservatism in Pu-238 Area

Ratio	Pu 238 Area	Bldg. A 1994 FFTF
TRU alpha/Am-241	2.68	4.2
Pu-241/Am-241	11.8	28.25
Pu-241/TRU alpha	4.4	6.69

4.7.3 Scrap Recovery

The plutonium scrap recovery operation was effective in separating a high-value plutonium product that was collected and bottled for shipment. The remaining materials (raffinate liquids containing enhanced Am-241 content relative to the Pu content of FFTF fuels) became a source of contamination through spillage in the normal course of handling and storage of drums. Thus, the use of FFTF scaling factors is clearly conservative in that they overestimate the presence of plutonium alpha emitters.

4.7.4 Production of Americium-Beryllium and Plutonium-Beryllium Neutron Sources

Limited quantities of transuranics were used in the plutonium laboratory to make neutron sources (AmBe and PuBe). This process enhances americium relative to plutonium when compared to the FFTF composition. An isotopic analysis from a waste water line that served this area demonstrates that the plutonium to americium ratio is 0.5, whereas this ratio is 4.2 for FFTF. This is another way of saying that FFTF scaling factors are conservative in that they overestimate the presence of plutonium alpha emitters

4.7.5 Other Area Confirmation

Additional scabble samples were taken from areas of Building B that had been used for work with transuranics. The results in Table 7 below are conclusive that FFTF scaling factors are conservative when applied to these areas.

TABLE 7: Factor Conservatism in Building B

Ratio	Storeroom	Hafnium Highbay	Bldg. A 1994 FFTF
TRU alpha/Am-241	2.79	2.75	4.2
Pu-241/Am-241	3.53	4.55	28.25
Pu-241/TRU alpha	1.26	5.28	6.69

4.8 Survey Unit A Plutonium to Americium Scaling Factor Confirmation Plan

The scaling factors used for soils are provisional. A confirmatory soil isotopic analysis plan has been developed to validate the scaling factors for Project Unit A.

The plan consists of six major elements:

- A review of the historic use of all portions of project unit A and the contamination patterns determined by the site characterization surveys. The project unit has been subdivided into subunits, reflecting differences in history, and the presence of major areas of site contamination.
- Scaling factors shall be determined for each subunit of project unit A. A composite sample comprised of at least four separate samples will be analyzed for each subunit.
- Sample preparation will ensure that each composite sample is homogenous.
- Sample analysis will be by two separate approved laboratories. Each laboratory will perform three separate analyses on each composite sample.
- Qualified B&W personnel will review the results. This review will compare the soil isotopic results to those presently in use for the project. The validity of the results will be evaluated through analysis of the replicate results and a vendor to vendor comparison.
- All samples and measurements will be collected and performed in accordance with approved site procedures, including the site chain of custody procedure QIP-23.

4.8.1 Project Unit A Scaling Factor Areas

The affected area of Project Unit A is divided into three principal zones (shown on the map in Attachment 2). The division is based on the historic use of the site and the contamination patterns determined by the site characterization.

Zone 1 — Comprises all of the area occupied by the former drum field (an outside storage area that was used for drum storing until 1970) and all site areas, where soil from the drum field was moved or stored at some time in the history of the site. It includes the entire area presently occupied by Fabs 8 and 9, the north parking lot, and the former soil mound. The principle contamination source for these areas was the former drum field.

Zone 2 — Located on the southeast corner of building A. It includes Fabs 4-6 and the site grids exterior to the building that are in direct contact with these rooms. The zone includes the area between:

- X coordinates 210 to 240; Y coordinates 50 and 80, and
- X coordinates 200 to 240; Y coordinates 80 to 100.

This area represents the historical usage of Fabs 4, 5 and 6 and presence of two significant areas of contamination associated with those work areas.

Zone 3 — Includes all of the remaining portions of Project Unit A. These areas, which include sub-slabs and soils, are the oldest and longest used portions of the Plutonium Processing Facility, and the immediately associated grounds. The zone, excluding the area occupied by zone 2, is bounded by:

- X coordinates 90 and 240
- Y coordinates 10 and 90.

The sample locations were selected on the basis of previous sample data, particularly that of the characterization plan. Archived samples are to be used when available. Information on these archived samples, including the Am-241 activity of each is tabulated in Attachment 3. If they are not available, additional samples will be taken at the selected sampling location at a soil depth of 0 to 6 inches. The selection of sample locations is based on criteria below:

- Composite samples should have an activity level of approximately 25 to 100 pCi/g (to ensure statistically valid results).
- Selected samples should be distributed throughout the selected zone to ensure that the entire area is represented.
- Minimum number of 4 sub-samples is required for each of the composite samples to prevent any single sample from skewing the results.

See Attachments 2 & 3 for the locations for the composite sample for each zone.

4.8.2 Sample Preparation

The composite samples will be prepared by the Parks laboratory. One composite sample will be prepared for each of the three (3) zones in Project Unit A. The laboratory will perform a gamma spectroscopic analysis on each soil sample, prior to taking an aliquot from that sample for the zone composite sample. Each sample used to make up a composite will be equally represented on a weight basis. The laboratory will thoroughly mix and ball mill each composite to ensure that it is homogenous. The mass of the composite sample should be at least 700 grams. The laboratory will perform a gamma spectroscopic analysis on each composite sample after the completion of the sample ball milling. The laboratory will then sieve the composite samples. The laboratory will perform a gamma spectroscopic analysis on a representative sample (approximately 200 grams) of the fine fraction from each of the three composite samples to ensure that the activity in the fine fraction of each composite is adequate for alpha spectroscopic analysis. The laboratory will package and ship aliquots of approximately 100 grams from the fine fraction of each separate composite sample for shipment to each of the two laboratories selected to perform isotopic analysis. The remainder of the fine fraction of each composite sample will be retained by the Parks laboratory as archive samples.

Approximately 100 grams from the fine fraction of each composite sample will be provided to each of two (2) separate approved laboratories for analysis for Americium (Am 241) and Plutonium (Pu 238, Pu 239, Pu 240, Pu 241, and Pu 242). Each laboratory will perform three (3) separate analyses on each sample.

Health Physics Engineering is responsible for reviewing and evaluating the resultant data. Engineering and the Parks Facility Analytical Lab Director will also review the data. The data analysis will:

- Determine the isotopic ratios for each analysis of each sample by each laboratory.
- Compare the analysis to analysis results for each laboratory for each composite sample.
- Compare the laboratory to laboratory results.
- Determine the overall scaling factors for each zone.
- Compare the scaling factors to the presently used factors.

The reviewers will determine if the use of FFTF based scaling factors is reasonable and conservative. The reviewers will make recommendations for the acceptance of the FFTF-Based ratios or the performance of sufficient additional sampling and analysis to support the use of alternate scaling factors, on a zone by zone basis, in the Parks Facility Survey Unit A.

The approved scaling factors will be validated by the soil sampling program or developed from accepted follow-up sample surveys. Additional isotopic analyses will be used to confirm the plutonium isotopic content of Parks Facility Survey Unit soil samples. Gamma spectroscopy will be used to determine the Am-241 content of the samples. The Am-241 activity concentration in the sample will be multiplied by the applicable scaling factors to determine the sample alpha emitting plutonium activity concentration and the sample Pu-241 activity concentration.

4.8.3 Building B

Transuranics associated with the Building B grounds are largely limited to the soils immediately adjacent to the west wing of Building B and the underneath the west wing slab. The residual TRU is expected to be in the drain lines beneath and immediately adjacent to the building B west wing floor slab. The samples needed to accurately determine the isotopic composition of the subslab will be collected when the drain lines and associated soils are accessed for survey and possible remediation. Removed materials will be stockpiled, until an accurate isotopic composition is determined.

5.0 STATION OUTFALL 3

Outfall 3 is storm water discharge from the Parks Facility to the Kiskiminetas River. This discharge outfall is authorized by NPDES permit. It is located within Project Unit D. In the past Building A sink and shower waters were discharged in a batch mode to the Kiskiminetas River via this outfall. Extensive remediation of the associated river bank has been performed as a result of residual transuranic contamination in these soils.

Isotopic analyses of these soils have been performed by both B&W and the Nuclear Regulatory Commission. These analyses show considerable variation in the isotopic distribution.

B&W, in conjunction with the USNRC Region I, will develop the appropriate scaling factors for the outfall from the existing isotopic data.

APPENDIX E

ATTACHMENT 1

Sample Shipping Record Analysis of Plutonium-based Fuel

BWNM 144-606C

CUSTOMER
CONTRACT NO.

TYPE OF MATERIAL: $PuO_2 \cdot UO_2$

LOT NO. _____ COST CENTER _____ LOG BOOK NO. _____

Babcock & Wilcox

Nuclear Materials Division
609 North Warren Avenue, Apollo, Pa. 15613

ANALYTICAL REPORT

RESULTS TO _____

SUBMITTED BY _____

DATE 1-22-

☐ SHIPPING ☐ RECEIVING ☒ CONTROL

SAMPLE	BOAT NO.	Pu w/o	U w/o	Pu-238 w/o	Pu-239 w/o	Pu-240 w/o	Pu-241 w/o	Pu-242 w/o		O/M	TGR cc/g	H_2O ppm	C ppm	F ppm mg/in2	Cl ppm mg/in2	N ppm	S ppm	P ppm	W ppm
175-A				0.055	86.750	11.726	1.275	0.193											
175-B				0.056	86.786	11.686	1.281	0.191											

PROCEDURE USED	REV. NO.	ANALYST	DATE
PAS-08-MS	5	M	2-
UAS-04-MS	3	[illegible]	1-20

COMMENTS

Powder sample from box # 175, Pu facility / Pu Isotopic

CERTIFIED BY T [illegible]

DATE _____

2595-614C
Rev. 6/10/76

Babcock & Wilcox
Nuclear Materials Division
Pennsylvania Operations
609 North Wagner Avenue, Apollo, Pa. 15613

CUSTOMER
CONTRACT NO.
TYPE OF MATERIAL PuO2-UO2
LOT NO. COST CENTER

RESULTS TO R. Foord / H. Austin
SUBMITTED BY
DATE 11-28-79

ANALYTICAL REPORT — SHIPPING RECEIVING CONTROL

SAMPLE	U	o/u	U 233	U 234	U 235	U 236	U 238	F	Cl	N	C	O	H	U+6	Nb	Sm	Cont.
175-A				0.003	0.244	0.002	99.752										
								No	U-237	@	1MV Range						
175-B				0.004	0.241	0.003	99.751										

PROCEDURE	REV. NO.	ANALYST	DATE
PASTOS-M	5	N. Edmonds	11-28-79
UHS-01-MS	2	[illegible]	11/29/79

"Knowingly or willfully falsifying or concealing a material fact on this form, or making false, fictitious or fraudulent statements or representations herein could constitute a felony punishable under Federal statues."

NOTE: ALL ELEMENTS REPORTED IN PPM EXCEPT AS NOTED

COMMENTS: Powder sample from box #175, Pu facility / Uranium Isotopic

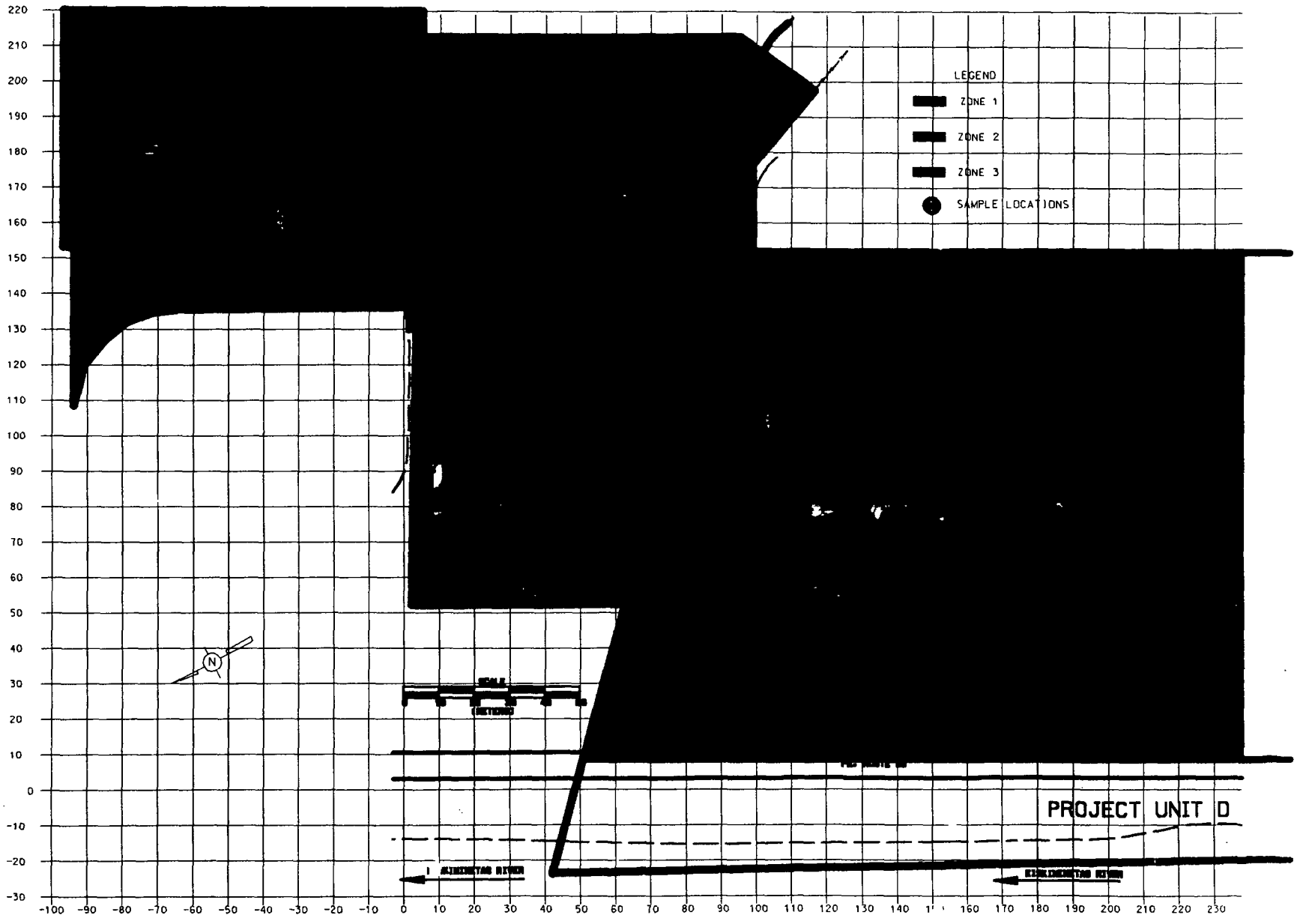
CERTIFIED BY T. Stay

DATE 11-30-79

APPENDIX E

ATTACHMENT 2

Pu/Am Zone Map for Parks Project Unit A


LEGEND
ZONE 1
ZONE 2
ZONE 3
SAMPLE LOCATIONS
PROJECT UNIT D

APPENDIX E

ATTACHMENT 3

Grounds Isotopic Ratio Confirmation
Sample Locations

Zone	Sample #	Am-241 (pCi/g)	Location	X	Y	Z
1	01.00426-030	8.48	Leach Bed	198	107	-0.6
1	01.P0613-001	30.56	MOUND	111	126	-0.2
1	01.P0620-001	31.59	MOUND	126	118	-0.2
1	01.P0733-020	180.09	Building A #6	151	140	-0.6
1	01.P0039-020	17.21	B-16	148	117	-0.9
AVERAGE		53.69				
2	01.P1719-006	19.02	A-HA-106	220	62	-0.6
2	01.P1723-012	390.73	A-HA-110	225	88	-1.2
2	01.P1371-006	32.93	A-HA-38	225	67	-0.6
2	01.P1317-006	13.21	A-B-18	221	58	-0.6
AVERAGE		113.97				
3	01.01397-006	108.74	A-HA-64	112	79	-0.6
3	01.P1367-006	20.82	A-HA-34	198	72	-0.6
3	01.P1968-006	11.18	A-HA-172	108	62	-0.6
3	01.P1838-006	21.62	A-HA-123	150	68	-0.6
3	01.P1882-006	130.93	A-HA-167	128	74	-0.6
AVERAGE		58.66				

If the archived samples are not available, new samples shall be taken from the first 6 inches of soils at each locations with TRU content.

SUMMARY OF QUESTIONS AND RESPONSES

1. Q. Would NRC provide copies of past meeting summaries?
   A. NRC staff indicated that it would provide these summaries.

2. Q. Is the meeting being recorded?
   A. NRC staff indicated that it was not, but that a meeting summary would be prepared.

3. Q. Would BWXT provide a copy of their latest annual report?
   A. BWXT staff indicated that they would provide a copy of the report.

4. Q. Would NRC provide a copy of the decommissioning plan?
   A. NRC staff indicated that they would provide a copy of the decommissioning plan and the revisions supplied by BWXT.

5. Q. What is the status of Mr. Cepicka?
   A. BWXT staff indicated that he was a part-time employee working for the Parks Information Center.

6. Q. Would NRC provide the resumes of BWXT staff
   A. NRC staff indicated that it would provide the resumes when they were provided by BWXT.

7. Q. Has BWXT (or B&W) ever used Hess Laboratories?
   A. B&W staff indicated that they did not believe that B&W had used this laboratory in the past.

8. Q. Will BWXT provide copies of waste manifests for radioactive waste generated during operations at the site?
   A. BWXT staff indicated that they would consider the request.

9. Q. Are split samples taken and if so by whom?
   A. NRC staff indicated that the NRC staff may take split samples, depending on the circumstances at the site.

10. Q. Have their been any incidents related to worker health and safety at the facility?
    A. NRC staff indicated that their were exposures due to an incident in Fab 6 in 1997, but the NRC staff determined that these exposures were not in excess of the NRC's limits for occupationally exposed individuals.

11. Q. Who is the new Plant Manager?
    A. BWXT staff stated that William Heer is the General Manager for the Parks Restoration Project.

12. Q. Are the cost estimates for the project the total cost?
    A. BWXT staff indicated that they did not believe that this was a pertinent question

13. Q. Are any Federal monies being expended to remediate the site?
A. BWXT staff indicated that no Federal funds were being expended remediating the site.

14. Q. Because Site Specific Advisory Board (SSAB) were convened at other facilities such as the Department of Energy's Hanford plant would an SSAB be convened at the PTS?
A. NRC staff indicated that because BWXT intended to decommission the facility to levels that would allow unrestricted use of the site, the NRC regulations did not require that BWXT convene an SSAB.

15. Q. Were there any pseudo wells on the site?
A. Neither BWXT nor NRC staff were familiar with the term and could not confirm or deny whether one was on-site.

16. Q. When was the information center scheduled to open?
A. BWXT staff indicated that the information center was scheduled to open during the first week of May, 1998.

17. Q. Could NRC set up an Local Public Document Room in Leechburg, Pa for SNM-414?
A. NRC staff indicated it would consider the request.