

DEPARTMENT OF THE NAVY OFFICE OF THE CHIEF OF NAVAL OPERATIONS 2000 NAVY PENTAGON WASHINGTON, DC 20350-2000

IN REPLY REFER TO

6-7

5104 Ser 455C/6U838280 15 November 2006

PH 12:

45-23645-01NA

03029462

U. S. Nuclear Regulatory Commission Region I 475 Allendale Road King of Prussia, PA 19406 (Attn: Ms. O. Masnyk-Bailey)

Gentlemen:

SUBJECT: DECOMMISSIONING BUILDING 200, BAY 4 DEPLETED URANIUM (DU) INDOOR TEST RANGE AT NAVAL SURFACE WARFARE CENTER DAHLGREN DIVISION (NAVSURFWARCEN)

NAVSURFWARCEN Dahlgren notified the Naval Radiation Safety Committee of the intent to decommission Building 200 Bay 4, indoor depleted uranium test range that will lead to terminating NRMP No. 45-00178-Y1NP.

The Navy has reviewed the notification and historical information and conducted an on-site visit to compare the previous operations with the decommissioning guidance of NUREG-1757. Remediation will require methods not previously approved in the command NRMP. Consequently, the Navy recommends the NAVSURFWARCEN Dahlgren termination be processed as a Group 3 decommissioning requiring a decommissioning plan. A contractor with a current NRC license authorizing decommissioning operations will conduct scoping surveys and prepare the decommissioning plan. The Navy prepared a decommissioning assessment that is provided as enclosure (1).

NAVSURFWARCEN Dahlgren funded scoping surveys and preparation of the decommissioning plan to begin in fiscal year 07. Request you advise the Naval Radiation Safety Committee in a timely manner if the NRC intends to review and concur on the decommissioning plan. Your response is requested by 15 January 2007.

> 139760 NMSS/RGNI MATERIALS-CO2

Subj: DECOMMISSIONING BUILDING 200, BAY 4 DU INDOOR TEST RANGE AT NAVAL SURFACE WARFARE CENTER DAHLGREN DIVISION

If you have any further question regarding this action, please contact Mr. William Morris or Dr. Steve Doremus at NAVSEADET RASO: (757) 887-4692, or <u>William.j.morris2@navy.mil</u> or <u>steve.doremus@navy.mil</u>.

Sincerely,

LL magno L. L FRAGOSO

By direction

Enclosure: 1. Decommissioning Assessment for Building 200, Bay 4 Du Indoor Test Range Naval Surface Warfare Center Dahlgren Division, Dahlgren Virginia

Copy to: COMNAVSEASYSCOM (04N) NAVSEADET RASO NAVWARCEN, Dahlgren (XDC8)

DECOMMISSIONING ASSESSMENT For BUILDING 200, BAY 4 DU INDOOR TEST RANGE NAVAL SURFACE WARFARE CENTER DAHLGREN DIVISION DAHLGREN, VA

Prepared by

NAVSEADET RASO Yorktown, VA 23691

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Naval Surface Warfare Center, Dahlgren

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ACRONYMS & ABBREVIATIONS

AEC	Atomic Energy Commission square centimeter
cm ²	
DCGL	derived concentration guideline level
dpm	disintegrations per minute
DU	Depleted Uranium
eqn	equation
lb	pound
LLRW	low-level radioactive waste
MARSSIM	Multi Agency Radiological Site and Survey
	Investigation Manual
mm	millimeter
mrem	millirem
NRC	Nuclear Regulatory Commission
NRMP	Naval Radioactive Materials Permit
NSWC	Naval Surface Warfare Center
NSWCDD	Naval Surface Warfare Center Dahlgren Division
8	percent
pCi	picocurie
Rev	revision
UXO	unexploded ordnance

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1.0 EXECUTIVE SUMMARY

Naval Surface Warfare Center Dahlgren Division (NSWCDD) intends to decommission Building 200, Bay 4 and adjacent areas for release to unrestricted use and subsequently terminate NRMP 45-00178-Y1NP.

NSWCDD is located on the western bank of the Potomac River in King George County, Virginia approximately 40 miles south of Washington, DC. Building 200, Bay 4, is located on the main laboratory site approximately 150 feet from upper Machodoc Creek on the southern boundary of the laboratory site. NSWCDD conducts research and development and testing of naval guns. The main laboratory site access is limited to authorized military and DoD civilian personnel.

From the early 1970s until the early 1990s, NSWCDD tested 20 mm DU munitions in Bay 4, at a Gun Butt outdoor site adjacent to Building 200, and an experimental explosives area (Pumpkin Neck) south of Machodoc creek (off the main laboratory site). An outdoor storage area for target debris at Building 1180, the Building 200 Gun Butt outdoor site, and the Pumpkin Neck area were previously remediated and released for unrestricted use. The average remaining residual soil concentration of DU is less than the generic screening value from Appendix B, NUREG 1757, Vol 1, Rev 1. NSWCDD scoping surveys, made in 1994, measured residual surface contamination ranging from 40,000 to 100,000 $dpm/100 cm^2$ on the floor at one end of Bay 4 where targets were mounted and impacted by the DU penetrators. Approximately 30 square meters of the floor are contaminated and additional contaminated floor areas may exist. The exhaust fan and housing above the target area are contaminated to levels between 4,000 to 40,000 dpm/100 cm^2 . Residual contamination is expected on the walls of Bay 4, on the roof of Bay 4, and in the outdoor soil on the west side of Building 200, Bay 4.

The objective of the decommissioning is release for unrestricted use. The release criteria for DU in soil will be the generic screening value of 14 pCi/g from Appendix B, NUREG 1757, Vol 1, Rev 1. A DU DCGL of 2400 dpm/100 cm² for a building occupancy scenario was determined using RESRAD Build 3.21 and Building Occupancy parameters from NUREG 5512. The individual DCGL for each nuclide in DU was determined and the DU DCGL was then determined using Eqn 4-4 of MARSSIM. The resulting dose is 20 mrem/y primarily from U-238. Use of screening values for soil contamination is sufficiently conservative to be ALARA. The use of building occupancy parameters from NUREG-5512 with RESRAD

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Build are equivalent to screening values for building surfaces and are considered ALARA. The future use of Bay 4 remains a target range with a very low occupancy time, lower than the building occupancy scenario. Swipe surveys in Bay 4 show minimal removable contamination and indicate a removal fraction an order of magnitude lower than 0.1 used by the building occupancy scenario.

NSWCDD has funding for the preparation of a decommissioning plan and scoping surveys to begin in fiscal year 2007. Further scheduling will be established after completing the decommissioning plan.

2.0 FACILITY OPERATING HISTORY

2.1 License Number, Status, and Authorized Activities

NSWCDD currently holds NRMP 45-00178-Y1NP (timely filed) that authorizes possession of 2200 lbs of depleted uranium in the form of expended ordnance contained in target material awaiting site remediation and disposition as waste.

2.2 License and Permit History

NSWCDD conducted testing of depleted uranium (DU) munitions (20 mm-40 mm) under the authority of Atomic Energy Commission (AEC) and subsequently the Nuclear Regulatory Commission (NRC) License No. SMB-1145. The license was issued in September 1972 and authorized possession of thorium and uranium in specific physical forms for testing with ordnance and authorized storage in a fenced area surrounding Buildings 97 and 1120. The license was renewed in 1977 and authorized testing of depleted uranium munitions at an indoor range in Building 200 and an outdoor range in the explosives experimental area at Pumpkin Neck and storage in a fenced area surrounding Building 1180. Figure 1 shows the main laboratory site for NSWCDD with arrows identifying the location of Buildings 200 and 1180. The explosives experimental area at Pumpkin Neck is located in a separate area (not shown) across upper Machodoc Creek south of Building 200. NSWCDD started testing DU munitions in the early 70s and continued through the early 1990s.

DU munitions were stored in various bunkers prior to use in testing. Contaminated targets and waste material were stored in a fenced exclusion area outside Building 1180. In 1986, the license was amended to authorize storage of expended DU penetrators in Building 1104, an underground storage vault.

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The Navy received an NRC Master Materials License in 1987 and subsequently converted all NRC licenses, issued to Navy and Marine Corps commands, to Naval Radioactive Materials Permits (NRMP). NSWCDD's license was converted to NRMP No. 45-60921-S1NP. After the closure of NSWC, White Oak Laboratory in 1995 and subsequent reorganization, NRMP No. 45-60921-S1NP was converted to NRMP No. 45-00178-S1NP. NRMP No. 45-00178-S1NP was converted to 45-00178-Y1NP to reflect the authorized use as storage of residual radioactive contamination waiting decommissioning.

2.3 <u>Previous Decommissioning Activities</u>

Three areas were previously decommissioned between 1993 and 2000: An outdoor storage area at Building 1180; Building 200 Gun Butt, an outdoor site adjacent to Building 200 where approximately 20,000 rounds of 20 mm DU munitions were test fired; and the Harris DU Mound at Pumpkin Neck, a site of limited test firing (~500 rounds of DU munitions) in an explosives test area. All the sites were decommissioned to a release limit of 35 pCi/g.

2.3.1 Building 1180 outdoor storage area

In July and August 1993, Chem Nuclear, Inc decommissioned the outdoor storage area (60,000 square feet) surrounding Building 1180. Remaining levels of residual DU contamination are at background (U-238) level and well below the current screening values for release to unrestricted use. NAVSEADET RASO approved free release of this area by letter dated 14 Apr 95.

2.3.2 Building 200 Gun Butt and Harris DU Mound at Pumpkin Neck

Beginning in 1995, The Navy contracted through the Army Field Support Command for an Engineering Evaluation/Cost Analysis, characterization surveys, decontamination and decommissioning work for decommissioning Building 200 Gun Butt and the Harris DU Mound at Pumpkin Neck that were performed by Allied Technology Group, OHM, and IT Corporation. The ATG characterization survey concluded that 500 years would be required for DU contamination to reach the Potomac River. In 1997 and 1998, OHM conducted remediation and a final status survey. As part of the final status survey at the Building 200 Gun Butt, soil samples were taken on the east side of Bay 4 (site of the Gun Butt) in 31 grids of 10 meters by 10 meters. As part of the final status survey at the Harris DU mounds, soil samples were taken at the in 27 grids of 10 meters by 10 meters. The residual soil activity at each site did not exceed an average of 14 pCi/g, the generic screening level for DU. Confirmatory samples were taken by the Nuclear Regulatory Commission and NAVSEA DET RASO.

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NAVSEADET RASO approved free release of this area by letter dated 5 Jun 01.

3.0 FACILITY DESCRIPTION

3.1 Site Location and Description

NSWCDD is located on the western bank of the Potomac River in King George County, Virginia, approximately 25 miles east of Fredericksburg and 40 miles south of Washington, DC. NSWCDD is bounded on the east by the Potomac River (see Figure (1)). NSWCDD is one of the six divisions of the Naval Surface Warfare Center. NSWCDD is one of the U. S. Navy's principal research, development, and test and evaluation, engineering and fleet support activities for surface warfare, surface ship combat systems, ordnance, strategic systems, amphibious warfare, mines and mine countermeasures, and amphibious and special warfare systems. The Division conducts analysis, systems engineering, research, test, evaluation, and integration of important naval and joint warfare systems.

Building 200, Bay 4, is the indoor firing range where single shot tests on 20-40 mm DU and tungsten kinetic energy penetrators are evaluated for use in the Phalanx weapons system. Assembled rounds consist of a DU or tungsten penetrator, a sabot that surrounds the penetrators to provide support for the penetrators when in the gun barrel, and a cartridge case filled with propellant. An unofficial estimate is that 2,000 - 3,000 DU rounds were fired in Bay 4 starting in the early 1970s before converting the munitions undergoing testing to tungsten steel alloy in the early 1990s.

Building 200 is located approximately 200 feet from the Potomac River (upper Machodoc Creek) and is within the 100 year flood plain. An outside area east and southeast of Building 200 was surveyed and released for unrestricted use during the remediation and final status survey of the Gun Butt located next to Building 200.

Building 200, Bay 4 (indoor firing range) is a long narrow structure that is divided into a gun bay and target bay. The gun bay houses the gun used to fire the penetrators. The two bays are interconnected by a narrow hallway forcing the pieces of the sabot to remain in the gun bay, while the penetrator is allowed to continue into the target bay. The target bay housed instrumentation used for penetrator velocity studies, steel and aluminum plate array used to evaluate penetrability and break-up

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of penetrators, and a plywood target butt that stops the penetrators. Target plates and plywood used to backstop the target plates have mostly been removed and previously disposed of as LLRW. Instrumentation has also been removed. Both bays have exhaust ventilation systems that are used to clear smoke and debris.

A diagram of the firing range is included as Figure 2. The gun bay is 14.5 feet wide, 9 feet high, and 138 feet in length. The roof and walls of the gun bay are concrete. The roof of the gun bay is part of a single roof covering all the bays. The gun bay roof is sealed with an asphaltic material in good condition. It is not known when the sealant was last applied. The ventilation exhaust fan and housing for the gun bay are located approximately over the gun mount. The target bay is 14.5 feet wide, 9 feet high, and 106 feet in length. The walls and ceiling of the target bay are steel plate. The floor is poured concrete.

The plywood gun butt is 8 feet high, 14 feet wide, and 15 inches thick and contains up to 50 DU penetrators. Some penetrators may have passed through the plywood and impacted the back wall. A cart holding plywood sheets and a metal support frame about 40 inches high by 2 feet wide by 6 feet long (steel legs and frame) remain and are contaminated with DU. The ventilation exhaust fan and housing for the target bay are located directly at the southwest edge of Bay 4. The fan housing is connected by a duct to an opening approximately over target area location. The target bay roof is covered by painted foam which is weathered. Rusted steel shows in numerous places. There is a store room adjacent to the target bay with approximate dimensions of 50 feet by 20 feet (The roof of the storeroom may be potentially impacted from ventilation exhaust).

3.2 <u>Population Distribution, Future Land Use, Climate, and Natural</u> <u>Resources</u>

NSWC DD will continue use of the laboratory property into the foreseeable future. Bldg 200 will continue to be used as a small caliber target range. The information on population distribution, climate, and natural resources was previously collected and described in an Engineering Evaluation/Cost Analysis prepared by Allied Technology Group for decommissioning of the Building 200 Gun Butt and Building 200 Gun Butt and the Harris DU Mound at Pumpkin Neck. A contractor will prepare a decommissioning plan that will include an updated discussion of this information.

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4.0 RADIOLOGICAL STATUS OF FACILITY

4.1 Contaminated Structures

The NSWCDD conducted direct surface contamination surveys and swipe surveys of the gun and target bays in 1994 and 95 that included the exhaust ventilation fans on the roof. The direct surface contamination surveys were conducted with a frisker with an estimated minimum detectable activity of 2000 dpm/100 cm² alpha activity. In the gun bay, the only contaminated area detected was a hole in a steel deflector plate (that slopes and forms part of the ceiling) caused by a misfire. In the target bay, the floor and one wall were surveyed. Residual contamination was measured on approximately 20-30 square meters of floor, near the target area. Maximum contamination levels on the floor are equivalent to 40,000 to 100,000 dpm/100 cm^2 . The roof of the target bay may be potentially contaminated as well as the roof of the adjacent storeroom. A total of 600 swipes were taken and analyzed and only 10 to 20 showed removable contamination with a maximum level of 50 dpm/100cm². The MDA of the frisker probe used in the direct measurements limits knowledge of DU contamination levels since the MDA of the frisker is approximately equal to the DU DCGL for unrestricted release. There is guite likely more than 20-30 square meters of contaminated floor and walls. The plywood gun butt is 8 feet high, 14 feet wide, and 15 inches thick and contains up to 50 DU penetrators. Some penetrators may have passed through the plywood and impacted the back wall.

4.2 Contaminated Systems and Equipment

Residual contamination equivalent to 4,000 to 40,000 dpm/100 cm² was measured on the exhaust fan and housing over the target bay. The roof surrounding the housing is potentially contaminated. Inside the target bay, the plywood gun butt is 8 feet high, 14 feet wide, and 15 inches thick and contains up to 50 DU penetrators. A cart holding plywood sheets and a metal support frame about 40 inches high by 2 feet wide by 6 feet long (steel legs and frame) remain and are contaminated with DU.

4.3 <u>Surface Soil Contamination</u>

Soil contamination is anticipated on the west side of Building 200, Bay 4 below the target area ventilation exhaust outlet and around an equipment access door where target debris was previously loaded and shipped as radioactive. Previous surveys on the south side of Bay 4 indicate a potential for soil contamination on the west side of Bay 4 that could exceed the screening level. Soil contamination may be present on the

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northeast side of Bay 4, in an area of 53 feet by 50 feet in size. This area was part of a previous characterization survey but survey results consist of radiation levels without a map. It is unknown whether residual contamination meets the screening level for unrestricted release. See Figure 3, Areas B and A, respectively.

5.0 DOSE MODELING

5.1 Unrestricted Release Using Screening Criteria

5.1.1 Unrestricted release using screening criteria for building surface residual radioactivity

The DU screening value DCGL for building surfaces will be **2400 dpm/100 cm²**. This was calculated using RESRAD Build 3.21 and Building Occupancy Scenario parameters from NUREG/CR-5512 along with the area and height of the target bay. DU for purposes of this calculation consisted of 99.7% U-238, 0.3% U-235, and 0.001% U-234 by weight. The DCGL for DU was calculated using the formula for gross activity DCGL, MARSSIM eqn. 4-4, and RESRAD Build calculations for the individual nuclide DCGLs. The DCGL for DU is 2400 dpm/100 cm². The resulting dose is approximately 20 mrem/y.

5.1.2 Unrestricted release using screening criteria for surface soil residual radioactivity

The screening value for soil is 14 pCi/g from Appendix B, Table B.2 of NUREG 1757, Vol 1, Rev 1.

6.0 PLANNED DECOMMISSIONING ACTIVITIES

A contractor holding a current NRC license authorizing decommissioning activities will conduct scoping surveys and prepare a Group 3 decommissioning plan to address detailed procedures for cleaning and surveying contaminated structures and removing contaminated systems and equipment. After approval of the decommissioning plan, the contractor will carry out planned decommissioning activities and a final status survey.

6.1 Contaminated Structures

6.1.1 Gun Bay

The steel deflector plate or a portion of it will be removed and the contaminated hole cut out. Scoping surveys and final status surveys will be conducted on and behind the deflector plate and

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on the walls, floor, and ceiling of the gun bay. A scoping survey will be conducted on the roof of the gun bay surrounding the exhaust fan and extending away from the fan as needed. Contaminated roofing material will be removed as needed.

6.1.2 Target Bay

Scoping surveys will be conducted on the floor, walls, and ceiling of the target bay. Contaminated building surfaces will be cleaned. Portions of contaminated concrete floor will be removed as needed. A final status survey will be conducted on the floors, wall, and ceiling of the target bay. A scoping survey will be conducted on the roof of the target bay starting at the exhaust fan and fan housing and extending away from the fan housing as needed. Contaminated roofing material will be removed as needed.

6.2 Contaminated Systems and Equipment

6.2.1 Gun Bay

A scoping survey will be conducted on the exhaust fan and fan housing. If contaminated, the exhaust fan and fan housing will be removed and disposed of LLRW.

6.2.2 Target Bay

The plywood gun butt will be removed and disposed of as LLRW. A cart holding plywood sheets and a metal support frame about 40 inches high by 2 feet wide by 6 feet long (steel legs and frame) are contaminated with DU and will be disposed of as LLRW. The ventilation exhaust fan and housing and exhaust duct for the target bay will be removed and disposed of as LLRW.

6.3 <u>Soil</u>

A contractor will conduct scoping surveys on the west side of Bay 4 and on the Northeast side of Bay 4. Soil will be removed as necessary. UXO surveillance will be conducted prior to any soil digging in these areas. Final status surveys will be conducted after any soil removal.

7.0 REFERENCES

Nuclear Regulatory Commission License No. SMB-1145

Naval Radioactive Materials Permit No. 45-60921-S1NP

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Naval Radioactive Materials Permit No. 45-00178-S1NP

Naval Radioactive Materials Permit No. 45-00178-Y1NP

Final Report - Engineering Evaluation Cost Analysis 1997 and Building 200 Gun Butt and Harris DU Mound Sites, Site Characterization/Engineering Evaluation/Cost Analysis 1995 prepared by Allied Technology Group, Inc. and Geo/Source Consultants

Final Radiological Status Report for Decommissioning Building 200 Gun Butt and Harris DU Mound Sites-Naval Surface Warfare Center, Dahlgren Division, Dahlgren Virginia, June 22, 2000 prepared by IT, Inc.

Final Report for the NSWC Dahlgren Project, Building 1180, NSWC Dahlgren, Dahlgren VA of 19 Sept 94 prepared by Chem Nuclear Inc.

NAVSEA DET RASO letter 5104/00178 Ser 02F/00310 of 14 Apr 1995

NAVSEA DET RASO letter 5104/60921 Ser 02C/300 5 June 2001

NAVSEA DET RASO Trip Report Oct 20, 2005

NSWCDD Health Physics Survey of the Indoor DU Firing Range 9-13 July 1990

NSWCDD Building 200 Surveys dated 1994 and 1995

NUREG 1757, Volume 1, Rev 1 Consolidated NMSS Decommissioning Guidance - Decommissioning Process

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Figure 1-NSWC DD Laboratory Site Arrows show Bldg 1180 and Bldg 200

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Figure 2 Building 200 DU Indoor Firing Range

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Figure 3 Building 200 Potentially Impacted Outdoor Areas

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DEPARTMENT OF THE NAVY NAVAL SURFACE WARFARE CENTER DAHLGREN DIVISION 17320 DAHLGREN ROAD DAHLGREN, VIRGINIA 22448-5100

IN REPLY REFER TO 5090 Ser XDC8/936 19 APR 2004

From: Commander, Dahlgren Division, Naval Surface Warfare Center To: Officer in Charge, Naval Sea Systems Command Detachment Radiological Affairs Support Office (RASO) NWS PO Drawer 260

Yorktown, Virginia 23691-0260

Subj: REQUEST FOR COST ESTIMATE TO DECOMMISSION BUILDING 200, BAY 4

Encl:

- : (1) Building 200 Map Grid F16 Zone 5
 - (2) Building 200 Ordnance Operating Room and Indoor Firing Range
 - (3) Building 200 DU Indoor Firing Range Isometric

1. The Naval Surface Warfare Center, Dahlgren Site (NSWCDL) requests a cost estimate from the DoD Executive Agency for the decommissioning of Building 200, Bay 4, to return the facility to unrestricted use. To facilitate funding, please break up the estimate into several parts such as survey, disposal of wood, decontamination and disposal.

2. Building 200, Bay 4, an indoor firing range, is a fully enclosed tunnel constructed of reinforced concrete with a steel lining. The tunnel is 240 feet long, 12 feet wide and 9 feet high. The tunnel contains two roof fans: one near the entrance to the range and the other above the target array. Enclosures (1) through (3) are attached for your information.

3. The areas/items to be surveyed and decontaminated include:

a. Top portion (walls, ceiling and floor) of Bay 4 including gun mount area

b. Bottom portion of Bay 4 (walls, ceiling and floor)

c. The two roof fans in Bay 4

Subj: REQUEST FOR COST ESTIMATE TO DECOMMISSION BUILDING 200, BAY 4

d. Target plate array, cart-containing plywood to catch the DU penetrators, sensor stands and back wall of plywood

e. Roof of Bay 4

f. A 50-foot perimeter around Bay 4 (outside).

4. NSWCDL requests this cost estimate by 30 June 2004 to budget for this decommission.

5. For more information, please contact Ms. Sheran M. Phin, Code XDC8, Radiation Safety Officer, at DSN 249-4298 or Commercial (540) 653-4298.

LYAL B. DAVIDSON







This is to acknowledge the receipt of your letter/application dated

		21200) b	, an	nd to inform	you that the	initial p	rocessing	which			
includes an administrative review has been performed.												
	A	1	1	11	NOLI	r nini	1					

Amendment 45-23645-01NA There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

Please provide to this office within 30 days of your receipt of this card

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned Mail Control Number 39760. When calling to inquire about this action, please refer to this control number. You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI) (6-96) Sincerely, Licensing Assistance Team Leader