

# POLICY ISSUE

## (Notation Vote)

May 18, 2006

SECY-06-0117

FOR: The Commissioners

FROM: Luis A. Reyes  
Executive Director for Operations /RA/

SUBJECT: TERMINATION OF NUCLEAR REGULATORY COMMISSION LICENSE  
FOR THE HERITAGE MINERALS INC. SITE IN MANCHESTER  
TOWNSHIP, NEW JERSEY

### PURPOSE:

To inform the Commission of the results of the staff's assessment of potential doses to the public from residual radioactive material remaining at the Heritage Minerals Inc. (HMI) site, and to obtain Commission approval to terminate the Nuclear Regulatory Commission (NRC) license and release the site for unrestricted use. This paper does not address any new resource implications.

### SUMMARY:

The radiological criteria for license termination specified in 10 CFR Part 20, Subpart E, do not apply for certain licensees with NRC-approved Decommissioning Plans (DPs) that are in accordance with the Site Decommissioning Management Plan (SDMP) Action Plan criteria. This paper discusses the decommissioning and related staff actions for such a site. The HMI site meets the cleanup criteria in its approved DP, but the resultant dose is greater than the radiological unrestricted release criterion of 25 millirem/year (mrem/yr). The Commission directed the staff to obtain Commission approval prior to releasing grandfathered sites when, after completing decommissioning, the dose from residual radioactivity exceeds the unrestricted release provision. This paper describes the HMI site licensing and decommissioning history

CONTACT: Marjorie McLaughlin, RI/DNMS  
(610) 337-5240

and presents the results of a staff dose assessment. Based on the licensee's completion of activities required by their approved DP, the staff recommends that the Commission approve termination of HMI's NRC license and release of the site for unrestricted use.

#### BACKGROUND:

The HMI site is a former minerals mining and processing facility, owned by HMI, which is located in Manchester Township, New Jersey within the Pine Barrens. The site, like the surrounding properties in Ocean County is flat with coastal sands. Although the site consists of almost 7000 acres, mining and processing operations took place on approximately 287 acres, and NRC-licensed areas comprised less than one acre. The facility was used from 1973-1989 for the mechanical processing of dredged native sand to extract titanium- and zirconium-bearing heavy minerals. The native sand also contains natural uranium and thorium, which were concentrated in the process waste tailings. In 1989, HMI began reprocessing the tailings to extract any remaining heavy minerals. The resultant waste tailings contained a concentration of uranium and thorium in excess of 0.05% by weight, exceeding the 10 CFR 40.13(a) unimportant quantity exemption for source material. HMI segregated the source material and applied for an NRC license.

Before the license was issued, reduced demand caused HMI to cease processing activities. The NRC license, issued in 1991, authorized possession of the stockpiled source material and decommissioning of the impacted areas of the site (specified as the two mill buildings and the ground beneath the stockpile). The ground between and surrounding the impacted areas contains diffuse thorium and uranium concentrations above background but below 0.05%, resulting from staging and regrading waste sands from previous (unlicensed) processing activities. This material remained exempt from NRC regulations. In 1992, HMI was designated a SDMP site.

When the "License Termination Rule" (LTR) was promulgated (10 CFR 20, Subpart E), it included a provision to address sites that had developed DPs and committed to meet SDMP Action Plan criteria. Section 10 CFR 20.1401(b)(3) grandfathered sites with DPs that were submitted to the NRC before August 20, 1998, and approved by August 20, 1999. In SECY-99-195, "Notation Vote on an Exemption for Decommissioning Management Program Sites with Decommissioning Plans Under Nuclear Regulatory Commission Review and Eligible for Grandfathering, Pursuant to 10 CFR 20.1401(b)(3)," July 19, 1999, the approval date was extended to August 20, 2000, for twelve sites, including the HMI site. Decommissioning of grandfathered sites is performed in accordance with the SDMP Action Plan (SECY-92-106), "Action Plan to Ensure Timely Remediation of Sites Listed in the Site Decommissioning Management Plan," April 3, 1992, under which cleanup criteria are based on residual contamination levels. Remediation is considered to be complete when the actions described in the approved DP are completed. In addition, Commission approval is required prior to releasing grandfathered sites when the dose from residual radioactivity after completing decommissioning exceeds the unrestricted release provision in the LTR (25 millirem per year (mrem/yr)).

In March 2005, HMI completed the decommissioning activities described in its approved DP, and requested termination of its NRC license. A staff dose assessment (Enclosure 1) of the NRC-licensed areas indicates that the resultant total effective dose equivalent (TEDE) to an average member of the critical group is greater than 25 mrem/yr. HMI has remediated its licensed areas to the contamination levels specified in its approved DP, which are the cleanup standards to which all licensees were held before promulgation of the LTR. These cleanup standards were not dose-based, but were considered to result in a dose less than 100 mrem/yr.

#### DISCUSSION:

The HMI DP, approved in September 1999, committed to meet the SDMP Action Plan criteria, specifically, 5 picoCuries per gram (pCi/g) total thorium and 5 pCi/g total uranium. Primary decommissioning activities occurred between 1999 and 2001, and consisted of facility decontamination and shipment of the stockpiled waste. HMI submitted a Final Status Survey (FSS) report in November 2001.

An NRC confirmatory survey in December 2001 indicated that contamination remained on surfaces within the mill buildings and that pockets of source material (> 0.05% by weight concentration) existed both in the footprint of the former stockpile area and around the mill building pads. The pockets around the mill pads were outside the boundaries of the defined NRC-licensed areas. HMI contended that these were localized areas where non-licensed sands from past operations (1972-1989) had been regraded and/or staged, and enough had built up to exceed the unimportant quantity concentration. The sands surrounding the pockets also contain elevated concentrations of thorium and uranium, although not in amounts exceeding 0.05%. NRC staff agreed that the elevated samples were not from the waste stream covered by the license, and did not amend the HMI license to add the material in these soil locations. However, because the concentration of source material in several locations exceeded the unimportant quantity exemption, they were deemed by NRC staff to be "licensable." The NRC required that HMI remediate the pockets to meet the contamination levels specified in the DP. Based on the confirmatory survey, the site did not meet the approved criteria for unrestricted release. Further, the NRC identified an apparent violation of the Decommissioning Timeliness Rule 10 CFR 40.42(h)(1), because more than 24 months had passed since approval of the DP. Following a January 8, 2003, Predecisional Enforcement Conference related to this apparent violation, HMI committed to a plan and schedule for completion of site remediation.

Further decommissioning in April/May of 2003 involved demolition and decontamination of the mill buildings and equipment, and excavation of the source material pockets. A second NRC confirmatory survey in September 2003 confirmed that the mill pads met the decommissioning criteria, but identified additional pockets of source material. Following remediation of these pockets in December 2004/January 2005, HMI and NRC performed a walkover survey and did not identify any remaining licensed material onsite.

The NRC performed a dose assessment of the licensed areas (the mill pads and former stockpile area) to determine the potential dose impact from the remaining residual radioactivity.

The mill pads were modeled assuming reuse of the structures for residential occupancy. The highest resultant dose, assuming an individual is continuously on either pad for 75% of a year, is 1.6 mrem/year. The former stockpile area was modeled using two potential scenarios to remain consistent with the realistic scenarios approach discussed in SECY-03-0069, "Results of the License Termination Rule Analysis," May 2, 2003. The most likely reuse scenario for the HMI site is the construction of a suburban housing development, based on licensee documented intent and development trends for the surrounding area. A "Suburban Resident" scenario assumes an individual is impacted by direct radiation exposure, inhalation and ingestion of re-suspended soil, and ingestion of produce grown in a private garden. The highest resultant dose from this scenario is 40 mrem/year. The other scenario examined for the contaminated soil is the "Resident Farmer," which is impacted by all the factors affecting the Suburban Resident, with the addition of: contaminated irrigation and drinking water, ingestion of animals raised onsite using feed and water from potentially contaminated sources, ingestion of fish from a potentially contaminated pond, and ingestion of a greater amount of produce. Although a residential farm is deemed an unlikely future use for the HMI site, and the tightly bound thorium and uranium in the monazite sands is not likely to contaminate the groundwater, it was evaluated as a bounding scenario. The highest resulting dose in this case is 83 mrem/year.

The staff dose assessment only considered the exposure to the public from the residual radioactivity within the boundary of the NRC-licensed areas. The average concentration of thorium-232 (the greatest contributor to radiation exposure) within this area is 2.3 pCi/g. The soil outside the NRC-licensed areas contains measured thorium concentrations ranging from well below 1 pCi/g to greater than 44 pCi/g. Source material concentrations outside the NRC-licensed areas may exist up to just below 0.05%. The dose to the public from the elevated concentrations of natural thorium and natural uranium from past site operations is expected to exceed the calculated dose within the licensed area. Because this material originated from unlicensed activities, and never reached the defined concentration of source material, NRC did not require its remediation. Decommissioning of the remainder of the site falls under the jurisdiction of the State of New Jersey. HMI has provided the New Jersey Department of Environmental Protection (NJDEP) its proposed plan for remediation of the entire site to the state cleanup levels, based on 15 mrem/year TEDE.

NRC staff has held numerous discussions with NJDEP staff regarding the licensing and decommissioning of the HMI site. The NJDEP has disagreed with NRC's licensing of only the source material and the plant structures and affected equipment. The State's position is that NRC should extend its jurisdiction over the whole site, and require that this entire area be remediated. The NJDEP also commented that the NRC dose assessment did not consider the dose impact from the material outside the boundaries of the NRC-licensed areas. The NRC staff maintains that NRC jurisdiction at the HMI site only extends to the waste and soil that contained concentrations that met or exceeded the 0.05% by weight definition of source material and the impacted equipment and structures. Earlier operations at the site also concentrated the native natural thorium and natural uranium in the soil, but not to levels that meet the definition of source material. The elevated thorium and uranium concentrations in this soil would exist at the site even if HMI had not concentrated source material and been required

to obtain an NRC license for a portion of the site. The remaining material at the HMI site falls under State jurisdiction.

The staff considered a NJDEP suggestion that NRC maintain oversight of the HMI site until the entire property has been remediated to the state cleanup standards. This would require holding the NRC license in abeyance until all decommissioning required by NJDEP at the site is complete. The NJDEP stated a concern that source material exceeding 0.05% by weight, and therefore, requiring a NRC license, may be discovered in subsurface areas during cleanup of the remainder of the site. The staff considers this to be an unlikely possibility based on the results of both NRC and licensee surveys of the areas around the former mill buildings and the remainder of the site impacted by mining operations. The staff concluded in its final walkover survey that all licensable material has been removed from the site. To address the state-regulated radioactive material, HMI submitted a site remediation plan to NJDEP that would use large scale soil mixing of the entire affected site. HMI indicated to the staff that this process may require several years to complete (the site may be remediated in sections). The staff concludes that requiring HMI to maintain its NRC license for this length of time, when there is no regulatory, public health, or safety-significant basis to do so, would constitute an undue burden.

HMI maintains that the dose from material in the NRC-licensed portion of the site does not exceed the LTR. The licensee provided its own analysis indicating that the dose from the residual radioactivity within these areas does not exceed 25 mrem/year. The NRC staff reviewed this analysis and provided a response to the comments and dose assessment received from HMI. While the NRC staff did not agree with all of HMI's dose assessment modeling input parameters, the NRC staff determined that HMI met the applicable cleanup criteria, i.e., SDMP criteria, established for this site, as described above.

The NRC staff has coordinated with the U.S. Environmental Protection Agency (EPA), Region 2 office on the current radiological status and proposed NRC actions regarding the HMI site. EPA acknowledged the staff's plan, and requested copies of the NRC Inspection Report and final dose assessment, as well as notification of the proposed public meeting in Manchester Township prior to license termination. The NRC staff provided copies of the NRC inspection report, which included the final dose assessment, to EPA Region 2 and to Manchester Township.

HMI was required to meet the grandfathered provisions of the LTR and was not required to meet the dose criterion of the LTR. HMI was required to comply with the decommissioning activities described in their approved DP, which met the license termination criteria in effect at that time. The staff has concluded that HMI has completed these activities. Additionally, the NRC dose assessment of this area indicates that the public dose limit of 100 mrem/yr, specified in 10 CFR 20.1301, will not be exceeded. The enclosed draft Environmental Assessment and *Federal Register Notice* provide the technical basis for the action and the Finding of No Significant Impact (Enclosures 2 and 3). A draft letter terminating the HMI license and dispositioning the open enforcement action is provided as Enclosure 4.

#### COMMITMENTS:

Listed below are the actions or activities committed to by the staff in this paper.

1. Publish in the *Federal Register* a Finding of No Significant Impact with respect to the proposed termination of the HMI license, and make the Environmental Assessment (EA) publicly available.
2. Announce and conduct a public meeting in the local vicinity to inform interested stakeholders of the results of the EA and Staff Dose Assessment that support the NRC staff plans to terminate the NRC license at the HMI site.
3. Meet with NJDEP to discuss the Commission's decision on this paper and planned next actions, in recognition of the State's concerns regarding this site.
4. Issue a letter terminating the NRC license and document the disposition of the open enforcement action regarding the timeliness of the decommissioning.

Commitment Nos. 1 and 4 are necessary activities for the termination of the HMI license. The staff proposes Commitment No. 2 due to past interest in site remediation from the state and local community. The staff proposes Commitment No. 3 to continue to coordinate with the State.

RECOMMENDATION:

The staff recommends that the Commission:

Approve, the recommended termination of HMI's NRC license and release the site for unrestricted use.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections.

***/William F. Kane Acting For/***

Luis A. Reyes  
Executive Director  
for Operations

Enclosures:

1. NRC Dose Assessment of HMI site (ML06060003)
2. HMI Draft Environmental Assessment
3. HMI Draft *Federal Register Notice*
4. Proposed Letter Terminating HMI License

**ENCLOSURE 1:**

**Dose Assessment for Unrestricted Future Use Scenarios  
Following License Termination of the Heritage Minerals,  
Incorporated, Site in Lakehurst, NJ**

**ML060060003**

## **FINAL REPORT**

### **DOSE ASSESSMENT FOR UNRESTRICTED FUTURE USE SCENARIOS FOLLOWING LICENSE TERMINATION OF THE HERITAGE MINERALS, INCORPORATED, SITE IN LAKEHURST, NJ.**

**By: David Brown and Christopher McKenney  
December 23, 2005**

#### **1. Introduction**

On June 7, 2005, Region I (RGN-I) submitted a technical assistance request (TAR) to the Division of Waste Management and Environmental Protection (DWMEP). RGN-I requested that DWMEP perform an assessment of radiological dose to the average member of the critical group, based on realistic future uses of dismantled and remediated mill structures and remediated soil at the Heritage Minerals, Inc. (HMI) site. The TAR further requested that DWMEP determine if the licensed portions of HMI meet the 10 CFR 20 Subpart E dose-based criteria for release for unrestricted use. As described further below, the purpose of the dose assessment is to determine whether, in accordance with approved procedure, the staff must request the Commission's approval to terminate HMI's license (License SMB-1541).

HMI is not required to meet the 10 CFR 20 Subpart E radiological criteria for license termination. HMI's decommissioning plan was approved prior to August 20, 1999. For this reason, and in accordance with Commission policy, HMI must meet the decommissioning criteria specified in Option 1 of the 1981 Branch Technical Position on "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations" (46 FR 52061) and U.S. Nuclear Regulatory Commission (NRC) Policy and Guidance Directive FC 83-23, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use for Termination of Byproduct, Source, and Special Nuclear Material Licensees." The purpose of the staff's dose assessment is solely to determine whether staff may terminate HMI's license, after HMI meets the applicable criteria, without prior approval from the Commission.

DWMEP staff conducted a comprehensive review and assessment using HMI site characterization and survey data. On July 19, 2005, DWMEP and RGN-I staff visited HMI to become familiar with site physical conditions and environmental surroundings. Subsequently, the staff evaluated potential future use scenarios of the HMI site. Based on these analyses and evaluations, suburban resident and resident farmer unrestricted release exposure scenarios were selected as future land uses. The re-use of the former building foundations (mill pads) was evaluated using a probabilistic approach using RESRAD-BUILD v. 3.22. For the soil areas, a probabilistic dose analysis using site specific parameters and applicable scenarios was performed using RESRAD 6.3.

## **2. Background**

### **2.1 Site Location and Description:**

The HMI facility is located in Lakehurst, Manchester Township, Ocean County, New Jersey. It is approximately 50 kilometers (30 miles) southeast of downtown Trenton, New Jersey. The site is bounded on the north and west by Route 70, on the northeast by the Central Railroad tracks and privately-owned properties, and on the south by the State of New Jersey and corporate or privately-owned properties. The overall site area is located on the Atlantic Coastal Plain. The area is characterized by sandy deposits that resulted from processes involving surface erosion, transport of eroded materials via slowing streams or water bodies, and deposition by wind creep and saltation in a shallow surface water environment. The deposition processes continued for sometime, accumulating thick deposits reaching a depth of 500 m (1500 feet). The bedrock is not encountered until a depth of 1000 m (3000 feet). The sandy deposits are typically permeable. The upper most shallow aquifer (the Cohansey aquifer) at the site is reached at a minimum depth of approximately 2 m (6 feet). However, the average depth of shallow wells at the site for industrial water use could reach approximately 8 m (25 feet). The plant manager indicated that the shallow aquifer well water may not be appropriate for drinking without a proper treatment to remove the high content of iron. However, the deep aquifer water at a depth of few hundred feet could be more appropriate for drinking.

The area is covered by vegetation, shrubs, and trees. There are some farms located within approximately 3 to 5 km (2-3 miles) of the site. The area also adjoins some creeks, streams, small lakes, and marshy land.

The entire site has an area of 2,800 hectares (7,000 acres) with approximately 116 hectares (287 acres) involved in the mining operations prior to licensing. The NRC licensed area comprises about 0.4 hectares (1 acre) across three non-contiguous areas on the site: two concrete pads, which are what remains of the Wet Mill and the Dry Mill; and the footprint of a large pile of monazite-rich sand that has been removed.

### **2.2 Historical Site Assessment**

#### *ASARCO Operations (1973-1986)*

From 1973 to 1982, HMI's predecessor company, ASARCO, conducted mining of the sand deposits (e.g., dredging), hydraulic (wet) gravity processing, and electro-magnetic (dry) separation to extract heavy minerals, such as, ilmenite from the sand. ASARCO mining and wet processing involved creating a pond for the dredge, pumping the dredge sand to a screening barge at a rate of about 1090 metric tons (MT) (1,200 tons) per hour, and then pumping the sand in a slurry to a processing plant where heavy minerals were concentrated using numerous spiral separators. This integrated wet gravity process was conducted in the 'Wet Mill.'

The wet mill tailings (mostly silica sand and water) are normally returned to the moving dredge pond as backfill. However, to enlarge the original dredge pond for adequate space for the dredging and operating equipment, the original one million tons of tailings (referred to as the ASARCO wet mill tailings) were stored at the dredge construction site located to the west of the old Central Railroad tracks.

Based on its history, the radionuclide concentration of these mine tailings is below the natural background concentration of the area and, hence, not licensable source material since all the heavy mineral fraction that contained monazite has been removed.

The heavy mineral fraction followed a different path downward through the spirals, and was dewatered, and stockpiled, outside the Wet Mill, for further processing at the rate of 45 metric tons (50 tons) per hour.

The excess wash water, containing the suspended clay washed from the heavy mineral fraction, was processed by decanting using the Wet Mill holding tanks (sumps). It was, then, pumped to a series of large area settling ponds located to the north of the Wet Mill. These settling ponds are identified as the 'Blue Area.'

The stockpiled heavy fraction contained monazite ( $\text{Fe}$ ,  $\text{Ce}$ ,  $\text{U}$ ,  $\text{Th}$ ,  $\text{PO}_4$ , and  $\text{ZrSiO}_4$ ), the concentration of which had been increased by a factor of 24. The factor of 24 is calculated by dividing the 1090 MT (1,200 tons) of dredged sand per hour by the 45 MT (50 tons) of heavy fraction produced per hour. The drained heavy mineral concentrate was transferred into a storage silo, and then fed by a conveyor into an oil-fired rotary kiln for drying at  $167.5\text{ }^\circ\text{C}$  ( $300\text{ }^\circ\text{F}$ ). The dried heavy sand fraction was then transferred to the Dry Mill for high-tension electrostatic separation and high-intensity magnetic separation.

The Dry Mill electrostatic process removed the electrically conductive mineral ilmenite for commercial use at a rate of about 27 MT (30 tons) per hour. Other minerals remaining in the concentrate were non-conductors and referred to as the Dry Mill tailings, which were produced at a rate of about 18 MT (20 tons) per hour. The Dry Mill tailings were mixed with water and pumped to a storage area east of the mill, which is also referred to as the 'Gray Area.'

NRC conducted an inspection of the Gray Area in January 1988 and collected soil samples. The Dry Mill tailings were determined by NRC to contain 180 parts per million (ppm) thorium plus uranium (Th+U). Therefore, the one million tons of material accumulated in the Gray Area contains less than 0.05 wt% (i.e., 500 ppm) uranium and thorium, and is not licensable source material.

ASARCO discontinued all operations at the site in 1982. In April 1982, ASARCO leased the site to Humphrey's Gold, Inc. for pilot scale tests of zircon extraction from the Dry Mill tailings. Humphrey's Gold operated the Wet Mill and Dry Mill for one month and placed test products and tails in the Gray Area. ASARCO sold the property to HMI in 1986.

### *HMI Operations (1986-1990)*

From October 1986 through August 1987, Mineral Recovery, Inc. (MRI) refurbished parts of the Dry Mill and conducted minimal break-in and tune-up operations at the site under a lease from HMI. HMI terminated MRI's lease in 1987 and started full-scale operations to recover zircon and additional titanium-bearing minerals that were left in the Dry Mill tailings located in the Gray Area. These Phase I operations continued (as described below) until February 1990, when the Gray Area feed was exhausted.

#### *Phase I (1987-1989)*

In the secondary process, the ASARCO Dry Mill tailings stockpiled in the Gray Area were mixed with water to form a slurry that was pumped to the Wet Mill at a rate of about 45 MT (50 tons) per hour. The vacuum-dried, heated product from the Wet Mill was fed to the Dry Mill titanium circuit. The wet mill tails were pumped to the area north of the wet mill now referred to as the Blue Area.

The product of the Dry Mill titanium circuit was market-grade leucozircon, a titanium-bearing mineral. The Dry Mill titanium circuit tailings were recycled to the Wet Mill by slurry with water. An NRC sample of the Dry Mill titanium circuit product showed that it contained 140 ppm Th+U, or less than the 500 ppm licensable limit.

Back at the Wet Mill, the recycled Dry Mill titanium circuit tailings were further refined by a hydraulic classifier and shaking tables. The second Wet Mill product stream was sent to another section of the Dry Mill called the 'zircon circuit.' The product of the zircon circuit was market-grade zircon containing 350 ppm Th+U. The zircon circuit tails, containing zircon and monazite, were fed to high-intensity magnets, which removed monazite, staurolite, and tourmaline. The product of the high-intensity magnets was market-grade zircon containing 350 ppm Th+U.

The tails of the magnetic separation stage, containing monazite, was slurried and returned to the Wet Mill, combined with other tailings and ultimately returned to the Blue Area. These tailings contained 120 ppm Th+U, as determined by NRC inspectors, and therefore, contains less than 0.05 wt% (i.e., 500 ppm) uranium and thorium, and is not licensable source material.

During Dry Mill operations, both ASARCO and HMI used "Mill Shutdown Avoidance Procedures" when equipment malfunctioned. This cost-savings procedure allowed the operable equipment in the mill to continue operating while any inoperable unit was being repaired or replaced. This practice resulted in heavy mineral concentrates being conveyed through portals in the south wall and stockpiled on the ground. Depending on which equipment failed, the dumped material could have contained monazite in concentrations exceeding 0.05 wt% Th+U. These spills were routinely graded and re-graded onto the surface and into the subsurface.

### *Phase II (1990)*

In early 1990, HMI had decided that sufficient zircon and titanium remained in the Blue Area tailings to warrant a second round of processing known as the Phase II of HMI operation. In this phase, tailings (enriched in monazite) of the Phase II operations were stored in a controlled area southeast of the Dry Mill known as the "Monazite Pile." In August 1990, after the processing of about 181,500 MT (200,000 tons) of tailings, HMI decided to terminate all operations due to economic turndown. The processing of the 181,500 MT (200,000 tons) of plant tailings resulted in the production of about 1270 MT (1,400 tons) of monazite rich product generated and stored in the Monazite Pile area.

HMI submitted an application for an NRC license on March 10, 1989. When the license was issued in January 1991, HMI had terminated all mineral recovery operations. The current license does not authorize production of source material, but directs the licensee to decontaminate buildings, equipment and the soil area at the monazite pile in accordance with NRC's Office of Nuclear Material Safety & Safeguards (NMSS) Policy and Guidance Directive FC 83-23, "Termination of Byproduct, Source and Special Nuclear Material Licenses," and Option 1 of the Branch Technical Position "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations," 46 FR 52061 (October 23, 1981) before areas are released to unrestricted use.

As a result of operations at ASARCO and HMI described above, the areas of the site affected by the handling and use of licensable source material were the Monazite Pile area, the Wet Mill and the Dry Mill.

### **2.3 Cleanup, Survey, and Decommissioning Activities:**

After the plant shut down in August, 1990, both mills (e.g., Wet and Dry Mills) were cleaned commercially. Equipment in the Wet Mill, used in Phase II operation, was washed down with high-pressure water until no sand was visible on or around the equipment. The sand and water remaining in the sumps and pumps were drained, collected, and transported to the "Monazite Pile." The equipment and structures in the Dry Mill were cleaned using high pressure air hoses.

After the plant cleanup, a gamma survey was performed in early 1991 on the buildings and equipment. In 1996, a survey of the natural background levels of U and Th within the soils was conducted by Radiation Science, Inc. In March 1997 and July 1997, Camp Dresser & McKee, Inc. conducted an investigation to characterize the mine tailings at the HMI site. The investigation consisted of surface gamma radiation survey, a subsurface soil investigation, and a groundwater and surface water investigation. The groundwater and surface water investigation confirmed that no significant radionuclide transport or elevated concentrations are occurring in the surface water or the aquifer system at the site.

In November 1997, HMI submitted a Final Status Survey Plan (FSSP) and requested unrestricted site release. HMI started remediation activities in 2001, after NRC's approval of the FSSP in 1999. In 2001, the material in the Monazite Pile was packaged in Department of Transportation approved inter-modal containers and shipped via truck and rail to International Uranium Corporation in Blanding, Utah, for use as an alternate feed material for the uranium mill. The packaging at the site was accomplished using a front-end loader to transfer material to waste packages. During loading, dust control measures were applied using mainly a water spray system in the area surrounding the pile. Residual monazite sands in the surface and subsurface soils were also removed.

HMI submitted a Final Status Survey Report (FSSR) in November 2001. An NRC confirmatory survey in December 2001 (report dated March 2002) identified several areas where licensable material was still present. NRC subsequently informed HMI that additional decommissioning actions would be necessary.

In May 2003, NRC approved a revised decommissioning plan which included demolition of the mill structures and the removal of pockets of fugitive licensable material in the soil. The demolition of the mill structures resulted in the creation of a stockpile of licensable material south of the Dry Mill, near the former monazite pile. This stockpile contained contaminated sand with total Th concentrations of 25-27 pCi/g, which is less than the 116 pCi/g value that corresponds to 0.05 wt% total Th ( $^{228}\text{Th} + ^{232}\text{Th}$ ).

In April 2003, Enercon, HMI's decommissioning contractor, implemented an approved decommissioning strategy.

In December 2003, another NRC confirmatory survey revealed the presence of nine additional pockets of fugitive licensable material in soils north of the Wet Mill pad, near the Dry Mill pad, and in and around the footprint of the former monazite pile. In June 2004, HMI provided NRC with a proposal to complete decontamination and disposal of remaining fugitive licensable soils within an identified buffer zone surrounding NRC-licensed areas. This proposal included disposition of the stockpiled waste soil that was created during dismantling and decontamination of the mill structures in 2003.

In November 2004, NRC approved HMI's proposal to remediate any material within the buffer zone which exceeds the unimportant quantity limit (116 pCi/g of total Th). NRC also directed HMI to dispose of the stockpiled waste as licensed material.

In December 2004, NRC inspectors observed excavation and shipping activities at HMI. Thirteen split samples were obtained with Enercon personnel from the nine excavated soil locations (ORISE 1-9). The stockpiled waste had not been completely removed, and would be sampled during a subsequent inspection. Enercon determined that four locations sampled in December required additional excavation to meet the release criteria. These locations were re-sampled in January 2005, along with the area under the former stockpiled waste.

### 3. Objective

The first objective of this study is to evaluate and select the appropriate scenarios compatible with the unrestricted use of HMI facilities (e.g., mill pads as well as soils contaminated with residual radioactivity). The second objective is to assess the dose impact to the average member of the critical group, as defined by the scenarios, from exposures to indoor and outdoor areas containing residual radioactivity. The purpose of the dose assessment is to determine whether the staff must request the Commission's approval to terminate HMI's license (SMB-1541).

### 4. Analysis Methodology

Staff evaluated available information on the HMI site and its surroundings. The information included the general geology, the hydrology, the demography, and the generic activities of inhabitants within a few mile radius from the site. Such information helped the staff in assessing the potential uses of mill pads, as well as the selection of appropriate scenarios based on site-specific conditions and possible uses of HMI facilities. The staff evaluated the available site-specific characterization and survey data to assess the extent of contamination (e.g., horizontal/vertical) and subsequently establish the appropriate source term(s) for the dose modeling analysis. The staff also evaluated surface water and groundwater monitoring data, as well as survey information on radiological background levels and the unaffected areas.

The main radionuclides of concern in this analysis include: total uranium (primarily,  $^{238}\text{U} + ^{234}\text{U}$ ) and total thorium ( $^{232}\text{Th} + ^{228}\text{Th}$ ) in equilibrium with progeny in their respective decay chains.

For the mill pads, staff evaluated final status survey data contained in the March 2005 license termination request. This data include gross beta readings of removable and fixed plus removable contamination that remains on the pads. Gross readings using the Ludlum 43-68 alpha/beta detector were converted to estimates of area concentrations ( $\text{pCi}/\text{m}^2$ ) of  $^{232}\text{Th}$  and its progeny, assuming secular equilibrium. Thorium-232 was selected, rather than  $^{238}\text{U}$ , or any combination of the two, because  $^{232}\text{Th}$  results in a higher dose ( $\text{mrem}/\text{yr}$ ) per unit of surface activity ( $\text{pCi}/\text{m}^2$ ). A statistical summary of pad contamination level measurements is provided in Table 1.

To estimate the average uranium and thorium concentrations within the monazite pile footprint, staff used the final confirmatory survey results for soil samples obtained by Enercon in April 2003, and confirmatory sample results obtained by NRC in 2003 and 2004. These sample results are provided in Table 2. To calculate the isotopic concentrations, total uranium is assumed to be natural uranium with 49% of the activity being U-238, 49% U-234, and 2% U-235. Therefore, the average isotopic concentrations are 2.37  $\text{pCi}/\text{g}$  of U-238 and U-234 each, and 0.1  $\text{pCi}/\text{g}$  of U-235. For total thorium, the activity is 50% from Thorium-228 and 50% from Thorium-232, and therefore, the isotopic concentration is 2.3  $\text{pCi}/\text{g}$  each.

**Table 1. Statistical Summary of Wet and Dry Pad Residual Surface Contamination Levels (1)**

Statistic	Total DPM/100 cm <sup>2</sup>	<sup>232</sup> Th, Bq/m <sup>2</sup> (2)
Minimum Value	0	0
Maximum Value	442	74
Average Value	180	30

Notes:

(1) Statistics based on 60 measurements of the Wet Mill and Dry Mill pads.

(2) Estimate of <sup>232</sup>Th surface concentration is based on an assumption that 10% of measured alpha/beta radiation measured using a Ludlum 43-68 is <sup>232</sup>Th, with remainder attributable to <sup>232</sup>Th daughters in secular equilibrium. The factor for converting from DPM/100 cm<sup>2</sup> to Bq/m<sup>2</sup> is 1.67.

**Table 2. Soil Sample Results Inside the Monazite Pile Footprint: Background Subtracted**

Sample ID	Date	Total Uranium, pCi/g	Total Thorium, pCi/g
NRC-04-07	December 2004	3.15	11.78
NRC-04-08	December 2004	1.75	5.12
ORISE 36	September 2003	<background	0.38
ORISE 37	September 2003	0.65	1.5
ORISE 38	September 2003	4.65	10.06
17-10	April 2003	7.5	5.57
17-10N	April 2003	4.38	1.64
17-10E	April 2003	5.35	10.55
17-10S	April 2003	3.1	0.4
17-10W	April 2003	9.55	3.24
17-11	April 2003	3.25	1.73
17-11N	April 2003	7.28	4.1
17-11E	April 2003	5.58	3.6
17-11S	April 2003	9.62	5.38
17-11W	April 2003	6.75	4.07
Average		4.84	4.6

## **5. Data Analysis and Exposure Scenarios**

### **5.1 Scenario for Soil Unrestricted Use**

The staff employed the approach in NUREG-1727 for analysis of potential exposure pathways from unrestricted use of decommissioned soil. The staff evaluated the physical conditions at the site (e.g., soil characteristics, groundwater conditions, climate, topography, and geology) and current inhabitants' activities around the site.

Year 2000 census information indicates that in Manchester Township, NJ, only about 0.1% of the population works in the farming, fishing, or forestry occupation. Also, the NJ Department of Labor and Development projects that there will be no job growth in these occupations in Manchester Township through 2012. Further, a distinct majority of the population in Manchester Township (64.7%) is over 55 years old, with a median age of 67.7 years. There are currently 217 small farms covering about 12,239 acres in Ocean County, which is less than 3% of the county's land area of 636 sq. miles. The property owner is specifically interested in building residences at the site.

The soil in Ocean County is sandy with some silt and clay contents and is suitable for agricultural uses. Therefore, there is no physical evidence to exclude the potential use of the soil in farming activities. The quality (e.g., salinity) and quantity of well water (withdrawn from shallow and deep aquifers) is appropriate for irrigation, livestock, and human domestic uses. Though a plant manager had previously indicated that the shallow groundwater was unsuitable for drinking due to high iron concentrations, staff have conservatively assumed that the water is potable, as described below.

Given the land use patterns and demography of Manchester Township, and the interest of the current owner in developing the site for residential use, staff postulated that a suburban resident is a reasonably foreseeable future use scenario for unrestricted use of the HMI site. A suburban resident would be subjected to several radiological pathways, including direct radiation exposure; inhalation and ingestion of re-suspended soil; and ingestion of produce grown in a private garden. It is unlikely that a suburban resident would either be exposed to groundwater from a private well, or could raise animals using feed and water from potentially contaminated sources. A suburban resident is also unlikely to obtain fish from a pond filled with water from a potentially contaminated aquifer.

Staff also evaluated a resident farmer scenario. Though this scenario is considered less likely than that of the suburban resident, it is evaluated here for completeness. A resident farmer would be exposed to the same pathways as the suburban resident, and the following additional pathways: Use of a contaminated aquifer to supply irrigation; ingestion of animal products grown onsite and using feed and water from potentially contaminated sources; ingestion of fish from a pond filled with water from the aquifer; and human ingestion of drinking water from the aquifer.

## 5.2 Mill Pad Scenario

This portion of the site is comprised of two pads remaining from dismantlement of the Wet Mill (WM) and Dry Mill (DM) buildings. The WM pad is 69.8 m (229 ft) long x 30.2 m (99 ft) wide, which is an area of 2108 m<sup>2</sup> (22,671 ft<sup>2</sup>). The DM pad is approximately 36.6 m (120 ft) long x 29.0 m (95 ft) wide, which is an area of 1061 m<sup>2</sup> (11,400 ft<sup>2</sup>). A plausible exposure scenario involves both direct radiation exposure to residual monazite present on the pads, and inhalation of monazite dusts by an individual on or near the pads. The pads are either in too poor condition following dismantlement, or are too specialized in design (including monolithic concrete forms and structures used to bear extremely heavy processing equipment), to be useful as foundations for future structures.

## 6. Assumptions and Input Parameters

For contamination on pads, the following assumptions and parameters were used:

### Pad Assumptions:

- (i) The receptor is assumed to be in the center of the pad. Pad centers were determined by the specific building dimensions (e.g., WM: 69.8 m x 30.2 m; and DM: 36.6 m x 29 m).
- (ii) The occupancy factor is estimated to be 0.75. No shielding factor is applied.
- (iii) The dose is estimated using RESRAD-BUILD v. 3.22.
- (iv) The surface concentration of Thorium-232 is calculated for the average value of fixed plus removable contamination remaining on the pad (see Table 1).

Table 3 presents important input parameter values used in RESRAD-BUILD v. 3.22. Table 3 also presents sensitive parameters and corresponding distributions selected for RESRAD-BUILD probabilistic runs.

For contamination in the surface soil the following assumptions and parameters were used:

### Surface Soil Assumptions:

- (i) The contamination is homogeneously distributed in the top 1.0 m.
- (ii) There is no surface soil cover layer (e.g., thickness of cover was set to zero).
- (iii) An average annual precipitation of 1.20 m was selected.
- (iv) The thickness of the unsaturated layer was assumed to have a bounded log-normal distribution with a mean value of 2.00 m, a standard deviation of 1.276 m, a minimum thickness of 0.18 m, and a maximum thickness of 10.0 m.
- (v) The area of contaminated zone was assumed to be 2000 m<sup>2</sup>.

- (vi) The length parallel to the aquifer was assumed to have a uniform distribution with a minimum value of 20 m and a maximum value of 200 m.
- (vii) The distribution coefficients for each isotope of uranium and thorium for the contaminated zone, the unsaturated zone, and the saturated zone were assumed to have log-normal distribution. All the isotopic distributions were assumed to be perfectly correlated with each other (i.e., the distribution coefficient for U-234 was highly similar to the distribution coefficient for U-238).
- (viii) The consumption rates of food-stuffs and both indoor and outdoor exposure times is based on the critical group descriptions in NUREG/CR-5512, Volume 3.
- (ix) The contamination fraction for the resident farmer is calculated by RESRAD using an area factor. For the suburban resident, the contamination fraction is set to 0.1.
- (x) The soil-to-plant transfer factors were assumed to have a log-normal distribution for each radionuclide.
- (xi) The soil was assumed to be primarily of a sandy silt soil. Therefore, soil physical parameters were selected to correspond with the assumed soil type.
- (xii) Groundwater was assumed to be uncontaminated (e.g., with background concentration). The critical group receptor drinking water intake was assumed to be 510 L/yr for the resident farmer scenario. The suburban resident is not assumed to use a well onsite.
- (xiii) The depth of roots for the plants used the default uniform distribution from RESRAD with a minimum value of 0.3 m and a maximum value of 4 m.

#### Surface Soil Input Parameters Selections:

Table 4 presents important input parameters values used in RESRAD 6.3. Table 5 presents sensitive parameters and corresponding distributions selected for RESRAD 6.3 probabilistic runs.

## **7. Results**

The dose to a potential suburban resident and resident farmer was calculated for the pads and surface soil. The approach and methodology are described above. The assumptions and input parameters and distributions used in this dose assessment are listed in Tables 1-5. Table 6 presents a summary of the doses derived for pads and soil within the former monazite pile footprint.

The Total Effective Dose Equivalent (TEDE) to an individual standing on or near either pad is about 1.6 mrem in the first year. The dose decreases significantly in the second year and thereafter, because the removable component of the source is nearly all blown downwind during the first year. The important pathways for the first year dose on the pad include ingestion (94% of the TEDE), and inhalation (6% of the TEDE). The dose during the second year is 0.0065 mrem/yr, which is all attributable to the direct radiation (external) dose pathway.

The peak of the mean TEDE to a suburban resident living within the footprint of the former monazite pile is about 40 mrem/yr, which occurs in the first year following termination. The direct radiation dose pathway is predominant, with the predominate radionuclides being radium-226, thorium-228, and thorium-232. The dose to the resident farmer is higher, with the peak of the mean TEDE of about 83 mrem/yr. For the resident farmer, the direct radiation dose and water-independent produce consumption pathways, for radium-226, thorium-228, and thorium-232, are predominant. For the farmer, soil ingestion contributes about 1% of the TEDE, and meat and milk ingestion, and dust inhalation pathways combined contributing another 1%.

**Table 3. RESRAD-BUILD Important Input Parameters for Mill Pads**

Parameter	Unit	Value	Distribution	Remarks
<sup>232</sup> Th Concentration	Bq/m <sup>2</sup>	30	NA	Table 1
Receptor location	m	22.9, 22.9, 1.5	NA	1.5 m height from source
Receptor exposure duration	d	365.25	NA	
Indoor fraction		0.75	NA	
Receptor time fraction		1		receptor is located in one room
Deposition velocity	m/s	0	NA	assumes windborne dust does not settle
Resuspension rate	1/s	5E-7	Log-Uniform min 2.8E-10 max 1.4E-05	default
Room height	m	3	NA	
Air exchange rate	1/h	78.5	Uniform min 40 max 200	air exchange caused by wind on an open pad
Receptor inhalation rate	m <sup>3</sup> /d	28.8	NA	light industry
Number of sources		1	NA	one room
Source direction		floor Z	NA	perpendicular to the exposed area
Air release fraction		0.1	triangular mode 0.07 lower quantile 1E-05 upper quantile 0.75	
Room area	m <sup>2</sup>	2108	NA	Wet mill pad area
Direct ingestion rate	1/h	4.91E-7	loguniform min 1.0E-7 max 1.0E-6	
Removable fraction		0.2	NA	based on pad survey results
Time for source removal	d	365	NA	
Shielding thickness	cm	0	NA	

**Table 4. RESRAD 6.3 Important Input Parameters for Surface Soil**

Parameter	Unit	Value	Distribution	Remarks
Radionuclide Concentration, <sup>234</sup> U	pCi/g	2.37	NA	Average values calculated from data in Table 2
Radionuclide Concentration, <sup>235</sup> U	pCi/g	0.1	NA	
Radionuclide Concentration, <sup>238</sup> U	pCi/g	2.37	NA	
Radionuclide Concentration, <sup>228</sup> Th	pCi/g	2.3	NA	
Radionuclide Concentration, <sup>232</sup> Th	pCi/g	2.3	NA	
Cover depth	m	0.0	NA	
Thickness of contaminated zone (CZ)	m	1.0	NA	Based on survey results
Density of contaminated zone (CZ)	g/cm <sup>3</sup>	1.50	NA	Soil type & licensee value
Area of CZ	m <sup>2</sup>	2000	NA	
Length parallel to aquifer flow	m	20-200	Uniform	
CZ erosion rate	m/yr	1.0E-03	NA	RESRAD Default
CZ & unsaturated zone (UZ) hydraulic conductivity	m/yr	20	NA	Site
Precipitation Rate	m/yr	1.20	NA	Site
UZ thickness	m	0.15	NA	Site
Saturated zone (SZ) hydraulic conductivity	m/yr	200	NA	Site
Contamination Fraction (suburban resident)	-	0.1	NA	RESRAD Default
Indoor Time Fraction	yr	0.657	NA	NUREG/CR-5512, Vol. 3
Outdoor Time Fraction	yr	0.11	NA	NUREG/CR-5512, Vol. 3
Fruit, Vegetable, Grain Consumption	kg	112	NA	NUREG/CR-5512, Vol. 3
Leafy Vegetables Consumption	kg	21	NA	NUREG/CR-5512, Vol. 3

**Table 5. Sensitive Parameters and Corresponding Distributions Selected for Resrad 6.3 Probabilistic Runs for Surface/subsurface Contamination**

<b>Parameter/Unit</b>	<b>Distributions</b>	<b>Mean (Mu), Standard Deviation &amp; Other Parameters</b>
K <sub>d</sub> for Uranium isotopes (CON, US, and SAT zones); cm <sup>3</sup> /g (correlated)	Log-Normal	Mu 1.75 σ 3.15
Plant transfer factor for Uranium; dimension less	Log-Normal	Mu -6.21 σ 0.916291
K <sub>d</sub> for Thorium (CON, US, and SAT zones); cm <sup>3</sup> /g (correlated)	Log-Normal	Mu 6.1 σ 1.7
Plant transfer factor for Thorium; dimension less	Log-Normal	Mu -6.91 σ 0.916291
K <sub>d</sub> for Radium isotopes (CON, US, and SAT zones); cm <sup>3</sup> /g (correlated)	Log-Normal	Mu 8.17 σ 1.7
Plant transfer factor for Radium; dimension less	Log-Normal	Mu -3.22 σ 0.916921
Length parallel to aquifer, m	Uniform	Min 20 Max 200
Unsaturated zone thickness, m	Bounded Log-Normal	Mu 2.0 σ 1.276 Min 0.18 Max 10.00
Depth of Roots, m	Uniform	Min 0.3 Max 4

**Table 6. Total Effective Dose Equivalent for Potential Future Land Uses at Heritage Minerals, Inc, Lakehurst, NJ**

Survey Units	Source Description	Radionuclides	Average TEDE, mrem/year
Wet Mill and Dry Mill Pads	Concrete pads remaining from dismantled buildings and structures	(Monazite)  U-238 + U-235 + U-234 + Th-232 + Th-228 + progeny in secular equilibrium	1.6
Former monazite pile footprint	Outdoor sandy soil contaminated with residual radioactivity		Peak of the Mean TEDE, mrem/year
			(suburban resident) 40  (resident farmer) 83

## 8. Summary and Conclusion

Staff evaluated scenarios for reuse of HMI pads and the outdoor surface soil at the site of the former monazite storage pile. Staff calculated the dose to the average member of the critical group for each scenario. These doses were calculated using a probabilistic methodology based on the RESRAD-BUILD v. 3.22 model for the pad scenario, and probabilistic RESRAD 6.3 codes and specific input parameters or parameter distributions for the monazite pile footprint which correspond to HMI site-specific conditions.

The dose result for the average member of the critical group exposed to residual radioactivity at the monazite pile footprint means that the staff requires Commission approval to terminate the HMI license (License SMB-1541).

U.S. NUCLEAR REGULATORY COMMISSION  
DOCKET NO. 040-08980  
June 26, 2006

Draft Environmental Assessment for the Proposed Termination of  
U.S. Nuclear Regulatory Commission Materials License No. SMB-1541,  
Issued to Heritage Minerals, Inc. in Manchester Township, New Jersey,  
and Release for Unrestricted Use

## **Introduction**

The U.S. Nuclear Regulatory Commission (NRC) has prepared this Environmental Assessment for the proposed termination of the Heritage Minerals, Inc. (HMI) materials license number SMB-1541, and the release of the NRC-licensed areas of HMI's Manchester Township, New Jersey site (Heritage) for unrestricted use. HMI was authorized by NRC from January 2, 1991, to decontaminate affected portions of the land and facilities, and to store and transfer natural thorium and natural uranium from past site operations. On March 4, 2005, HMI requested that NRC terminate the license and release the facility for unrestricted use. HMI has conducted surveys of the facility and determined that the facility meets the requirements for release for unrestricted use specified in its NRC-approved Decommissioning Plan (DP). The NRC staff has evaluated the request from HMI and the results of the surveys, performed independent, confirmatory measurements and a quantitative dose assessment, and has developed this Environmental Assessment (EA) in accordance with the requirements of 10 CFR Part 51. The NRC has determined that a Finding of No Significant Impact (FONSI) is appropriate for the proposed action.

## **The Proposed Action**

By letter dated March 4, 2005, HMI has requested to have its NRC Materials License No. SMB-1541 terminated and the site at Mile Marker 41 on Route 70 in Manchester Township, New Jersey released for unrestricted use. HMI stated that no further actions are required to remediate the location. HMI has provided surveys and documentation showing that it has met the decommissioning requirements of its approved DP.

## **Purpose and Need for the Proposed Action**

The proposed action is to have NRC Materials License No. SMB-1541 amended to allow for the release of the Heritage site for unrestricted use and to terminate the license. The licensee is completing the requirements of 10 CFR 40.42(h)(2), which states that a licensee shall request termination of its license upon completion of decommissioning. The NRC is fulfilling its responsibilities under the Atomic Energy Act to make a timely decision on a proposed license amendment for release of facilities for unrestricted use and termination of a license that ensures protection of public health and safety and the environment.

## Site Background Information

HMI requested release for unrestricted use of the NRC-licensed areas at the Heritage site as authorized by NRC License No. SMB-1541, and termination of the license. HMI was authorized by the NRC from January 2, 1991 for the possession of radioactive materials resulting from past operations at the site, and for decommissioning of the affected portions of the site. The facility had been used in 1972 to 1990 for the mechanical processing of dredged, native sands to extract various heavy minerals (zirconium and titanium). The native sand also contained natural uranium and monazite (an ore containing natural thorium), which were incidentally concentrated due to the processing operations. A process change in 1989 led to reprocessing of previously-stockpiled tailings (unwanted sands from earlier processing). The resultant waste stream from this process contained sufficient concentrations of natural radioactive material to require an NRC license. 10 CFR, Part 40 "Domestic Licensing of Source Material" defines source material, in part, as ores which contain by weight, one twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof. The 10 CFR 0.13(a) cites an exemption to NRC regulations for source material which is by weight less than 0.05% of the mixture, compound, solution, or alloy.

Although the Heritage site comprises almost 7000 acres, processing activities were confined to approximately 287 acres, and the remainder of the site was not utilized. Within this smaller area, the NRC-licensed areas (those areas involving licensed material), consisted of portions of two mill buildings and a stockpile of approximately 1400 tons of licensed material. The Wet Mill was a three-story steel structure on a 229' X 99' concrete slab. The Dry Mill was also a three-story steel structure, and was situated on a 120' X 95' concrete slab. Both mill buildings have been demolished and only the concrete pads remain. The 1400 tons of stockpiled licensed material was stored within a fenced area. The material has been shipped offsite and the fence removed. Together, the NRC-licensed portions of the site comprise less than one acre.

### *Site Description*

The Heritage site is predominantly flat, but has been recontoured by surface mining activities. The area is characterized by thick sandy deposits, resulting from surface erosion, water transport, and wind deposition. The sand reaches a depth of 1500 feet, with underlying deposits of stratified clay, silt, sand, and gravel over bedrock that is not encountered until 3000 feet. Two lakes were formed as a result of the mine dredging operations. Groundwater flow occurs from areas located north and west of the site to east and northeast towards the tributaries of the Toms River. The Toms River and its tributaries form the major groundwater discharge zones for the region. Site groundwater is recharged by precipitation and flows unconfined through the permeable underlying sands. The upper most shallow aquifer (Cohansey) is reached at a minimum depth of approximately six feet. The licensee indicated that the shallow aquifer water may not be potable without treatment to remove high iron content. However, deep aquifer water at a depth of a few hundred feet could be more appropriate for drinking.

The mill and tailings area are relatively free of vegetation, but the remainder of the site is covered by shrubs and trees. The current land use of the property is limited to state-required fuel oil remediation. Areas adjacent to the site are predominantly rural and residential. The area also adjoins some creeks, streams, small lakes, and marshy land.

### *Site Operating History*

The Heritage site was originally owned and operated by ASARCO, Inc. (ASARCO). In the late 1950s, ASARCO investigated the area around the site for deposits of titanium-bearing minerals. In 1960, ASARCO purchased 7000 acres for the purpose of titanium mineral recovery. In 1968, design and construction of the mineral recovery plant began, and was completed in 1973. Between 1973 and 1982, ASARCO dredged and processed native sands to extract ilmenite, a titanium-bearing mineral. The mined sand contained mostly (95%) light silica sands, clays, and gravels. The remaining 5% consisted of the titanium-bearing minerals ilmenite, leucosene, and rutile, as well as other heavy minerals, including zircon, thorium, and uranium.

The ASARCO operation was completely mechanical (i.e. no chemical processing took place). Dredged sands were screened for size and pumped to a Wet Mill, where gravity separation removed the lighter silica from the heavy minerals (concentrate). The silica was returned to the dredging pond as backfill, and the concentrate was stored on the ground east of the Wet Mill to dewater and be fed into a Dry Mill with front-end loaders. The concentrate pile was continually being added to, graded, blended, and picked up throughout this process. In the Dry Mill, the material was conveyed through dryers and electrostatic and electromagnetic mineral separators. The non-conductor materials (including zircon, thorium, and uranium) were stored on site in a location designated the Gray Area. The ilmenite product was stored until shipment. ASARCO ceased operations in March 1982, and leased the site to another company (Humphrey's Gold, Inc.) that wished to process the Gray Area material for commercial grade zircon. The company leased the site for six months, and conducted unsuccessful pilot tests for one month. All of the processed and waste material was returned to the Gray Area.

From the end of the Humphrey's Gold lease until 1986, ASARCO maintained the site in standby. In 1986, HMI purchased the property and leased the plant to Mineral Recovery, Inc. (MRI). The MRI successfully processed the Gray Area material for its zircon content by sending it through a smaller dryer. The waste material from this process was stored in a location north of the Wet Mill, called the Blue Area. The MRI operated the site from October 1986 until August 1987, when HMI assumed control over site operations, and processed the remaining Gray Area material. Tests indicated that the stored Blue Area material also contained sufficient amounts of the desired minerals, and HMI began processing it.

HMI's reprocessing of the Blue Area material resulted in uranium and thorium concentrations in excess of 0.05% by weight (specifically, after the light fraction had been removed in the Wet Mill). An NRC inspection performed on January 12, 1989, identified that HMI was concentrating source material, and that an NRC license was required. Following the inspection, HMI separated the source material from all other waste material, and stored this sand under tarps. Later, HMI erected a fence around this stockpile area. On March 10, 1989, HMI submitted an application for an NRC source material license.

Before the license was issued, reduced demand and prices for zircon caused HMI to suspend all processing operations. On August 23, 1990, HMI informed the NRC that the plant would be placed in standby until market conditions improved. In the meantime, HMI stated that they would initiate decontamination of the plants and equipment. Between 1989 and the cessation of plant operation, HMI had processed 200,000 tons of Blue Area material. As a result, an estimated 1000 tons of source material had been segregated and stockpiled for disposal. HMI never restarted processing operations.

### *Site Licensing*

The original HMI license application, submitted on March 3, 1989, requested NRC approval to possess source material that was incidentally created through the processing of site native soil. Before the license was issued, HMI ceased all processing activities, and the only source material on site was the stockpiled waste and any residual material within the Wet and Dry Mill equipment and structures. The original processing operations performed at the site from 1973-1989 had also resulted in elevated concentrations of natural thorium and natural uranium in the material stored in the Gray Area and in the Blue Area, and periodically staged and re-graded around the mill buildings. Because these concentrations had not exceeded 0.05% by weight, however, they were exempt from NRC requirements, as specified in 10 CFR 40.13(a).

On January 2, 1991, the NRC issued License No. SMB-1541 authorizing Heritage Minerals, Inc. to possess the stockpiled source material and to perform decommissioning of the impacted areas of the site. The license required decontamination of the impacted portions of the mill buildings and of the stockpiled source material. Plant buildings and equipment were specified to be decontaminated so that fixed and removable contamination met NRC release limits for unrestricted release stated in NRC's Office of Nuclear Materials Safety & Safeguards (NMSS) Policy and Guidance Directive FC 83-23, "Termination of Byproduct, Source, or Special Nuclear Material Licenses" (November 4, 1983). The stockpile was required to be remediated to 10 pCi/g above background for total thorium and uranium, based on Option 1 of the Branch Technical Position "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations" (October 23, 1981). The cleanup criteria were derived from the concentration-based decommissioning guidelines in place at the time.

The NRC licensing and oversight of the Heritage site acknowledged that above-background concentrations of natural thorium and uranium existed in sands placed and graded around the plant during previous processing operations. However, in accordance with 10 CFR 40.13(a), material "in which the source material is by weight less than one-twentieth of 1 percent (0.05%) of the mixture, compound, solution, or alloy," is exempt from NRC regulations, so decommissioning of the site did not require removal of this exempt material. State regulations may necessitate additional remediation at the site to remove this other concentrated material. The complexity of this site, where NRC-regulated material and potentially-state-regulated material are in such close proximity (and layered over each other in some locations), prompted NRC to add the Heritage site to its Site Decommissioning Management Plan (SDMP) in April 1992. The SDMP was created in 1990 to effect the decommissioning of sites with unique concerns warranting special attention by the Commission.

On November 3, 1997, HMI submitted a Decommissioning Plan (DP) describing final cleanup and disposal of the stockpiled source material and remediation of mill buildings and equipment. The DP specified the decommissioning cleanup levels and described activities and methods for protecting workers and the public during removal of the waste and survey and decontamination of the mill buildings and equipment. NRC's assessment of the DP was published in the *Federal Register* on September 1, 1999 (64 FR 47872 - 47877), and the plan was formally approved on October 19, 1999.

Published in 2001, 10 CFR 20 Subpart E ("The License Termination Rule" (LTR)) bases the termination of NRC licenses and the release of facilities for unrestricted use on meeting residual radioactivity levels (distinguishable from background) that do not result in a Total Effective Dose Equivalent to an average member of the critical group above 25 millirem (mrem) per year. The rule was a change from prior practice, which based release of a site for unrestricted use on meeting specific contamination cleanup levels. When the LTR was published (62 FR 39088), a provision was included (10 CFR 20.1401(b)(3)) to "grandfather" sites with DPs submitted to the NRC before August 20, 1998 and approved by August 20, 1999 (the approval date was extended to August 20, 2000 for twelve sites, including Heritage Minerals, in SECY-99-195). Decommissioning of grandfathered sites is performed in accordance with the SDMP Action Plan (SECY-92-106), under which cleanup criteria are based on residual contamination levels. Remediation is considered to be complete when the actions described in the approved DP are completed. When a grandfathered site is being considered for release for unrestricted use, a dose analysis must be performed to determine if the site falls below the 25 mrem/year dose criterion in the LTR. If the dose criteria are not met, Commission approval must be obtained prior to termination of the license and release of the site for unrestricted use. The results of the dose analysis for Heritage are described in a later section of this EA.

#### *Site Decommissioning*

The Heritage site has undergone various stages of decontamination and decommissioning (D&D). The first such activities took place between September 1990 and January 1991, and consisted of dismantling the Wet Mill equipment, and washing down the mill structure and equipment until surface readings were decreased to 20 mrem/hr. High pressure water and steam were then used, and any residual sand was physically removed from the equipment. The Dry Mill structure and equipment was also dismantled, but was cleaned using blown air, dusting, and sweeping. Sands recovered from these operations were added to the stockpiled source material for disposal. On May 22, 1991, NRC performed confirmatory contamination surveys and identified no loose contamination on equipment within the mill buildings.

In March 2001, HMI hired a contractor to perform site D&D. By October 2001, the stockpiled source material had been loaded and shipped to International Uranium Corporation (IUC) in Blanding, Utah. In addition to the 1400 tons of stockpiled material, the contractor excavated soil underneath the pile to reach the 10 pCi/g thorium and uranium cleanup criterion. During this campaign, Heritage shipped approximately 3,385 tons of soil from the site. HMI also surveyed and decontaminated both the wet mill and the dry mill buildings and equipment. Surveys and soil samples performed by HMI indicated that remaining soil in the source material storage area met the 10 pCi/g total thorium and uranium criterion. Surveys of the mill buildings and equipment showed that residual contamination levels also fell below the NRC release criteria. A description of decommissioning activities and the results of these surveys were submitted by HMI as the Final Status Survey (FSS) for the Heritage site on November 25, 2001.

The NRC confirmatory surveys of the site, performed on December 10-13, 2001, showed that residual contamination exceeding the unrestricted release criteria remained in the mill buildings and on equipment. In addition, soil samples taken from the stockpile area and around the mill buildings identified locations with remaining source material concentrations greater than the 10 pCi/g release criterion. Additionally, some of the locations around the mill buildings had source material concentrations exceeding 0.05% by weight.

On April 23, 2002, NRC and HMI met to discuss the results of the confirmatory survey and the actions that would be required to complete site remediation. HMI explained that the identification of concentrated thorium and uranium around the mill buildings was understandable given the pre-licensing operations at the site. As described in the *Site Licensing* section above, when portions of the plant process were shut down for repairs, the sand from the other process trains would be staged around the mill buildings. These piles were continually added to and graded around the site. HMI maintained, and NRC agreed, that this practice had resulted in concentrating the source material to levels below 0.05% by weight, which were not regulated by NRC. HMI further maintained that this process had created "pockets" of soil where the source material concentration exceeded 0.05% by weight. This material was considered "licensable" because it exceeded 0.05% by weight concentration of source material, but was concentrated to this amount by the staging and regrading of lower concentrations of source material during, pre-NRC licensed activities.

In a letter dated November 22, 2002, HMI prepared a mass balance report showing that while only 1400 tons of source material had been created at the site, approximately 3385 tons of soil had been shipped to IUC, thus ensuring that all licensed material had been removed. HMI also committed to remediating the "licensable" soil pockets, and proposed to perform a new characterization survey of the soil areas around the mills and stockpile area to identify any such material. On May 6, 2003, HMI submitted final remediation plans to the NRC, which included total demolition of the mill buildings and remediation of seventeen identified soil pockets of licensable material.

Regardless of the time period during which the material had been placed around the site, NRC determined that HMI was responsible, under the NRC license, to remove all soil pockets where uranium and thorium concentration exceeded the exempt concentration in 10 CFR 40.13(a). In a letter dated May 19, 2003, NRC concurred with HMI's description of the licensable soil pockets, and required that they be remediated to 10 pCi/g total thorium and uranium.

The contaminated soil pockets were subsequently excavated, sampled, and backfilled with clean sand. The excavated soil (313 tons) was packaged and shipped to IUC. HMI demolished both mill buildings and decontaminated the equipment and pads using power washers. Only the concrete slabs remain of the mill buildings. Residual sand from the steel cleaning processes which had collected on the slabs was collected and staged for later disposition. Uncontaminated support buildings, used for equipment storage and office space, were left intact.

On September 8-10, 2003, NRC performed a second confirmatory survey. This survey identified some elevated contamination on the mill pads, which were immediately decontaminated by HMI. These activities completed remediation of the mill pads. The NRC also performed a surface scan of the soil around the mill pads and the stockpile area. Soil samples were obtained where the scans identified elevated levels of contaminants, and the sample results identified additional pockets of licensable material in previously-unexcavated areas.

On June 30, 2004, HMI proposed a new plan to complete remediation activities which included defining the site boundary within which NRC-licensed operations took place. The boundary encompassed the contaminated soil pockets identified by the NRC confirmatory survey. This bounded area was determined based on historical site surveys, physical boundaries, and the

performance of a walkover gamma survey. HMI committed to remediating all licensable soil pockets within the bounded area. The proposal also requested disposition of the approximately 400 tons of staged soil which had been recovered from demolition of the mill buildings. On November 17, 2004, the NRC accepted the defined boundary and the proposed remediation activities, and required that the 400 tons of soil be considered licensed material and managed in the same manner as the stockpiled source material.

In mid-December 2004 and mid-January 2005, HMI excavated the soil pockets and shipped the soil to IUC (both the excavated soil as well as the 400 tons of staged soil). On December 14-15, 2004 and January 20, 2005, NRC and HMI obtained side-by-side soil samples from the newly-excavated pockets. After the samples were obtained, the pockets were backfilled with clean soil. The NRC inspectors then performed a gamma walkover survey of the area encompassed by the boundary identified in the June 30, 2004 letter. The survey verified that no licensable material remained within this area. Comparison of analytical results from HMI's and NRC's respective samples demonstrated agreement and attainment of the 10 pCi/g release criterion. Accordingly, the NRC considers remediation activities at the site to be complete.

On March 4, 2005, HMI requested termination of its NRC license and release of the facility for unrestricted use. The request provided survey data of materials and equipment removed from the Wet and Dry Mills and of the remaining mill pads, as well as the results of the soil samples from the excavated pockets. Termination of the NRC license for the Heritage site has been contingent upon the removal of all NRC-licensed material (i.e. source material > 0.05% by weight concentration), and the decontamination of all equipment and structures impacted by this material (i.e. the Mill Buildings). The surveys provided by the licensee and the confirmatory surveys performed for the NRC show that all licensed material has been removed from the site.

From all D&D activities performed at the Heritage site since 1991, approximately 1800 tons of steel and 4246 tons of soil have been disposed.

### **Environmental Impacts of the Proposed Action**

The affected environment was described in the Site Background section. The proposed action to terminate the HMI license and release the Heritage site for unrestricted use is procedural in nature because the licensee has completed all NRC-required remediation at the site. The proposed action would have no impact on site geology, ecology, or water. The proposed action may impact land use, because release of the site for unrestricted use would allow it to be used for other purposes.

#### *Radiological Impacts*

In March and July of 1997, analyses of radioactivity of surface and groundwater samples collected from existing site monitoring wells and offsite streams were reported by HMI as part of a mine tailings assessment for the New Jersey Department of Environmental Protection (NJDEP). The investigation confirmed that no significant radionuclide transport or elevated concentrations are occurring in the surface water or aquifer system at the site.

The NRC staff reviewed the surveys performed by HMI to demonstrate compliance with the criteria in its approved DP. The NRC staff performed a dose analysis of the licensed portions of the site (the Wet Mill pad, the Dry Mill pad, and the footprint of the stockpiled source material area). Analysis of the mill building pads was performed using a probabilistic approach using RESRAD-BUILD v 3.22. The staff used the FSS data for the pads contained in the March 4, 2005 termination request, converting gross contamination readings to estimates of area concentrations of thorium-232 and its progeny. Using thorium-232 as the sole contaminant (rather than uranium-238 or any combination of the two) results in higher dose per unit of surface activity. Using a scenario of an individual standing in the center of a pad for 75% of a year with no shielding, the potential total effective dose equivalent (TEDE) is approximately 1.6 mrem.

Analysis of the footprint of the stockpiled source material area was performed using RESRAD 6.3. The staff used final status soil sample results determined to have been taken within the footprint. Sample locations were selected during performance of gamma walkover surveys on April 14-18, 2003. Areas with higher dose rates were flagged and sampled. Sample locations that required additional remediation were sampled on December 14-15, 2004, after remediation was complete. The selection of sample points was biased high, as all locations were identified from the highest-resulting readings from a gamma survey. The dose analysis was performed using the most realistic dose-receptor scenario, that of a suburban resident. The potential TEDE to such an individual living within this footprint resulted in 40 mrem/yr. Because NRC staff commonly assesses dose using the most conservative dose-receptor scenario, a "resident farmer" evaluation was also performed. The resident farmer scenario considers ingestion pathways to a greater extent than the suburban resident scenario. This analysis resulted in a potential TEDE of 83 mrem/yr.

The NRC staff's assessment of the resulting dose from the NRC-licensed portions of the Heritage site indicates that the LTR criterion of 25 mrem/yr specified in 10 CFR 20.1402 is exceeded. However, HMI is a grandfathered licensee, in accordance with 10 CFR 20.1401, it is not required to meet the LTR dose-based criterion. The dose assessment for the Heritage site indicates that the public dose limit of 100 mrem/yr, specified in 10 CFR 20.1301, will not be exceeded.

### **Environmental Impacts of the Alternatives to the Proposed Action**

Since the Heritage site has already been surveyed and found acceptable for release for unrestricted use, the only alternative to the proposed action of termination of the license and release of the site for unrestricted use is denial of the proposed action (i.e. no action). The affect on the environment from the no action alternative is the same as that from the proposed action, with the exception of land use. The no action alternative would extend the NRC license, preventing the licensed property from being used. Because NRC requirements have been met, there is no basis for maintaining the license over these portions of the site. Denial of the application would result in no change in the environmental impacts described above, and would constitute an unwarranted burden on the licensee.

## **Agencies and Persons Consulted**

The NRC staff has determined that the proposed action is of a procedural nature, and will not affect listed species or critical habitat. Therefore, no further consultation is required under Section 7 of the Endangered Species Act. Likewise, the NRC staff has determined that the proposed action is not the type of activity that has the potential to cause effects on historic properties. Therefore, no further consultation is required under Section 106 of the National Historic Preservation Act.

The NRC staff coordinated with the US Environmental Protection Agency (EPA), Region 2 office on the current radiological status and proposed NRC actions regarding the Heritage site. EPA acknowledged the staff's plan for this site during a January 11, 2006 conference call.

The NRC staff provided a draft of its EA to the NJDEP for review. On July 12, 2005, they responded by letter, providing comments on the proposed action and on the EA. In this response, NJDEP stated disagreement with the EA because they believe, in part: 1) the NRC cleanup criteria of 10 pCi/g does not result in dose that is As Low As Reasonably Achievable, 2) the licensee's FSS of the stockpiled area insufficiently analyzed areas of elevated dose, and 3) the NRC should have required HMI to remediate the entire bounded area to meet the cleanup criteria. The NRC staff met with NJDEP staff on July 19, 2005, and discussed these disagreements as well as the NRC's licensing and oversight of HMI. The NRC considers the cleanup criteria for HMI appropriate because it is in accordance with NRC regulations, which provide for public health and safety. The NRC required HMI to remediate the portions of its site affected by licensed operations, as well as those containing licensable materials from prior operations. As such, NRC required remediation of the site beyond the scope originally required by the approved DP. The NRC staff considers the final status of the licensed areas to be adequately surveyed by the licensee and verified through the staff's various confirmatory surveys. Finally, the remaining concentrated material within the bounded area and the surrounding site, are below licensable concentrations, and as such are exempt from NRC regulations. The state may require remediation of these materials. The New Jersey radiological remediation standard is based on a dose limit of 15 mrem/yr.

## **Conclusions**

The NRC staff have prepared this EA in support of its review of the proposed action to terminate Materials License No. SMB-1541 and to release the NRC-licensed portions of the Heritage site for unrestricted use. The NRC confirmatory surveys of the Heritage site verify that the requirements of its approved DP have been met. The NRC staff performed a dose assessment, and determined that the public dose limit of 100 mrem/yr specified in 10 CFR 20.1301 will not be exceeded by releasing the NRC-licensed portions of the site. On the basis of the EA, NRC has concluded that there are no significant environmental impacts and the license amendment does not warrant the preparation of an Environmental Impact Statement. Accordingly, the NRC staff has determined that a Finding of No Significant Impact is appropriate.

## **Prepared By:**

Marjorie McLaughlin, Health Physicist, Division of Nuclear Materials Safety, Region I

## List of References

1. NRC License No. SMB-1541 inspection and licensing records [NRC Docket No. 040-08980].
2. "Federal Register Notice Discussing Five Options for NRC Approval of Disposal or Onsite Storage of Thorium or Uranium Wastes From Past Nuclear Operations," dated October 23, 1981 [ADAMS Accession No. ML033630718].
3. FC 83-23 "Termination of Byproduct, Source, and Special Nuclear Materials Licenses," dated November 4, 1983 [ADAMS Accession No. ML003745523].
4. "Letter terminating Heritage plant activities," dated August 23, 1990 [ADAMS Accession No. ML030370350].
5. "Additional Information Regarding License Application," dated July 25, 1990 [ADAMS Accession No. ML030370324].
6. "Environmental Assessment and Finding of No Significant Impact - Heritage Minerals," dated October 19, 1999 [ADAMS Accession No. ML003721778].
7. "Heritage Minerals, Inc, Final Status Survey," dated November 25, 2001 [ADAMS Accession No. ML021150357].
8. "ORISE Confirmatory Survey Report," dated April 10, 2002 [ADAMS Accession No. ML021060589].
9. "Heritage Minerals, Inc. Response to January 8, 2003 Pre-Decisional Enforcement Conference Summary Letter," dated March 10, 2003 [ADAMS Accession No. ML030830547].
10. "Law Offices of A.J. Thompson, Ltr. Dtd 05/06/2003, Ref. Heritage Minerals, Inc.," dated May 6, 2003 [ADAMS Accession No. ML031320537].
11. "Confirmatory Survey of Portions of the Heritage Minerals, Inc., Facility, Lakehurst, NJ, Phase 2," dated December 31, 2003 [ADAMS Accession No. ML040250070].
12. "Law Offices of Anthony J. Thompson, P.C., Ltr. Dtd 06/30/2004, re: Heritage Minerals, Inc.," dated June 30, 2004 [ADAMS Accession No. ML041910222].
13. "Heritage Minerals, Inc. (HMI) Letter Dated November 17, 2004," dated November 17, 2004 [ADAMS Accession No. ML043240049].
14. "Heritage Minerals, Incorporated, Termination Request dtd 03/04/2005," dated March 04, 2005 [ADAMS Accession No. ML050960109].
15. "Oak Ridge Institute for Science and Education (ORISE) , Ltr. dated 2/14/2005, re: Analytical Results for Soil Samples from Heritage Minerals, Inc.," dated February 14, 2005 [ADAMS Accession No. ML050960038].

16. "NJDEP Ltr dtd 07/12/2005, EA comments Ref Heritage Minerals, Inc.," dated July 12, 2005 [ADAMS Accession No. ML052000408].
17. "Dose Assessment for Unrestricted Future Use Scenarios Following License Termination of the Heritage Minerals, Incorporated, Site in Lakehurst, NJ," dated August 25, 2005 [ADAMS Accession No. ML052410061].
18. Federal Register Notice, Volume 65, No. 114, page 37186, dated Tuesday, June 13, 2000, "Use of Screening Values to Demonstrate Compliance With The Federal Rule on Radiological Criteria for License Termination."
19. Title 10 Code of Federal Regulations, Part 20, Subpart E, "Radiological Criteria for License Termination."
20. Title 10, Code of Federal Regulations, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

The application for the license amendment and supporting documentation are available for inspection at NRC's Public Electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. Any questions with respect to this action should be referred to Marjorie McLaughlin, Decommissioning Branch, Division of Nuclear Materials Safety, Region I, 475 Allendale Road, King of Prussia, Pennsylvania 19406, telephone (610) 337-5240, fax (610) 337-5269.

Dated at King of Prussia, Pennsylvania this        day of        , 2006.

FOR THE NUCLEAR REGULATORY COMMISSION

Marie Miller, Chief  
Decommissioning Branch  
Division of Nuclear Materials Safety  
Region I

**NUCLEAR REGULATORY COMMISSION**

**[Docket No. 040-08980]**

**Notice of Availability of Environmental Assessment and Finding of No Significant Impact  
for License Amendment for Heritage Minerals, Inc., Manchester Township, New Jersey**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Notice of availability.

**FOR FURTHER INFORMATION CONTACT:** Marjorie McLaughlin, Project Manager,  
Decommissioning Branch, Division of Nuclear Materials Safety, Region I, U.S. Nuclear  
Regulatory Commission, 475 Allendale Road, King of Prussia, Pennsylvania, 19406-1415.  
Telephone: (610) 337-5240; fax number: (610) 337-5269; e-mail: mmm3@nrc.gov.

**SUPPLEMENTARY INFORMATION:**

**I. Introduction**

The U.S. Nuclear Regulatory Commission (NRC) is considering the issuance of a license amendment to Materials License No. SMB-1541 issued to Heritage Minerals, Inc. (HMI or the licensee), to authorize release of the NRC-licensed areas of its facility in Manchester Township, New Jersey (the Heritage site) for unrestricted use and license termination, and has prepared an Environmental Assessment (EA) in support of this amendment in accordance with the requirements of 10 CFR Part 51. Based on the EA, the NRC has concluded that a Finding of No Significant Impact (FONSI) is appropriate. The amendment will be issued following the publication of this Notice.

Enclosure 3

## **II. EA Summary**

The purpose of the proposed amendment is to allow the release of the NRC-licensed areas of the licensee's Manchester Township, New Jersey facility for unrestricted use and license termination. HMI was authorized by the NRC on January 2, 1991, to possess radioactive source materials resulting from past minerals processing operations at the site. The facility was used by HMI and previous owners from 1973-1989 for the mechanical processing of dredged native sand to extract various heavy minerals (zirconium and titanium). The native sand also contained natural uranium and thorium, which were concentrated in the waste tailings of the processing operation.

In 1989, HMI began reprocessing stockpiled tailings to extract any remaining heavy minerals, producing a more concentrated waste stream. The resultant waste tailings from this process contained a concentration of uranium and thorium in excess of 0.05% by weight, meeting the 10 CFR Part 40 definition of radioactive source material (10 CFR 40.4). This concentration exceeds the unimportant quantity exemption for source material stated in 10 CFR 40.13(a), and therefore required an NRC license. HMI separated the source material from all other waste material, and stored this sand within a stockpile area that was later enclosed by a fence. On March 10, 1989, HMI submitted an application for an NRC source material license. Before the license was issued, reduced demand and price for zircon caused HMI to cease processing activities, and no additional source material was added. On January 2, 1991, the NRC issued Materials License No. SMB-1541 authorizing HMI to possess the stockpiled source material and to perform decommissioning of the impacted areas of the site (two mill buildings and the ground beneath the stockpile), comprising approximately one acre.

The ground (approximately 287 acres) between and surrounding the impacted areas contains uranium and thorium concentrations that are above background but below 0.05% by weight. The above-background concentrations of source material in these regions resulted from staging and regrading waste sands from previous (unlicensed) processing activities. Because the source material concentration of this material is below 0.05% by weight, it remains exempt from NRC regulations, and is not part of the license. Removal of this material may be required by the State of New Jersey. Within this region, however, NRC confirmatory surveys identified several pockets of material exceeding 0.05% source material concentration by weight. NRC staff determined that these pockets were inadvertently formed from the staging and grading of the exempt material described above. Consequently, the staff determined that this material was "licensable," in that it met the 10 CFR Part 40 definition of source material. The staff required HMI to remediate all pockets of licensable material in the same manner as the licensed material.

On March 4, 2005, HMI requested that NRC release the facility for unrestricted use. Both mill buildings have been demolished and only the concrete pads remain. The stockpiled licensed material has been disposed and the ground beneath the pile excavated. The pockets of licensable material identified between the impacted areas have also been excavated and disposed offsite. The HMI has conducted surveys of the impacted areas and the remediated pockets and provided information to the NRC demonstrating these areas meet the license termination criteria for unrestricted release in its approved Decommissioning Plan (DP). HMI's DP was previously noticed in the *Federal Register* on September 1, 1999 (64 FR 47872-47877), along with a notice of an opportunity to request a hearing.

The 10 CFR 20 Subpart E, "The License Termination Rule" (LTR), bases termination of NRC licenses and release of facilities for unrestricted use on meeting residual radioactivity levels distinguishable from background, that do not result in a Total Effective Dose Equivalent

(TEDE) to an average member of the critical group above 25 millirem (mrem) per year. The rule was a change from past practice, which based release of a site for unrestricted use on meeting specific concentration-based cleanup levels. When the LTR was published (62 FR 39088), a provision was included in 10 CFR 20.1401(b)(3) to “grandfather” sites with DPs submitted to the NRC before August 20, 1998 and approved by August 20, 1999 (the approval date was extended to August 20, 2000 for twelve sites, including Heritage Minerals, by SECY-99-195). Grandfathered sites are decommissioned under the criteria in their approved DPs, using the previous concentration-based cleanup levels. These cleanup standards were considered to result in a dose less than the public dose limit of 100 mrem/yr, specified in 10 CFR 20.1301.

The NRC staff has prepared an EA in support of the proposed action of terminating HMI’s Materials License No. SMB-1541, and releasing the NRC-licensed areas of the Heritage site for unrestricted use. The staff evaluated the request from HMI and the results of their surveys, performed independent, confirmatory measurements, and performed a quantitative dose assessment of the licensed areas. The mill pads were modeled with the assumption of reuse of the structures for residential occupancy. The highest resultant TEDE for this scenario is 1.6 mrem/yr. The stockpile area was modeled for a suburban resident, resulting in a maximum possible TEDE of 40 mrem/yr.

### **III. Finding of No Significant Impact**

The staff has prepared an EA in support of the proposed license amendment to terminate HMI’s license and release the NRC-licensed areas of the Heritage site for unrestricted use. The staff has found that the radiological environmental impacts from the proposed action would not exceed the public dose limit of 100 mrem/yr. Surface and

groundwater analyses performed at the site confirm that no significant radionuclide transport or elevated concentrations are occurring in the surface water or aquifer system. The NRC staff has determined that the proposed action would have no impact on site geology, ecology, or water. The staff has also found that the proposed action is procedural in nature because HMI has completed all NRC-required remediation at the site. On the basis of the EA, NRC has concluded that there are no significant environmental impacts from the proposed action of terminating HMI's license and releasing for unrestricted use the NRC-licensed areas of the Heritage site, and has determined not to prepare an environmental impact statement.

#### **IV. Further Information**

Documents related to this action, including the application for amendment and supporting documentation, are available electronically at the NRC's Electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. From this site, you can access the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents. The ADAMS accession numbers for the documents related to this notice are:

	Summarized Document Description	ADAMS Accession No.
1	"Five Options for NRC Approval of Disposal or Onsite Storage of Thorium or Uranium Wastes From Past Nuclear Operations," dated 10/23/81	ML033630718
2	FC 83-23 "Termination of Byproduct, Source, and Special Nuclear Materials Licenses," dated 11/4/83	ML003745523
3	Letter terminating Heritage plant activities, dated 8/23/90	ML030370350
4	Additional Information for License Application, dated 7/25/90	ML030370324
5	Environmental Assessment and Finding of No Significant Impact for HMI DP, dated 10/19/99	ML003721778
6	HMI Final Status Survey, dated 11/25/01	ML021150357
7	NRC Confirmatory Survey Report, dated 4/10/02	ML021060589
8	HMI proposed additional remediation activities, dated 3/10/03	ML030830547
9	HMI amendment to proposed additional remediation activities, dated 5/6/03	ML031320537
10	NRC Confirmatory Survey Phase 2, dated 12/31/03	ML040250070
11	HMI proposed final remediation activities, dated 6/30/04	ML041910222
12	NRC letter accepting proposed final remediation activities, dated 11/17/04	ML043240049
13	HMI Termination Request, dated 3/04/05	ML050960109
14	Soil Sample Results from HMI, dated 2/14/05	ML050960038
15	NJDEP comments on draft HMI EA, dated 7/12/05	ML052000408
16	Dose Assessment for Unrestricted Future Use Scenarios of the HMI site, dated 8/25/05	ML052410061

If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC Public Document Room (PDR) Reference staff at 1-800-397-4209, 301-415-4737, or by email to [pdr@nrc.gov](mailto:pdr@nrc.gov).

These documents may also be viewed electronically on the public computers located at the NRC's PDR, O 1 F21, One White Flint North, 11555 Rockville Pike, Rockville, MD 20852. The PDR reproduction contractor will copy documents for a fee.

Dated at King of Prussia, Pennsylvania this        day of        , 2006.

FOR THE NUCLEAR REGULATORY COMMISSION

---

Marie Miller, Chief,  
Decommissioning Branch,  
Division of Nuclear Materials Safety,  
Region I.