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Integrated Environmental Management, Inc.

Decommissioning Funding Plan for the Newfield, New Jersey Facility

Shieldalloy Metallurgical Corporation

Report No. 94005/G-9194 (Rev. 2)

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Decommissioning Funding Plan for the Newfield, New Jersey Facility

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1. INTRODUCTION

Shieldalloy Metallurgical Corporation (Shieldalloy) operates a manufacturing facility located in Newfield, New Jersey. This facility manufactures or has manufactured specialty steel and super alloy additives, primary aluminum master alloys, metal carbides, powdered metals, and optical surfacing products. Raw materials in use at the facility include ores which contain oxides of columbium (niobium), vanadium, aluminum metal, titanium metal, strontium metal, zirconium metal, and fluoride (titanium and boron) salts. During the manufacturing process, the facility generates slag, dross, and baghouse dust.

One of the materials received, used and stored by Shieldalloy contains radioactive material which is classified as "source material" pursuant to Title 10, Code of Federal Regulations, Part 40. This material is called pyrochlore, a concentrated ore containing columbium (niobium). Pyrochlore contains greater than 0.05% of natural uranium and natural thorium. Therefore, it is licensable by the U. S. Nuclear Regulatory Commission (USNRC).

Shieldalloy currently holds USNRC License No. SMB-743 which allows possession, use, storage, transfer and disposal of source material ancillary to metallurgical operations. The most recent amendment of SMB-743 was issued on August 27, 1999. The license expiration date is October 20, 2002.

Pursuant to 10 CFR 40.36, applicants who submitted renewal applications prior to July 27, 1990 must submit a decommissioning funding plan (and provide financial assurance for decommissioning). More specifically, Provision 15 of License No. SMB-743 requires the submission of a decommissioning funding plan by October 20, 1999. This report describes Shieldalloy's conceptual plan to decommission the Newfield facility after licensed activities have been terminated and the means by which funding for these activities will be ensured.

Included in this report is a radiological characterization of the pertinent areas of the site, description of the decommissioning objective for the Shieldalloy facility, the conceptual plan for decommissioning the site, a conservative estimate of the cost for achieving the decommissioning objective, and a description of how the decommissioning costs will be funded. The guidance found in USNRC Regulatory Guide 3.66 and in (proposed Revision 1) USNRC Regulatory Guide 3.66 was used in its preparation.[1,2] Appendix A contains a completed "Checklist for Decommissioning Financial Assurance" as recommended in Regulatory Guide 3.66. Appendix B contains the information regarding structures and surfaces to be remediated and the level of effort to complete

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[1] U. S. Nuclear Regulatory Commission, Regulatory Guide 3.66, "Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning Under 10 CFR Parts 30, 40, 70, and 72", June, 1990.

[2] U. S. Nuclear Regulatory Commission, "Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning Under 10 CFR Parts 30, 40, 70, and 72" Draft Regulatory Guide DG-3014 (Proposed Revision 1 to Regulatory Guide 3.66), June, 1999.

the decommissioning effort. The information is formatted and presented as recommended in (proposed Revision 1) USNRC Regulatory Guide 3.66.

The decommissioning efforts and ultimate in-situ disposal of the slag described herein are intended to ensure that short- and long-term radiation exposures to workers and members of the general population after license termination are as low as reasonably achievable. Shieldalloy is committed to implementing a decommissioning program which satisfies all of the requirements described by the USNRC in Subpart E of 10 CFR 20.

2. SITE CHARACTERISTICS

The Shieldalloy plant is built on approximately 60 acres in the Borough of Newfield (Gloucester County), New Jersey.[3] The topography of the Newfield area is relatively flat, and the Shieldalloy property is located on a slight topographic high, with the ground surface generally sloping to the west-southwest, towards the Hudson's Branch. The Hudson's Branch, an intermittent, slow-moving tributary of Burnt Mill Branch in the Maurice River Basin, is the predominant surface water body in the vicinity of the plant. It borders the southern boundary of the property, where it flows from east to west.[4]

The plant is divided into three functional areas. These are the manufacturing area, the storage yard, and other undeveloped plant property. The following is a brief description of each functional areas:

- Manufacturing area - This area contains a number of operations facilities, offices, and loading docks. For the most part, the area is covered with buildings and asphalt or concrete pavement. Included are the Railroad Siding Area, Department 111 (ferrocolumbium operation), Department 102 (former aluminothermic reduction operation), Department 112 (crushing operations), Department 107 (induction melting) Department 101 (metal grinding operations), Department 115 (aluminum master alloys), Department 116/118 (metal powder compaction operations), Department 203 (warehouse operations), and Department 204 (maintenance operations).[5,6]

- Storage Yard - This area is located on the eastern portion of the property, and is used to store materials generated during manufacturing operations. Slag generated during the ore processing procedures is stored in this area, as is baghouse dust and excavated soils.

- Undeveloped plant property - This area is located along the southern plant property boundary, and includes all undeveloped and unused areas of the plant.

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[3] A small portion of the property lies in Cumberland County, New Jersey.

[4] The Hudson's Branch flows from northeast to southwest after it leaves the Shieldalloy property.

[5] Department 111 and Department 102 process the radioactive materials for this operation.

[6] At one time, D-116 processed polishing compounds and other materials that are exempt from licensing pursuant to 10 CFR 40.13. Although these materials contained thorium and uranium, the cost of characterization, remediation and final status survey of D-116 is not included in this plan because it was never a radiologically restricted area, and because the operations therein were exempt from the regulations in 10 CFR 40.

There are over 20 buildings on the property, and their construction is either steel frame or concrete block. However, as of the date of this report, only five (5) of them are designated as radiologically restricted areas. The following is a brief description of the radiological characteristics of each, based upon the findings of the most recent radiological survey of these areas.[7] Included as well as a listing of locations throughout the plant where slag has been used as fill.

2.1 D-111 Production Department and Flex-Kleen Baghouse

The ferrocolumbium production department, D111, is the predominant location where source material is used. D111 is a 1,742 m^2 by 12 m tall building constructed of metal, concrete, asbestos siding and steel sheeting. It is equipped with an operator control room, mechanical booms and heavy equipment handlers, storage containers, scales, a variety of melting pots, two furnaces, a dust collection system, and other miscellaneous items.

The radiation exposure rates in D-111 range from background to a maximum of 325 microrem per hour in the immediate vicinity of residual ferrocolumbium slag. The contamination levels are as follows:

- Office and break area - up to 133 dpm/100 cm^2
- Storage area - up to 194 dpm/100 cm^2
- Upper level production area - Maximum of 199 dpm/100 cm^2
- Lower level production area - Maximum of 413 dpm/100 cm^2

If it is conservatively assumed that all building surfaces in D111 are uniformly contaminated at the maximum measured level, and that the building has a surface area of approximately 8,710 m^2, there are approximately 1.6×10^{-4} curies of residual thorium and uranium contamination currently in D111.[8]

The Flex-Kleen air handling system was installed in D111 in 1987. It is designed to draw up to 200,000 cfm, but it typically operates in concert with the AAF system. Pulsed air jets in the Flex-Kleen baghouse remove the dust from the fabric. The dust is then conveyed via a series of screw conveyors and conveying ducts to a silo for temporary storage. The building is equipped with storage bins, filter bags, and other miscellaneous items.

[7] Integrated Environmental Management, Inc., Report No. 94005/G-5197, "Report of Radiation Safety Surveillance for Quarter 4, 1999", January 24, 2000.

[8] Valenti, J., Shieldalloy Metallurgical Corporation, facsimile communication to C. D. Berger, Integrated Environmental Management, Inc., October 23, 1995.

At this time, there are approximately 8.0 x 10^{-3} curies each of uranium and thorium in the form of baghouse dust present in this location. This estimate was determined by conservatively assuming that the contents of the Flex-Kleen baghouse is at its maximum (approximately 80 cubic meters),[9] that the density of the baghouse dust is approximately two (2) grams per cubic centimeter, and that the uranium and thorium concentrations in the baghouse dust are 42 ppm and 261 ppm, respectively.[10] The radiation exposure rates in this area currently range from background to about 50 microR per hour.

The contamination levels on the Flex-Kleen Baghouse concrete pad currently average about 627 disintegrations per minute (dpm) per 100 cm^2. If it is conservatively assumed that all concrete pad surfaces at the Flex-Kleen Baghouse are uniformly contaminated at this level, and that the pad has a total of 375 m^2 of surface area,[11] there are approximately 1.1 x 10^{-5} curies of residual thorium and uranium contamination currently in this area.

At one time, there was a second air handling system attached to D-111. During a remedial action, which took place between May 17 and June 17, 1999, this system, designated the AAF Baghouse, was disassembled.[12] All that remains of the structure is the concrete pad that provided support to the baghouse. The residual radioactivity on this surface ranges from background to a maximum of 1102 dpm/100 cm^2.

2.2 D-102/D-112 Production Department

The D102 Production Department houses the aluminothermic reduction operation and the stockpile for the CANAL© crushing/sizing/packaging operation. This building is equipped with a furnace, crushing equipment, scales, bagging equipment, and other miscellaneous items.

For the purposes of this report, it is assumed that there will be no licensable materials (other than residual contamination) present in this location at the time of decommissioning. The radiation exposure rates in this area range from background to approximately 80 microrem per hour. The contamination levels currently range from background to 413 dpm/100 cm^2, with the highest levels measured in a location by the east roll-up door. If it is conservatively assumed that all building surfaces in D102 are uniformly contaminated at the maximum level, and that the building has approximately 7,950 m^2 of surface area,13 there is approximately 5.3 x 10^{-6} curies of residual thorium and uranium activity currently in this area. For the purposes of developing a

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[9] Valenti, J., Shieldalloy Metallurgical Corporation, facsimile communication to C. D. Berger, Integrated Environmental Management, Inc., October 23, 1995.

[10] Berger, C. D., Integrated Environmental Management, Inc., written communication to C. S. Eves, Shieldalloy Metallurgical Corporation, October 6, 1994.

[11] Valenti, J., Shieldalloy Metallurgical Corporation, facsimile communication to C. D. Berger, Integrated Environmental Management, Inc., October 23, 1995.

[12] Integrated Environmental Management, Inc. Report No. 94005/G-20187, "Demolition and Final Status Survey of the AAF Baghouse", January 7, 2000.

decommissioning cost, areas of ceilings and walls that require decontamination were assumed to be 2787 m^2 and 1858 m^2, respectively (see .Table 3.5 (D-102/D112)).

The D-112 Production Department does not contain licensable materials. Ambient exposure rates and contamination levels cannot be readily distinguished from background. However, because it is physically connected to D-102, it is thus included in the listing of restricted areas.

2.3 D-203 (G-Warehouse)

Pyrochlore is received and temporarily stored in D-203 (G-Warehouse) before being transferred to D111. The warehouse may also be used to stage source material prior to shipment. At this time, the radiation exposure rates in G-Warehouse are indistinguishable from background except in the vicinity of some pallets of potassium titanium fluoride, where a maximum of 50 microrem per hour is noted. There is no residual contamination in the building.

2.4 Storage Yard

Ferrocolumbium standard slag, ferrocolumbium high-ratio slag, and columbium nickel slag generated from the D111 and D102 smelting operations consist of solid, non-combustible material with the consistency of vitrified rock. All three slag types have been maintained separately from the others at their respective points of generation and are transported in trucks from D111 and D 102 to the Storage Yard. For the purposes of this report, it is conservatively assumed that there are approximately 20,000 cubic meters of ferrocolumbium slag (high ratio and standard) in the Storage Yard.[13]

In addition, baghouse dust is transported by truck to the Storage Yard. It is assumed that approximately 20,000 cubic meters of baghouse dust are currently in the Storage Yard.[14,15]

There are approximately 23 curies each of uranium and thorium in the form of slag and baghouse dust in the Storage Yard. The concentration of each in the slag is approximately 400 pCi/gram. In the baghouse dust, the concentrations are less than 10 pCi/g each. The radiation exposure rates

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[13] From the volumetric information obtained from an October, 1991 fly-over of the Newfield site, the Storage Yard contained 16,800 m^3 of standard slag and 1040 m^3 of high-ratio slag at that time, for a total of 17,840 m^3 (Shieldalloy Metallurgical Corporation, "Applicant's Environmental Report for the Newfield, New Jersey Facility", October 1, 1992). The volume of slag produced during ferrocolumbium operations performed after the 1991 fly-over and before the date of this report was added to this total in order to estimate the present-day volume of slag in the Storage Yard.

[14] Historically, dusts generated from both ferrocolumbium production and un-recycled dusts from ferrovanadium production were not segregated. Currently, however, the ferrovanadium contribution to the collected dusts is negligible.

[15] From the volumetric information obtained from an October, 1991 fly-over of the Newfield site, the Storage Yard contained 15,100 m^3 of baghouse dust (Shieldalloy Metallurgical Corporation, "Applicant's Environmental Report for the Newfield, New Jersey Facility", October 1, 1992). An additional 4,900 m^3 from smelting operations performed between the date of the 1991 fly-over and the date of this report are currently present.

in this area range from background to 0.2 milliR per hour, with the maximum measured exposure rate being due north of the Storage Yard, approximately 30 feet from the slag piles.

The physical form of the slag in the Storage Yard slag (glass-like rock) does not permit the radioactive elements to leach out into the regional water supply or local wetlands. Leachability studies performed on samples of the slag support this conclusion.[16] Also, the surface of the baghouse dust pile forms a "crust" when it encounters moisture, which serves to deter fugitive dust emissions. Furthermore, neither the groundwater nor the surface water collected from the vicinity of the Newfield site exhibit elevated (above background) radionuclide concentrations.[17]

The Storage Yard also contains approximately 6,500 m^3 of soil excavated during a previous remedial action. Section 2.5, below, discusses this issue in greater depth.

2.5 Slag Used as Fill

In the past, ferrocolumbium slag may have been used on-site as fill material for certain construction projects within the plant site. Possible placement locations included the southwest fence line, in the vicinity of the T12 Tank Area, and under the Haul Road.

The Haul Road was, at one time, a county right-of-way that ran through SMC's Newfield plant. Over the years, the south portion of the road was surfaced with crushed slag from SMC operations. Characterization efforts that took place in 1988 and 1991 showed that the contact exposure rates in and near the road were only slightly discernible from background, that the contaminants therein were natural uranium and natural thorium, and that the slag used to form the road bed was not characteristic of licensed material (i.e., ferrocolumbium slag).[18,19,20] In September of 1998, approximately 6,500 m^3 of predominantly soil, with some residual slag, was scraped from the road transferred to the Storage Yard. This soil is assumed to contain

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[16] Teledyne Isotopes, "Report of Leachability Studies for Shieldalloy Metallurgical Corporation", Teledyne Isotopes, Westwood, New Jersey, 1992.

[17] TRC Environmental Consultants, Inc., "Remedial Investigation Technical Report", Project No. 7650-N51, Windsor Connecticut, April, 1992.

[18] Oak Ridge Associated Universities, "Radiological Survey of the Shieldalloy Metallurgical Corporation, Newfield, New Jersey", Report No. ORAU 88/G-79, July, 1988.

[19] IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", Report No. IT/NS-92-106, April 2, 1992.

[20] Exposure rates in and near the road generally ranged from background to 26 microR per hour, with a maximum exposure rate of 90 microR per hour directly over slag pieces. If these are compared to the contact exposure rate from ferrocolumbium slag, which is in the vicinity of 1,000 to 2,000 microR per hour, it is clear that the slag in the road was the result of a different operation.

approximately 0.2 curies of uranium, and thorium.[21] A final status survey of the remediated area demonstrated that the Haul Road may be released for unrestricted use (i.e., without regard for radiological constituents).[22]

The remaining areas on the property where fill slag may exist (i.e., the southwest fence line and in the T12 Tank Area) are not designated "Restricted Areas" since the ambient exposure rates in these areas currently range from background to only a few tens of microR per hour.[23] While the mass of fill slag is not well-characterized, the lateral extent of elevated surface exposure rates identified in previous site characterization efforts (i.e., approximately 8,000 m^2) gives a reasonable estimate the spatial extent of residual radioactivity therein. A nominal assumption of uniform thickness (i.e., one meter) over this entire area results in an estimate of 8,000 m^3 of fill slag on the property, which contains approximately 4.2 curies each of uranium and thorium.[24]

2.6 Ancillary Areas

There are locations at the Newfield facility where source material, in generally-licensed quantities, was stored/used at one time. These are D-117 (Cave), D-202 (Laboratory) and D-Warehouse. Although routine surveillance data confirm that there is no residual radioactivity in these areas, their final radiological status as compared to the site-specific release criteria will be included in the final status survey report for the decommissioning effort.

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[21] If the source material content of ferrocolumbium slag (i.e., 400 pCi per gram each of thorium and uraniium) is multiplied by the ratio of the maximum contact exposure rates for the materials excavated from the road and ferrocolumbium slag, a reasonable estimate of the source material concentration in the excavated soils is 18 pCi per gram. Assuming a soil density of 1.6 grams per cm^3, and a total soil volume of 6,500 m^3, the curie content of the excavated soils is about 0.2 curies each of uranium and thorium.

[22] Integrated Environmental Management, Inc. Report No. 94005/G-17172, "Final Status Survey of Haul Road", June 22, 1999.

[23] IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation Report No. IT/NS-92-106, April 1, 1992.

[24] Assuming a source material concentration of 400 pCi per gram each of thorium and uranium in the slag, a slag density of 1.3 grams per cubic centimeter, and a total slag volume of 8,000 m^3, the curie content of the slag used as fill is approximately 8.4 curies each of uranium and thorium.

3. SCOPE OF THE DECOMMISSIONING EFFORT

3.1 Radioactive Material Inventory

The majority of the licensed radioactive material inventory at the plant currently consists of the slag from the D-111 production department, and the dust from the D-111 Flex-Kleen baghouse. It may, on occasion, also include consumable pyrochlore ore and other feed materials for ferrocolumbium and other metallurgical operations. However, after processing, greater than 99% of the radioactive species in the feed material for the smelting operation remains in the slag and, to a much lesser extent, in the baghouse dust.[25]

License No. SMB-743 authorizes possession of up to 303,050 kilograms of thorium in any chemical/physical form, and up to 45,000 kilograms of uranium in any chemical or physical form. As of December 31, 1999, Shieldalloy was at 96.8% of the thorium limit and 87.6% of the uranium limit.

3.2 Preferred Decommissioning Method

Prior to terminating License No. SMB-743, Shieldalloy intends to move all residual radioactive materials at the Newfield Facility to the Storage Yard, which is on the East boundary of the plant. There it will be graded, topped with the excavated soils from elsewhere on the plant, capped in place, and subject to long-term maintenance and monitoring. This *in situ* decommissioning methodology has already received federal and state (Ohio) regulatory acceptance at a site that performed similar operations, and with similar quantities/forms of residual radioactive materials.[26,27]

After all on-site activities are complete, a final status survey will be performed, the results of which will be documented in a comprehensive report. Included therein will be a demonstration that the site, at the end of the decommissioning process, meets the decommissioning objective.

3.3 Decommissioning Objective

A critical step in the decommissioning process is to determine the objective of the action. The objective typically refers to the maximum acceptable dose limit that will be incurred by members of the general public after all action is complete and the USNRC license is terminated.

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[25] IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation Report No. IT/NS-92-106, April 1, 1992.

[26] U. S. Nuclear Regulatory Commission, NUREG-1543, "Environmental Impact Statement; Decommissioning of the Shieldalloy Metallurgical Corporation Cambridge, Ohio Facility", July, 1996.

[27] PTI Environmental Services, "Remedial Investigation and Feasibility Study at the Shieldalloy Metallurgical Corporation Site in Cambridge, Ohio", September, 1996.

The criteria for allowing release of sites for unrestricted use are shown in 10 CFR 20.1402. These criteria require that residual radioactivity in buildings, equipment, soil, groundwater, and surface water resulting from the licensed operation be reduced to acceptably low levels. The maximally-exposed individual, after licensed operations have ceased, would not receive an annual radiation dose above 25 millirem total effective dose equivalent (TEDE). In addition, the licensee must demonstrate, in a Final Status Survey, that:

- Residual contamination in all facilities and environmental media has been properly reduced or eliminated, and that;
- Except for any residual radiological contamination found to be acceptable by USNRC to remain at the site, radioactive material is transferred off-site to authorized recipients.

The methodology for performing Final Status Surveys and demonstrating achievement of these requirements is described in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).[28]

Shieldalloy is committed to implement conservative radiological protection practices, and intends to be consistent with federal requirements that licensed radioactive materials be handled and released in a manner that ensures that exposures are as low as is reasonably achievable (ALARA) taking into account economic and societal factors.[29] Because the goal of decommissioning the Newfield site is to ensure that members of the general population do not incur radiation doses in excess of 25 millirem per year after the license is terminated, these two objectives (i.e., the dose limit contained in 10 CFR 20.1402 and the ALARA provisions) form the basis for the level of effort necessary for decommissioning and for this decommissioning funding plan.

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[28] U. S. Nuclear Regulatory Commission et al, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)", NUREG-1575, December, 1997.

[29] Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation".

4. CONCEPTUAL DECOMMISSIONING PLAN

At the time of license termination, decommissioning actions at the Newfield Facility will begin by evaluating the adequacy of existing site characterization data, developing a plan for acquisition of additional data (as needed), and performing additional characterization work if justified. A site-wide decommissioning plan that describes all building decontamination efforts and the *in situ* disposal of all residual radioactivity will be submitted to the USNRC. Included in that plan will be a detailed description of the activities to be performed, a statement of and justification for the release criteria that will be used during decontamination activities, a health and safety plan, a quality assurance plan, and the plan for performing and documenting the final status survey, including a demonstration that, over the 1,000 years that follow license termination, no member of the general public will receive an radiation dose in excess of 25 millirem as a result of proximity to or contact with the residual radioactivity.

For cost estimating purposes, it is assumed that the majority of the material to be placed beneath the engineered cap consists of the licensable slag that is currently located in the Storage Yard. In addition, slag used as fill in specific locations around the site will be moved to the Storage Yard. Process equipment and construction debris from D-111 and other restricted areas (i.e. concrete rubble and rebar), along with all personal protective equipment and other disposable equipment used during decontamination efforts that cannot be decontaminated or released for unrestricted use will also be placed in the storage yard under the cap.

During decontamination efforts, the volumes of water used will be maintained at a practical minimum. However, all water collected during these operations will be used for dust control during placement of materials into the Storage Yard.

In regard to the stockpile of baghouse dust currently in the Storage Yard, it is Shieldalloy's intent to sell it to a local cement manufacturer.[30] Any baghouse dust that remains at the site at the time of decommissioning will be moved to the pile and capped also. However, for the purpose of this funding plan, it is assumed that all of the existing baghouse dust inventory will be placed under the engineered cap.

Excavated soils from previous remedial actions that are currently being stored on-site will also be placed under the cap. These materials will be used to fill voids in the slag and to provide a firm surface for placement of a soil barrier layer.

Once the slag, baghouse dust and excavated soil have been positioned, the pile will be covered with a compacted soil barrier (shielding) layer and geotextile liner. A drainage layer consisting of a granular material will then be placed over the soil barrier, followed by a frost protection

[30] Baghouse dust has financial value as a source of calcium and silicon for cement production.

layer, and a final vegetative layer.[31] Crushed stone riprap will be placed along the toe of the slope, and storm water management and drainage controls will be installed. Any excavations or changes in grade that are the result of remedial actions elsewhere around the plant will be covered with clean fill and new grass will be sown.

For cost estimating purposes, it is assumed that Shieldalloy will hire a Decommissioning Contractor to prepare the work plans (including design specifications for the engineered cap, storm water management and drainage controls), implement the approved decommissioning plan, follow the progress of the work, verify that each aspect of the plan is implemented correctly. The Decommissioning Contractor will also perform the final status survey at the completion of all remedial actions and prior to any work area restoration. The final status survey methodology will follow the guidance contained in MARSSIM.

The cost of long-term monitoring and maintenance of the cap, assumed to begin following completion of cap construction and extending for 1,000 years, is also included in this funding plan. Operation and maintenance for all components of the decommissioning will begin after it is demonstrated that those components are operational and functional. The cost breakdown for the cap is contained in Appendix C.

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[31] The vegetation mix will provide a complete and dense vegetative cover that requires minimal maintenance.

5. DECOMMISSIONING COST ESTIMATE

5.1 Key Assumptions

In (draft) Regulatory Guide 3.66, a series of tables are provided for licensee use in developing the conceptual cost of decommissioning. Appendix B of this funding plan contains the completed tables for the Newfield facility. For their development, the cost of implementing the actions described in the previous section was based on a variety of cost-estimating data, including curves, generic unit costs, vendor information, conventional cost-estimating guides, and prior similar estimates as modified by site-specific information. Site-cost experience and good engineering judgements were also used to identify those items that will control the estimates. In addition, the following were also assumed:

- The decommissioning effort will begin immediately after the cessation of production activities with no delay in decontamination or remedial activities.

- No credit is included in the estimate of decommissioning costs for salvage value or the sale of construction debris or scrap that is deemed to have intrinsic value and may be potentially decontaminated and released for unrestricted use.

- Only D-111/Flex-Kleen, D-102/D-112, the Storage Yard, and the areas where slag was used as fill will be subject to decommissioning. G-Warehouse and other ancillary areas, because they contain no residual radioactivity, have no decommissioning costs other than the cost of completing and documenting a final status survey.

- For construction of the engineered cap, the slag/soil/baghouse dust pile is covered with a geotextile liner and layers of sand, clay and soil. The covered pile is seeded and maintained. Costs include expenses for design and development of plans and procedures. Administrative expenses and engineering oversight are included as well.

- Long term surveillance and maintenance of the cap will include annual exposure rate measurements and visual inspection; well installation, upkeep and sampling; vegetation removal, and general repair. The duration of long-term surveillance is assumed to be 1,000 years.

Both capital and operation and maintenance (O & M) costs were considered, where appropriate. Present-worth analysis was used for expenditures that may occur over different time periods. In addition, the cost of goods and services is based upon the value of 2001 dollars.

Appendix C contains the calculation sheets and assumptions used to derive the decommissioning cost estimate for the Newfield facility. Based upon this information and the aforementioned assumptions, and by using the cost-estimating tables that appear in (Proposed Revision 1) Regulatory Guide 3.66, the estimated cost of decommissioning the Newfield site at the time of license termination is $2,977,845. This amount is considered to be a reasonable basis for decommissioning funding because, when the relative volumes of material to be disposed of *in situ* are taken into account, this cost estimate is comparable to that associated with the decommissioning of a similar facility.[32,33]

5.2 Cost Adjustment Methods over Life of Facility

The contents of this decommissioning funding plan will be reviewed at least every five (5) years by the Shieldalloy Radiation Safety Officer (RSO) to determine if it requires revision due to changes in status of the Newfield facility. More frequent reviews may be performed if significant events take place, such as a reduction in the inventory of source material at the facility, decontamination and free release of a major area specifically addressed in this plan, or an incident involving the spread of contamination to previously uncontaminated areas of the facility occurs. The costs associated with the current prices of goods and services will also be updated during each five-year review.

Should events at the Newfield facility warrant a revision to this plan, the RSO will present the proposed changes to the Shieldalloy Radiation Safety Committee (RSC) for their review. Once RSC approval has been obtained, a revised decommissioning funding plan will be forwarded to the USNRC, and modifications to the financial assurance instrument, as necessary, will be made.

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[32] Shieldalloy Metallurgical Corporation, "Decommissioning Plan for the Cambridge, Ohio Facility", Report No. 94005/G-21182, July 13, 1999.

[33] This cost estimate compares favorably to the costs of capping and closing a metallurgical facility with similar characteristics. As shown in the decommissioning plan for the Shieldalloy Metallurgical Corporation facility in Cambridge Ohio, approximately 280,000 cubic meters of material will be disposed of *in situ* at a total cost of $6.1M. Scaling this cost for the Newfield disposal volume of approximately 50,000 cubic meters results in a cost of $1.1 M. For comparison purposes only, and in light of the fact that, unlike the Cambridge facility, the Newfield facility requires building decontamination and dismantling, and the fact that labor rates are likely to be greater in New Jersey, the total cost estimate of $3.15M for Newfield appears reasonable.

6. FINANCIAL ASSURANCE INSTRUMENT

When this Plan is approved, the USNRC will have an irrevocable stand-by letter of credit in the amount of $3,000,000, a copy of which, along with SMC's signed certification that the financial assurance, is being forwarded under separate cover. The wording of the instrument is equivalent to the Model Letter of Credit.[34] Furthermore, the bank issuing the irrevocable stand-by letter of credit is a financial institution whose operations are regulated and examined by a Federal agency, and a standby trust fund has been established to receive funds from the letter of credit.

As described in Section 5.2 of this plan, Shieldalloy may, through planned and periodic reviews, determine that additional funds beyond those described herein are needed for decommissioning. In that event, Shieldalloy will either revise the letter of credit to assure the higher amount, or will obtain another financial instrument to make up the difference between the new coverage level and the amount of the original letter of credit.

[34] U. S. Nuclear Regulatory Commission, "Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning Under 10 CFR Parts 30, 40, 70, and 72" Draft Regulatory Guide DG-3014 (Proposed Revision 1 to Regulatory Guide 3.66), Section 10.4, 1999.

1

7. APPENDICES

Appendix A - Checklist for Decommissioning Financial Assurance
(Regulatory Guide 3.66)

Name of Addressee or Applicant:
Shieldalloy Metallurgical Corporation

Mailing Address:
12 West Boulevard
Post Office Box 768
Newfield, New Jersey 08344

A. Licensee Part (check one of the following):

☐	Part 30 Licensee	☐	Part 70 Licensee or Applicant
☒	Part 40 Licensee or Applicant	☐	Part 72 Licensee or Applicant

B. Check appropriate item in each category (if applicable):

1. Date of Financial Assurance Submission: Within 30 business days after approval of this DFP
2. ☐ Public Entity
   ☒ Private Entity
3. ☐ Certification of Financial Assurance
   ☒ Decommissioning Funding Plan

4(a). ☐ Prepayment Option
- ☐ Trust Fund
- ☐ Escrow Account
- ☐ Certificate of Deposit
- ☐ Government Fund
- ☐ Deposit of Government Securities

4(b). ☒ Surety/Insurance/Other Guarantee
- ☐ Surety bond
- ☒ Letter of Credit
- ☐ Line of Credit
- ☐ Parent Company Guarantee/Financial Test

4(c). ☐ External Sinking Fund, Sinking Account and Surety/Insurance
- ☐ Trust Fund
- ☐ Escrow Account
- ☐ Certificate of Deposit
- ☐ Government Fund
- ☐ Deposit of Government Securities
- ☐ Surety Bond
- ☐ Letter of Credit
- ☐ Line of Credit

4(d). ☐ Other (Certificate of Resolution)

Appendix B - Completed Forms

As recommended in (Proposed Revision 1) Regulatory Guide 3.66

Table 3.5 (D-111/Flex-Kleen)

Number and Dimension of Facility Components			
Component	**Number of Components**	**Dimensions of Component (units)**	**Total Dimensions (units)**
Glove Boxes	0	-	-
Fume Hoods	0	-	-
Lab Benches	0	-	-
Sinks	0	-	-
Drains	0	-	-
Floors (D-111 lower and upper levels, AAF and Flex-Kleen baghouses concrete pads)	1	930 m^2	930 m^2
Walls (D-111 main bldg. walls)	4	2@1115 m^2, 2@372 m^2	2974 m^2
Ceilings (D-111 ceiling)	1	2787 m^2	2787 m^2
Ventilation/Ductwork (Flex-Kleen baghouse and associated ducting, used bags, and baghouse dust)	1	5574 m^3	5574 m^3
Hot Cells	0	-	-
Equipment/Materials (2 furnaces, overhead crane, vanadium furnaces, scale, vibrating hopper, misc. equipment)	1	3716 m^3	3716 m^3
Soil Plots (part of floor of D-111 is soil)	1	1858 m^3	1858 m^3
Storage Tanks	0	-	-
Storage Areas	0	-	-
Radwaste Areas	0	-	-
Scrap Recovery Areas	0	-	-
Maintenance Shop	0	-	-
Equipment Decontamination Areas	0	-	-
Other (specify)	0	-	-

Table 3.5 (Storage Yard)

Number and Dimension of Facility Components			
Component	**Number of Components**	**Dimensions of Component (units)**	**Total Dimensions (units)**
Glove Boxes	0	-	-
Fume Hoods	0	-	-
Lab Benches	0	-	-
Sinks	0	-	-
Drains	0	-	-
Floors	0	-	-
Walls	0	-	-
Ceilings	0	-	-
Ventilation/Ductwork	0	-	-
Hot Cells	0	-	-
Equipment/Materials	0	-	-
Soil Plots (20,000 m^3 slag, 20,000 m^3 baghouse dust, soil excavated from past cleanups 6500 m^3)	3	1@20,000 m^3 1@20,000 m^3 1@6500 m^3	46,500 m^3
Storage Tanks	0	-	-
Storage Areas	0	-	-
Radwaste Areas	0	-	-
Scrap Recovery Areas	0	-	-
Maintenance Shop	0	-	-
Equipment Decontamination Areas	0	-	-
Other (specify)	0	-	-

Table 3.5 (Slag Used as Fill)

Number and Dimension of Facility Components			
Component	Number of Components	Dimensions of Component (units)	Total Dimensions (units)
Glove Boxes	0	-	-
Fume Hoods	0	-	-
Lab Benches	0	-	-
Sinks	0	-	-
Drains	0	-	-
Floors	0	-	-
Walls	0	-	-
Ceilings	0	-	-
Ventilation/Ductwork	0	-	-
Hot Cells	0	-	-
Equipment/Materials	0	-	-
Soil Plots (west fence line and well house areas)[a]	1	8000 m^3	8000 m^3
Storage Tanks	0	-	-
Storage Areas	0	-	-
Radwaste Areas	0	-	-
Scrap Recovery Areas	0	-	-
Maintenance Shop	0	-	-
Equipment Decontamination Areas	0	-	-
Other (specify)	0	-	-

[a] As identified in IT Corporation Report No. IT/NS-92-106, "Assessment of Environmental Radiological Conditions at the Newfield Facility", April 2, 1992.

Table 3.5 (D-102/D112)

Number and Dimension of Facility Components			
Component	Number of Components	Dimensions of Component (units)	Total Dimensions (units)
Glove Boxes	0	-	-
Fume Hoods	0	-	-
Lab Benches	0	-	-
Sinks	0	-	-
Drains	0	-	-
Floors (small areas of misc. Bldgs.)	1	19 m^3	19 m^3
Walls (D102/D112 walls)	1	1858 m^2	1858 m^2
Ceilings (D102/D112 roof)	1	2787 m^2	2787 m^2
Ventilation/Ductwork	0	-	-
Hot Cells	0	-	-
Equipment/Materials (former mix platform, rotoblast areas, misc. scrap equipment)	1	186 m^3	186 m^3
Soil Plots (floor of D102)	1	186 m^3	186 m^3
Storage Tanks	0	-	-
Storage Areas	0	-	-
Radwaste Areas	0	-	-
Scrap Recovery Areas	0	-	-
Maintenance Shop	0	-	-
Equipment Decontamination Areas	0	-	-
Other (specify)	0	-	-

Table 3.6

Planning and Preparation				
Task	Work Days			
	Supervisor	Foreman	Health Physicist	Clerical
Preparation of Documentation for Regulatory Agencies	4	4	2	.5
Submittal of Decommissioning Plan to NRC when required by 10 CFR 40.36	5	5	5	1
Development of work plans	5	10	5	1
Procurement of Special equipment	2	2	1	.5
Staff training	1	1	1	.5
Characterization of radiological condition of the facility (including soil and tailings analysis or groundwater analysis, if applicable)	10	10	5	2
Other	0	0	0	0
Total	27	32	19	5.5

Table 3.7 (D-111/Flex-Kleen)

Decontamination or Dismantling of Radioactive Facility Components (Work Days)					
Component	**Decon. Method**	**Supervisor**	**Foreman**	**HP Tech**	**Laborer**
Glove Boxes	-	-	-	-	-
Fume Hoods	-	-	-	-	-
Lab Benches	-	-	-	-	-
Sinks	-	-	-	-	-
Drains	-	-	-	-	-
Floors	scabbling/on site disposal	4	12	2	12
Walls	HEPA vacuum/partial dismantlement/on site disposal	5	10	5	30
Ceilings	HEPA vacuum/partial dismantlement/on site disposal	2	5	2	20
Ventilation/Ductwork	HEPA vacuum/partial dismantlement/on site disposal	10	20	5	50
Hot Cells	-	-	-	-	-
Equipment/Materials	HEPA vacuum/partial dismantlement/on site disposal	10	20	5	50
Soil Plots	excavation/on site disposal	4	8	4	20
Storage Tanks	-	-	-	-	-
Storage Areas	-	-	-	-	-
Radwaste Areas	-	-	-	-	-
Scrap Recovery Areas	-	-	-	-	-
Maintenance Shop	-	-	-	-	-
Equipment Decontamination Areas	-	-	-	-	-
Other (specify)	-	-	-	-	-

Table 3.7 (Storage Yard)

Decontamination or Dismantling of Radioactive Facility Components (Work Days)					
Component	Decon. Method	Supervisor	Foreman	HP Tech	Laborer
Glove Boxes	-	-	-	-	-
Fume Hoods	-	-	-	-	-
Lab Benches	-	-	-	-	-
Sinks	-	-	-	-	-
Drains	-	-	-	-	-
Floors	-	-	-	-	-
Walls	-	-	-	-	-
Ceilings	-	-	-	-	-
Ventilation/Ductwork	-	-	-	-	-
Hot Cells	-	-	-	-	-
Equipment/Materials	-	-	-	-	-
Soil Plots	Excavation/on site disposal	45	45	15	90
Storage Tanks	-	-	-	-	-
Storage Areas	-	-	-	-	-
Radwaste Areas	-	-	-	-	-
Scrap Recovery Areas	-	-	-	-	-
Maintenance Shop	-	-	-	-	-
Equipment Decontamination Areas	-	-	-	-	-
Other (specify)	-	-	-	-	-

Table 3.7 (Slag Used as Fill)

Decontamination or Dismantling of Radioactive Facility Components (Work Days)					
Component	Decon. Method	Supervisor	Foreman	HP Tech	Laborer
Glove Boxes	-	-	-	-	-
Fume Hoods	-	-	-	-	-
Lab Benches	-	-	-	-	-
Sinks	-	-	-	-	-
Drains	-	-	-	-	-
Floors	-	-	-	-	-
Walls	-	-	-	-	-
Ceilings	-	-	-	-	-
Ventilation/Ductwork	-	-	-	-	-
Hot Cells	-	-	-	-	-
Equipment/Materials	-	-	-	-	-
Soil Plots	Excavation/on site disposal	20	20	10	60
Storage Tanks	-	-	-	-	-
Storage Areas	-	-	-	-	-
Radwaste Areas	-	-	-	-	-
Scrap Recovery Areas	-	-	-	-	-
Maintenance Shop	-	-	-	-	-
Equipment Decontamination Areas	-	-	-	-	-
Other (specify)	-	-	-	-	-

Table 3.7 (D-102/D-112)

Decontamination or Dismantling of Radioactive Facility Components (Work Days)					
Component	Decon. Method	Supervisor	Foreman	HP Tech	Laborer
Glove Boxes	-	-	-	-	-
Fume Hoods	-	-	-	-	-
Lab Benches	-	-	-	-	-
Sinks	-	-	-	-	-
Drains	-	-	-	-	-
Floors	Scabbling/on site disposal	1	1	0.5	1
Walls	HEPA vacuum/partial dismantlement/on site disposal	4	10	4	20
Ceilings	Dismantlement/on site disposal	2	6	2	6
Ventilation/Ductwork	-	-	-	-	-
Hot Cells	-	-	-	-	-
Equipment/Materials	Dismantlement/on site disposal	5	10	3	20
Soil Plots	Excavation/on site disposal	2	5	2	10
Storage Tanks	-	-	-	-	-
Storage Areas	-	-	-	-	-
Radwaste Areas	-	-	-	-	-
Scrap Recovery Areas	-	-	-	-	-
Maintenance Shop	-	-	-	-	-
Equipment Decontamination Areas	-	-	-	-	-
Other (specify)	-	-	-	-	-

Table 3.8

Restoration of Contaminated Areas on Facility Grounds				
Task	Work Days			
	Supervisor	Foreman	Laborer	Clerical
Backfill and restore site	4	4	15	1
Total	4	4	15	1

Table 3.9

Final Radiation Survey				
Task	Work Days			
	Supervisor	Foreman	HP Tech	Clerical
Outdoor release survey	4	20	20	1
Building release survey[a]	10	25	25	5
Totals	14	45	45	6

[a]Includes the cost of the G-Warehouse final status survey, as well as surveys of D-117 (Cave), D-202 (Laboratory) and D-Warehouse.

Table 3.10

Site Stabilization and Long-Term Surveillance				
Task	Work Days			
	Supervisor	Foreman	HP Tech	Clerical
Long-term maintenance and surveillance of the cap	0	0	0	0
Totals	0	0	0	0

Table 3.11

Total Work Days by Labor Category						
Task	Work Days					
	Supervisor	Foreman	Health Physicist	HP Tech	Clerical	Laborer
Planning and Preparation (Totals from Table 3.6)	27	32	19	0	5.5	0
Decontamination and/or Dismantling of Radioactive Facility Components (Sum of Totals from all copies of Table 3.7)	114	172	0	59.5	0	389
Restoration of Contaminated Areas on Facility Grounds (Totals from Table 3.8)	4	4	0	0	1	15
Final Radiation Survey (Totals from Table 3.9)	14	45	0	45	0	6
Site Stabilization and Long-Term Surveillance (Totals from Table 3.10)	0	0	0	0	0	0

Table 3.12

Worker Unit Cost Schedule							
Labor Cost Component	**Supervisor***	**Foreman***	**Health Physicist****	**Equipment Operator***	**H P Tech***	**Laborer***	**Clerical***
Salary and Fringe ($/yr)	61,110	55,545	133,714	53,970	51,030	41,580	12,860
Overhead Rate (%)	70	60	110	141.5	53.7	141.5	61.2
Total Cost Per Year	103,887	88,872	280,800	130,338	78,433	100,416	20,730
Total Cost Per Work Day***	452	386	1080	567	341	437	90

*Values taken from NUREG/CR-6477, Appendix A, Table A.1
**Values based on an average IEM employed Health Physicist
***Based on an 8 hour work day (hourly rate w/overhead taken from NUREG/CR-6477 Appendix A Table A.1 multiplied by 8 hours/day)

Table 3.13

Total Labor Costs by Major Decommissioning Task							
Task	Supervisor	Foreman	Health Physicist	HP Tech	Clerical	Laborer	Total
Planning and Preparation	12,204	12,352	20,520	0	495	0	45,571
Decontamination or Dismantling of Radioactive Facility Components	51,528	66,392	0	20,290	0	169,993	308,203
Restoration of Contaminated Areas on Facility Grounds	1808	1544	0	0	90	6555	9997
Final Radiation Survey[b]	6328	17,370	0	15,345	0	2622	41,665
Site Stabilization and Long-Term Surveillance[a]	0	0	0	0	0	0	0

[a]Labor costs for long-term surveillance and cap maintenance are included in the total surveillance cost in Table 3.15

[b]Includes D-111/Flex-Kleen, D-102/D-112, G-Warehouse, Storage Yard, mislocated slag areas, D-117 (Cave), D-202 (Laboratory) and D-Warehouse.

Table 3.14 (a)

Packing Material Costs					
Waste type	**Volume (m^3)**	**No. Of containers**	**Type of Container**	**Unit Cost of Container**	**Total Packaging Costs**
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Total	-	-	-	-	-

Table 3.14 (b)

Shipping Costs						
Waste Type	No. of Truckloads	Unit Cost ($/mile/truckload)	Surcharge ($/mile)	Overweight Charges ($/mile)	Distance Shipped (miles)	Total Shipment Cost ($)
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
Total	-	-	-	-	-	-

Table 3.14 (c)

Waste Disposal Costs				
Waste Type	**Disposal Volume (m^3)**	**Unit Cost ($\$/m^3$)**	**Surcharges ($\$/m^3$ or $/container)**	**Total Disposal Cost ($)**
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
Total	-	-	-	-

Table 3.15

Equipment/Supply Costs (Excluding Containers)			
Equipment/Supplies	**Quantity**	**Unit Cost**	**Total Equipment/Supply Cost ($)**
Analytical/laboratory	200 samples	200	40000
Waste disposal cap (includes engineering design)[a]	1 ea.	720372	720372
Rad. Survey Equipment	1 lot	8768	8768
Travel/Living Expenses (motel, meals, car)	870 man-days	120	104400
Floor scabbling equipment rental	1 lot	10000	10000
Rental equipment for dismantlement (trackhoe, crane, dump truck, saws, torches)	4 months	40,000	160000
Long term surveillance (annual gamma/visual inspection, well installation and upkeep, vegetation removal, general repair, analytical samples).[b]	1	15,341,000 over 1000 year period, using 2% discount rate, in 2001 dollars-	781300
Total			1824840

[a] Derived from the West Pile cap cost shown in Section 5 of U. S. Nuclear Regulatory Commission, NUREG-1543, "Environmental Impact Statement; Decommissioning of the Shieldalloy Metallurgical Corporation Cambridge, Ohio Facility", July, 1996. Because the surface area necessary for the Newfield site will be only 53% of the West Pile surface area, the West Pile cap cost was scaled accordingly (i.e., $513,400 x 0.53 = $274,868). To this was added overhead and profit (30%), administrative costs (10%), engineering oversight (20%), the cost of permits and legal actions (10%), and engineering design cost (20%), for a total of $270,372 (see Appendix C).

[b] Based on cost shown in Section 5 of NUREG-1543 for a 1,000 year period. Includes one time charge of $15,000 for well installation.

Table 3.16

Miscellaneous Costs)	
Cost Item	**Total Cost ($)**
License Fees	2,000
Insurance	--
Taxes	--
Other (unspecified regulatory)	150,000
Total	152,000

Table 3.17

Total Decommissioning Costs		
Task/Component	**Total Cost**	**Percentage of Total Cost**
Planning and Preparation (From Table 3.13)	45571	2
Decontamination and/or Dismantling of Radioactive Facility Components (From Table 3.13)	308,203	13
Restoration of contaminated Areas on Facility Grounds (From Table 3.13)	9997	0
Final Radiation Survey (From Table 3.13)	41665	2
Site Stabilization and Long-Term Surveillance (From Table 3.13 and 3.15)	781300	33
Packing Material costs (Total from Table 3.14(a))	0	0
Shipping Costs (Total from Table 3.14(b))	0	0
Waste Disposal Costs (Total from Table 3.14(c))	0	0
Equipment/Supply Costs (Total from Table 3.15, excluding long-term surveillance costs, includes on site disposal costs)	1043540	44
Miscellaneous Costs (Total from Table 3.16)	152000	6
Subtotal	2382276	100%
25% Contingency	595569	-
Total Decommissioning Cost Estimate	2977845	-

Appendix C - Assumptions and Calculations

IEM
Integrated Environmental Management, Inc.

Project No: 94005.09		Page 1 of 10	
Subject: SMC (Newfield) DFP			
Performed by: [signature]		Date: 5/29/2001	
Checked by: [signature]		Date: 7/25/01	

I. Purpose - Provide written backup/calculations for SMC Newfield Decommissioning Funding Plan. Provide documentation of assumptions made to develop cost estimate.

II. References

a. "Decommissioning Funding Plan for the Newfield, New Jersey Facility", IEM report no. 94005/G-9194

b. U.S. Nuclear Regulatory Commission, NUREG 1543, "Environmental Impact Statement; Decommissioning of the Shieldalloy Metallurgical Corporation Cambridge Ohio Facility", July, 1996.

c. IT Corporation Report #IT/NS-92-106, "Assessment of Environmental Radiological Conditions at the Newfield Facility", April 2, 1992.

d. U.S. Nuclear Regulatory Commission, NUREG/CR-6477, "Revised Analyses of Decommissioning Reference Non-Fuel Cycle Facilities", July, 1998.

III Assumptions

a. Volume of slag in storage yard is 20,000 m^3 (706,293 ft^3)

b. Slag/building waste will be disposed of on site in an engineered cap.

c. Volume of baghouse dust in the storage yard is 20,000 m^3 (706,293 ft^3)

d. There is 8000 m^3 (282,517 ft^3) of slag used as fill in various locations around the site.

e. Ther is 6500 m^3 (229,545 ft^3) of soil from previous remediation efforts on site.

f. The following building/areas are designated as radiologically restricted areas but will not be considered as areas requiring remediation. This assumption is based on the survey results obtained during quarterly surveillances at the facility. These areas will be included when considering the costs for conducting a final status survey. The areas/bldgs. include:

- Bldg. D-203 (G-Warehouse)
- Bldg. D-117 (Cave)
- Bldg. D-202 (Laboratory)
- 'D' Warehouse (Shipping Dept.)

That leaves the following Areas/Bldgs. as the focus of remedial efforts:

- Bldg. D111
- Flex Kleen baghouse
- Bldg. D102
- Storage Yard
- Areas of mislocated slag

IV Cost Calculations

a. Bldg. D111/Flexkleen Baghouse (DFP Table 3.5)

Floors – Includes portions of D111 upper level, some areas of D111 lower level (most areas are dirt floor), Flex Kleen & AAF Baghouse concrete pads. It is assumed that project personnel are required to remove the top 1/8" of concrete surface utilizing a dustless scabbling system. Based on quarterly surveillance surveys, floors of the break room/office area and the majority of floors in D111 upper & lower levels do not exceed release criteria (600 dpm/100cm² Total alpha). For the purposes of cost estimating, it was assumed ~450 m² of D111 floor space requires decontamination, ~370 m² of Flex Kleen baghouse pad, & 110 m² of the AAF pad require decon. Assume scabbling Rate of 10 m²/hr.*

Labor – $\frac{930\,m^2}{10\,m^2/hr} = 93\,hrs$

Assume a 2 man crew is required
1 Foreman × 93 hrs × $386/dy/8hr/dy = $448
1 laborer × 93 hrs × $437/dy/8hr/dy = $508

Waste volume generated = $\frac{.125''}{} \Big| \frac{930\,m^2}{} \Big| \frac{1\,m}{\sim 40''} = \sim 3\,m^3$

Use packaging efficiency/contingency factor of 1.5.
⇒ $1.5 \times 3\,m^3 = 4.5\,m^3$

2 week equipment rental – 1 dustless scabbling system × 2 wks × $5000/wk = $10,000

* Scabbling rate taken from NUREG/CR-6477, Appendix A, Table A.2.

Walls – 2 walls @ 15m X 75m, 2 walls @ 15m X 25m.
Walls are constructed of steel beam supports & thin paneling. It is assumed based on quarterly surveillance surveys that the panels are not contaminated greater than the release criteria but steel beams are contaminated (covered with accumulated dust from plant operations). External surfaces of bldg. assumed to not be contaminated. Steel beams will be cleaned by HEPA vacuuming and pressure washing as necessary.

Ceilings – Area covers ~2800 m^2. As with the walls, it is assumed that panels are not contaminated & that only support beams with horizontal flats will require some amount of decontamination. Beams will be HEPA vacuumed & pressure washed as required.

Ventilation System/Ductwork - This system includes the suction plenums located in D111 above the furnaces, ductwork connecting the plenums to the Flex Kleen baghouse, & the Flex Kleen baghouse itself. Items/equipment will be decontaminated by HEPA vacuuming & pressure washing as necessary. Based on the radiological condition of the AAF baghouse when it was disassembled, it can be assumed that the majority of the metal will not be contaminated at levels greater than the release criteria. The majority of waste generated requiring disposal will be the baghouse filter bags & residual dust. Estimated volume of materials to be handled is 5574 m^3.

Equipment/Materials - This category includes the two large furnaces, overhead crane, vanadium furnaces, scale, vibrating hopper, & miscellaneous items. It is assumed that there will be ~3700 m^3 of equipment/materials that will require surveying, decontamination, and/or disposal.

Soil Areas - It is assumed that 4900 m³ of materials are required to be removed from the floor of Bldg. D111/baghouses. Area assumed to be excavated is 75m x 25m x 1m deep.

b. Storage Yard (DFP Table 3.5)

Based on Estimate provided by SMC, the volume of materials in the storage yard are as follows:

- Slag - 20,000 m³
- Baghouse Dust - 20,000 m³
- Excavated Soil - 6500 m³

These materials will be disposed of on site.

c. Slag used as fill material (DFP Table 3.5)

Areas identified in ENSR report as having slag used for fill will be excavated and the materials moved to the storage yard for on-site disposal. It is estimated that 8000 m³ of material will be excavated & disposed.

d. Other Bldgs. (DFP Table 3.5)

It was assumed that ~18 m² of floor space of miscellaneous restricted areas would require decontamination. This was inculded as a contingency & is not based on any characterization data. The remainder of the Table 3.5 (For All Other Bldgs.) is for Bldg. D102/112 (one bldg.) It was assumed that as in D111, the tin ceiling/wall panels are not contaminated, but beams with horizontal surfaces are contaminated. It was also assumed that some equipment (186 m³) + soil plot (186 m³) require onsite disposal

IEM
Integrated Environmental Management, Inc.

Project No:	94005.09	Page	7 of 10
Subject:	SMC (Newfield) DFP		
Performed by:	[signature]	Date:	7/20/01
Checked by:	(D Burgin)	Date:	7/25/01

c. Waste Disposal

All waste is assumed to be disposed of on site in an engineered disposal facility. The following considerations went into the long term surveillance of the disposal cap (1000 year period). Assumes annual gamma survey/visual inspection, installation of 3 wells w/a total of 6 water samples collected/yr.

Annual Value of Labor For Long Term Care	Time (Days)	Supervisor	Foreman	Equip Operator	HP Tech	Clerk	Laborer
Administration	2	2				2	
Site Maintenance	3		3	3			3
Environmental Surveillance	1				2		
Vegetation Management	4		4				8
LABOR TOTAL	10	2	7	3	2	2	11

Labor Costs (Annual) (From DFP Table 3.12)

Supervisor - 2 dy x \$452/dy = \$904
Foreman - 7 dy x \$386/dy = \$2702
Equip. Operator - 3 dy x \$567/dy = \$1701
HP Tech - 2 dy x \$341/dy = \$682
Clerical 2 dy x \$90/dy = \$180
Laborer 11 dy x \$437/dy = \$4807
TOTAL \$10,976 x 1000 yrs.

Total Labor - $\boxed{\$10,976,000}$

Well Installation (1 Time cost) - 3 wells x \$5000/well = $\boxed{\$15,000}$

Annual well sampling - 6 samples/yr x \$300/sample = $\boxed{\$1,800}$

Annual Equipment Cost - $\boxed{\$1,800}$ (NUREG CR-6477 App E. TABLE E-6)

Annual Materials Cost - $\boxed{\$750}$ (NUREG CR-6477 App. E TABLE E-6)

TOTAL ANNUAL COST - \$10,976 + \$1,800 + \$1,800 + 750 = \$15,326

TOTAL COST - (\$15,326 x 1000 yrs) + \$15,000 = \$15,341,000

Using a 2% discount rate in 2001 dollars ⇒ \$15,326/.02 =

Money to be set aside currently to pay for long term surveillance/maintence. ⇒ $\boxed{\$766,300}$ + \$15K well install

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Cost of waste disposal cap (In-situ disposal option)

Basis: Cambridge Volume $\cong$ 168,730 m^3 [DEIS]

Cambridge Surf. Area $\cong \left[(Vol_c)^{1/3}\right]^2$

$$\cong \left[(168{,}730\ m^3)^{1/3}\right]^2$$

$$\cong (55.24\ m)^2$$

$$\cong 3052\ m^2$$

Cambridge Cost - \$513,400 [DEIS]

Assumption:

$$\text{Cambridge Cost} * \frac{\text{Surface Area}_{(N)}}{\text{Surface Area}(c)} = \text{Newfield Cost}$$

$$\text{Cap Cost} \propto \text{Surface Area}$$

Calculations

$$\text{Surface Area}_{(N)} = \left[(Vol_N)^{1/3}\right]^2 \qquad Vol_N = 66{,}050\ m^3$$

$$= \left[(66{,}050)^{1/3}\right]^2$$

$$\cong \left[40.4\ m\right]^2$$

$$\cong 1634\ m^2$$

$$\text{Newfield Cost} \cong \$\ 513{,}400 * \frac{1634\ m^2}{3052\ m^2}$$

$$\boxed{= \$274{,}868}$$

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Checked by:	[illegible]	Date:	7/25/01

Newly calculated cost for Newfield cap
= $ 274,868 (construction cost subtotal)

Add ons -

- Overhead & profit - 30% +$ 82,460
  $ 357,328
- Contingencies -20% +$ 71,466

Construction Cost Total - $ 428,794

Administrative Cost - 10% $ 42879

Engineering Oversight - 20% $ 85,758

Permits/Legal -10% $ 42,879

Implementation Cost Total $ 600,310

Engineering Design Cost - 20% $ 120,062

Total - $ 720,372

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Performed by:	[signature]	Date:	7/20/01
Checked by:	CD Bulger	Date:	7/25/01

Survey Instruments

The following survey instruments are assumed to be required during the decommissioning of the site. Prices quoted are IEM published rental rates w/the exception of the Floor monitor, whose price is based on recent IEM rental of such instruments.

Instrument	# required	Duration	Rental Rate	Total Cost
Ludlum Floor Monitor	1	2 mo.	$400/mo.	$800
Bicron MicroRem	1	8 mo.	$153/mo.	$1224
Ludlum 2224 w/ 43-89 α/β probe	2	8 mo	$166/mo.	$2656
Ludlum 2241 w/ 44-10 probe	2	8 mo.	$148/mo.	$2368
Ludlum 2929 scaler	1	8 mo	$215/mo	$1720
			TOTAL Instrument Cost	$8768

Shieldalloy Decommissioning Funding Plan
Newfield Site
Response to NRC comment (4)

Cost Breakdown - Waste Disposal CAP (*In-Situ* Disposal) Option: Capital Costs

Cost Component and Description	*Quantity*	*Units*[a]	*Unit Cost*[b]	*Total Cost*	*Assumptions*
Mobilization/demobilization	1	LS	$5,000	$5,000	
Site preparation	1	LS	$10,000	$10,000	
Construct trench for cap key (1' x 4')	1,600	CY	$3.77	$6,032	ECHOS 1997 17 03 0255
Low permeability clay cap (2' thick)	1,300	CY	$12.49	$16,237	ECHOS 1997 33 08 0507
Separation fabric (60 mil)	1,950	SY	$1.33	$2,594	ECHOS 1997 33 08 0531
VLDPE (20 mil)	17,550	SF	$0.55	$9,653	ECHOS 1997 33 08 0541
Sand layer (1' thick)	650	CY	$8.82	$5,733	ECHOS 1997 17 03 0426
Drainage fabric (60 mil)	1,950	SY	$1.33	$2,594	ECHOS 1997 33 08 0531
Geotextile fabric (60 mil)	1,950	SY	$1.33	$2,594	ECHOS 1997 33 08 0531
Unclassified Fill (2' thick)	1,300	CY	$7.35	$9,555	ECHOS 1997 17 03 0423
Topsoil (6" thick)	325	CY	$31.18	$10,134	ECHOS 1997 18 05 0301
Seeding	0.4	AC	$1,813	$725	ECHOS 1997 18 05 0402
Riprap ditching	530	LF	$23.00	$12,190	ECHOS 1997 33 05 0804
Water truck	1	LS	$8,000	$8,000	
Survey markers	1	LS	$10,000	$10,000	
Deed restrictions	1	LS	$10,000	$10,000	
Sub-Total				***$121,039***	
Location Multiplier			0.08	$9,683	
Sub-Total				***$130,722***	
Overhead and profit			20%	$26,144	
Sub-Total				***$156,866***	
Contingencies			20%	$31,373	
Construction Cost Total				***$188,239***	
Administrative costs			10%	$18,824	
Engineering oversight			20%	$37,648	
Permits and legal			10%	$18,824	
Implementation Cost Total				***$263,535***	
Engineering design			20%	$52,707	
CAPITAL COST TOTAL				***$316,242***	

[a] LS = lump sum, CY = cubic yard, SY = square yard, SF = square feet, LF = linear feet, AC = acre
[b] Costs based on safety level D

This report was prepared under the direction of
Shieldalloy Metallurgical Corporation

by

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