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

DEC 0 1 1993

Docket No. 40-8778
License No. SMB-1393

Molycorp, Inc.
ATTN: Ms. Barbara K. Dankmyer
Resident Manager
300 Caldwell Avenue
Washington, Pennsylvania 15301

Dear Ms. Dankmyer:

SUBJECT: NRC COMMENTS ON THE REVISED PLAN FOR SITE CHARACTERIZATION IN SUPPORT OF DECOMMISSIONING OF THE MOLYCORP INC., WASHINGTON, PA FACILITY

The U.S. Nuclear Regulatory Commission staff has completed its review of the report entitled "Plan for Site Characterization in Support of Decommissioning of the Molycorp Inc. Washington, PA, Facility" as revised and dated August 1993. This document is herein referred to as Molycorp's revised Site Characterization Plan (revised SCP). In its review of the revised SCP, the staff also considered the comments made by NRC on the original SCP which were sent to you on February 25, 1993. Enclosed is a specific list of our comments on the revised SCP.

After review, NRC approves of the revised SCP provided Molycorp resolves general comments 3 and 4 and the specific comments in a satisfactory manner. However, the staff continues to caution Molycorp with respect to the following concerns:

1) NRC staff is concerned with Molycorp's insistence on using decommissioning criteria other than those provided by NRC. NRC's 1981 Branch Technical Position (BTP) entitled "Disposal or Onsite Storage of Thorium or Uranium Wastes From Past Operations" contains options for decommissioning and criteria which will be the bases NRC will use to make a determination if the site can be released for unrestricted use. The 1992 "Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites" further describes the approach NRC will use for the remediation of contaminated sites. The Action Plan emphasizes Option 1 of the BTP as well as Option 2 with the application of the As Low As Reasonably Achievable (ALARA) principle. The current dose limit in 10 CFR Part 20 is 100 mrem/yr. For ALARA requirements, NRC would expect reasonable assurance that actual doses on the site would be a small fraction of 100 mrem/yr. A dose criterion may be useful to Molycorp as a remediation goal; however, NRC will not accept a dose criterion in place of soil concentration criteria for releasing the site for unrestricted use absent a satisfactory ALARA justification. NRC

will compare the soil concentrations provided by Molycorp, determined by sampling and radiochemical analysis, with the soil concentration limits in the BTP. A dose criterion may be used in pathway analyses to support or supplement compliance by showing that doses are below the remediation goal set by Molycorp.

2) Several statements in the revised SCP indicate that gamma logging measurements will be used to determine the $^{232}Th$ concentrations in the soils. As stated in our previous comments, this technique, although useful in identifying areas of contamination for use by Molycorp, can not be used alone to determine the soil concentrations presented to NRC as criteria for releasing the site. Conventional soil sampling and analysis will be required in Molycorp's termination survey to demonstrate compliance with NRC's remediation criteria outlined in the BTP. While the gamma logging technique may be adequate for site characterization, it has not been adequately demonstrated in terms of accurately deriving subsurface thorium concentrations. Therefore, the use of this technique needs to be supplemented with soil sampling and analysis to verify the accuracy of derived soil concentrations.

3) In many responses to NRC comments, Molycorp committed to providing some requested information at later stages in the decommissioning process. This is acceptable as long as Molycorp is aware that the information requested will be required in the future. Many of the comments made by NRC were provided in order to familiarize Molycorp with future obligations and necessary information in an effort to minimize repetitive efforts. For example, soil sampling frequency which is acceptable for site characterization may not be as extensive as would be necessary for a final termination survey. As stated by Molycorp, the SCP is intended for Site Characterization, and therefore does not have to provide reasonable assurance of the extent of contamination as will be required through the final Site Decommissioning Plan and termination survey. However, it has been NRC's experience that inadequate site characterization has lead to prolonged decommissioning activities.

In accordance with License No. SMB-1393, Condition 14.C, Molycorp is required to submit a report to the NRC detailing the site characterization results 8 months from the date of this letter. If you do not anticipate meeting this license condition, Molycorp should communicate the potential for delay and submit a license amendment request including the reasons why it is unable to comply with this requirement.

If you would like to meet with the NRC staff to discuss these comments, we would be happy to arrange such a meeting. If you have any questions, please contact me at (301) 504-2546.

Sincerely,
/S/

Chad J. Glenn, Project Manager
Decommissioning and Regulatory
Issues Branch
Division of Low-Level Waste Management
and Decommissioning
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated
cc: G. Dawes, Molycorp
J. Yusko, PA-DER-RP
B. Belanger, EPA Region 3
J. Kinneman, NRC Region 1

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NRC Comments On:
Plan For Site Characterization In Support Of Decommissioning
Of The Molycorp Inc. Washington, Pa Facility
August 1993 Revision

General Comments

#1 Decommissioning Criteria:

A dose criterion should not be used in place of NRC's existing decommissioning criteria without a satisfactory justification of ALARA. In the revised SCP, Molycorp presents its rationale for using a dose criterion with respect to Option 2 of NRC's 1981 Branch Technical Position (BTP) entitled "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations". The technique Molycorp presented, although it may prove to be a useful technique in the future, has not been proven effective and therefore cannot be used alone or as a substitute to the method NRC normally uses to determine the suitability of a site for release for unrestricted use.

As stated in the revised SCP, the determination of a soil concentration which would result in a specific dose is a mathematical function. However, there are several variables present in these equations (e.g., occupational factor) which could vary from the values used by NRC to determine the soil concentration levels in the 1981 BTP. If the calculations are not performed correctly, the soil concentrations calculated by Molycorp may be above NRC release limits while the calculated dose remains at or below those stated in the supporting analysis for the BTP. Remediation of the site to comply with the dose criterion could cause a problem when the termination survey is completed. Although Molycorp may use a dose criterion, the final confirmatory survey performed by NRC and its contractor (ORISE) will be based on soil concentration limits. If Molycorp's termination survey or NRC's confirmatory survey indicate the soil concentrations are above the release limits listed in the BTP, the site may not be releasable for unrestricted use even though Molycorp's calculations show the dose limits to be acceptable. This may result in the need for additional remediation by Molycorp to bring the site into compliance, and could unnecessarily require additional NRC and licensee resources.

A dose criterion may be useful to Molycorp as a supplement to the soil analysis data, or to support remediation activities. For example, Molycorp may wish to use a dose limit to determine areas of contamination, or when remediation efforts have brought the level of contamination down to approximately BTP levels. However, Molycorp should then perform soil sampling to demonstrate compliance with the BTP. NRC expects Molycorp to select and justify appropriate decommissioning criteria in accordance with the SDMP Action Plan [57 FR 13389; April 16, 1992] and present them in the Decommissioning Plan for the Molycorp Washington site.

Enclosure

#2 Radiological Characterization of Site:

Based on NRC staff's review, the 440 soil samples seem adequate to determine the general areas of contamination. However, more samples may be needed to assure the site has been remediated to meet the criteria set in the SDMP Action Plan. If, for example, the areas of contamination are larger than expected more samples may be necessary. In general, instead of a maximum number of samples, it may be more useful to specify a number of samples per area of contaminated soil. This ensures an adequate number of samples and allows the sampling to be governed by the contaminated area instead of by number of samples planned.

In addition, sampling requirements for characterization and termination surveys differ between sites depending on the type of site contamination. When the contamination is homogeneously distributed over a site, it can be characterized relatively easily with limited surveys and soil sampling following the guidance in NUREG/CR-5849. This is acceptable because the sampling described in NUREG/CR-5849 could give NRC reasonable assurance of the levels of contamination on site before and after remediation. A 10 meter grid containing four surface samples in an area of evenly distributed contamination will represent the contamination in that area with reasonable accuracy. However, on a site with heterogeneous contamination, the same 10 meter grid containing four surface samples could show the area to be uncontaminated when in reality the sampling method simply missed the areas of contamination. The Molycorp site contamination is concentrated in discrete pieces of slag and therefore it is much more difficult to represent the contamination in the area with reasonable accuracy.

There appear to be two possible approaches for remediating the subsurface contamination in affected areas. One approach is direct excavation and removal of contamination in all affected areas. A second approach is meticulous use of the gamma logging technique in all affected areas, provided Molycorp can prove its applicability and reliability, followed by excavation and removal of contamination detected from the gamma logging survey. NRC staff supports the direct excavation and removal of subsurface contamination in affected areas for the reasons explained in comment #3.

#3 Use of the Gamma Logging Technique to Derive $^{232}Th$ Concentrations:

As stated in NRC's original comments (February 25, 1993), NRC staff presently does not support the use of this technique for the determination of $^{232}Th$ concentrations which will be used in the final stages of the remediation. This technique has not been demonstrated to be accurate and would need verification sampling to prove that it is a valuable and reliable method for governing the remediation of the site. If Molycorp can demonstrate the reliability of this method (see comment #4), then NRC would support its use in the unaffected areas to demonstrate compliance in these areas.

This technique does not appear to be acceptable for use in the affected areas because the subsurface contamination in the affected areas is heterogeneous and laterally discontinuous. Boreholes on a 10 meter grid spacing may not be adequate to detect subsurface contamination between boreholes, especially if the gamma logging technique is only laterally effective a short distance from the

borehole. Molycorp has classified areas to be "affected" which implies there is a possibility of radioactive contamination in those areas. If Molycorp used a 10 meter grid sampling approach, either with the gamma logging or with traditional soil sampling, there are areas between the sampling locations which could contain significant contamination which would not be detected. NRC can not release a site for unrestricted use without sufficient confidence that there are no areas on the site which contain unacceptably elevated contamination levels in excess of NRC's remediation criteria.

As stated in comment #2 there are two possible options for remediating subsurface contamination in affected areas. The first option is proceeding directly with excavation and removal of contamination. The areas Molycorp has classified as affected and containing heterogeneous contamination could be remediated directly without further characterization sampling. After remediation of these areas, Molycorp could demonstrate compliance using the termination survey guidance in NUREG/CR-5849 either in the form of soil sampling or with gamma logging if Molycorp can demonstrate its applicability and reliability (see comment #4).

The second option is meticulous use of the gamma logging technique. In order to use this technique, Molycorp must prove to NRC with reasonable assurance that derived contamination levels present in the affected areas correspond to the contamination levels determined by conventional soil sampling and analyses. This would involve a demonstration by Molycorp of the gamma logging technique and its effective range laterally into the soil around the borehole. For example, if the technique can be demonstrated to accurately determine the contamination levels in the borehole out one meter from the hole itself, then gamma logs should be taken every two meters over the entire affected area. This would produce an accurate picture of the contamination and would allow Molycorp to remediate the areas which are presently above BTP limits. Areas which were originally classified as affected but contain contamination below BTP limits could be reclassified as unaffected, with NRC approval, because NRC would be assured no contamination was missed because the spacing of boreholes would correspond with the effective range of the gamma logging technique. This option increases the number of boreholes needed, but would reduce the termination survey samples that would be required. Areas classified by this meticulous gamma logging method would not need to be resurveyed for the termination report provided the technique adheres to pertinent guidance in NUREG/CR-5849, other than borehole spacing. Only the areas which were remediated would need to be resurveyed for the final termination survey.

In the revised SCP, Molycorp commented on the lack of a method in NUREG/CR-5849 for averaging over volumes of soils. NRC has based decommissioning decisions on the soil concentrations as measured by soil samples and chemical or radiological analysis, not by a technique such as gamma logging which requires averaging over an unspecified volume of soil in a three dimensional geometry. Therefore, guidance was not provided in this area. If Molycorp intends to use gamma logging as a technique for averaging concentrations in soil, it is up to Molycorp to demonstrate the accuracy of this method. It is important to note that NRC would be unable to accept a technique for averaging over large volumes, if an NRC confirmatory survey identifies areas of contamination that are unacceptably high.

#4 Demonstrating the Gamma Logging Technique

In the revised SCP, Molycorp states that it plans to obtain 40 samples from three boreholes drilled five feet from other boreholes previously surveyed using the gamma logging technique. This exercise apparently will be used to demonstrate the effectiveness of the gamma logging results in the affected areas. The gamma logs of these boreholes will be compared to the analysis of core samples from the three new boreholes to develop the correlation between the concentrations of $^{232}Th$ in the soil determined by radiochemical methods and the concentration determined by the gamma logging.

In demonstrating the effectiveness of the gamma logging in determining $^{232}Th$ concentrations, NRC suggests that Molycorp consider collecting core samples from three boreholes drilled five feet apart in a triangular pattern in place of the demonstration technique presented in the SCP. After coring, each of these boreholes would then be surveyed using the gamma logging technique. The core and gamma logging data from these three boreholes should be used in establishing the correlation between soil concentrations and gamma logging. Another borehole should be drilled in the center of this triangular pattern. This borehole should also be cored and surveyed using the gamma logging technique. However, the data from this borehole should not be used in developing the correlation of the two methods, but as a test of the accuracy of the correlation. Once Molycorp has established its correlation between gamma counts and $^{232}Th$ concentration based on the data from the three exterior boreholes, Molycorp should estimate the concentration profile for $^{232}Th$ in the center borehole by using the gamma logging results. This profile should then be compared with the actual measured concentrations of $^{232}Th$ from soil samples in the center borehole.

In addition to this correlation task, Molycorp should demonstrate the effective detection limit of this technique laterally from a borehole. A demonstration of a series of boreholes and gamma logs which can be correlated laterally is also important for demonstrating the applicability of the technique in connection with comment #3. The triangular grid can be used for this demonstration. One concern is that the demonstration actually correlates measurements made on the same soil sample. For example, a core of a hole could contain one piece of slag, while a gamma log of the same area in the borehole could detect several pieces of slag. It may be difficult to correlate these two techniques under such heterogeneous conditions. One method to avoid gamma logging and coring different soils is to use the lateral correlation between the three triangular boreholes. If the three outer holes were cored and logged it should be possible to interpolate from the logs the concentration in the center bore hole before it is cored. Then, when the center borehole core is analyzed radiochemically, the gamma logs from the outer boreholes should correlate with the soil samples from the center borehole.

Specific Comments to Molycorp's Replies Appendix H

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In this section, Molycorp states that a leachability test will be used to determine whether or not a $K_d$ measurement is needed. There was no mention of the threshold value indicated by the leach test that Molycorp would utilize to determine if a $K_d$ would be measured. In addition, although leachability is

indirectly related to $K_d$, it is not a direct indication of the $K_d$ value. $K_d$ is based on several chemical and physical properties and can not be completely characterized by the leachability of the soil matrix. An approximate $K_d$ value is necessary if Molycorp plans to assess groundwater transport of radionuclides in evaluating the potential risk to the general public produced by the site.

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Molycorp quotes a section of NUREG/CR-5849 entitled "Measurement Uncertainty" to respond to a comment from NRC concerning slag sampling. This section does not address the number of slag samples to be analyzed which would be required to determine the variability in the chemical composition. This section states that six repeat samples are necessary to determine the variability of a particular measurement or measurement technique. If, for example, six identical samples are measured using the same technique and all the measurements fall within the 95% confidence level, then the technique can be considered precise and adequate for the types of measurements performed. However, 30 samples of the slag are needed to build a statistically accurate base of the variability in the chemical composition of the slag onsite. Therefore, samples for slag variability, such as particle size and leachability, should be performed in sets of 30 samples.

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In this section, Molycorp states that the definition of background radiation is dependent on the instrument making the measurement. This section states:

> If the instrument does not respond to the cosmic radiation (e.g., a scintillometer), then the background value refers only to the gamma component and the cosmic component must be omitted.

This statement implies that the definition of cosmic radiation is limited to high-energy particles which can be detected by an ion chamber. However, cosmic radiation also includes secondary radiations (i.e., gamma and x-rays) produced when high-energy particles enter and interact with the upper atmosphere. Therefore, even using a scintillometer, the cosmic component is detected (Knoll, G., *Radiation Detection and Measurement*, Second Edition 1979, pp 719). In the interest of technical accuracy, Molycorp should include the cosmic component in the definition of background radiation.