

# Final Status Survey Report for Various Foundation Concrete at the Molycorp Site

Building 33 Additional Footer Material, Buildings  
19 and 26 Footer Material, Hx Exchanger Tank  
Foundation, Electrical Switch Gear Slab and the  
Acid Storage Tank Foundation

Washington, PA



**MACTEC, Inc.**

Revision - 0  
Dated 11/11/02

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## **1.0 BACKGROUND INFORMATION**

Molycorp, Inc.'s (Molycorp) predecessor, the Molybdenum Corporation of America, was formed from the Electric Reduction Company in Washington, Pennsylvania on June 16, 1920. The facility was purchased to manufacture ferroalloys.

Molybdenum manufacturing began in the 1920s. Processing of this material was idled in 1991. Although primarily manufacturing molybdenum products, the plant also produced ferrocolumbium (FeCb, 1964 to 1971), as well as other ferroalloys, e.g., tungsten.

In February 2002, site decommissioning and demolition was initiated for aboveground structures and buildings. Building final status surveys (FSS) were initiated in mid February, building demolition started in May 2002. Initially, each building or area located in a building was a single survey unit that included the foundation and shell/structure. After completing the FSS for the first set of buildings, it was realized that by combining the foundation and structure into a single survey unit, the completion of the NRC independent verification (IV) survey and release from radiological controls was delayed. In order to facilitate and expedite NRC IV surveys and the release of radiological controls, all subsequent building FSS consisted of independent surveys for the building's foundation and the shell/structure.

## **2.0 SITE INFORMATION**

### **2.1 SITE DESCRIPTION**

The Molycorp, Inc. project site (the site) is located in southwestern Pennsylvania on the outskirts of Washington County approximately 35 miles southwest of Pittsburgh. The site is separated from the populated City's urbanized area by the ramps and structures associated with Interstate 70 (I-70). The region is generally comprised of towns located close to transportation corridors surrounded by agricultural lands and open areas.

The current work site consists of approximately 8 acres that is located inside a 20 acre fenced portion of the 59-acre parcel owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania, 15301. The fenced area is situated between 1,010 and 1,045 feet above mean sea level with relatively flat topography.

Molycorp's property has frontage along two dedicated public streets in Canton Township – Caldwell Avenue and Weirich Avenue. The site is transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX operated railroad via two lines that were formerly owned by the Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad.

Adjacent property owners can be classified into three major categories on the current use of the land - residential, industrial, and public. The residential property lies to the east of the site on Green Street and to the west along Weirich Avenue. The industrial property is located predominately north of the site and includes property under the ownership of the Findlay Refractories Company and Allegheny Ludlum Corporation. Darrt Development Company owns several scattered parcels located to the south and east of

the site. Land under public ownership includes the Canton Township Volunteer Fire Company property, the right-of-way for I-70, and other public streets. The Washington Institute of Technology owns a vacant 38-acre parcel adjacent to the southwestern property line.

## **2.2 SITE CONDITIONS AT TIME OF FOUNDATION/MATERIAL SURVEYS**

As part of the past decommissioning activities, building structural materials have been removed and processed, either as clean construction debris or as radiological waste. Clean construction debris has been continually removed from site as building materials and concrete foundations have been cleared from radiological controls by the NRC. Radiological waste has been segregated and stored on-site for final disposal activities. Shipping of radiological waste began in early October, 2002. Radioactive waste shipments will continue through job completion.

## **2.3 GROUNDS**

The Molycorp Washington, PA facility produced a ferrocolumbium alloy from Brazilian ore (pyrochlore) between 1946 and 1970. While the use of pyrochlore was commonplace by that time, this particular ore contained thorium as an accessory metal. The thorium was also in concentrations that required Molycorp to acquire a Source Materials License. This operation resulted in the production of a thorium-bearing slag. A portion of this slag was ball-milled (turned into a granular powder) and used as fill over portions of the site.

While significant amounts of this slag have been removed from the site, remaining slag in soil continued to play a significant role in the survey and release of buildings on-site. Building steel walls and concrete floors showed significant readings above "normal" background levels when surveyed by hand-held or portable detectors.

Because this elevated background condition exists at the Molycorp site, MACTEC devised instrument detector windows for some of their instruments and used them in areas where thorium slag in soil created a background nuisance during survey activities.

## **2.4 FOUNDATION CLASSIFICATION**

All foundations do not have the same potential for residual contamination and therefore do not require the same level of survey coverage. For purposes of establishing the degree of survey effort required, building foundations have been segregated into affected and unaffected foundations.

- **Affected foundation:** Foundations that have a potential for surface residual contamination from contact with underlying soils.
- **Unaffected foundation:** Foundations not classified as affected.

TABLE 1 - CLASSIFICATION OF BUILDING FOUNDATION

Foundation Classification <sup>(1)</sup>	Building Number	Radiological Information
U	1	Concrete floor. Underside of slab identified as contaminated above release limits.
U	2	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	2W	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	2 Train Bay	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	13	Slab final status surveyed and released by NRC.
U	14	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	19	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	21	Slab final status surveyed and released by NRC.
U	22	Concrete floor. Underside of slab identified as contaminated above release limits.
U	23	Slab final status surveyed and released by NRC.
U	25	Slab final status surveyed and released by NRC.
U	26	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
A	28	Concrete floor. Not yet released by NRC. Building foundation is located on contaminated fill.
U	29	Concrete floor. Underside of slab identified as contaminated above release limits.
U	31	Concrete floor. Topside of slab identified as contaminated above release limits.
A	32	Concrete floor. Underside of slab identified as contaminated above release limits.
A	33	Slab final status surveyed and released by NRC.
A	34	Concrete floor. Underside of slab identified as contaminated above release limits.
A	35	Slab final status surveyed and released by NRC.

A	36	Slab final status surveyed and released by NRC.
U	37	Concrete floor. Underside of slab identified as contaminated above release limits.
A	38	Concrete floor. Not yet released by NRC. Building foundation is located on contaminated fill.
A	39	Concrete floor. Not yet released by NRC. Building foundation is located on contaminated fill.
A	42	Slab final status surveyed and released by NRC.

(1) Building foundation classification is derived from building location, obtained from Molycorp's Material License, Amendment No. 5, SMB-1393.

## 2.5 SURVEY UNITS

Each building foundation was considered an individual survey unit for final status survey purposes. Determination of compliance with the average unrestricted use limits was evaluated on a survey unit basis. Each survey unit must be shown to meet the average surface contamination and exposure rate limits at a 95% confidence.

## 3.0 DECOMMISSIONING ACTIVITIES

Decommissioning activities of the buildings on site were performed as a "first step" to release the site for unrestricted future use. The scope of work during this phase includes D and D of all above surface structures.

### 3.1 OBJECTIVES

The objectives for this phase of D and D activities included:

- Removal of equipment and surplus supplies from buildings
- Characterization of hazards associated with the buildings (performance of effective radiological surveys)
- Remediation or disposal of hazards identified in the characterization process
- Completion of Final Status Survey
- Unrestricted release of buildings
- Demolition of buildings

### 3.2 RESULTS OF PREVIOUS SURVEYS

Numerous radiological studies and surveys have been conducted at the Molycorp Washington, PA site. Since the late 1960s, regulatory requirements and pressure from local agencies have driven surveys and studies of the hazards associated with the production of various ferroalloys. Listed below is a brief history of the previous surveys performed on the Molycorp site:

Applied Health Physics, Inc. was contracted by Molycorp to conduct a series of leaching studies on ferrocolumbium slag during the late 1960s. These studies indicated that radioactive materials were fixed and would not leach into the groundwater in excess of prescribed limits. During this period, Molycorp applied unsuccessfully to the Pennsylvania Department of Health's Industrial Wastes Section and AEC for an onsite burial permit. Ferrocolumbium slag cleanup was concentrated in the early to mid-1970s time frame.

In June 1971, an AEC compliance inspection revealed that thorium-bearing slag had been inadvertently buried onsite in violation of the terms and conditions of their license and AEC regulations. The AEC issued a Notice of Violation and requested Molycorp to take remedial action to excavate these materials and dispose of them in accordance with AEC regulations and guidance documents. Applied Health Physics was contracted to perform a thorough radiological survey of the site and to provide health physics and waste disposal services necessary to comply with AEC's request. Survey measurements indicated exposure levels at 1.2 mR/hr in some areas.

In 1972, thoriated material from the site was disposed of at the West Valley, New York, burial site. The disposal was terminated when New York officials decided that the volume of waste was too large and the contamination level insignificant to use up valuable burial area. Molycorp performed cleanup operations to segregate and stabilize the remaining thoriated material in a capped pile containing about 27,700 cubic yards of slag on the south property. A 1975 Applied Health Physics, Inc. report indicated the average concentration of thorium-232 in the slag pile was 1,250 pCi/g, with exposures within the 0.2 mR/hr Nuclear Regulatory Commission maximum level allowed at the time (AEC was reorganized as the NRC in 1974). This pile was eventually removed and disposed of.

In 1978, one of two molybdenum-roasting furnaces was shut down as part of a consent decree with the Pennsylvania Department of Environmental Resources (PADER) Air Quality Agency due to exceedances of SO<sub>2</sub> standards. All remaining processes continued until 1991.

Oak Ridge Associated Universities, an NRC contractor, conducted a radiological survey of the site in 1985. The survey identified elevated (twice background or greater) levels of thorium in the dikes that separated the surface impoundments, and indicated the potential of subsurface thoriated slags in the western portion of the site.

RSA, Inc. conducted a subsurface survey for Molycorp in 1990 to characterize the thorium contamination across the western portion of the site (i.e., the impoundment area), and the areas immediately to the north, west, and northwest. Thirty-two holes were drilled on the site and radiation measurements were logged at every six inches of depth from the surface down to bedrock, both above and below water table. Radiation levels were also logged in monitoring wells previously drilled on the site. In addition to the subsurface survey, RSA, Inc. conducted a survey of the radiation exposure rates inside the study area. This survey consisted of approximately 400 measurements of the gamma radiation field at a height of one meter above

ground level. Findings revealed that; in general, the subsurface concentrations of thorium were above those in the surface soils in almost every hole drilled. A general pattern was that the underground radiation levels decreased to background at a depth of about ten feet. While a majority of the holes exhibited concentrations of greater than 0.01 percent thorium, in only a few holes did the thorium content exceed an average of 0.05 percent at some point below the surface of the ground.

Foster Wheeler Environmental Corporation conducted a site characterization of the Molycorp Washington, PA site in 1994 and published its report titled "Site Characterization Report for License Termination of the Washington, PA Facility, 1995." This three-volume report was conducted to meet the Site Characterization Plan's objectives:

- To determine the extent of the distribution of thoriated residues on the site, in the structures and in the environmental media.
- To determine the rate(s) of migration, if any, of thorium or its daughters through various pathways to man.
- To assess associated non-radiological constituents and determine their effects on the radiological constituents and potential impacts on decommissioning.
- To quantify parameters that affect potential human exposure to existing site radiological materials.
- To support evaluation of alternative decommissioning actions and detailed planning of a preferred approach for decommissioning, decontamination, and waste disposal.

### **3.3 DECONTAMINATION PROCEDURES**

Building foundations and equipment footings found to contain radioactivity above the release limits were not normally decontaminated. Concrete and foundation materials found to have elevated levels of radioactivity were controlled as radioactive material and will ultimately be disposed of as radioactive waste.

### **4.0 FINAL SURVEY PROCEDURES**

The basis of the Molycorp radiological survey design conformed to NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," RSI's "Decommission Plan for the Washington, PA Facility, Part 1 Revision," and the requirements of Molycorp's "U.S. Nuclear Regulatory Commission Material License, Amendment No. 5, SMB-1393." These references provide adequate information and sampling requirements to ensure a proper survey had been planned and performed. The requirements listed in these references were compiled into a sampling plan (MACTEC's "Concrete Sample and Management Plan") and used as the guidance document for sampling instructions.

#### **4.1 SAMPLING PARAMETERS**

Sampling parameters were identified from NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," RSI's "Decommission Plan for the Washington, PA Facility,

Part 1 Revision,” and the requirements of Molycorp’s “U.S. Nuclear Regulatory Commission Material License, Amendment No. 5, SMB-1393.”

Survey results were obtained and used for comparison against the limits for unrestricted release, as defined in the site’s NRC License.

Table 2 identifies the release limits of the license.

**TABLE 2 - ACCEPTABLE SURFACE CONTAMINATION LEVELS(DPM/100CM<sup>2</sup>)**

Radionuclide <sup>(1)</sup>	Average	Maximum	Removable
U-nat, U-235, U-238, and associated decay products	5,000 α	15,000α	1,000α
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000	15,000	1,000

(1) Where surface contamination by both alpha and beta-gamma emitting nuclides exist, the limits established for alpha and beta-gamma emitting nuclides should apply independently.

Even though limited quantities of natural uranium has been identified at the Washington, PA site, and is included as a part of the site’s NRC License, the more restrictive limits for release (for surface activity) are for the natural thorium radionuclide, which is the significant radionuclide of concern. Therefore, the limits for release are due to the natural thorium radionuclide, and the limits are 1,000 dpm/100cm<sup>2</sup> average, 3,000 dpm/100cm<sup>2</sup> maximum and 200 dpm/100cm<sup>2</sup> removable.

Because both alpha and beta radiations are a product of the decay of natural thorium (in equilibrium), the limits listed above apply independently to both alpha radiation and beta radiation.

Due to the inherent difficulty of properly quantifying the alpha radiation component during the decay of natural thorium when using a hand-held instrument, a ratio of alpha decays to beta decays was identified and beta radiation was used as a surrogate to quantify the alpha activity. This was not the case for determining removable contamination. The Ludlum 2929 was calibrated and set up for the measurement of both alpha and beta radioactivity.

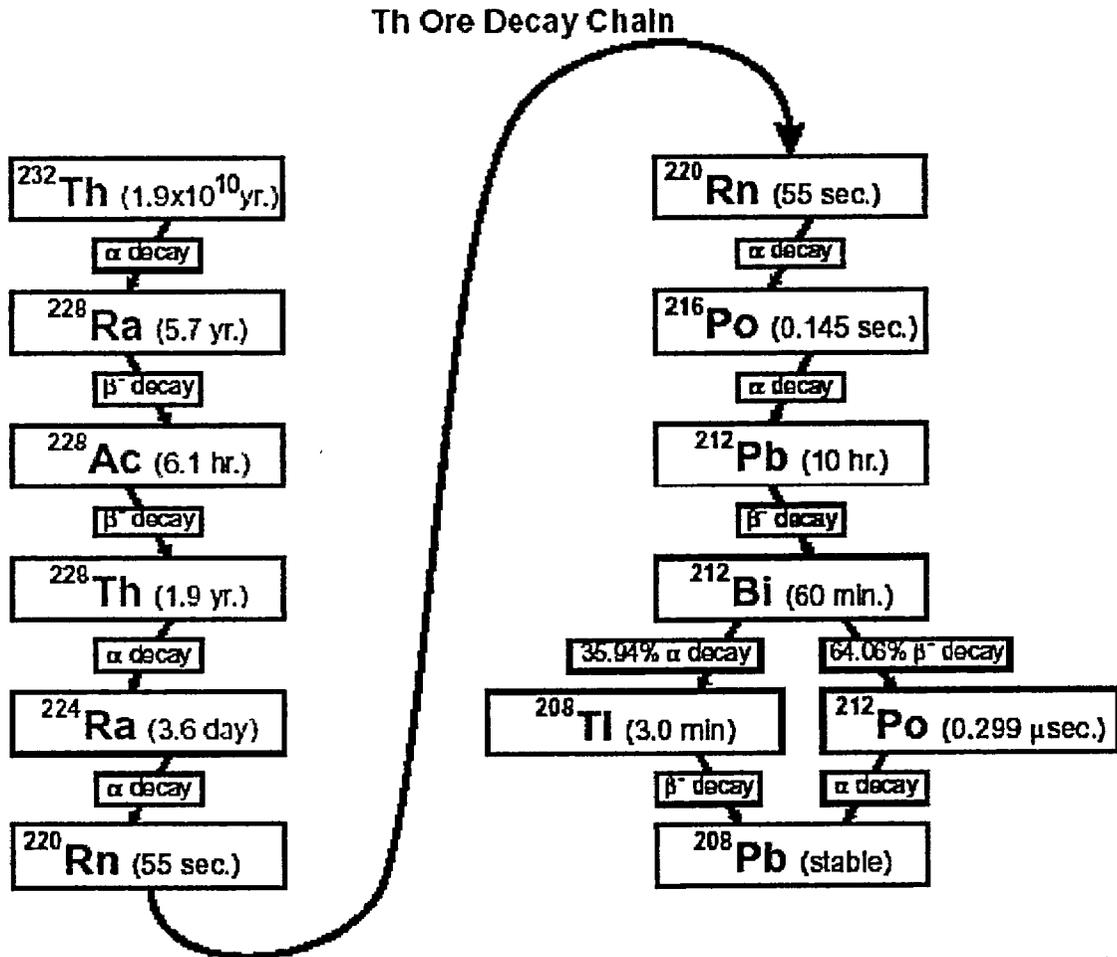
The detectable ratio of alpha to beta is a 2:1 for natural thorium decay. In actuality, the decay of natural thorium produces 6 alphas and 4 betas to reach stable lead. However, one of the betas emitted during the decay process (from Ra-228) is not detectable (39 keV E-max). The other three betas emitted are detectable and are suitable as a surrogate.

The alpha readings recorded on the various data forms and record sheets were actual instrument readings, obtained from the instrument during the survey, and do not represent this ratio factoring. The use of alpha

to beta ratio factoring is incorporated in the data set just prior to statistical analysis and comparison to limit values.

Figure 1 is a graphical representation of the decay of natural thorium.

FIGURE 1 - NATURAL THORIUM DECAY CHAIN



## 5.0 SURVEY PROCEDURE

### 5.1 GENERAL

Approved SOPs and/or field procedures were followed for activities described in this plan.

### 5.2 SURFACE SCANS

Scanning of surfaces to identify locations of elevated residual surface activity were performed according to Table 3.

**TABLE 3 - SURFACE SCAN SCHEDULE**

Foundation Classification	Survey Location	Surface Scan
All Previously Surveyed Foundation Tops	Top surface of foundation.	5 - 10% cursory beta-gamma scan (at random locations) on top surface of previously surveyed foundations prior to lifting foundation.
Affected Foundations	Underside surface of foundation.	100 % beta-gamma scan of underside of foundation when foundation is lifted.
Unaffected Foundations	Underside surface of foundation.	10 % beta-gamma scan of underside of foundation when foundation is lifted.
Result Requirements		Locations of surface activity exceeding twice background will be marked for further evaluation by direct measurement.

The instruments that were used for scanning are listed in Table 7. For hand-held instrumentation, the detector was kept as close as possible to the surface and moved across the surface at a slow speed. Scan surveys were performed by moving the detector over the surface area at a maximum speed of 1-2 inches per second and a distance of approximately 1/2 inch for beta. If the count rate increased, the rate of movement of the detector was decreased or stopped. If the increase in count rate was real (approximately twice background and not a random variation in the background count rate), a static 60-second measurement was performed over the area to quantify the activity. Audible indicators (headphones or instrument speaker) were used to identify locations having elevated activity levels. All scanning results were noted on standard survey forms and locations of elevated radiation were identified for later investigation.

### 5.3 DIRECT SURFACE MEASUREMENTS

Direct measurements were performed according to Table 4.

**TABLE 4 - DIRECT SURFACE MEASUREMENT SCHEDULE**

<b>Foundation Classification</b>	<b>Survey Location</b>	<b>Direct Measurement</b>
All Previously Surveyed Foundations	Top surface of foundation.	Measurements will be performed at each location of elevated activity identified by surface scan measurements.
Affected Foundations	Underside surface of foundation.	Measurements will be performed at a minimum of 30 locations for the entire foundation (survey unit) and sufficient additional locations to provide coverage at a minimum of approximately one location per 20 m <sup>2</sup> of the underside surface of the foundation.
Unaffected Foundations	Underside surface of foundation.	Measurements will be performed at a minimum of 30 locations for the entire foundation (survey unit) and sufficient additional locations to provide coverage at a minimum of approximately one location per 50 m <sup>2</sup> of the underside surface of the foundation.
Result Requirements		If measurement indicates residual activity above guideline limits, the affected area is identified and controlled as radioactive material.

Direct surface measurements were performed at the identified locations using the instruments described in Table 7. Direct surface measurements were conducted by integrating counts over a 1-minute period.

Due to the inherent difficulty of properly quantifying the alpha radiation component of the decay of natural thorium when using a hand-held instrument, a derived ratio of alpha decays to beta decays was used. The detectable ratio of alpha to beta is 2:1 for natural thorium decay. In actuality, the decay of natural thorium produces 6 alphas and 4 betas to reach stable lead. However, one of the betas emitted during the decay process (from Ra-228) is not detectable (39 keV E-max). The other three betas emitted are detectable and are suitable as a surrogate. Beta radiation was used as a surrogate to quantify alpha activity when performing direct measurements.

Alpha readings obtained during the surveying process were recorded on the proper data form(s) and/or record sheet(s) but were not be used to quantify the alpha activity component for direct measurements.

Alpha to beta ratio factoring was incorporated in the data set just prior to statistical analysis and comparison to limit values.

#### 5.4 SMEAR SURVEYS

Smear surveys were conducted according to Table 5.

**TABLE 5 - LOOSE SURFACE MEASUREMENT SCHEDULE**

Foundation Classification	Survey Location	Removable Surface Activity
All Previously Surveyed Foundations	Top surface of foundation.	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
Affected Foundations	Underside surface of foundation.	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
Unaffected Foundations	Underside surface of foundation.	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).

Smear sampling was performed in accordance with applicable procedures. Smears were counted for gross alpha and beta with the appropriate instrument described in Table 7.

#### 5.5 EXPOSURE RATE MEASUREMENTS

Exposure rate measurements were performed according to Table 6.

**TABLE 6 - EXPOSURE RATE MEASUREMENT SCHEDULE**

Foundation Classification	Survey Location	Exposure Rate Measurement
NA	External surface of "clean" concrete waste pile.	Gamma exposure rates measured 1 meter perpendicular to the piled concrete surface at 1 measurement per 50 m <sup>2</sup> of surface area.

Exposure rate measurements were performed at the identified locations using the instruments described in Table 7. Pile exposure rate measurements were not be taken at locations greater than seven feet above ground level.

#### 5.6 BACKGROUND LEVEL DETERMINATION

Background levels were determined for concrete surfaces by taking a minimum of 10 measurements at locations of similar construction, but without a history of radioactive materials use (off-site locations).

## 5.7 DOCUMENTATION

All survey and sampling efforts were documented by sampling personnel. One member of the sampling team was assigned as a document coordinator and was responsible for recording all required information during survey and sampling activities, other than the normal sampling information commonly performed by the individual obtaining the sample. Samples that were sent to an off-site processing facility were transferred from sample collection personnel to the designated counting technician for handling and custody control. This technician was responsible for documentation, sample identification, packaging, and shipping of samples, as required. A standard chain-of-custody record was used to record sample transfers to offsite facilities. Samples were held in the custody of the document coordinator until being shipped to the laboratory.

All survey data was documented on the appropriate radiological survey form, map, and/or data sheet. Information included, but was not limited to:

- Date, time and purpose of the survey
- General and specific location of the survey
- Name and signature of the surveyor
- Instrument model, serial number, and calibration due date
- Survey results for radiological contamination (recorded in dpm/100 cm<sup>2</sup>)

Survey documentation was completed and reviewed in a timely manner. Errors identified during the review process were brought to the Health Physics Technician (HPT) for correction.

## 6.0 INSTRUMENTATION

### 6.1 INSTRUMENT OPERATION AND CALIBRATION

All instruments were operated, maintained, and calibrated according to the manufacturer's recommendations and/or the specifications of ANSI N323-1978.

- Survey instruments were calibrated before initial use, at least semi-annually and following maintenance or repair that could have affected calibration. Calibration sources were National Institute of Science and Technology (NIST) traceable.
- Meters were not calibrated for readings greater than 1,000 mR/hr.
- Daily functional checks were conducted on each instrument to verify that equipment was functioning properly.
- When not in use, instruments were stored at a central location and protected from harsh environments.
- Records of instrument calibration and daily functional checks are maintained for inspection.

- Calibration stickers which included sources used to calibrate, correction factors or efficiencies for each scale or decade calibrated, the date calibrated and due date, were attached to each instrument as applicable.

## 6.2 MINIMUM DETECTABLE ACTIVITY

The detection sensitivity of a measurement system refers to the statistically determined quantity of radioactive material or radiation that can be measured or detected at a pre-selected confidence level. This sensitivity is a factor of both the instrumentation and the technique or procedure being used. Typically, detection sensitivity has been defined (EPA 1980) as the level above which there is less than a 5% probability that radioactivity will be reported present when it is really absent (Type I error) or reported absent when it is really present (Type II error).

Minimum detectable activity (MDA) is an *a priori* estimate of the minimum activity level which is practically measurable with a specific instrument and sampling and/or measurement technique. The basic equation for determining field instrument MDA (NUREG/CR-5849) is:

FIGURE 1 - BASIC MDA EQUATION

$$MDA = \frac{2.71 + 4.65\sqrt{B_R * t}}{E * \frac{A}{100}}$$

Where:

$B_R$	=	background count rate
$t$	=	background count time (min)
$E$	=	efficiency
$A$	=	area of probe

## 6.3 INSTRUMENT SELECTION

During the final status survey of building foundations at the Molycorp site, several radiological instruments were used to identify and quantify the radioactivity of building surfaces. The instruments identified in Table 7 are commonly used for measuring surface deposited radioactive levels from thorium series source of radioactivity. These instruments are reliable, readily available, and reasonably easy to use by trained personal. As necessary, instruments were substituted with an equivalent, or better, instrument. Prior to instrument substitution, the site radiological engineer was notified and approved of the substitution.

**TABLE 7 - INSTRUMENTATION GUIDE**

<b>Instruments</b>	<b>Probe</b>	<b>Radiation</b>	<b>MDA (dpm/100 cm<sup>2</sup>)</b>	<b>Use</b>
Ludlum, Model 2360	43-89	Alpha	67	Static Surveys
Ludlum, Model 2360	43-89	Beta	520	Static Surveys
Ludlum, Model 2350-1	43-68/106	Alpha	66	Static Surveys
Ludlum, Model 2350-1	43-68/106	Beta	319	Static Surveys
Ludlum, Model 2929	43-10-1	Alpha	29	Counter Scaler
Ludlum, Model 2929	43-10-1	Beta	182	Counter Scaler
Ludlum, Model 2350-1	43-68/106	Alpha	105	Scan Surveys
Ludlum, Model 2350-1	43-68/106	Beta	625	Scan Surveys
Ludlum, Model 239-1F	43-37	Alpha	64	Floor Monitor
Ludlum, Model 239-1F	43-37	Beta	1186	Floor Monitor
Ludlum, Model 19	Internal	Gamma	NA	Exposure Rates

#### 6.4 INSTRUMENT USE TECHNIQUES

Instruments selected for performing final status surveys were provided by GTS Duratek, Field Engineering and Field Services group, Kingston, TN. Prior to delivery, instrument calibrations and operations were verified by the vendor, and shipped to Washington, PA. Upon arrival, the instruments were inspected and verified operational. Instrument backgrounds were preformed. QC check control limits were established and Chi-squared tests were performed, as necessary.

Prior to daily use, instruments were response checked and compared against their two and three sigma warning and control limit values. For scaler instruments, daily backgrounds were determined and MDCs were calculated in addition to their response checks. After daily use, hand-held instruments were once again source response checked to ensure that the instrument did not fail during the day's work. All instrument "daily checks" data was logged in the appropriate data log record.

Qualified HP technicians were trained on the use of the instruments, and provided access to the instrument's User Manuals. Surveys were performed in accordance with approved radiological survey procedures on site. Survey results were reviewed by the Radiological Engineer for accuracy and completeness.

## 7.0 SURVEY FINDINGS

Detailed data reports (Survey Findings Report) for each survey unit sampled are provided as an appendix to this report. Field data collection forms, survey report forms, instrumentation information (background, QC, MDA, and source response data forms), statistical test results, and comparisons to release limits are all provided as a single package. Each package also contains a summary of the final status survey for that survey unit and includes information on anomalies discovered during the survey process. Where significant differences existed between final status survey results and results of previous surveys for the survey unit, explanations are provided.

Raw survey data was compiled into survey data tables, where appropriate, and presented with calculational results and comparisons.

### 7.1 TECHNIQUES FOR REDUCING/EVALUATING DATA

Survey information was obtained from the instrument's meter face used at the time of the survey. This data was recorded on a Radiological Survey Location Indicator data sheet, in the instrument's units. For scans and static measurements, the units were in counts per minute (cpm). Smear data was recorded after counting, subtracting background, and converted to units of disintegrations per minute per 100 square centimeters (dpm/100cm<sup>2</sup>). Dose rate measurements were recorded in units of micro-Roentgen per hour (uR/hr) and taken directly from the instruments meter face. Information used in the conversion from cpm to dpm (instrument efficiencies) was recorded on the Radiation Protection Survey Report form. For scans, the highest reading for the given immediate scan area was recorded in cpm.

Where "hot spots" needed to be evaluated, additional readings were taken and the average hot spot activity was calculated in accordance with NUREG/CR-5849, Section 8.5.2 - Elevated Areas of Activity.

### 7.2 STATISTICAL EVALUATION AND COMPARISON TABLES

The statistical methodology used to provide the true representation of the data in relationship to the applicable limits is found in Sections 2.0 and 8.0 of NUREG/CR-5849. Comparison tables and tests used in the analysis are presented as part of each survey unit's Survey Findings Report package, as an appendix to this report.

## 8.0 SUMMARY

Final status survey of the building/area foundations located at the Molycorp Washington, PA site were performed in accordance with the requirements listed in NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," RSI's "Decommission Plan for the Washington, PA Facility, Part 1 Revision," Molycorp's "U.S. Nuclear Regulatory Commission Material License, Amendment No. 5, SMB-1393," and MACTEC's "Concrete Sample and Management Plan."

According to the findings of the final status surveys performed at the Molycorp Washington, PA site, all release criteria have been met. Results of the final status survey demonstrate that the residual radioactivity is below the unrestricted use criteria and confirm that the building foundations are suitable for unrestricted use.

## 9.0 REFERENCES

- 1) *Manual for Conducting Radiological Surveys in Support of License Termination*, NUREG/CR-5849, Draft, December 1993.
- 2) *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Revision 1*, NUREG-1575, Rev. 1, US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, Washington, DC, August 2000.
- 3) *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, American National Standard, ANSI/ASQC E4-1994.
- 4) *Quality Assurance for Radiological Monitoring Program - Effluent Streams and the Environment*, NRC Regulatory Guide 4.15, 1979.
- 5) *Termination of Operating Licenses for Nuclear Reactors*, Nuclear Regulatory Commission, Regulatory Guide 1.86, 1974.
- 6) *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*, NUREG/CR-1507, Final, 1997.
- 7) *Statistical Methods for Evaluating the Attainment of Cleanup Standards*, Pacific Northwest Laboratory, Richland, WA, December 1992.
- 8) *Radiation Detection and Measurement*, Knoll, 1979.
- 9) *Washington, PA Facility, Decommissioning Plan, Part 1 Revision*, June 30, 1999, Radiological Services Inc.
- 10) *Radiation Protection Program, Health Physics Procedures*, June 1999, Radiological Services Inc.
- 11) *Site Characterization Report for License Termination of the Washington, PA Facility*, January 1995, Radiological Services Inc.
- 12) *U.S. Nuclear Regulatory Commission Materials License*, Molycorp, Inc, SMB-1393, Docket No. 040-08778, Amendment 5.
- 13) Antech Ltd. - Waltz Mill, Project No. 02-0284W, *Analytical Survey Results for Composite Tile Sample at Molycorp, Washington, PA*, May 13, 2002.

## Appendix A

# **Building 19 Footer Data Package**

**Molycorp Washington, PA**

November, 2002

ODO-138 Radiation Protection Survey Report Site: MolyCorp / Washington, PA

Section 1: Survey Information

Date: 11-5-02 Time: 1100 Location: Pad # 19 Survey Issue Log Number: 02-1382  
 RWP Number: NA Purpose of Survey:  RWP  Routine Survey  Unconditional Release  Other: Page 1 of 2

Survey Title	Smear Number	Beta dpm/100cm <sup>2</sup>	Alpha dpm/100cm <sup>2</sup>
FSS PAD#19 Foundation (Footers) 1 minute statistics taken ON CONCRETE  Bkg: 7-8 uR/hr  B- Bkg MDA :: :: 144 244 :: :: α - 8 81	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12		
	13		
	14		
	15		
	16		
	17		
	18		
	19		
	20		
	21		
	22		
	23		
	24		

Legend  
 00 = mRem/h gamma 00 C = mRem/h gamma contact ⊕ = Smear Location ∇ = Air Sample Location -X-X- = Rope, Boundary, or Barrier  
 00 β = mRem/h beta 00 βC = mRem/h beta contact -⊖- = Large Area Wipe □ = Bulk Material Sample

Section 2: Instrument Used

Instrument Model/SN.	Cal Due Date:	Probe Model/SN:	Cal Due Date:	Detector Eff.: (cpm/dpm)	MDA: β- α	Other β- Bkg α
2350.1/126190	1-16-03	43106/128914	2-2-03	270/195	659 65	280 1.8
2929/79980	2-20-03	4310/082908	2-20-03	255/312	422.74 14	65 2
19/22526	1-29-03	NA	NA	NA	116 NA	NA

Section 3: Review and Approval

Survey Performed By (Sign): *Joe Huber* Area Posted and/or Barricaded:  Yes  No  Not Required Date and Time: 11-5-02 1100  
 Radiation Safety Officer (Print Name & Sign): *Steve Kowalski / Steve Kowalski* Date and Time: 11-6-02 / 1145



**Results of Surface Scans**  
**Molycorp - Building 19 Survey Unit**

**Footer Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	458	178
F2	463	183
F3	368	88
F4	483	203
F5	393	113
F6	441	161
F7	377	97
F8	438	158
F9	557	277
F10	441	161
F11	403	123
F12	633	353
F13	438	158
F14	433	153
F15	477	197
F16	451	171
F17	448	168
F18	461	181
F19	473	193
F20	410	130

All footer material scans performed with Ludlum Model 2350-1 No. 126190  
with 43-106 No. 128914

**Monitor Info:**

Scan MDA Beta - 659 dpm/100cm<sup>2</sup>  
Scan background Beta - 280 cpm  
Detector Eff. Beta - .240

**Elevated Results of Surface Scans  
Molycorp - Building 19 Survey Unit**

**Footer Material**

No elevated scan results were reported

## Direct Measurements (Total Activity)

Molycorp - Building 19 Survey Unit

### Footer Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	425	318	107	144	-37	-154	129	244	-308
F2	442	265	177	144	33	138	146	244	275
F3	251	303	-52	144	-196	-817	78	244	-1633
F4	466	274	192	144	48	200	150	244	400
F5	367	274	93	144	-51	-213	126	244	-425
F6	412	303	109	144	-35	-146	130	244	-292
F7	353	281	72	144	-72	-300	120	244	-600
F8	410	303	107	144	-37	-154	129	244	-308
F9	531	337	194	144	50	208	150	244	417
F10	402	280	122	144	-22	-92	133	244	-183
F11	388	301	87	144	-57	-238	124	244	-475
F12	602	435	167	144	23	96	144	244	192
F13	420	283	137	144	-7	-29	137	244	-58
F14	403	296	107	144	-37	-154	129	244	-308
F15	461	285	176	144	32	133	146	244	267
F16	437	360	77	144	-67	-279	121	244	-558
F17	421	333	88	144	-56	-233	124	244	-467
F18	443	362	81	144	-63	-263	123	244	-525
F19	450	321	129	144	-15	-63	135	244	-125
F20	396	295	101	144	-43	-179	128	244	-358

All footer material direct measurements performed with Ludlum Model  
2350-1 No. 126190 with 43-106 No. 128914

Monitor Info:

Direct MDA Beta - 244 dpm/100cm<sup>2</sup>

Concrete background Beta - 144 cpm

Detector Eff. Beta - .240

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)  
Molycorp - Building 19 Survey Unit**

**Footer Material**

No elevated direct measurements were reported.

**Removable Surface Activity Measurements**  
**Molycorp - Building 19 Survey Unit**

**Footer Material**

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	36	24.6	116	-0.6	2.7	14
F2	-27	21.7	116	-0.6	2.7	14
F3	43	26.7	116	-0.6	2.7	14
F4	75	34.6	116	2.6	5.7	14
F5	-27	21.7	116	-0.6	2.7	14
F6	51	28.8	116	-0.6	2.7	14
F7	27	21.7	116	-0.6	2.7	14
F8	-30	22.7	116	-0.6	2.7	14
F9	-20	19.1	116	-0.6	2.7	14
F10	-31	23.0	116	2.6	5.7	14
F11	20	19.1	116	-0.6	2.7	14
F12	63	31.8	116	2.6	5.7	14
F13	75	34.6	116	-0.6	2.7	14
F14	39	25.5	116	-0.6	2.7	14
F15	27	21.7	116	-0.6	2.7	14
F16	12	15.6	116	-0.6	2.7	14
F17	20	19.1	116	-0.6	2.7	14
F18	8	13.6	116	-0.6	2.7	14
F19	51	28.8	116	-0.6	2.7	14
F20	27	21.7	116	-0.6	2.7	14

Ludlum 2929 No. 99980 with 43-10 No. 82908  
 Info:

	Beta	Alpha
Background (cpm)	65	0.2
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.255	0.312
MDA	116	14.0

**Elevated Removable Surface Activity Measurements**  
**Molycorp - Building 19 Survey Unit**

**Footer Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Building 19 Survey Unit**

**Footer Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	8	1
F2	8	1
F3	9	2
F4	8	1
F5	9	2
F6	9	2
F7	9	2
F8	10	3
F9	10	3
F10	10	3
F11	10	3
F12	8	1
F13	8	1
F14	8	1
F15	9	2
F16	9	2
F17	9	2
F18	9	2
F19	9	2
F20	9	2

Background dose rate: 7-8 uR/hr with Model 19, No. 22526

**Summary of Building Surface Direct Reading (Total Activity) Results**  
**Molycorp - Building 19 Survey Unit**

**Footer Material**

Beta				Alpha			
n	$\bar{x}$	s	$\mu_\alpha$	n	$\bar{x}$	s	$\mu_\alpha$
20	-127	230.0	-38.2	20	-254	460.0	-76.3
	$t_{1-\alpha}$	1.725					

**Guidelines/Conditions Satisfied?**

<b>Beta</b>	<b>Alpha</b>
Yes	Yes

**Summary of Exposure Rate Measurements**  
**Molycorp - Building 19 Survey Unit**

**Footer Material**

n	$\bar{x}$	s	$\mu_\alpha$
20	1.9	0.7	2.2
$t_{1-\alpha}$	1.725		

**Guidelines/Conditions**  
**Satisfied?**

Yes

Appendix B

**Building 26 Footer Data Package**  
Molycorp Washington, PA

November, 2002

## **Building 26 Footers Data Package**

This data package contains final status survey information for Building 26, Molycorp, Washington, PA site. The building's footers were surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

Several elevated dose rate measurements were reported greater than 5 uR/hr, with no one survey location being reported greater than 10 uR/hr. This anomaly was due solely to thorium slag (licensed material) that is buried directly beneath where the Building 26 footer survey was performed.

## **Summary**

Results from the final status survey of Building 26 footers provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the footers of Building 26 are suitable for unrestricted use and release.

DDO-138 Radiation Protection Survey Report Site: MolyCorp / Washington, PA

Section 1: Survey Information

Date: 11-7-02 Time: 1400 Location: Bldg 26 Survey Issue Log Number: 02-1390  
 RWP Number: NA Purpose of Survey:  RWP  Routine Survey  Unconditional Release  Other: Page 1 of 3

Smear Number	Beta dpm/100cm <sup>2</sup>	Alpha dpm/100cm <sup>2</sup>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

Survey Title: FSS Footers

1 Minute Static's Taken on Concrete

	BKG	MDA
B <sup>-</sup>	144	244
L	8	81

BKG = 10 cpm/hr Model 19 22526 DUA 1-29-03

Legend:  
 00 = mRem/h gamma    00 C = mRem/h gamma contact    ⊙ = Smear Location    ▽ = Air Sample Location    -X-X-X- = Rope, Boundary, or Barrier  
 00 β = mRem/h beta    00 βC = mRem/h beta contact    -⊙- = Large Area Wipe    □ = Bulk Material Sample

Section 2: Instrument Used

Instrument Model/SN.	Cal Due Date:	Probe Model/SN.	Cal Due Date:	Detector Eff.: (cpm/dpm)	MDA:		Other	
					B <sup>-</sup>	L	B <sup>-</sup>	BKG
2350-1/126190	1-16-03	43-106/128914	2-2-03	.240/.195	777	75	390	2.4
2929/115563	6-14-03	43-10/127216	6-14-03	.231/.347	139	12.7	77	.18

Section 3: Review and Approval

Survey Performed By (Sign): Mark Blawie / Joe Hahn Area Posted and/or Barricaded:  Yes  No  Not Required Date and Time: 11-8-02 / 1400  
 Radiation Safety Officer (Print Name & Sign): Steve Kowalski / Steve Kowalski Date and Time: 11-8-02 / 1530

# Radiological Survey Results - Survey Location Indicator

Survey # 02-1390

Survey Area Information: FSS Foundations								
Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA
Performed By:	Print Name			Signature			Date	
Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm <sup>2</sup> )	
							α	β
1	540	7	517	337	4	11	-0.5	4.3
2	577	8	553	321	5	11	-0.5	26
3	477	10	457	265	7	11	-0.5	-13
4	495	12	476	302	8	11	-0.5	4.3
5	420	8	408	301	6	12	-0.5	17
6	439	15	412	290	11	12	-0.5	35
7	463	9	430	335	7	12	2.4	-8.7
8	441	11	422	341	6	18	-0.5	4.3
9	475	12	466	366	7	17	-0.5	30
10	480	8	469	277	5	17	2.4	-17
11	610	7	584	391	4	18	-0.5	-8.7
12	635	6	406	386	4	17	-0.5	4.3
13	550	8	537	394	6	18	-0.5	26
14	510	9	480	392	8	11	-0.5	-13
15	475	11	430	320	9	10	-0.5	-17
16	505	10	455	343	8	11	2.4	4.3
17	515	9	480	395	6	11	-0.5	22
18	485	7	431	356	5	11	-0.5	-39
19	470	8	437	337	4	13	-0.5	-8.7
20	475	6	466	350	3	13	-0.5	22
21	460	10	420	394	8	13	2.4	-30
22	465	11	431	335	7	15	-0.5	4.3
23	480	13	434	328	7	17	-0.5	17
24	510	15	456	374	10	17	-0.5	0
25	450	11	407	309	8	13	-0.5	22
26	470	8	443	328	6	14	-0.5	-8.7
27	505	9	448	340	8	12	-0.5	13



**Results of Surface Scans**  
**Molycorp - Building 26 Survey Unit**

**Footer Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	540	150
F2	577	187
F3	477	87
F4	495	105
F5	430	40
F6	439	49
F7	463	73
F8	441	51
F9	475	85
F10	480	90
F11	610	220
F12	635	245
F13	550	160
F14	510	120
F15	475	85
F16	505	115
F17	515	125
F18	485	95
F19	470	80
F20	475	85
F21	460	70
F22	465	75
F23	480	90
F24	510	120
F25	450	60
F26	470	80
F27	505	115
F28	560	170
F29	470	80
F30	485	95

All footer scans performed with Ludlum Model 2350-1 No. 126190 with 43-106 No. 128914

Scan MDA Beta - 777 dpm/100cm<sup>2</sup>  
Scan background Beta - 390 cpm  
Detector Eff. Beta - .240

**Elevated Results of Surface Scans  
Molycorp - Building 26 Survey Unit**

**Footer Material**

No elevated scan results were reported.

## Direct Measurements (Total Activity)

Molycorp - Building 26 Survey Unit

### Footer Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	517	337	180	144	36	150	147	244	300
F2	553	321	232	144	88	367	158	244	733
F3	457	365	92	144	-52	-217	125	244	-433
F4	476	302	174	144	30	125	146	244	250
F5	408	301	107	144	-37	-154	129	244	-308
F6	412	290	122	144	-22	-92	133	244	-183
F7	430	335	95	144	-49	-204	126	244	-408
F8	422	341	81	144	-63	-263	123	244	-525
F9	466	366	100	144	-44	-183	128	244	-367
F10	469	277	192	144	48	200	150	244	400
F11	584	391	193	144	49	204	150	244	408
F12	606	386	220	144	76	317	156	244	633
F13	537	394	143	144	-1	-4	138	244	-8
F14	480	392	88	144	-56	-233	124	244	-467
F15	430	320	110	144	-34	-142	130	244	-283
F16	455	343	112	144	-32	-133	131	244	-267
F17	480	395	85	144	-59	-246	124	244	-492
F18	431	356	75	144	-69	-288	121	244	-575
F19	437	337	100	144	-44	-183	128	244	-367
F20	466	350	116	144	-28	-117	132	244	-233
F21	420	344	76	144	-68	-283	121	244	-567
F22	431	335	96	144	-48	-200	127	244	-400
F23	434	328	106	144	-38	-158	129	244	-317
F24	456	344	112	144	-32	-133	131	244	-267
F25	407	309	98	144	-46	-192	127	244	-383
F26	443	328	115	144	-29	-121	131	244	-242
F27	448	340	108	144	-36	-150	130	244	-300
F28	554	420	134	144	-10	-42	136	244	-83
F29	521	401	120	144	-24	-100	133	244	-200
F30	510	390	120	144	-24	-100	133	244	-200

All footer direct measurements performed with Ludlum Model 2350-1 No. 126190 with 43-106 No. 128914

Direct MDA Beta - 244 dpm/100cm<sup>2</sup>  
Concrete background Beta - 144 cpm  
Detector Eff. Beta - .240

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)**  
**Molycorp - Building 26 Survey Unit**

**Footer Material**

No elevated direct measurements were reported

**Removable Surface Activity Measurements**  
**Molycorp - Building 26 Survey Unit**

**Footer Material**

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	4.3	12.8	139	-0.5	2.4	12.7
F2	26	22.9	139	-0.5	2.4	12.7
F3	-13	17.6	139	-0.5	2.4	12.7
F4	4.3	12.8	139	-0.5	2.4	12.7
F5	17	19.4	139	-0.5	2.4	12.7
F6	35	26.0	139	-0.5	2.4	12.7
F7	-8.7	15.4	139	2.4	5.2	12.7
F8	4.3	12.8	139	-0.5	2.4	12.7
F9	30	24.3	139	-0.5	2.4	12.7
F10	-17	19.4	139	2.4	5.2	12.7
F11	-8.7	15.4	139	-0.5	2.4	12.7
F12	4.3	12.8	139	-0.5	2.4	12.7
F13	26	22.9	139	-0.5	2.4	12.7
F14	-13	17.6	139	-0.5	2.4	12.7
F15	-17	19.4	139	-0.5	2.4	12.7
F16	4.3	12.8	139	2.4	5.2	12.7
F17	22	21.4	139	-0.5	2.4	12.7
F18	-39	27.2	139	-0.5	2.4	12.7
F19	-8.7	15.4	139	-0.5	2.4	12.7
F20	22	21.4	139	-0.5	2.4	12.7
F21	-30	24.3	139	2.4	5.2	12.7
F22	4.3	12.8	139	-0.5	2.4	12.7
F23	17	19.4	139	-0.5	2.4	12.7
F24	0	9.6	139	-0.5	2.4	12.7
F25	22	21.4	139	-0.5	2.4	12.7
F26	-8.7	15.4	139	-0.5	2.4	12.7
F27	13	17.6	139	-0.5	2.4	12.7
F28	13	17.6	139	-0.5	2.4	12.7
F29	-17	19.4	139	-0.5	2.4	12.7
F30	8.7	15.4	139	-0.5	2.4	12.7

Ludlum 2929 No. 115563 with 43-10 No.  
 127216 Info:

	Beta	Alpha
Background (cpm)	77	0.18
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	139	12.7

**Elevated Removable Surface Activity Measurements  
Molycorp - Building 26 Survey Unit**

**Footer Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Building 26 Survey Unit**

**Footer Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	11	1
F2	11	1
F3	11	1
F4	11	1
F5	12	2
F6	12	2
F7	12	2
F8	18	8
F9	17	7
F10	17	7
F11	18	8
F12	17	7
F13	18	8
F14	11	1
F15	10	0
F16	11	1
F17	11	1
F18	11	1
F19	13	3
F20	13	3
F21	13	3
F22	15	5
F23	17	7
F24	17	7
F25	13	3
F26	14	4
F27	12	2
F28	14	4
F29	12	2
F30	14	4

Background dose rate: 7 uR/hr with Model 19, No. 22526

**Summary of Building Surface Direct Reading (Total Activity) Results**  
**Molycorp - Building 26 Survey Unit**

**Footer Material**

Beta				Alpha			
n	$\bar{x}$	s	$\mu_\alpha$	n	$\bar{x}$	s	$\mu_\alpha$
30	-86	176.0	-31.3	30	-172	352.0	-62.6
	$t_{1-\alpha}$	1.697					

**Guidelines/Conditions Satisfied?**

<b>Beta</b>	<b>Alpha</b>
Yes	Yes

**Summary of Exposure Rate Measurements**  
**Molycorp - Building 26 Survey Unit**

**Footer Material**

n	$\bar{x}$	s	$\mu_\alpha$
30	3.5	2.6	4.3
$t_{1-\alpha}$	1.697		

**Guidelines/Conditions**  
**Satisfied?**

Yes

Appendix C

**Building 33 Additional Footer Data  
Package**

**Molycorp Washington, PA**

November, 2002

## **Building 33 Additional Footers Data Package**

This data package contains final status survey information for Building 33, Molycorp, Washington, PA site. The building's footers (additional material) were surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

### **Summary**

Results from the final status survey of Building 33 footers provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the footers of Building 33 (additional material) are suitable for unrestricted use and release.





## Results of Surface Scans

Molycorp - Building 33 Additional Material Survey Unit

### Footer Material

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	380	58
F2	360	38
F3	440	118
F4	400	78
F5	380	58
F6	370	48
F7	360	38
F8	410	88
F9	510	188
F10	370	48
F11	370	48
F12	350	28
F13	470	148
F14	400	78
F15	390	68

All footer material scans performed with Ludlum Model 2350-1 No. 126190  
with 43-106 No. 128914

Scan MDA Beta - 706 dpm/100cm<sup>2</sup>  
Scan background Beta - 322 cpm  
Detector Eff. Beta - .240

**Elevated Results of Surface Scans**  
**Molycorp - Building 33 Additional Material Survey Unit**

**Footer Material**

No elevated scan results were reported

## Direct Measurements (Total Activity)

### Molycorp - Building 33 Additional Material Survey Unit

#### Footer Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	362	286	76	144	-68	-283	121	244	-567
F2	338	247	91	144	-53	-221	125	244	-442
F3	428	299	129	144	-15	-63	135	244	-125
F4	371	285	86	144	-58	-242	124	244	-483
F5	359	295	64	144	-80	-333	118	244	-667
F6	344	310	34	144	-110	-458	109	244	-917
F7	347	270	77	144	-67	-279	121	244	-558
F8	382	257	125	144	-19	-79	134	244	-158
F9	487	305	182	144	38	158	147	244	317
F10	355	269	86	144	-58	-242	124	244	-483
F11	357	296	61	144	-83	-346	117	244	-692
F12	322	275	47	144	-97	-404	113	244	-808
F13	445	303	142	144	-2	-8	138	244	-17
F14	388	260	128	144	-16	-67	135	244	-133
F15	362	270	92	144	-52	-217	125	244	-433

All footer material direct measurements performed with Ludlum Model  
2350-1 No. 126190 with 43-106 No. 128914

Direct MDA Beta - 244 dpm/100cm<sup>2</sup>  
Concrete background Beta - 144 cpm  
Detector Eff. Beta - .240

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)  
Molycorp - Building 33 Additional Material Survey Unit**

**Footer Material**

No elevated direct measurements were reported.

**Removable Surface Activity Measurements**  
**Molycorp - Building 33 Additional Material Survey Unit**

**Footer Material**

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	4.3	12.8	138	-0.3	2.0	12.5
F2	-13	17.5	138	2.5	5.3	12.5
F3	0	9.5	138	-0.3	2.0	12.5
F4	8.7	15.4	138	-0.2	1.6	12.5
F5	4.3	12.8	138	-0.3	2.0	12.5
F6	13	17.5	138	-0.3	2.0	12.5
F7	-4.3	12.8	138	-0.3	2.0	12.5
F8	13	17.5	138	2.5	5.3	12.5
F9	17	19.3	138	-0.3	2.0	12.5
F10	-22	21.4	138	-0.3	2.0	12.5
F11	13	17.5	138	-0.3	2.0	12.5
F12	22	21.4	138	-0.3	2.0	12.5
F13	-17	19.3	138	-0.3	2.0	12.5
F14	-8.7	15.4	138	-0.3	2.0	12.5
F15	4.3	12.8	138	-0.3	2.0	12.5

Ludlum 2929 No. 115563 with 43-10 No.  
 127216 Info:

	Beta	Alpha
Background (cpm)	76	0.12
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	138	11.8

**Elevated Removable Surface Activity Measurements  
Molycorp - Building 33 Additional Material Survey Unit**

**Footer Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Building 33 Additional Material Survey Unit**

**Footer Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	6	0
F2	7	1
F3	7	1
F4	6	0
F5	8	2
F6	7	1
F7	6	0
F8	7	1
F9	7	1
F10	8	2
F11	6	0
F12	8	2
F13	7	1
F14	7	1
F15	6	0

Background dose rate: 6 uR/hr with Model 19, No. 22526

**Summary of Building Surface Direct Reading (Total Activity) Results**  
**Molycorp - Building 33 Additional Material Survey Unit**

**Footer Material**

Beta				Alpha			
n	$\bar{x}$	s	$\mu_\alpha$	n	$\bar{x}$	s	$\mu_\alpha$
15	-206	164.9	-130.9	15	-411	329.9	-261.8
	$t_{1-\alpha}$	1.753					

**Guidelines/Conditions Satisfied?**

<b>Beta</b>	<b>Alpha</b>
Yes	Yes

**Summary of Exposure Rate Measurements**  
**Molycorp - Building 33 Additional Material Survey Unit**

**Footer Material**

n	$\bar{x}$	s	$\mu_\alpha$
15	0.9	0.7	1.2
$t_{1-\alpha}$	1.753		

**Guidelines/Conditions**  
**Satisfied?**

Yes

Appendix D

**Acid Tank Storage Pad Foundation  
Data Package**  
Molycorp Washington, PA

November, 2002

## **Acid Tank Storage Pad Foundation Data Package**

This data package contains final status survey information for the Acid Tank Storage Pad, Molycorp, Washington, PA site. The Acid Tank Storage Pad foundation was surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

### **Summary**

Results from the final status survey of the Acid Tank Storage Pad foundation provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the Acid Tank Storage Pad foundation is suitable for unrestricted use and release.

DDO-138 Radiation Protection Survey Report Site: MolyCorp / Washington, PA

Section 1: Survey Information

Date: 11-5-02 Time: 1500 Location: Acid TANKS Survey Issue Log Number: 02-1381

RWP Number: N/A Purpose of Survey:  RWP  Routine Survey  Unconditional Release  Other: Page 1 of 3

Survey Title: FSS Acid TANK SLAB Smear Number Beta dpm/100cm<sup>2</sup> Alpha dpm/100cm<sup>2</sup>

1		
2		
3		
4		
5		
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9		
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21		
22		
23		
24		

1 Minute STATICS TAKEN ON CONCRETE

	<u>BKG</u>	<u>MOA</u>
B <sup>-</sup>	144	244
α	8	81

Model #19 22526 Due 1-29-03  
BKG = 7 HR/h

Legend:  
 00 = mRem/h gamma    00 C = mRem/h gamma contact    ⊕ = Smear Location    ∇ = Air Sample Location    -X-X-X- = Rope, Boundary, or Barrier  
 00 β = mRem/h beta    00 βC = mRem/h beta contact    -⊖- = Large Area Wipe    □ = Bulk Material Sample

Section 2: Instrument Used

Instrument Model/SN.	Cal Due Date:	Probe Model/SN:	Cal Due Date:	Detector Eff.: β (cpm/dpm)	MDA:		Other	
					β <sup>-</sup>	α	β <sup>-</sup>	BKG
2350-1/126190	1-16-03	43-106/128914	2-2-03	.240/.195	726	43	340	.8
2929/115563	6-14-03	43-10/127216	6-14-03	.231/.347	137	12.4	74.4 <sup>MD</sup>	.16

Section 3: Review and Approval

Survey Performed By (Sign): *Mark Blawieck* Area Posted and/or Barricaded:  Yes  No  Not Required Date and Time: 11-5-02 / 1500

Radiation Safety Officer (Print Name & Sign): Steve Kowalski / *Steve Kowalski* Date and Time: 11-6-02 / 1200

**Radiological Survey Results - Survey Location Indicator**

Survey # 02-1381

Survey Area Information: <i>FSS Acid TANKS SLAB (underside)</i>								
Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA
Performed By:	Print Name			Signature			Date	
	_____			_____			_____	
	_____			_____			_____	

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm <sup>2</sup> )	
							α	β
1	400	11	380	298	13	8	-.46	17
2	410	8	367	296	9	7	-.46	48
3	420	9	414	289	8	8	2.4	8.6
4	360	7	347	294	6	7	-.46	8.6
5	390	6	378	288	5	7	2.4	0
6	390	5	384	312	4	7	-.46	26
7	410	7	393	278	6	8	-.46	13
8	470	6	455	310	5	8	-.46	-8.6
9	420	11	401	261	9	8	-.46	-17
10	410	6	357	302	7	7	-.46	35
11	400	5	375	294	3	7	-.46	48
12	430	7	416	319	4	8	2.4	13
13	390	6	364	271	7	8	-.46	43
14	490	8	477	283	8	8	-.46	-4.3
15	450	9	435	293	7	8	-.46	48
16	410	10	397	297	9	7	-.46	26
17	390	7	377	268	6	7	-.46	13
18	361	5	344	287	4	7	-.46	-43
19	420	6	400	262	5	8	2.4	22
20	330	4	317	278	3	8	-.46	0
21	320	7	303	280	6	9	-.46	65
22	320	8	295	260	7	7	-.46	-4.3
23	420	6	400	313	4	8	-.46	78
24	400	5	393	293	3	7	-.46	61
25	380	7	369	279	8	7	-.46	57
26	420	11	406	292	9	8	2.4	26
27	400	6	384	270	5	8	-.46	-13



**Results of Surface Scans**  
**Molycorp - Acid Storage Tank Pad Survey Unit**

**Slab Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	400	60
F2	410	70
F3	420	80
F4	360	20
F5	390	50
F6	390	50
F7	410	70
F8	470	130
F9	420	80
F10	410	70
F11	400	60
F12	430	90
F13	390	50
F14	490	150
F15	450	110
F16	410	70
F17	390	50
F18	361	21
F19	420	80
F20	330	-10
F21	320	-20
F22	320	-20
F23	420	80
F24	400	60
F25	380	40
F26	420	80
F27	400	60
F28	430	90
F29	420	80
F30	360	20

All concrete scans performed with Ludlum Model 2350-1 No. 126190 with  
43-106 No. 128914

Scan MDA Beta - 726 dpm/100cm<sup>2</sup>  
Scan background Beta - 340 cpm  
Detector Eff. Beta - .240

**Elevated Results of Surface Scans  
Molycorp - Acid Storage Tank Pad Survey Unit**

**Slab Material**

No elevated scan results were reported.

**Direct Measurements (Total Activity)**  
**Molycorp - Acid Storage Tank Pad Survey Unit**

**Slab Material**

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	380	298	82	144	-62	-258	123	244	-517
F2	387	296	91	144	-53	-221	125	244	-442
F3	414	289	125	144	-19	-79	134	244	-158
F4	347	294	53	144	-91	-379	115	244	-758
F5	378	288	90	144	-54	-225	125	244	-450
F6	384	312	72	144	-72	-300	120	244	-600
F7	393	278	115	144	-29	-121	131	244	-242
F8	455	310	145	144	1	4	139	244	8
F9	401	261	140	144	-4	-17	138	244	-33
F10	357	302	55	144	-89	-371	115	244	-742
F11	375	294	81	144	-63	-263	123	244	-525
F12	416	319	97	144	-47	-196	127	244	-392
F13	364	271	93	144	-51	-213	126	244	-425
F14	477	283	194	144	50	208	150	244	417
F15	435	293	142	144	-2	-8	138	244	-17
F16	397	297	100	144	-44	-183	128	244	-367
F17	377	268	109	144	-35	-146	130	244	-292
F18	344	287	57	144	-87	-363	116	244	-725
F19	400	262	138	144	-6	-25	137	244	-50
F20	317	278	39	144	-105	-438	110	244	-875
F21	303	280	23	144	-121	-504	106	244	-1008
F22	295	260	35	144	-109	-454	109	244	-908
F23	400	313	87	144	-57	-238	124	244	-475
F24	393	293	100	144	-44	-183	128	244	-367
F25	369	279	90	144	-54	-225	125	244	-450
F26	406	292	114	144	-30	-125	131	244	-250
F27	384	270	114	144	-30	-125	131	244	-250
F28	414	353	61	144	-83	-346	117	244	-692
F29	400	261	139	144	-5	-21	137	244	-42
F30	344	283	61	144	-83	-346	117	244	-692

All concrete direct measurements performed with Ludlum Model 2350-1  
No. 126190 with 43-106 No. 128914

Direct MDA Beta - 244 dpm/100cm<sup>2</sup>  
Concrete background Beta - 144 cpm  
Detector Eff. Beta - .240

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)**  
**Molycorp - Acid Storage Tank Pad Survey Unit**

**Slab Material**

No elevated direct measurements were reported.

**Removable Surface Activity Measurements  
Molycorp - Acid Storage Tank Pad Survey Unit**

**Slab Material**

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	17	19.3	137	-0.5	2.3	12.4
F2	48	29.8	137	-0.5	2.3	12.4
F3	8.6	15.2	137	2.4	5.2	12.4
F4	8.6	15.2	137	-0.5	2.3	12.4
F5	0	9.4	137	2.4	5.2	12.4
F6	26	22.8	137	-0.5	2.3	12.4
F7	13	17.5	137	-0.5	2.3	12.4
F8	-8.6	15.2	137	-0.5	2.3	12.4
F9	-17	19.3	137	-0.5	2.3	12.4
F10	35	25.9	137	-0.5	2.3	12.4
F11	48	29.8	137	-0.5	2.3	12.4
F12	13	17.5	137	2.4	5.2	12.4
F13	43	28.4	137	-0.5	2.3	12.4
F14	-4.3	12.7	137	-0.5	2.3	12.4
F15	48	29.8	137	-0.5	2.3	12.4
F16	26	22.8	137	-0.5	2.3	12.4
F17	13	17.5	137	-0.5	2.3	12.4
F18	-43	28.4	137	-0.5	2.3	12.4
F19	22	21.3	137	2.4	5.2	12.4
F20	0	9.4	137	-0.5	2.3	12.4
F21	65	34.2	137	-0.5	2.3	12.4
F22	-4.3	12.7	137	-0.5	2.3	12.4
F23	78	37.2	137	-0.5	2.3	12.4
F24	61	33.2	137	-0.5	2.3	12.4
F25	57	32.2	137	-0.5	2.3	12.4
F26	26	22.8	137	2.4	5.2	12.4
F27	-13	17.5	137	-0.5	2.3	12.4
F28	-17	19.3	137	-0.5	2.3	12.4
F29	0	9.4	137	-0.5	2.3	12.4
F30	-26	22.8	137	-0.5	2.3	12.4

Ludlum 2929 No. 115563 with 43-10 No.  
127216 Info:

	Beta	Alpha
Background (cpm)	74	0.16
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	137	12.4

**Elevated Removable Surface Activity Measurements  
Molycorp - Acid Storage Tank Pad Survey Unit**

**Slab Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Acid Storage Tank Pad Survey Unit**

**Slab Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	8	1
F2	7	0
F3	8	1
F4	7	0
F5	7	0
F6	7	0
F7	8	1
F8	8	1
F9	8	1
F10	7	0
F11	7	0
F12	8	1
F13	8	1
F14	8	1
F15	8	1
F16	7	0
F17	7	0
F18	7	0
F19	8	1
F20	8	1
F21	9	2
F22	7	0
F23	8	1
F24	7	0
F25	7	0
F26	8	1
F27	8	1
F28	7	0
F29	8	1
F30	8	1

Background dose rate: 7 uR/hr with Model 19, No. 22526

**Elevated Results of Surface Scans  
Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

No elevated scan results were reported.

**Direct Measurements (Total Activity)**  
**Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	399	321	78	144	-66	-275	122	244	-550
F2	311	296	15	144	-129	-538	103	244	-1075
F3	391	291	100	144	-44	-183	128	244	-367
F4	411	387	24	144	-120	-500	106	244	-1000
F5	386	279	107	144	-37	-154	129	244	-308
F6	379	297	82	144	-62	-258	123	244	-517
F7	408	305	103	144	-41	-171	128	244	-342
F8	420	299	121	144	-23	-96	133	244	-192
F9	410	291	119	144	-25	-104	132	244	-208
F10	426	306	120	144	-24	-100	133	244	-200
F11	299	257	42	144	-102	-425	111	244	-850
F12	307	248	59	144	-85	-354	116	244	-708
F13	355	264	91	144	-53	-221	125	244	-442
F14	345	267	78	144	-66	-275	122	244	-550
F15	371	268	103	144	-41	-171	128	244	-342
F16	393	264	129	144	-15	-63	135	244	-125
F17	364	227	137	144	-7	-29	137	244	-58
F18	358	249	109	144	-35	-146	130	244	-292
F19	376	256	120	144	-24	-100	133	244	-200
F20	464	300	164	144	20	83	143	244	167

All concrete direct measurements performed with Ludlum Model 2350-1  
 No. 126190 with 43-106 No. 128914

Direct MDA Beta - 244 dpm/100cm<sup>2</sup>  
 Concrete background Beta - 144 cpm  
 Detector Eff. Beta - .240

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)**  
**Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

No elevated direct measurements were reported.

**Removable Surface Activity Measurements**  
**Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	95	40.8	137	-0.46	2.3	12.4
F2	4.3	12.7	137	-0.46	2.3	12.4
F3	8.6	15.2	137	-0.46	2.3	12.4
F4	-4.3	12.7	137	-0.46	2.3	12.4
F5	13	17.5	137	2.4	5.2	12.4
F6	-17	19.3	137	-0.46	2.3	12.4
F7	22	21.3	137	-0.46	2.3	12.4
F8	0	9.4	137	2.4	5.2	12.4
F9	-17	19.3	137	-0.46	2.3	12.4
F10	-8.6	15.2	137	2.4	5.2	12.4
F11	48	29.8	137	-0.46	2.3	12.4
F12	-8.7	15.3	137	-0.46	2.3	12.4
F13	4.3	12.7	137	-0.46	2.3	12.4
F14	-13	17.5	137	-0.46	2.3	12.4
F15	22	21.3	137	-0.46	2.3	12.4
F16	-17	19.3	137	-0.46	2.3	12.4
F17	13	17.5	137	2.4	5.2	12.4
F18	8.7	15.3	137	-0.46	2.3	12.4
F19	0	9.4	137	2.4	5.2	12.4
F20	13	17.5	137	-0.46	2.3	12.4

Ludlum 2929 No. 115563 with 43-10 No.  
 127216 Info:

	Beta	Alpha
Background (cpm)	74	0.16
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	137	12.4

**Elevated Removable Surface Activity Measurements  
Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	7	-2
F2	9	0
F3	8	-1
F4	8	-1
F5	8	-1
F6	7	-2
F7	7	-2
F8	9	0
F9	8	-1
F10	8	-1
F11	10	1
F12	10	1
F13	11	2
F14	11	2
F15	12	3
F16	12	3
F17	11	2
F18	11	2
F19	12	3
F20	12	3

Background dose rate: 7-10 uR/hr with Model 19, No. 22526

**Summary of Building Surface Direct Reading (Total Activity) Results**  
**Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

Beta				Alpha			
n	$\bar{x}$	s	$\mu_\alpha$	n	$\bar{x}$	s	$\mu_\alpha$
20	-204	157.0	-143.4	20	-408	314.1	-286.8
	$t_{1-\alpha}$	1.725					

**Guidelines/Conditions Satisfied?**

<b>Beta</b>	<b>Alpha</b>
Yes	Yes

**Summary of Exposure Rate Measurements**  
**Molycorp - Switch Gear Foundation Survey Unit**

**Concrete Material**

n	$\bar{x}$	s	$\mu_\alpha$
20	0.6	1.8	1.3
$t_{1-\alpha}$	1.725		

**Guidelines/Conditions  
Satisfied?**

Yes

## Appendix G

# **Hx Tank Concrete Data Package**

**Molycorp Washington, PA**

November, 2002

## **Hx Tank Concrete Data Package**

This data package contains final status survey information for the Hx Tank Concrete, Molycorp, Washington, PA site. The Hx Tank Concrete material was surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

### **Summary**

Results from the final status survey of the Hx Tank Concrete provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the Hx Tank Concrete material is suitable for unrestricted use and release.

DDO-138 Radiation Protection Survey Report Site: Molycorp / Washington, PA

Section 1: Survey Information

Date: 11-8-02 Time: 1030 Location: TANK HT EXCHANGER Survey Issue Log Number: 02-1388

RWP Number: N/A Purpose of Survey:  RWP  Routine Survey  Unconditional Release  Other. Page 1 of 2

Survey Title FSS FOUNDATIONS Smear Number Beta dpm/100cm<sup>2</sup> Alpha dpm/100cm<sup>2</sup>

1-5 TOP SLAB 6-10 underside

MINUTE STATISTICS TAKEN ON CONCRETE

Smear Number	Beta dpm/100cm <sup>2</sup>	Alpha dpm/100cm <sup>2</sup>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

BKG MDA

B<sup>-</sup> 144 244

α 8 81

DKG 10 uR/hr Model # 22526 due 1-29-03

Legend: 00 = mRem/h gamma 00 C = mRem/h gamma contact ⊙ = Smear Location ∇ = Air Sample Location -X-X- = Rope, Boundary, or Barrier  
 00 β = mRem/h beta 00 βC = mRem/h beta contact -⊙- = Large Area Wipe □ = Bulk Material Sample

Section 2: Instrument Used

Instrument Model/SN:	Cal Due Date:	Probe Model/SN:	Cal Due Date:	Detector Eff.: β (cpm/dpm) α	MDA:			
					β <sup>-</sup>	β <sup>-</sup>	Other BKG α	
2350-1/126196	1-16-03	43-106/128914	2-2-03	.240   .195	759	75	372	2.4
2429/115563	6-14-03	43-10/127216	6-14-03	.231   .347	179	12.7	77	.18

Section 3: Review and Approval

Survey Performed By (Sign): Mark Blawieck Area Posted and/or Barricaded:  Yes  No  Not Required Date and Time: 11-8-02 / 1030

Radiation Safety Officer (Print Name & Sign): Steve Kowalski / Steve Kowalski Date and Time: 11-8-02 / 1230



**Results of Surface Scans**  
**Molycorp - Heat Exchanger Survey Unit**

**Foundation Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	580	208
F2	380	8
F3	460	88
F4	390	18
F5	380	8
F6	370	-2
F7	390	18
F8	440	68
F9	340	-32
F10	380	8

All foundation material scans performed with Ludlum Model 2350-1 No. 126190 with 43-106 No. 128914

**Monitor Info:**

Scan MDA Beta - 759 dpm/100cm<sup>2</sup>  
Scan background Beta - 372 cpm  
Detector Eff. Beta - .240

## **Instrumentation Data**

This data package contains instrumentation information (background, QC, and source response data forms) for the instruments used during the final status survey of building foundations.

# Ludlum Model 19 Micro-Rem

## Routine Performance and Background Data Form

Instrument ID #: 95453	Cal. Due: 12-12-02	Source ID #: CS-137 #1610
Mean Source Value: 150	Mean plus + 20% Value: 180	Mean plus - 20% Value: 120

Date	Time	Meter Scale				Background Reading	Sat/Unsat
		25 µrem (sat/unsat)	50 µrem (sat/unsat)	250 µrem +/-20% value	500 µrem +/-20% value		
10-22-02	0640			130		12	Sat
10-23-02	0645			140		10	Sat
10-24-02	0640			150		9	Sat
10-28-02	0640			150		11	Sat
10-29-02	0645			140		10	Sat
10-30-02	0635			140		10	Sat
10-31-02	0650			150		8	Sat
11-5-02	0700			150		9	Sat
11-7-02	0800			150		10	Sat

N

A

N

A











# Daily Instrumentation Operational Check Sheet

$E_{eff} = .255$

Instrument: 9929 # 79980      Cal Due: 2-20-03  
 Probe: 43-10-1 / 082908      Cal Due: 2-20-03

Source ID: Te 99 # 3:35      Radiation Type: 0  
 Mean Source Count Rate: 4446      Sigma Value: 71  
 Mean +2σ Value: 4588      Mean +3σ Value: 4659  
 Mean -2σ Value: 4304      Mean -3σ Value: 4233

Results		Source Check				Background				
SAT/ UNSAT	LLD	W/1σ Value	W/2σ Value	Gross Counts	Count	BKGD CPM	Gross Counts	Count	Time	Date
SAT	29.5	✓	✓	4464	1	63.9	3836	50	0620	10-15-02
SAT	29.7	✓	✓	4519	1	65	3906	60	0640	10-16-02
SAT	30.5	✓	✓	4389	1	69	4134	60	0635	10-17-02
SAT	30.1	✓	✓	4363	1	67	4035	60	0640	10-21-02
SAT	31.6	✓	✓	4375	1	63.1	3796	60	0615	10-22-02
SAT	29.4	✓	✓	4412	1	63.5	3814	60	0620	10-23-02
SAT	29.4	✓	✓	4478	1	63.4	3808	60	0730	10-24-02
SAT	29.7	✓	✓	4499	1	65	3914	60	0630	10-28-02
SAT	29.7	✓	✓	4485	1	65	3909	60	0615	10-29-02
SAT	30	✓	✓	4396	1	66.6	4001	60	0730	10-30-02
SAT	29	✓	✓	4536	1	61	3650	60	0635	10-31-02
SAT	30	✓	✓	4421	1	66	3945	60	0630	11-4-02
SAT	27.6	✓	✓	4469	1	64.7	3884	60	0630	11-5-02
SAT	31	✓	✓	4461	1	69	4123	60	0610	11-6-02
SAT	30	✓	✓	4450	1	66	3941	60	0705	11-7-02
SAT	30.2	✓	✓	4477	1	67	4034	60	0935	11-8-02

EFF = .312

# Daily Instrumentation Operational Check Sheet

Instrument: 2929 | 79980 Probe: 43-10-1 | 082908

Cal Due: 2-20-03 Cal Due: 2-20-03

Source ID: 41230 # 3937

Mean Source Count Rate: 1194

Mean +2  $\sigma$  Value: 1270

Mean -2  $\sigma$  Value: 1118

Radiation Type:  $\alpha$

Sigma Value: 38

Mean +3  $\sigma$  Value: 1308

Mean -3  $\sigma$  Value: 1080

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
10-15-02	0620	50	11	.18	1	1188	✓	✓	4.4	Sat
10-16-02	0640	60	14	.23	1	1194	✓	✓	4.6	Sat
10-17-02	0640	60	9	.15	1	1268	✓	✓	4.3	Sat
10-21-02	0640	60	8	.13	1	1173	✓	✓	4.2	Sat
10-27-02	0615	60	11	.18	1	1162	✓	✓	4.4	Sat
10-23-02	0620	60	11	.18	1	1171	✓	✓	4.4	Sat
10-24-02	0720	60	13	.22	1	1175	✓	✓	4.5	Sat
10-28-02	0630	60	12	.2	1	1208	✓	✓	4.5	Sat
10-29-02	0615	60	11	.18	1	1226	✓	✓	4.4	Sat
10-30-02	0735	60	7	.11	1	1217	✓	✓	4.1	Sat
10-31-02	0640	60	10	.17	1	1230	✓	✓	4.4	Sat
11-4-02	0630	60	7	.11	1	1160	✓	✓	4.1	Sat
11-5-02	0630	60	12	.2	1	1219	✓	✓	4.5	Sat
11-6-02	0630	60	15	.25	1	1193	✓	✓	4.6	Sat
11-7-02	0655	60	11	.18	1	1203	✓	✓	4.4	Sat
11-8-02	0935	60	9	.15	1	1211	✓	✓	4.3	Sat

Appendix I

**Background Assessment Data**  
Molycorp Washington, PA

## **Background Assessment**

MACTEC, Inc. performed material-specific backgrounds with its large-area gas-flow instruments (used for final status surveys) on surfaces of similar construction as the buildings at the site having no possibility of being impacted by site operations. Measurements were collected from multiple locations to provide an estimate of the variability or uncertainty.

An average background value was determined for each material surveyed (poured concrete, cinderblock, and a class of material designated a generic material).

The number of background measurements obtained per material type:

- Concrete - minimum of 20 measurements
- Cinderblock - minimum of 20 measurements
- Generic Material - minimum of 10 measurements for each type of material surveyed (i.e., wood, insulation, corrugated steel, etc.)

Background measurements were calculated from surveys obtained at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA. A mean value for each instrument was calculated. The most conservative background values were selected and used for all background subtracts for direct (static) type surveys performed.

Included in this appendix are the results of MACTEC's background assessment data.

**Concrete Background Assessment**  
**Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (126190) with 43-106 (133871)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	<u>Unshield</u>	<u>Shield</u>	<u>Net</u>	<u>Net</u>
	500	350	150	9
	418	314	104	6
	447	326	121	8
	494	312	182	5
	483	351	132	3
	466	306	160	6
	478	347	131	9
	469	327	142	8
	426	353	73	12
	429	343	86	7
	499	349	150	10
	462	330	132	9
	496	372	124	8
	491	336	155	9
	458	295	163	12
	527	337	190	11
	464	327	137	13
	521	302	219	12
	492	323	169	4
	484	319	165	8
Mean (cpm)	144			8
Stand Deviation	34.4			2.8
n <sub>b</sub>	4			8

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Concrete Background Assessment**  
**Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (95356) with 43-68 (91046)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	<u>Unshield</u>	<u>Shield</u>	<u>Net</u>	<u>Net</u>
	460	330	130	10
	482	397	85	14
	592	381	211	15
	589	381	208	12
	561	348	213	23
	555	408	147	11
	491	388	103	13
	511	392	119	6
	1014	409	605	18
	606	375	231	17
	523	429	94	12
	590	386	204	14
	703	407	296	17
	662	389	273	13
	551	408	143	10
	518	346	172	7
	478	349	129	12
	465	345	120	5
	520	403	117	14
	522	407	115	13
Mean (cpm)	186			13
Stand Deviation	115.5			4.2
n <sub>b</sub>	29			8

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Concrete Background Assessment  
Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (95359) with 43-106 (133866)

**Beta - Direct Measurements (cpm)**

	<u>Unshield</u>	<u>Shield</u>	<u>Net</u>
	460	330	130
	482	397	85
	592	381	211
	589	381	208
	561	344	217
	555	408	147
	491	388	103
	511	392	119
	643	409	234
	606	375	231
	563	429	134
	590	386	204
	703	407	296
	682	389	293
	551	370	181
	518	332	186
	601	411	190
	599	365	234
	520	403	117
	522	407	115
Mean (cpm)	182		
Stand Deviation	61.1		
$n_b$	8		

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Concrete Background Assessment  
Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (129414) with 43-106 (128914)

**Beta - Direct Measurements (cpm)**

<u>Unshield</u>	<u>Shield</u>	<u>Net</u>
492	301	191
479	348	131
496	306	190
537	340	197
610	316	294
465	302	163
547	331	216
509	335	174
510	355	155
541	346	195
563	320	243
517	341	176
505	375	130
530	352	178
520	370	150
518	332	186
519	411	108
506	365	141
570	360	210
534	343	191

Mean (cpm) 181

Stand Deviation 42.0

$n_b$  4

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Metal/Drywall Background Assessment**  
**Molycorp Washington, PA**

**Metal/Drywall Surfaces**

Ludlum Model 2350-1 (117563) with 43-106 (128912)

Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
<u>Unshield</u>	<u>Shield</u>	<u>Net</u>	<u>Net</u>
288	266	22	3
305	224	81	4
277	252	25	5
331	291	40	2
294	290	4	3
312	301	11	1
311	302	9	1
315	300	15	1
320	285	35	3
313	286	27	1
Mean (cpm)	27		2
Stand Deviation	22.2		1.4
n <sub>b</sub>	56		26

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their metal/drywall surfaces.

**Metal/Drywall Background Assessment**  
**Molycorp Washington, PA**

Metal/Drywall Surfaces

Ludlum Model 2350-1 (117566) with 43-68 (19046)

Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
<u>Unshield</u>	<u>Shield</u>	<u>Net</u>	<u>Net</u>
268	246	22	3
268	238	30	2
291	275	16	1
286	245	41	2
290	274	16	1
312	283	29	3
333	312	21	2
325	275	50	1
274	251	23	1
266	237	29	4
Mean (cpm)	28		2
Stand Deviation	10.8		1.1
n <sub>b</sub>	11		21

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their metal/drywall surfaces.