Final Status Survey Report for Building 26 At the Molycorp Site

Washington, PA

MACTEC, Inc.

Revision - 0
Dated 9/3/02

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1.0 BACKGROUND INFORMATION

1.1 GENERAL INFORMATION AND OPERATING HISTORY

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 was begun 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 the late 1960s new federal requirements necessitated Molycorp to obtain a Source Material License from the Atomic Energy Commission for possession and use of materials containing 0.05 percent or greater by weight uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for ferrocolumbium contained thorium above the 0.05 percent limit. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2 percent thorium. Almost immediately upon receiving a Source Material License in December 1968, various investigations were undertaken to address the new regulatory requirements.

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_2 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 reveled 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.

The Molycorp Source Material License (SMB 1393) was renewed in 1992 and included an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a Site Characterization Plan (SCP) to the NRC for approval.

Molycorp submitted the "Decommissioning Plan for the Washington, PA Facility" to the NRC in July 1995. In a letter dated June 1, 1999, (John C. Daniels, Molycorp Project Manager, to John W.N. Hickey, NRC Branch Chief) Molycorp informed the NRC that the Decommissioning Plan would be revised and re-submitted in two parts.

Part 1 Revision of the current Decommissioning Plan was submitted and approved June 30, 1999, and describes the activities required to remediate the site to unrestricted use levels in accordance with the SDMP Action Plan (57 FR 13389). The soil, slag or other material exceeding the SDMP Action Plan criteria will be transported to an NRC approved location for final disposition

Part 2 Revision of the Decommissioning Plan was to provide for the disposition of the material that exceeded the SDMP Action Plan criteria to a designated on-site impound at the Washington, PA site. The Decommissioning Plan Part 2 Revision was never approved.

1.2 REASON FOR DECOMMISSIONING

Decommissioning of the Molycorp Washington, PA Facility is being performed due to the cessation of molybdenum production at the facility. Several factors included age of equipment and the production of molybdenum elsewhere in the United States and overseas, have led to the shutdown of the production process and closure of the facility. In December 2001, all activities were halted and a majority of the workforce was terminated.

1.3 MANAGEMENT APPROACH

This report focuses on the approach taken by management to decommission buildings located at the Molycorp Washington, PA Site. This report does not address the decommissioning activities of soils or subsurface contamination at the site.

The approach taken by management for the decommissioning of buildings includes the characterization and classification of site buildings and areas, performance of radiological surveys to identify and quantify surface radioactive material, identification of elevated dose rates, performance of remedial actions (as required), removal of materials and equipment from buildings, performance of the final surveys to release buildings from radiological controls, and the performance of any remedial action necessary to meet the release criteria of the final status survey.

Once buildings have been surveyed for final status, and the NRC has reviewed and approved the building Final Status Survey Report and completed their verification surveys, the buildings will be demolished and the rubble removed. As identified earlier, subsurface (soil) decommissioning activities are not being performed under the current work scope (decommissioning work.)

Management supported and required the use of all regulatory and approved decommissioning plans and standards for the decommissioning process at Molycorp. The final status survey was conducted in accordance with, 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." Individual requirements of each reference were compiled in MACTEC's "Survey Plan for Determining the Final Status of Buildings at the Molycorp Site" and used as the plan for performing the final status survey.

Approved radiation protection procedures were used during the performance of radiological surveys in support of final status surveys. Qualified radiation protection staff was hired and trained to the requirements of the sampling plan. A radiological engineer (CHP) was assigned to support the project and oversee the day-to-day radiological survey operations. The MACTEC Corporate RSO was involved at all decision-making levels, and communicated directly with the NRC, State of Pennsylvania, ORISE Support Personnel and MACTEC Senior Management.

Radiological survey equipment was identified and selected to provide the highest sensitivity for the existing site conditions. Radiological survey equipment selection was based partially on equipment used for earlier final status surveys performed by Radiological Services, Inc. (RSI) in 2001. Additional radiological survey equipment was selected and implemented to what RSI had used in the past. The selection and addition of a hand-held gas-filled proportional instrument and detector package provided a greater sensitivity for the detection of radioactive material, and complemented the previously used selection of instruments used by RSI. All radiological survey equipment used for final surveys was calibrated by an instrument calibration facility using radioactive sources traceable to National Institute of Science and Technology (NIST). When radiological survey instrumentation was due for calibration, or the instrument malfunctioned, the instrument was removed from service and sent off-site for calibration or repair.

Radiation protection personnel worked closely with decommissioning and construction personnel on the project. The Project Manager interacted closely with the workforce, Radiological Engineer and the HP

technicians The Project Manager was provided weekly HP activity reports detailing the current week's activities and the coming week's goals.

2.0 SITE INFORMATION

2.1 SITE LOCATION

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 are 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 site consists of approximately 20 acres, which represents the fenced portion of the 59-acre parcel owned by Molycorp Inc. 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 38-acre parcel with a commercial building adjacent to the southwestern property line. This building was used as a mining education and training facility. However, it has not been used for this purpose for some time and has fallen into a state of disrepair and, therefore, is considered a vacant parcel.

A ten-acre parcel of vacant land under the ownership of L. and C. Cox on Weirich Avenue between Comfort Lane and Point View Drive (behind Allegheny Lundlum) may be the site of future commercial development. The property owner has formally requested that the zoning be changed from R-2 Residential to General Commercial.

2.2 BUILDING STATUS

All buildings/areas did not have the same potential for residual contamination and therefore did not require the same level of survey coverage. For the purposes of establishing the degree of survey effort required, building surfaces were segregated into affected and unaffected buildings/areas. The definitions for the areas:

- Affected area: Accessible areas that have potential radioactive contamination (based on facility operating history) or known radioactive contamination (based on past or preliminary radiological surveillance).

- Unaffected area: All accessible areas not classified as affected. These areas are not expected to contain residual radioactivity, based on knowledge of site history and previous survey information.

All 21 buildings located on site had been characterized (as identified in NRC Material License, Amendment No. 5, SMB-1393) for radiological hazards and classified as either affected or unaffected. 15 buildings had been characterized and classified as unaffected; two (2) buildings had been surveyed for final status; and six (6) buildings had been characterized and classified as affected (or containing affected areas). Building classification and radiological information are described in Table 2.1

TABLE 2.1 - BUILDING CLASSIFICATION AND RADIOLOGICAL INFORMATION

Classification	Building	Radiological Information
A	1	Lab Area, soil samples in the lab and a small source in a lab office. Possible fixed contamination exists on the floor of one of the lab rooms.
A	19	Building contains rad material samples in an individual office. The office has been classified as an affected area.
A	26	Building 26 contains a temporary rad storage area (~20'x30') identified with a rad boundary and radiological postings. The building also contains an above ground 4 section tank (one section being potentially contaminated, internal) and a stainless steel filter (~3 ft. dia. by 4 ft.) that is contaminated
A	29	Concrete floor with sumps, floor sumps are potentially contaminated and need to be characterized. The rest of the building is identified as unaffected.
A	31	Concrete floor with a steel liner on top. Steel walls and roof, insulated walls Licensed material mixer was stored in building.
A	33	Concrete floor, steel walls and roof, insulated Equipment/supplies were originally stored in building. The building was erected in 1979 and is otherwise radiologically clean. Categorized as affected due to the storage of sample containers (contaminated dirt) in the back corner of the building.
U	2	Heat exchange in front of Building 2. Several stories high, mixture of solid and grating floors. Concrete and tin construction.
U	13	Concrete floor, steel and brick walls, some insulation on walls and ceiling.

U	14	Most of the building internals have been removed, brick structure. Roof is rusted and partially disintegrated
U	21	Concrete floor, steel and cinder block walls, steel ceiling. Maintenance shop in use until March 2002.
U	22	Concrete floor, metal walls and roof. Equipment/supply storage is the main purpose of this building
U	23	Concrete floor, steel walls and ceiling.
U	25	Concrete floor, steel walls and ceiling.
U	28	Concrete floor, steel walls and roof, 2 walls insulated, equipment/ supplies located previously stored on shelve located in the building.
U	32	Concrete floor, one wall insulated, steel roof, equipment/supplies previously stored on shelves located in the building, steel front door.
U	34	Concrete floor, steel walls and roof, large conveyor system inside building. Sand pits are located in building
U	35	Concrete floor, insulated walls and ceiling Equipment/supplies previously stored in the building The building was erected in 1988.
U	36	Concrete floor with sumps, double walled construction ½ way up, insulated walls and ceiling.
U	37	Concrete floor, corrugated steel walls and roof. Smaller inside storage building, cinder block construction, roof area was used for storage of additional equipment/supplies.
FS Surveyed	39	Building 39 previously surveyed for final status.
FS Surveyed	42	Building 39 previously surveyed for final status.

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.

In two instances during the final status survey of buildings 39 and 42, performed by RSI, survey results indicated elevated levels of radioactivity on building walls (even though smears in the same locations indicated that no removable radioactivity existed.) To identify the source of elevated radioactivity, two sections (approximately 2' by 2') of the building's wall were removed from the building by RSI. These wall pieces were resurveyed in areas where background radiation levels were considered "normal" and found to be free of radioactivity (no readings greater than background).

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

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 conducted at the site during this phase of work included D and D of all above surface structures and buildings.

All existing structures (buildings, tanks, dryers, bag houses, utilities, etc.) will be removed from the site. Wastes created during the D and D activities will be identified, segregated, and processed for shipment to the appropriate waste facility. Waste will be removed from site in accordance with all applicable federal, state and local regulations and authorities.

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 1960, regulatory requirements and pressure from local agencies have driven surveys and studies of the hazards associated with the production of various ferroalloys. Recently, RSI has completed and submitted for review the Final Status Survey for buildings 39 and 42. 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.

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Foster Wheeler Environmental Corporation conducted a site characterization of the Molycorp Washington, PA site in 1994 and published its report titles "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 affects 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 wan detailed planning of a preferred approach for decommissioning, decontamination, and waste disposal.

3.3 DECONTAMINATION PROCEDURES

Most of the above surface buildings have been previously decontaminated and identified as unaffected buildings or areas. These classifications are noted in Molycorp's NRC License, SMB-1393 and identified in Section 2 2 Buildings classified as affected will be surveyed, and where remediation is necessary, decontamination will be performed. It has been estimated that very little radioactive waste will be generated during the entire project scope. Items found to be contaminated above the limits have and will be controlled as radioactive material, temporarily stored on site, and ultimately disposed of as radioactive waste.

MACTEC's "Survey Plan for Determining the Final Status of Buildings at the Molycorp Site" contains the procedures and requirements for the survey of the buildings on site. RSI's Radiation Protection Procedures (currently the approved procedures used on site) contain the procedural requirements for operational radiation activities on the site.

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 "Survey Plan for Determining the Final Status of Buildings at the Molycorp Site") 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." QC samples were included in the sampling requirements.

Site buildings or areas were classified by contamination potential and grouped into survey units having a common history, contamination potential, or that were naturally distinguishable from other site areas, to assure that the number of survey data points from each survey unit adequately represented the radiological environment of that survey unit. Survey units are subdivisions of the whole area of interest within the sampling plan.

Unaffected survey units identified by direct measurement that exceed 25% of the guideline levels were reclassified as affected areas, gridded as necessary, and resurveyed accordingly.

Representative surveying was accomplished for buildings by using a systematic grid approach to ensure spatial representation of the survey unit of interest. The grid system provided reference locations to aid in proper sample identification and distribution, and ensured that minimum sample surface areas were sampled.

Direct and loose surface measurement locations were identified on the actual surface being surveyed. The physical probe location was traced on the surface being surveyed. When necessary, survey readings were recorded on the physical surface at the location of the survey.

Survey results were obtained and used for comparison against the limits for unrestricted release, as defined in the site's NRC License. These limits are included in MACTEC's "Survey Plan for Determining the Final Status of Buildings at the Molycorp Site" as Appendix A.

Table 4.1 identifies the release limits of the license.

Table 4.1 - Acceptable Surface Contamination Levels (dpm/100cm^2)

Radionuclide (1)	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 have 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^2 average, 3,000 dpm/100cm^2 maximum and 200 dpm/100cm^2 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.

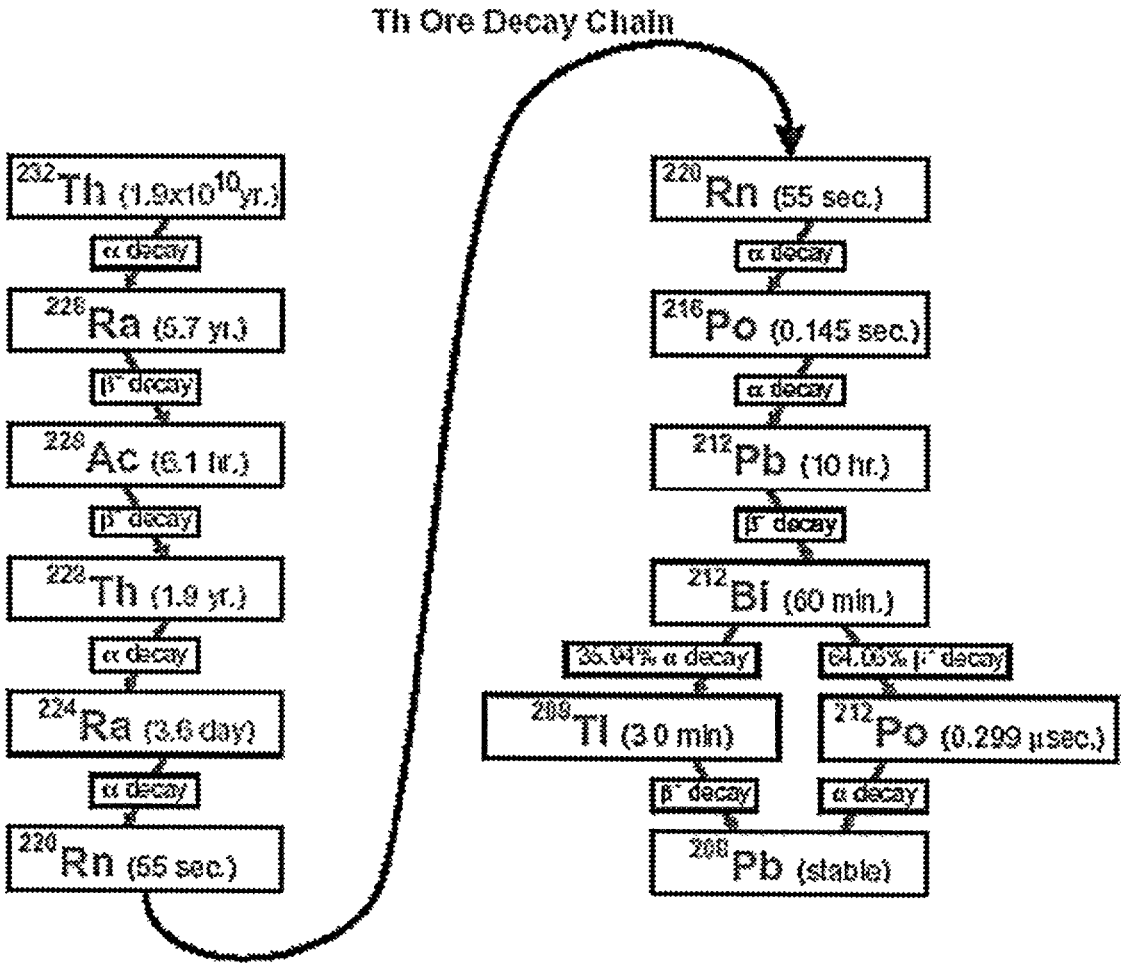
Due to the inherent difficulty of properly quantifying the alpha radiation component during the decay of natural thorium when using a hand-held instrument, a ratio of alpha decays to beta decays was identified and beta radiation was used as a surrogate to quantify the alpha activity. This was not the 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 4.1 is a graphical representation of the decay of natural thorium.

FIGURE 4.1 - NATURAL THORIUM DECAY CHAIN



4.2 SAMPLING SCHEDULE

Scanning of surfaces to identify locations of residual surface activity was performed according to Table 4.2.

TABLE 4.2 - SURFACE SCAN SCHEDULE

Building/ Structure Status	Survey Location	Surface Scan (4.6)
Affected Areas	Building floor and lower walls (<2 m from floor)	100% - Floor and lower walls (<2 m from floor) and other surfaces found to have residual activity in excess of guideline values during characterization surveys.
Affected Areas	Upper surfaces (>2 m from floor) of affected areas found to be non contaminated during the characterization	Limited - Areas found to be non contaminated during the characterization survey, scans in the immediate vicinity of direct measurement.
Affected Areas (4.10.1)	Exterior of piping, ventilation ducting, electrical boxes, conduit, or other interior surfaces that may contain residual contamination	B-G scans, biased, to determine locations that exceed 2x background. *At these locations, and available access points to pipe and duct interiors, direct alpha measurements and smear sample will be obtained.*
All Buildings (4.10.2)	Exterior surface of the roof	Gamma scan only - 1 measurement per 4 m^2 (see Exposure Rates Table)
All Buildings (4.10.2)	Exterior walls	B-G scan, 10% of lower wall surfaces (<2 m from floor)
Unaffected Areas	Building floor and lower wall surfaces (<2 m from floor)	B-G scan, 10% of floor and lower wall surfaces (<2 m from floor)
Equipment/ Structures Located in Affected Areas/Buildings	Equipment/Structure	Free Release Survey - If equipment/structure is identified as being used for processing licensed material. Biased - If equipment/structure was never used for processing licensed material.
Equipment/ Structures Located in Unaffected Areas/Buildings	Equipment/Structure	Biased - If equipment/structure is suspected of being used for processing licensed material. Not Required - If equipment/structure was never used for processing licensed material

Result Requirements		Locations of surface activity exceeding twice background will be marked for further evaluation.

Building interior surface scans were conducted for alpha and beta-gamma radiations. Scans of exterior building surfaces were for beta and gamma radiations to identify the presence of elevated areas that might indicate residual gross activity.

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 and 1/4 inch for alpha. When the count rate increased, the rate of movement of the detector was decreased or stopped. If the increase in count rate was real (not a random variation in the background count rate), a static 60-second measurement was performed over the area of increased count rate 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 as well as task-specific generated forms.

Gamma exposure rate measurements (gamma scan) were conducted with the instrument at 1 m above the floor at systematically and randomly selected locations

Direct measurements were performed according to Table 4.3.

TABLE 4.3 - DIRECT SURFACE MEASUREMENT SCHEDULE

Building/ Structure Status	Survey Location	Direct Measurement (4.7)
Affected Areas	Building floor and lower walls (<2 m from floor)	Floor and lower walls (<2 m from floor) and other surfaces found to have residual activity in excess of guideline values during characterization surveys (1)
Affected Areas	Upper surfaces (>2 m from floor) of affected areas found to be non contaminated during the characterization	Measurements will be performed at a minimum of 30 locations on both vertical and horizontal surfaces and sufficient additional locations to provide coverage at a minimum of one location per 20 m^2 of surface area (1)
Affected Areas (4.10.1)	Exterior of piping, ventilation ducting, electrical boxes, conduit, or other interior surfaces that may contain residual contamination	Where B-G scans exceed 2x background - obtain direct alpha measurements At available access points to pipe and duct interiors - obtain direct alpha measurements.

All Buildings (4.10.2)	Exterior and interior surfaces of air exhaust equipment and at roof drains	Biased
All Buildings (4.10.2)	Exterior walls	A minimum of 30 random direct measurements or an average of at least 1 measurement location per 50 m^2 surface area, whichever is greater, of the survey unit. (4.10.2)
All Buildings (4.10.2)	Exterior surface of the roof	Biased in areas of plausible contamination. (based on gamma scan results)
Unaffected Areas	Building floor and lower walls (<2 m from floor)	A minimum of 30 random direct measurements or an average of at least 1 measurement location per 50 m^2 surface area, whichever is greater. (5849)
Equipment/ Structures Located in Affected Areas/Buildings	Equipment/Structure	Free Release - If equipment/structure is identified as being used for processing licensed material. Biased - If equipment/structure was never used for processing licensed material.
Equipment/ Structures Located in Unaffected Areas/Buildings	Equipment/Structure	Biased - If equipment/structure is identified as being used for processing licensed material. Not Required - If equipment/structure was never used for processing licensed material.
Results Requirements		If direct measurements indicate residual activity exceeds 25% of the guideline, the area is surveyed per affected area requirements.

[1] If scanning methods are capable of detecting residual Th activity of less than 1,000 dpm/100 cm^2, direct surface activity measurements will be systematically performed at two-meter intervals on floors and lower walls and at the same intervals on upper surfaces. If scanning methods produce an MDA that exceeds 1,000 dpm/100 cm^2, measurements will be performed at one-meter intervals On upper surfaces of affected areas that are not scanned for the presence of residual activity, measurements will be performed at a minimum of 30 locations on both vertical and horizontal surfaces. These locations will include surfaces where radioactive material would likely settle and sufficient additional locations to provide coverage at a minimum of one location per 20 m^2 of surface area.

Direct surface measurements were conducted by integrating counts over a 1-minute period.

When scans or measurement exceeds guideline levels, the location was noted for further remediation or resolution. Localized scanning and measurements were repeated after any remediation activities were performed.

Smear surveys were preformed according to Table 4.4.

TABLE 4.4 - LOOSE SURFACE MEASUREMENT SCHEDULE

Building/ Structure Status	Survey Location	Removable Surface Activity
Affected Areas	Building floor and lower walls (<2 m from floor)	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
Affected Areas	Upper surfaces (>2 m from floor) of affected areas found to be non contaminated during the characterization.	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
Affected Areas (4.10.1)	Exterior of piping, ventilation ducting, electrical boxes, conduit, or other interior surfaces that may contain residual contamination.	Where B-G scans exceed 2x background - obtain alpha smear sample. At available access points to pipe and duct interiors - obtain alpha smear sample.
All Buildings (4.10 2)	Exterior and interior surfaces of air exhaust equipment and at roof drains.	Biased to locations where contamination is most likely.
All Buildings (4.10.2)	Exterior walls	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
All Buildings (4.10.2)	Exterior surface of the roof	Samples of roofing material (volumetric) will be obtained where direct measurements indicate contamination is present.
Unaffected Areas	Building and Structure Surfaces	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
Equipment/ Structures Located in Affected Areas/Buildings	Equipment/Structure	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).

Equipment/ Structures Located in Unaffected Areas/Buildings	Equipment/Structure	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).

A smear for removable contamination was obtained at each location where a direct surface activity measurement was taken, unless otherwise stated in Table 4.3.

Smears were counted for gross alpha and beta with the appropriate instrument.

As a precaution against accidental contamination of the instrumentation used to analyze the smear samples, screening of samples that had a high potential of containing elevated levels of radioactivity was performed

Exposure rate measurements were performed according to Table 4.5.

TABLE 4.5 - EXPOSURE RATE MEASUREMENT SCHEDULE

Building/ Structure Status	Survey Location	Exposure Rate Measurement (4.8)
Affected Areas	Building Surfaces	Gamma exposure rates measured 1 meter perpendicular to building surfaces at 1 measurement per 4 m^2.
All Buildings	Exterior Roof Surface (gamma scan)	Gamma exposure rates measured 1 meter perpendicular to building surfaces at 1 measurement per 4 m^2. (4.10.2)
Unaffected Areas	Building Surfaces	Gamma exposure rates measured 1 meter perpendicular to building surfaces at 1 measurement per 50 m^2 (calibrated for natural thorium).

Gamma exposure rates were measured at 1 m above ground or floor surfaces using a gamma scintillation instrument.

Where necessary, samples of paint were obtained from 100 cm^2 areas of painted surfaces where direct and removable activity measurements suggest contamination (> surface contamination levels) may have been painted over. These samples were analyzed for beta activity. Direct measurements and smear surveys were made of the underlying surface, after removal of the paint.

Samples of roofing materials (non-metal roofs) were obtained where direct measurements indicate contamination was present in the roofing material. Roof material samples were controlled as volumetric samples and analyzed as such.

Each piece of equipment that required monitoring was its own entity and was described by name and serial number on survey forms and/or logs. Special attention (increased sample density) was given to areas where there was a high potential for contamination. Equipment previously identified as not affected (not contaminated) was not surveyed unless there was indication that it had become contaminated

4.3 BACKGROUND LEVELS IDENTIFIED

Material-specific background levels were established by RSI in late 2001 for each type of instrument used for total surface contamination measurements during their final status surveys of Buildings 39 and 42. Similar instrumentation was selected for use by MACTEC to take advantage of this previously available information.

Background measurements were collected on surfaces of similar construction as the buildings at the site and having no possibility of being impacted by site operations. Measurements to establish background for a specific material were collected from multiple locations to provide an estimate of the variability or uncertainty. Background determination was performed using the same instrumentation that was used for final status survey data collection. An average background value was determined for each material surveyed and the most conservative value of all the instruments used was was subtracted from each measurement to determine a net count or count rate Background determinations were required and performed for concrete, cinderblock and a class of material designated a generic material.

The required number of background measurements per material type is as follows:

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

It was previously identified in the final status survey report for Buildings 39 and 42, submitted by RSI, that significant background radiation levels existed at the Molycorp site, primarily due to gamma radiation from the thorium slag in the soil RSI had reported levels as high as 30 micro-R per hour.

During survey activities performed by MACTEC at the site, a significant component of the measured activity was indeed identified to be from the elevated gamma background coming from the slag in the soil. A method was devised to minimize the interference of this background radiation when using the hand-held detectors, and produce more accurate results of beta activity, the primary indicator used for the detection and quantification of natural thorium. A shield or "beta window" was used to eliminate the beta component of a measurement made in areas where background levels proved to be a nuisance. A second measurement was taken without the shield in place. This measurement process produced two readings, one containing a beta-gamma interaction with the detector, and one containing only a gamma interaction with the detector. The difference between the two readings provided a beta-only component of the measurement, with the gamma background removed. This reading was then compared against the materials background that was determined at the off-site location and a net beta reading was obtained.

The material used to shield the beta radiation was a thin piece of aluminum (approximately 3/16 inch think). A test was performed to validate the aluminum's ability to shield the beta radiation. A beta source was

counted without the shield, and then the shield was put in place. The source was again counted Results of the tests indicated that in all cases, when the shield was in place, the instrument indicated background values and completely shielded out any beta radiation.

4.4 MAJOR CONTAMINATES IDENTIFIED

The major contaminate (significant radionuclide of concern) at the Molycorp Washington, PA site was identified to be natural thorium Trace amounts of natural uranium were also identified as a contaminate. Both of these materials are identified in the site's NRC License.

No other licensed material has been brought on site, based on the site Facility Superintendent's knowledge of process and site operations.

Results of preliminary assessment and characterization survey support the conclusion and identify the significant radiological contaminant to be thorium-232, from the processing of certain types of ore concentrates in the production of ferrocolumbium Most of the material Molycorp processed for ferrocolumbium was a pyrochlore, which contained thorium above the 0.05 percent limit. It is possible that buildings and structures involved with the processing of pyrochlore and production of ferrocolumbium may have been contaminated with thorium-232. The average activity ratio of Th-228 and Th-230 to Th-232 found in slag/soil samples are:

Th-228:Th-232	1.03%
Th-230:Th-232	0.16 %

4.5 GUIDELINES ESTABLISHED

All final status survey measurements were compared to the values listed in the Site's NRC License. The criteria specified in the guideline for natural thorium are more conservative than natural uranium, and were applied at the site for final status survey.

4.6 EQUIPMENT AND PROCEDURES SELECTED

Instrument and procedure selection was based on several criteria. The first criterion that was considered was the use of instruments and procedures that had been previously used on site for final status surveys. Since RSI had just completed the final status survey of two buildings at the site, prior to MACTEC's arrival, using similar procedures and instruments made sense. Because MACTEC's radiation protection operating procedures had not yet been approved for use at the site, RSI's radiation protection procedures were used. RSI's radiation protection procedures had previously been approved for use on site by the NRC. Verbal approval was given by the NRC to allow MACTEC to continue work using RSI's radiation protection procedures until their procedures were approved.

4.7 INSTRUMENT MDA

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 preselected 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·

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

Where:

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

FIGURE 4.2

Instrument MDAs were calculated on a daily basis and recorded on the applicable survey forms. Where instrument MDAs did not meet criteria (25% of the release limit value,) instrument background count times and sample count times were increased until MDA values became acceptable or a surrogate radiation with an acceptable MDA value for the sample was used.

4.8 INSTRUMENT SELECTION

Instrument and equipment selection was made based on previous use and the criteria of NUREG/CR-5849, for MDA sensitivity. In addition to the previous use criteria, instruments were selected based on the ability to detect the desired radiation and at a desired level, ease of use, availability and cost.

- For dose rate measurements, the Ludlum Micro-R meter was selected and used. It was selected due to it's relatively flat energy response curve and because it had been used on site previously for final status surveys.

- For surface scans of large areas (floor and walls), the Ludlum Floor Monitor (239-1F/2350-1) with the 582 cm^2 detector (43-37) was selected. The MDA for the instrument was considered acceptable until an area of elevated activity was detected by the instrument. During surveys with the floor monitor, when an area of elevated activity was detected, the probe size was theoretically reduced from 582 cm^2 to a size of 100 cm^2 (a postulated physical size of the elevated activity). The MDA of the instrument with its newly reduced probe size (100 cm^2 probe size) became unacceptable for scanning. For areas where the floor monitor detected elevated activity, the area was identified and resurveyed with a 100 cm^2 hand-held gas proportional detector. Instrument MDA was calculated and recorded at the start of the job, at the job site. If the instrument was relocated to a different location during the same day of work, the MDA was again calculated and recorded for the new location. The floor monitor was set up and calibrated to detect both alpha and beta radiations.

- For surface scans of areas with elevated readings, the Ludlum 2350-1 with the 43-68 or 43-106 was selected. Due to the detector's relative size (compared to the 43-37) the MDA for the detector was acceptable. However, using a hand-held instrument to survey large surface areas is not efficient in either cost or time. The primary duty of the large area hand-held gas-flow proportional detector was scanning areas where elevated levels of activity had been identified by the floor monitor. When

required to be used, the instrument's MDA was calculated and recorded at the start of the job, at the job site. If the instrument was relocated to a different location during the same day of work, the MDA was again calculated and recorded for the new location. The instrument's lower MDA allowed for the sample population density of other sample mediums (for affected area surveys units) to be less dense. When the MDA of the scanning instrument could not reach 25% of the release limit, the sample population density increased for the other sample mediums (direct and loose surface measurements) and a greater number of samples were required to be obtained. The instrument was set up and calibrated to detect both alpha and beta radiations

- For static (direct) surface measurements, the Ludlum 2360 with the 43-89 detector or Ludlum 2350-1 with the 43-68 or 43-106 was selected. The MDAs were acceptable Instrument MDA was calculated and recorded at the start of the job, at the job site If the instrument was relocated to a different location during the same day of work, the MDA was again calculated and recorded for the new location. When background radiation created an unacceptable MDA for the instrument, the instrument was reconfigured to count with a longer count time. Background count times were also increased to lower instrument MDA to acceptable levels when necessary. Durability, ease of use and cost were a consideration in the selection of these instruments. The instruments were set up and calibrated to detect both alpha and beta radiations.

- For counting samples (smears and air samples), the Ludlum 2929 with 43-10-1 detector was selected. Instrument MDA was calculated and recorded daily, and found to be acceptable. Durability, ease of use, familiarity and cost were a consideration in the selection of this instrument. The instrument was set up and calibrated to detect both alpha and beta radiations.

Table 4.6 provides information on the instruments selected to be used for final status surveys at the Molycorp Washington, PA site. Information on MDA calculations can be found in "Survey Plan for Determining the Final Status of Buildings at the Molycorp Site," Appendix B.

TABLE 4.6 - INSTRUMENT SELECTION

Instruments	Probe	Radiation	MDA (dpm/100 cm^2)	Use
Ludlum, Model 2360	43-89	Alpha	67	Static Surveys
Ludlum, Model 2360	43-89	Beta	520	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	43-68/43-106	Alpha	105	Scan Surveys
Ludlum, Model 2350-1	43-68/43-106	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		Exposure Rates

4.9 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.

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.

4.10 PROCEDURES FOLLOWED

The requirements of NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination" were followed for most statistical methodologies used during the performance of surveys and testing of data for the final status survey. In one instance, the methodology found in "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM) was used for determining the scanning MDA of those instruments used for scanning. This methodology provided a more accurate MDA result than would have been calculated from the guidance found in NUREG/CR-5849.

4.11 SURVEYING ORGANIZATION

Characterization and final status surveys were performed by a team composed of qualified personnel currently employed or subcontracted by MACTEC, Inc.

The team was operated under the supervision of the Project Manager, Mr. Vern Taylor, of MACTEC, Inc who has overall authority of the project.

The day-to-day operations of the site were the responsibility of the Site Superintendent, Mr. John Peek of MACTEC, Inc

Radiological field measurements and sample collection were the responsibility of Mr. Michael McDonald of MACTEC, Inc. Mike is a Board Certified Health Physicist (CHP) in comprehensive practice and a Registered Radiation Protection Technologist (RRPT).

Radiological surveys were performed by a team of HP technicians. One Senior HP Technician was assigned as the Lead Technician and was given the responsibility of the team.

5.0 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, and are presented in the Survey Findings Report

5.1 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 conversion to units of disintegrations per minute per 100 square centimeters (dpm/100cm^2). 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.

5.2 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.

6.0 SUMMARY

Final status survey of Building 26, located at the Molycorp Washington, PA site was 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 "Survey Plan for Determining the Final Status of Buildings at the Molycorp Site."

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 in Building 26 is below the unrestricted use criteria and confirm that the building is suitable for unrestricted use.

7.0 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) *Washing, 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 26 Data Package

Molycorp Washington, PA

Building 26 Data Package

This data package contains final status survey information for Building 26, Molycorp, Washington, PA site.

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

Summary

No anomalies were reported during the survey of Building 26. Elevated levels of background radiation, from soil radioactivity, continued to be a presence during survey activities.

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

Results of Surface Scans
Molycorp - Building 26 Survey Unit (Affected Area)

Building Floor

Location (see map)	Beta Scan gross cpm	Beta Scan net cpm	Alpha Scan gross cpm	Alpha Scan net cpm	Instrument #
F1	380	92	12	9.9	1
F2	490	202	9	6.9	1
F3	370	82	8	5.9	1
F4	430	142	6	3.9	1
F5	480	192	6	3.9	1
F6	530	242	7	4.9	1
F7	450	162	5	2.9	1
F8	520	232	6	3.9	1
F9	390	102	3	0.9	1
F10	360	72	4	1.9	1
F11	460	172	3	0.9	1
F12	340	52	2	-0.1	1
F13	340	52	6	3.9	1
F14	380	92	9	6.9	1
F15	580	292	10	7.9	1
F16	360	72	4	1.9	1
F17	350	62	3	0.9	1
F18	320	32	4	1.9	1
F19	360	72	4	1.9	1
F20	360	72	5	2.9	1
F21	630	342	22	19.9	1
F22	640	352	30	27.9	1
F23	480	192	8	5.9	1
F24	330	42	6	3.9	1
F25	320	32	6	3.9	1
F26	390	102	4	1.9	1
F27	390	102	8	5.9	1
F28	420	132	10	7.9	1
F29	760	472	22	19.9	1
F30	380	92	13	10.9	1
F31	380	92	12	9.9	1
F32	440	152	8	5.9	1
F33	510	222	30	27.9	1
F34	440	152	6	3.9	1
F35	390	102	6	3.9	1
F36	380	92	12	9.9	1
F37	330	82	10	6	2
F38	290	42	7	3	2
F39	430	182	12	8	2
F40	440	192	13	9	2
F41	390	142	28	24	2
F42	400	152	6	2	2
F43	350	102	11	7	2

F44	470	222	10	6	2
F45	330	82	9	5	2
F46	340	92	14	10	2
F47	320	72	13	9	2
F48	380	132	4	0	2
F49	420	172	15	11	2
F50	390	142	8	4	2
F51	420	172	16	12	2
F52	500	252	11	7	2
F53	330	82	10	6	2
F54	470	222	8	4	2
F55	420	172	6	2	2
F56	420	172	15	11	2
F57	470	222	8	4	2
F58	370	122	4	0	2
F59	410	162	6	2	2
F60	330	82	3	-1	2
F61	410	162	11	7	2
F62	320	72	6	2	2
F63	310	62	3	-1	2
F64	310	62	12	8	2
F65	320	72	8	4	2
F66	430	182	9	5	2
F67	500	252	6	2	2
F68	520	272	5	1	2
F69	520	272	12	8	2
F70	440	192	7	3	2
F71	400	152	8	4	2
F72	380	132	6	2	2

All floor scans performed with either: #1 - Ludlum 2350-1 No. 95356 with 43-106 No. 133866

Scan MDA Beta - 652 dpm/detector area
Scan MDA Alpha - 67 dpm/detector area
Scan background Beta - 288 cpm
Scan background Alpha - 2.1 cpm
Detector Eff. Beta - .246
Detector Eff. Alpha - .204

or

#2 - Ludlum 2350-1 No. 129414 with 43-106 No. 128914

Scan MDA Beta - 620 dpm/detector area
Scan MDA Alpha - 97 dpm/detector area
Scan background Beta - 248 cpm
Scan background Alpha - 4 cpm
Detector Eff. Beta - .240
Detector Eff. Alpha - .195

Results of Surface Scans
Molycorp - Building 26 Survey Unit (Affected Area)

Building Ceiling and Walls (Interior)

Location (see map)	Beta Scan gross cpm	Beta Scan net cpm	Alpha Scan gross cpm	Alpha Scan net cpm
W1	400	70	9	6
W2	350	20	7	4
W3	280	-50	4	1
W4	270	-60	3	0
W5	270	-60	2	-1
W6	280	-50	4	1
W7	250	-80	3	0
W8	290	-40	6	3
W9	280	-50	6	3
W10	320	-10	8	5
W11	320	-10	9	6
W12	300	-30	5	2
W13	360	30	9	6
W14	300	-30	7	4
W15	290	-40	6	3
W16	280	-50	8	5
W17	280	-50	4	1
W18	290	-40	6	3
W19	280	-50	4	1
W20	320	-10	3	0
W21	340	10	6	3
W22	310	-20	5	2
W23	300	-30	4	1
W24	360	30	9	6
W25	320	-10	10	7
W26	350	20	11	8
W27	340	10	4	1
W28	480	150	5	2
W29	510	180	9	6
W30	390	60	3	0
W31	380	50	7	4
W32	360	30	4	1
W33	290	-40	6	3
W34	380	50	9	6
W35	460	130	3	0
W36	390	60	7	4
W37	280	-50	5	2
W38	290	-40	3	0
W39	340	10	2	-1
W40	300	-30	3	0
W41	290	-40	6	3
W42	280	-50	5	2
W43	440	110	5	2

W44	360	30	3	0
W45	260	-70	9	6
W46	330	0	4	1
W47	290	-40	9	6
W48	380	50	7	4
W49	340	10	5	2
W50	320	-10	4	1
W51	380	50	7	4
W52	310	-20	5	2
W53	300	-30	6	3
W54	280	-50	3	0
W55	260	-70	4	1
W56	320	-10	6	3
W57	360	30	4	1
W58	380	50	5	2
W59	460	130	7	4
W60	390	60	4	1
W61	360	30	6	3
C-1	260	-70	8	5
C-2	300	-30	7	4
C-3	310	-20	6	3
C-4	300	-30	6	3
C-5	290	-40	5	2
C-6	320	-10	12	9
C-7	280	-50	9	6
C-8	290	-40	4	1
C-9	270	-60	3	0
C-10	290	-40	3	0
C-11	260	-70	5	2
C-12	380	50	7	4
C-13	290	-40	6	3
C-14	330	0	4	1
C-15	280	-50	2	-1
C-16	360	30	3	0
C-17	350	20	7	4
C-18	350	20	6	3
C-19	320	-10	4	1
C-20	340	10	9	6

All wall and ceiling scans performed with Ludlum 2350-1 No. 95356 with 43-106 No. 133866

Scan MDA Beta - 698 dpm/detector area
Scan MDA Alpha - 80 dpm/detector area
Scan background Beta - 330 cpm
Scan background Alpha - 3 cpm
Detector Eff. Beta - .246
Detector Eff. Alpha - .204

Results of Surface Scans
Molycorp - Building 26 Survey Unit (Affected Area)

Building Exterior (Walls)

Location (see map)	Beta Scan gross cpm	Beta Scan net cpm	Alpha Scan gross cpm	Alpha Scan net cpm
W1	480	151	8	4
W2	290	-39	6	2
W3	290	-39	4	0
W4	280	-49	4	0
W5	300	-29	12	8
W6	280	-49	13	9
W7	350	21	9	5
W8	360	31	7	3
W9	340	11	4	0
W10	420	91	9	5
W11	550	221	8	4
W12	620	291	11	7
W13	630	301	10	6
W14	600	271	9	5
W15	560	231	5	1
W16	460	131	4	0
W17	340	11	2	-2
W18	320	-9	1	-3
W19	390	61	3	-1
W20	360	31	2	-2
W21	340	11	2	-2
W22	350	21	7	3
W23	360	31	4	0
W24	410	81	5	1
W25	480	151	6	2
W26	380	51	8	4
W27	460	131	8	4
W28	480	151	7	3
W29	360	31	8	4
W30	360	31	9	5

All exterior scans performed with Ludlum 2350-1 No. 95356 with 43-106 No. 133866:

Scan MDA Beta - 697 dpm/detector area
Scan MDA Alpha - 93 dpm/detector area
Scan background Beta - 329 cpm
Scan background Alpha - 4 cpm
Detector Eff. Beta - .246
Detector Eff. Alpha - .204

Elevated Scan Readings
Molycorp - Building 26 Survey Unit (Affected Area)

Location (see map)	Alpha Scan net cpm
F1	9.9
F2	6 9
F3	5.9
F6	4.9
F14	6.9
F15	7.9
F21	19.9
F22	27.9
F23	5.9
F27	5.9
F28	7.9
F29	19.9
F30	10.9
F31	9.9
F32	5.9
F33	27.9
F36	9.9
F40	9
F41	24
F46	10
F47	9
F49	11
F51	12
F56	11
W25	7
W26	8
C-6	9
EW6	9

Elevated scan locations identified above were marked for further investigation

Direct Measurements (Total Activity)
Molycorp - Building 26 Survey Unit (Affected Area)

Building Floor (Interior)

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA (dpm/100cm^2)	Direct Alpha [1] (dpm/100cm^2)	Instrument #
F1	350	293	57	144	-87	-354	113	238	-707	1
F2	466	288	178	144	34	138	143	238	276	1
F3	337	296	41	144	-103	-419	108	238	-837	1
F4	417	276	141	144	-3	-12	135	238	-24	1
F5	449	281	168	144	24	98	141	238	195	1
F6	517	272	245	144	101	411	157	238	821	1
F7	431	279	152	144	8	33	137	238	65	1
F8	505	293	212	144	68	276	150	238	553	1
F9	378	302	76	144	-68	-276	118	238	-553	1
F10	343	281	62	144	-82	-333	114	238	-667	1
F11	421	299	122	144	-22	-89	130	238	-179	1
F12	328	304	24	144	-120	-488	103	238	-976	1
F13	326	303	23	144	-121	-492	103	238	-984	1
F14	361	326	35	144	-109	-443	107	238	-886	1
F15	536	321	215	144	71	289	151	238	577	1
F16	336	296	40	144	-104	-423	108	238	-846	1
F17	318	278	40	144	-104	-423	108	238	-846	1
F18	299	261	38	144	-106	-431	107	238	-862	1
F19	344	265	79	144	-65	-264	119	238	-528	1
F20	345	263	82	144	-62	-252	120	238	-504	1
F21	591	259	332	144	188	764	174	238	1528	1
F22	600	254	346	144	202	821	176	238	1642	1
F23	462	288	174	144	30	122	142	238	244	1
F24	300	243	57	144	-87	-354	113	238	-707	1
F25	310	274	36	144	-108	-439	107	238	-878	1
F26	371	262	109	144	-35	-142	127	238	-285	1
F27	379	259	120	144	-24	-98	129	238	-195	1
F28	386	310	76	144	-68	-276	118	238	-553	1

F29	730	298	432	144	288	1171	191	238	2341	1
F30	359	341	18	144	-126	-512	101	238	-1024	1
F31	355	289	66	144	-78	-317	115	238	-634	1
F32	409	288	121	144	-23	-93	130	238	-187	1
F33	485	287	198	144	54	220	147	238	439	1
F34	406	302	104	144	-40	-163	125	238	-325	1
F35	362	240	122	144	-22	-89	130	238	-179	1
F36	354	282	72	144	-72	-293	117	238	-585	1
F37	285	217	68	144	-76	-317	119	244	-633	2
F38	265	259	6	144	-138	-575	100	244	-1150	2
F39	405	332	73	144	-71	-296	120	244	-592	2
F40	429	288	141	144	-3	-13	138	244	-25	2
F41	366	243	123	144	-21	-88	133	244	-175	2
F42	376	256	120	144	-24	-100	133	244	-200	2
F43	334	254	80	144	-64	-267	122	244	-533	2
F44	453	286	167	144	23	96	144	244	192	2
F45	314	273	41	144	-103	-429	111	244	-858	2
F46	305	275	30	144	-114	-475	108	244	-950	2
F47	293	289	4	144	-140	-583	99	244	-1167	2
F48	361	329	32	144	-112	-467	108	244	-933	2
F49	382	289	93	144	-51	-213	126	244	-425	2
F50	355	241	114	144	-30	-125	131	244	-250	2
F51	373	273	100	144	-44	-183	128	244	-367	2
F52	440	319	121	144	-23	-96	133	244	-192	2
F53	307	261	46	144	-98	-408	113	244	-817	2
F54	403	322	81	144	-63	-263	123	244	-525	2
F55	383	301	82	144	-62	-258	123	244	-517	2
F56	365	259	106	144	-38	-158	129	244	-317	2
F57	415	322	93	144	-51	-213	126	244	-425	2
F58	330	305	25	144	-119	-496	106	244	-992	2
F59	371	280	91	144	-53	-221	125	244	-442	2
F60	289	263	26	144	-118	-492	106	244	-983	2
F61	375	280	95	144	-49	-204	126	244	-408	2
F62	302	278	24	144	-120	-500	106	244	-1000	2
F63	295	290	5	144	-139	-579	100	244	-1158	2
F64	271	247	24	144	-120	-500	106	244	-1000	2
F65	286	283	3	144	-141	-588	99	244	-1175	2

F66	364	256	108	144	-36	-150	130	244	-300	2
F67	443	395	48	144	-96	-400	113	244	-800	2
F68	449	378	71	144	-73	-304	120	244	-608	2
F69	458	325	133	144	-11	-46	136	244	-92	2
F70	418	314	104	144	-40	-167	129	244	-333	2
F71	375	284	91	144	-53	-221	125	244	-442	2
F72	327	258	69	144	-75	-313	119	244	-625	2

All building interior floor direct measurements were performed with either: #1 - Ludlum 2350-1 No. 95356 and 43-106 No. 133866

	Beta	Alpha
Efficiency	0.246	0.204
Floor Background (cpm)	144	8
Floor MDA (dpm/100 cm^2)	238	78

or

#2 - Ludlum 2350-1 No. 129414 and 43-106 No. 128914

	Beta	Alpha
Efficiency	0.24	0.195
Floor Background (cpm)	144	8
Floor MDA (dpm/100 cm^2)	244	81

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

Direct Measurements (Total Activity)
Molycorp - Building 26 Survey Unit (Affected Area)

Building Walls and Ceilings (Interior)

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA (dpm/100cm^2)	Direct Alpha [1] (dpm/100cm^2)
W1	380	361	19	27	-8	-33	54	109	-65
W2	329	250	79	27	52	211	82	109	423
W3	266	236	30	27	3	12	60	109	24
W4	248	238	10	27	-17	-69	48	109	-138
W5	226	265	-39	27	-66	-268	28	109	-537
W6	269	209	60	27	33	134	74	109	268
W7	238	259	-21	27	-48	-195	20	109	-390
W8	261	274	-13	27	-40	-163	30	109	-325
W9	249	240	9	27	-18	-73	48	109	-146
W10	309	326	-17	27	-44	-179	25	109	-358
W11	302	276	26	27	-1	-4	58	109	-8
W12	276	256	20	27	-7	-28	55	109	-57
W13	336	287	49	27	22	89	69	109	179
W14	280	251	29	27	2	8	60	109	16
W15	269	287	-18	27	-45	-183	24	109	-366
W16	263	311	-48	27	-75	-305	37	109	-610
W17	268	260	8	27	-19	-77	47	109	-154
W18	265	223	42	27	15	61	66	109	122
W19	254	243	11	27	-16	-65	49	109	-130
W20	296	262	34	27	7	28	62	109	57
W21	308	307	1	27	-26	-106	42	109	-211
W22	280	261	19	27	-8	-33	54	109	-65
W23	269	253	16	27	-11	-45	52	109	-89
W24	332	311	21	27	-6	-24	55	109	-49
W25	282	255	27	27	0	0	59	109	0
W26	310	287	23	27	-4	-16	56	109	-33
W27	311	282	29	27	2	8	60	109	16
W28	438	426	12	27	-15	-61	50	109	-122

W29	483	464	19	27	-8	-33	54	109	-65
W30	371	361	10	27	-17	-69	48	109	-138
W31	349	331	18	27	-9	-37	53	109	-73
W32	328	310	18	27	-9	-37	53	109	-73
W33	272	261	11	27	-16	-65	49	109	-130
W34	354	301	53	27	26	106	71	109	211
W35	430	402	28	27	1	4	59	109	8
W36	357	342	15	27	-12	-49	52	109	-98
W37	253	231	22	27	-5	-20	56	109	-41
W38	283	257	26	27	-1	-4	58	109	-8
W39	285	262	23	27	-4	-16	56	109	-33
W40	259	247	12	27	-15	-61	50	109	-122
W41	263	251	12	27	-15	-61	50	109	-122
W42	256	254	2	27	-25	-102	43	109	-203
W43	399	293	106	27	79	321	92	109	642
W44	324	303	21	27	-6	-24	55	109	-49
W45	241	259	-18	27	-45	-183	24	109	-366
W46	286	256	30	27	3	12	60	109	24
W47	264	264	0	27	-27	-110	41	109	-220
W48	358	278	80	27	53	215	82	109	431
W49	328	336	-8	27	-35	-142	35	109	-285
W50	291	300	-9	27	-36	-146	34	109	-293
W51	351	341	10	27	-17	-69	48	109	-138
W52	283	296	-13	27	-40	-163	30	109	-325
W53	282	245	37	27	10	41	64	109	81
W54	241	245	-4	27	-31	-126	38	109	-252
W55	234	240	-6	27	-33	-134	37	109	-268
W56	298	281	17	27	-10	-41	53	109	-81
W57	321	317	4	27	-23	-93	44	109	-187
W58	355	367	-12	27	-39	-159	31	109	-317
W59	426	374	52	27	25	102	71	109	203
W60	369	250	119	27	92	374	96	109	748
W61	325	291	34	27	7	28	62	109	57
C1	236	206	30	27	3	12	60	109	24
C2	286	286	0	27	-27	-110	41	109	-220
C3	246	303	-57	27	-84	-341	44	109	-683
C4	287	257	30	27	3	12	60	109	24

C5	279	299	-20	27	-47	-191	21	109	-382
C6	289	269	20	27	-7	-28	55	109	-57
C7	244	265	-21	27	-48	-195	20	109	-390
C8	268	225	43	27	16	65	67	109	130
C9	244	244	0	27	-27	-110	41	109	-220
C10	277	313	-36	27	-63	-256	24	109	-512
C11	229	218	11	27	-16	-65	49	109	-130
C12	355	320	35	27	8	33	63	109	65
C13	284	294	-10	27	-37	-150	33	109	-301
C14	312	296	16	27	-11	-45	52	109	-89
C15	241	217	24	27	-3	-12	57	109	-24
C16	324	316	8	27	-19	-77	47	109	-154
C17	330	324	6	27	-21	-85	46	109	-171
C18	328	304	24	27	-3	-12	57	109	-24
C19	298	315	-17	27	-44	-179	25	109	-358
C20	315	275	40	27	13	53	65	109	106

All building interior wall and ceiling direct measurements were performed with Ludlum 2350-1 No. 95356 and 43-106 No. 133866

	Beta	Alpha
Efficiency	0.246	0.204
Background (cpm)	27	2
MDA (dpm/100 cm^2)	109	46

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

Direct Measurements (Total Activity)
Molycorp - Building 26 Survey Unit (Affected Area)

Building Exterior (Walls)

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA (dpm/100cm^2)	Direct Alpha [1] (dpm/100cm^2)
W1	460	375	85	27	58	236	84	109	472
W2	279	244	35	27	8	33	63	109	65
W3	268	235	33	27	6	24	62	109	49
W4	272	271	1	27	-26	-106	42	109	-211
W5	269	267	2	27	-25	-102	43	109	-203
W6	277	271	6	27	-21	-85	46	109	-171
W7	328	312	16	27	-11	-45	52	109	-89
W8	344	335	9	27	-18	-73	48	109	-146
W9	334	307	27	27	0	0	59	109	0
W10	382	354	28	27	1	4	59	109	8
W11	511	405	106	27	79	321	92	109	642
W12	609	481	128	27	101	411	99	109	821
W13	614	535	79	27	52	211	82	109	423
W14	565	425	140	27	113	459	103	109	919
W15	531	408	123	27	96	390	98	109	780
W16	436	306	130	27	103	419	100	109	837
W17	319	253	66	27	39	159	77	109	317
W18	302	282	20	27	-7	-28	55	109	-57
W19	377	286	91	27	64	260	87	109	520
W20	322	301	21	27	-6	-24	55	109	-49
W21	327	266	61	27	34	138	75	109	276
W22	322	334	-12	27	-39	-159	31	109	-317
W23	325	295	30	27	3	12	60	109	24
W24	378	293	85	27	58	236	84	109	472
W25	451	334	117	27	90	366	96	109	732
W26	351	364	-13	27	-40	-163	30	109	-325
W27	434	322	112	27	85	346	94	109	691
W28	447	339	108	27	81	329	93	109	659

W29	333	316	17	27	-10	-41	53	109	-81
W30	330	289	41	27	14	57	66	109	114

All building exterior wall direct measurements were performed with Ludlum 2350-1 No. 95356 and 43-106 No. 133866

	Beta	Alpha
Efficiency	0.246	0.204
Background (cpm)	27	2
MDA (dpm/100 cm^2)	109	46

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

Elevated Direct Measurements (Total Activity) and Averaging Results

Molycorp - Building 26 Survey Unit (Affected Area)

Building Floor (Interior)

Location	Direct Beta ($dpm/100cm^2$)	Direct Alpha ($dpm/100cm^2$)	Over Area (cm^2)	Exceeds Limits Maximum	Exceeds Limits Average	Averaged Value (over 1 m^2)	Within Limits? Yes/No
F21	na	1528	100	No	Yes	-80	Yes
F22	na	1642	100	No	Yes	-114	Yes
F29	1171	2341	100	No	Yes	Identified and marked for removal/disposal	

Removable Surface Activity Measurements
Molycorp - Building 26 Survey Unit (Affected Area)

Building Floor

Location (see map)	Removable Beta (dpm/100cm2)	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm2)	Uncertainty 95% CL	MDA
F1	48	29.6	130	-0.5	2.4	12
F2	56	31.8	130	5.3	7.7	12
F3	-30	24.1	130	-0.5	2.4	12
F4	0	9.0	130	2.4	5.2	12
F5	74	36.2	130	-0.5	2.4	12
F6	30	24.1	130	-0.5	2.4	12
F7	-13	17.2	130	2.4	5.2	12
F8	65	34.1	130	-0.5	2.4	12
F9	-13	17.2	130	2.4	5.2	12
F10	35	25.7	130	-0.5	2.4	12
F11	-30	24.1	130	-0.5	2.4	12
F12	-17	19.1	130	-0.5	2.4	12
F13	-39	27.0	130	-0.5	2.4	12
F14	-17	19.1	130	8.2	9.5	12
F15	-13	17.2	130	5.3	7.7	12
F16	17	19.1	130	-0.5	2.4	12
F17	-8.7	15.0	130	-0.5	2.4	12
F18	-30	24.1	130	2.4	5.2	12
F19	-35	25.7	130	2.4	5.2	12
F20	17	19.1	130	-0.5	2.4	12
F21	22	21.1	130	-0.5	2.4	12
F22	-4.3	12.3	130	2.4	5.2	12
F23	0	9.0	130	-0.5	2.4	12
F24	82	38.0	130	-0.5	2.4	12
F25	-17	19.1	130	-0.5	2.4	12
F26	91	39.9	130	2.4	5.2	12
F27	69	35.0	130	-0.5	2.4	12
F28	22	21.1	130	2.4	5.2	12
F29	-22	21.1	130	2.4	5.2	12
F30	13	17.2	130	5.2	7.6	12
F31	8.7	15.0	130	2.4	5.2	12
F32	-4.3	12.3	130	-0.5	2.4	12
F33	56	31.8	130	2.4	5.2	12
F34	17	19.1	130	-0.5	2.4	12
F35	65	34.1	130	-0.5	2.4	12
F36	4.3	12.3	130	2.4	5.2	12
F37	-30	24.1	130	-0.5	2.4	12
F38	0	9.0	130	-0.5	2.4	12
F39	-26	22.6	130	0.5	2.4	12
F40	8.7	15.0	130	-0.5	2.4	12
F41	17	19.1	130	-0.5	2.4	12
F42	17	19.1	130	2.4	5.2	12
F43	61	33.1	130	-0.5	2.4	12
F44	-13	17.2	130	-0.5	2.4	12
F45	-61	33.1	130	2.4	5.2	12
F46	26	22.6	130	2.4	5.2	12

F47	39	27.0	130	-0.5	2.4	12
F48	-17	19.1	130	2.4	5.2	12
F49	43	28.2	130	-0.5	2.4	12
F50	43	28.2	130	-0.5	2.4	12
F51	-8.7	15.0	130	2.4	5.2	12
F52	69	35.0	130	2.4	5.2	12
F53	-56	31.8	130	-0.5	2.4	12
F54	-30	24.1	130	-0.5	2.4	12
F55	17	19.1	130	-0.5	2.4	12
F56	-13	17.2	130	-0.5	2.4	12
F57	-56	31.8	130	-0.5	2.4	12
F58	-30	24.1	130	-0.5	2.4	12
F59	4.3	12.3	130	2.4	5.2	12
F60	-2.4	11.0	130	-0.5	2.4	12
F61	35	25.7	130	-0.5	2.4	12
F62	-35	25.7	130	2.4	5.2	12
F63	43	28.2	130	-0.5	2.4	12
F64	-52	30.7	130	-0.5	2.4	12
F65	13	17.2	130	-0.5	2.4	12
F66	78	37.1	130	-0.5	2.4	12
F67	8.7	15.0	130	-0.5	2.4	12
F68	-13	17.2	130	2.4	5.2	12
F69	-13	17.2	130	-0.5	2.4	12
F70	-65	34.1	130	-0.5	2.4	12
F71	56	31.8	130	-0.5	2.4	12
F72	52	30.7	130	-0.5	2.4	12

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

	Beta	Alpha
Background (cpm)	67	0.17
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	130	12.0

Removable Surface Activity Measurements
Molycorp - Building 26 Survey Unit (Affected Area)

Building Walls and Ceilings (Interior)

Location (see map)	Removable Beta (dpm/100cm2)	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm2)	Uncertainty 95% CL	MDA
W1	35	25.8	134	2.4	5.2	12
W2	-43	28.3	134	-0.5	2.4	12
W3	-61	33.1	134	-0.5	2.4	12
W4	-8.7	15.1	134	-0.5	2.4	12
W5	-8.7	15.1	134	-0.5	2.4	12
W6	-30	24.1	134	2.4	5.2	12
W7	30	24.1	134	2.4	5.2	12
W8	-52	30.8	134	2.4	5.2	12
W9	-39	27.1	134	-0.5	2.4	12
W10	56	31.9	134	-0.5	2.4	12
W11	4.3	12.5	134	-0.5	2.4	12
W12	8.7	15.1	134	-0.5	2.4	12
W13	30	24.1	134	-0.5	2.4	12
W14	30	24.1	134	-0.5	2.4	12
W15	-4.3	12.5	134	8.2	9.5	12
W16	35	25.8	134	-0.5	2.4	12
W17	-17	19.1	134	-0.5	2.4	12
W18	39	27.1	134	2.5	5.3	12
W19	13	17.3	134	5.3	7.7	12
W20	-17	19.1	134	-0.5	2.4	12
W21	30	24.1	134	-0.5	2.4	12
W22	43	28.3	134	5.3	7.7	12
W23	-13	17.3	134	-0.5	2.4	12
W24	-26	22.7	134	-0.5	2.4	12
W25	-13	17.3	134	-0.5	2.4	12
W26	39	27.1	134	-0.5	2.4	12
W27	43	28.3	134	-0.5	2.4	12
W28	-26	22.7	134	-0.5	2.4	12
W29	48	29.7	134	2.4	5.2	12
W30	30	24.1	134	2.4	5.2	12
W31	-17	19.1	134	-0.5	2.4	12
W32	-13	17.3	134	2.4	5.2	12
W33	-35	25.8	134	2.4	5.2	12
W34	17	19.1	134	-0.5	2.4	12
W35	4.3	12.5	134	-0.5	2.4	12
W36	-4.3	12.5	134	2.4	5.2	12
W37	-12	16.8	134	-0.5	2.4	12
W38	-22	21.2	134	-0.5	2.4	12
W39	-4.3	12.5	134	-0.5	2.4	12
W40	-13	17.3	134	-0.5	2.4	12
W41	4.3	12.5	134	-0.5	2.4	12
W42	22	21.2	134	5.3	7.7	12
W43	8.7	15.1	134	2.4	5.2	12
W44	4.3	12.5	134	-0.5	2.4	12
W45	-39	27.1	134	-0.5	2.4	12
W46	26	22.7	134	-0.5	2.4	12

W47	13	17.3	134	-0.5	2.4	12
W48	13	17.3	134	2.4	5.2	12
W49	-4.3	12.5	134	-0.5	2.4	12
W50	4.3	12.5	134	2.4	5.2	12
W51	0	9.2	134	-0 5	2.4	12
W52	-13	17.3	134	-0.5	2.4	12
W53	-43	28.3	134	-0.5	2.4	12
W54	-13	17.3	134	2.4	5.2	12
W55	8.7	15.1	134	-0.5	2.4	12
W56	-13	17.3	134	-0.5	2.4	12
W57	0	9.2	134	-0.5	2.4	12
W58	22	21.2	134	2.4	5.2	12
W59	-4.3	12.5	134	-0.5	2.4	12
W60	8.7	15.1	134	-0.5	2.4	12
W61	13	17.3	134	-0.5	2.4	12
C1	-26	22.7	134	-0.5	2.4	12
C2	-13	17.3	134	-0.5	2.4	12
C3	8.7	15.1	134	2.4	5.2	12
C4	0	9.2	134	-0.5	2.4	12
C5	13	17.3	134	-0.5	2.4	12
C6	95	40.8	134	-0.5	2.4	12
C7	8.7	15.1	134	-0.5	2.4	12
C8	13	17.3	134	5.3	7.7	12
C9	-61	33.1	134	2.4	5.2	12
C10	-13	17.3	134	-0.5	2.4	12
C11	-43	28.3	134	-0.5	2.4	12
C12	-4.3	12.5	134	-0.5	2.4	12
C13	13	17.3	134	-0.5	2.4	12
C14	0	9.2	134	-0.5	2.4	12
C15	8.7	15.1	134	2.4	5.2	12
C16	-30	24.1	134	-0.5	2.4	12
C17	-17	19.1	134	-0.5	2.4	12
C18	30	24.1	134	-0.5	2.4	12
C19	22	21.2	134	2.4	5.2	12
C20	4.3	12.5	134	-0.5	2.4	12

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

	Beta	Alpha
Background (cpm)	70	0.17
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	12.0

Removable Surface Activity Measurements
Molycorp - Building 26 Survey Unit (Affected Area)

Building Exterior

Location (see map)	Removable Beta (dpm/100cm2)	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm2)	Uncertainty 95% CL	MDA
W1	-13	17.3	134	2.4	5.2	12
W2	8.7	15.1	134	2.4	5.2	12
W3	-22	21.2	134	-0.5	2.4	12
W4	22	21.2	134	-0.5	2.4	12
W5	17	19.1	134	-0.5	2.4	12
W6	8.7	15.1	134	-0.5	2.4	12
W7	43	28.3	134	-0.5	2.4	12
W8	4.3	12.5	134	2.4	5.2	12
W9	-13	17.3	134	5.3	7.7	12
W10	30	24.1	134	2.4	5.2	12
W11	35	25.8	134	-0.5	2.4	12
W12	74	36.3	134	-0.5	2.4	12
W13	-4.3	12.5	134	-0.5	2.4	12
W14	-8.7	15.1	134	-0.5	2.4	12
W15	26	22.7	134	-0.5	2.4	12
W16	-30	24.1	134	-0.5	2.4	12
W17	-4.3	12.5	134	2.4	5.2	12
W18	-48	29.7	134	-0.5	2.4	12
W19	4.3	12.5	134	-0.5	2.4	12
W20	8.7	15.1	134	-0.5	2.4	12
W21	-13	17.3	134	2.4	5.2	12
W22	22	21.2	134	-0.5	2.4	12
W23	0	9.2	134	2.4	5.2	12
W24	56	31.9	134	-0.5	2.4	12
W25	-26	22.7	134	-0.5	2.4	12
W26	-17	19.1	134	-0.5	2.4	12
W27	-8.7	15.1	134	-0.5	2.4	12
W28	35	25.8	134	-0.5	2.4	12
W29	4.3	12.5	134	-0.5	2.4	12
W30	8.7	15.1	134	2.4	5.2	12

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

	Beta	Alpha
Background (cpm)	70	0.17
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	12.0

Elevated Removable Surface Activity Measurements
Molycorp - Building 26 Survey Unit (Affected Area)

No elevated removable surface activity was reported above limits.

Exposure Rate Measurements
Molycorp - Building 26 Survey Unit (Affected Area)

Building Floor

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	8	2
F2	8	2
F3	8	2
F4	8	2
F5	7	1
F6	8	2
F7	8	2
F8	8	2
F9	7	1
F10	7	1
F11	7	1
F12	7	1
F13	7	1
F14	7	1
F15	8	2
F16	8	2
F17	8	2
F18	7	1
F19	8	2
F20	9	3
F21	9	3
F22	8	2
F23	7	1
F24	7	1
F25	7	1
F26	7	1
F27	9	3
F28	9	3
F29	9	3
F30	9	3
F31	8	2
F32	8	2
F33	9	3
F34	9	3
F35	9	3
F36	9	3
F37	8	2
F38	8	2
F39	9	3
F40	10	4
F41	9	3
F42	9	3
F43	9	3

F44	9	3
F45	9	3
F46	10	4
F47	10	4
F48	9	3
F49	9	3
F50	9	3
F51	10	4
F52	11	5
F53	11	5
F54	12	5
F55	11	5
F56	11	5
F57	11	5
F58	10	4
F59	10	4
F60	9	3
F61	9	3
F62	9	3
F63	9	3
F64	9	3
F65	9	3
F66	10	4
F67	10	4
F68	10	4
F69	10	4
F70	11	5
F71	12	5
F72	10	4

Background dose rate: 6-8 uR/hr with Model 19, No.22526

Exposure Rate Measurements
Molycorp - Building 26 Survey Unit (Affected Area)

Building Walls and Ceilings (Interior)

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
W1	10	3
W2	10	3
W3	10	3
W4	10	3
W5	10	3
W6	9	2
W7	8	1
W8	9	2
W9	9	2
W10	9	2
W11	9	2
W12	10	3
W13	10	3
W14	10	3
W15	10	3
W16	10	3
W17	9	2
W18	11	4
W19	11	4
W20	12	5
W21	12	5
W22	11	4
W23	12	5
W24	12	5
W25	12	5
W26	11	4
W27	12	5
W28	12	5
W29	11	4
W30	11	4
W31	10	3
W32	11	4
W33	11	4
W34	11	4
W35	8	1
W36	8	1
W37	6	-1
W38	6	-1
W39	6	-1
W40	6	-1
W41	6	-1
W42	6	-1
W43	6	-1

W44	5	-2
W45	6	-1
W46	7	0
W47	5	-2
W48	6	-1
W49	6	-1
W50	6	-1
W51	7	0
W52	7	0
W53	5	-2
W54	5	-2
W55	5	-2
W56	6	-1
W57	8	1
W58	7	0
W59	8	1
W60	7	0
W61	7	0
C1	7	0
C2	7	0
C3	6	-1
C4	6	-1
C5	7	0
C6	6	-1
C7	6	-1
C8	5	-2
C9	5	-2
C10	6	-1
C11	6	-1
C12	7	0
C13	8	1
C14	8	1
C15	7	0
C16	6	-1
C17	6	-1
C18	7	0
C19	6	-1
C20	7	0

Background dose rate: 6-8 uR/hr with Model 19, No.22526

Exposure Rate Measurements
Molycorp - Building 26 Survey Unit (Affected Area)

Building Exterior (Walls and Roof)

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
W1	14	7
W2	13	6
W3	11	4
W4	10	3
W5	10	3
W6	11	4
W7	12	5
W8	11	4
W9	12	5
W10	15	8
W11	14	7
W12	19	12
W13	23	16
W14	18	11
W15	14	7
W16	8	1
W17	7	0
W18	7	0
W19	7	0
W20	6	-1
W21	6	-1
W22	7	0
W23	10	3
W24	14	7
W25	16	9
W26	10	3
W27	13	6
W28	8	1
W29	8	1
W30	6	-1
Roof	8	1
Roof	7	0
Roof	7	0
Roof	8	1
Roof	8	1
Roof	8	1
Roof	7	0
Roof	7	0
Roof	6	-1
Roof	7	0
Roof	7	0
Roof	7	0
Roof	7	0

Roof	6	-1
Roof	6	-1
Roof	7	0
Roof	6	-1
Roof	6	-1
Roof	6	-1
Roof	6	-1
Roof	6	-1
Roof	6	-1
Roof	7	0
Roof	8	1
Roof	7	0
Roof	7	0
Roof	6	-1
Roof	6	-1
Roof	6	-1
Roof	7	0
Roof	7	0
Roof	7	0
Roof	7	0
Roof	7	0
Roof	7	0
Roof	6	-1
Roof	6	-1
Roof	6	-1
Roof	7	0
Roof	7	0
Roof	7	0

Background dose rate: 6-8 uR/hr with Model 19, No.22526

Summary of Building Surface Direct Reading (Total Activity) Results
Molycorp - Building 26 Survey Unit Foundation Only (Affected Area)

Including all building foundation interior measurements

Beta				Alpha			
n	$\bar{x}$	s	μ_α	n	$\bar{x}$	s	μ_α
70	-219	281.6	-162.8	70	-438	563.1	-325.7

$t_{1-\alpha}$ 1.668

Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

Summary of Building Surface Direct Reading (Total Activity) Results
Molycorp - Building 26 Survey Unit Shell Only (Affected Area)

Including all building interior and exterior measurements

Beta				Alpha			
n	$\bar{x}$	s	μ_α	n	$\bar{x}$	s	μ_α
111	-2	160.9	23.4	111	-4	321.7	46.9

$t_{1-\alpha}$ 1.660

Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

Summary of Exposure Rate Measurements

Molycorp - Building 26 Survey Unit Foundation Only (Affected Area)

Including all building interior foundations measurements (uR/hr)

n	$\bar{x}$	s	μ_α
72	2.8	1.2	3.1

$t_{1-\alpha}$ 1.669

Guidelines/Conditions Satisfied?

Yes

Summary of Exposure Rate Measurements
Molycorp - Building 26 Survey Unit Shell Only (Affected Area)

Including all building interior and exterior measurements (uR/hr)

n	$\bar{x}$	s	μ_α
152	1.4	2.9	1.8

$t_{1-\alpha}$ 1.657

Guidelines/Conditions Satisfied?
Yes

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

Section 1: Survey Information

Date: 8-29-02	Time: 1500	Location: Bldg #26	Survey Issue Log Number: 02-0861
RWP Number: N/A	Purpose of Survey: FSS ☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other		Page 13 of 19

Survey Title: FSS Interior Floor

1 Minute statics taken on Concrete (Floor)

		BKG	MDA
Inst #1	β⁻	144	238
	α	8	78
Inst #2	β⁻	144	243.7
	α	8	81

Model 19 # 22526 Due 1-29-03

Bkgd Readings 6 mR/hr

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

N/A

Legend

00 = mRem/h gamma | 00 C = mRem/h gamma contact | ① = Smear Location | ▽ = Air Sample Location | -X-X-X- = Rope, Boundary, or Barrier

00 β = mRem/h beta | 00 βC = mRem/h beta contact | –①– = 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 β⁻	MDA α	Other β⁻	Other α
Inst #1	2350-1/95356	1-29-03	43-106/133866	1-29-03	.246/.204	652	67	288	2.1
Inst #2	2350-1/129414	8-2-03	43-106/128914	2-2-03	.240/.195	620	97	248	4
	2929/115563	6-14-03	43-10/127216	6-14-03	.231/.347	130	12	67	.17
		N					N		
			A					A	

Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Mark Blanusak / John Huber	☐ Yes ☐ No ☐ Not Required	8-29-02 / 1500
Radiation Safety Officer (Print Name & Sign)		**Date and Time**
Steve Kowalski / Steve Kowalski		8-29-02 / 1630

Radiological Survey Results - Survey Location Indicator

Survey #02-0861

Survey Area Information: Bldg. 26 FSS Floor

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 cm²) α	Smears (dpm/100 cm²) β
1	380	12	350	293	8	8	-.5	48
2	490	9	466	288	7	8	5.3	56
3	370	8	337	296	3	8	-.5	-30
4	430	6	417	276	2	8	2.4	0
5	480	6	449	281	3	7	-.5	74
6	530	7	517	272	3	8	-.5	30
7	450	5	431	279	2	8	2.4	-13
8	520	6	505	293	4	8	-.5	65
9	390	3	378	302	2	7	2.4	-13
10	360	4	343	281	1	7	-.5	35
11	460	3	421	299	2	7	-.5	-30
12	340	2	328	304	2	7	-.5	-17
13	340	6	326	303	3	7	-.5	-39
14	380	9	361	326	2	7	8.2	-17
15	580	10	536	321	4	8	5.3	-13
16	360	4	336	296	1	8	-.5	17
17	350	3	318	278	2	8	-.5	-8.7
18	320	4	299	261	1	7	2.4	-30
19	360	4	344	265	3	8	2.4	-35
20	360	5	345	263	2	9	-.5	17
21	630	22	591	259	18	9	-.5	22
22	640	30	600	254	26	8	2.4	-4.3
23	480	8	462	288	4	7	-.5	0
24	330	6	300	243	4	7	-.5	82
25	320	6	310	274	2	7	-.5	-17
25QC	320	5	296	254	3	7	-.5	-22
26	390	4	371	262	3	7	2.4	91

INST # 1

Survey #02-0861

Radiological Survey Results - Survey Location Indicator

Survey Area Information: Bldg 26 FSS (Floor)

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 cm²) α	Smears (dpm/100 cm²) β
27	390	8	379	259	2	9	-.5	69
28	420	10	386	310	5	9	2.4	22
29	760	22	730	298	15	9	2.4	-22
30	380	13	359	341	6	9	5.2	13
31	380	12	355	289	4	8	2.4	8.7
32	440	8	409	288	2	8	-.5	-4.3
33	510	30	485	287	22	9	2.4	56
34	440	6	406	302	3	9	-.5	17
35	390	6	362	240	5	9	-.5	65
36	380	12	354	282	7	9	2.4	4.3

INST # 1

Radiological Survey Results - Survey Location Indicator

Survey #02-0861

Survey Area Information: Bldg #26 FSS (FLOOR)

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 cm²) α	Smears (dpm/100 cm²) β
37	330	10	285	217	8	8	-.5	-30
38	290	7	265	259	3	8	-.5	Ø
39	430	12	405	332	7	9	-.5	-26
40	440	13	429	288	10	10	-.5	8.7
41	390	28	366	243	23	9	-.5	17
42	400	6	376	256	4	9	2.4	17
43	350	11	334	254	7	9	-.5	61
44	470	10	453	286	8	9	-.5	-13
45	330	9	314	273	7	9	2.4	-61
46	340	14	305	275	7	10	2.4	26
47	320	13	293	289	8	10	-.5	39
48	380	4	361	329	2	9	2.4	-17
49	420	15	382	289	9	9	-.5	43
50	390	8	355	241	6	9	-.5	43
51	420	16	373	273	14	10	2.4	-8.7
52	500	11	440	319	9	11	2.4	69
53	330	10	307	261	8	11	-.5	-56
54	470	8	403	322	6	12	-.5	-30
55	420	6	383	301	3	11	-.5	17
56	420	15	365	259	12	11	-.5	-13
57	470	8	415	322	7	11	-.5	-56
58	370	4	330	305	2	10	-.5	-30
59	410	6	371	280	5	10	2.4	4.3
60	330	3	289	263	2	9	-.5	-2.4
61	410	11	375	280	8	9	-.5	35
62	320	6	302	278	5	9	2.4	-35
63	310	3	295	290	1	9	-.5	43

INST #2

Radiological Survey Results - Survey Location Indicator

Survey #02-0861

Survey Area Information: Bldg #36 FSS (Floor)

Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA

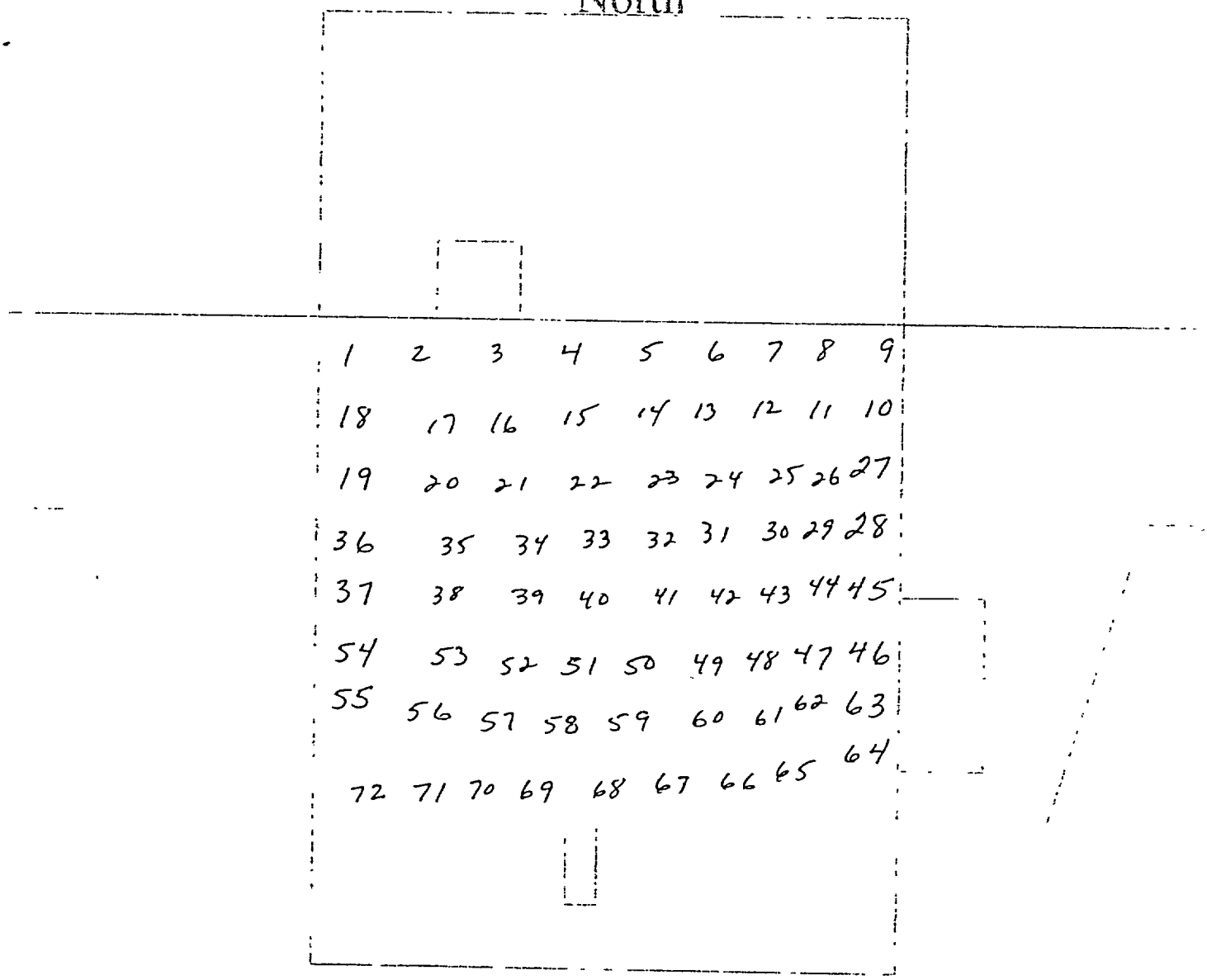
Performed By:	Print Name	Signature	Date

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	Smears (dpm/100 cm²) β
64	310	12	271	247	4	9	-.5	-52
65	320	8	286	283	3	9	-.5	13
66	430	9	364	256	6	10	-.5	78
67	500	6	443	395	1	10	-.5	8.7
68	520	5	449	378	4	10	2.4	-13
69	520	12	458	325	15	10	-.5	-13
70	440	7	418	314	5	11	-.5	-65
71	400	8	375	284	5	12	-.5	56
72	380	6	327	258	4	10	-.5	52

INST #2

Survey # 02-0861

Building 26
North



Interior
FLOOR

Scale:
4m x 4m

INST #1+2

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

Section 1: Survey Information

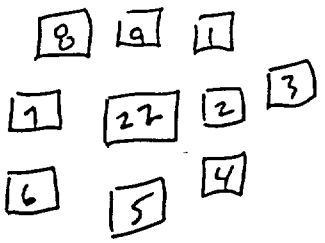
Date	Time	Location	Survey Issue Log Number
9-5-02	1500	Bldg #26	02-0928

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

Survey Title: One Square Meter Survey Grid 22

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

N/A



$821\left(\frac{100}{10{,}000}\right) + -67\left(1-\frac{100}{10{,}000}\right)$

$8.21 + -66 = -57.8$

Bkgd Readings N/A

Legend

00 = mRem/h gamma | 00-C = mRem/h gamma contact | ① = Smear Location | ▽ = Air Sample Location | -X-X-X- = Rope, Boundary, or Barrier

00 β = mRem/h beta | 00 βC = mRem/h beta contact | –①– = 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 HB	Other BKG
2350-1/95356	1-29-03	43-106/133866	1-29-03	.246/204	~~N/A~~ 238	β⁻ = 144
		N				
			A			

Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Mark Blancuch	☐ Yes ☐ No ☒ Not Required	9/5/02 / 1500

Radiation Safety Officer (Print Name & Sign)	Date and Time
Steve Kowalski / Steve Kowalski	9-9-02 / 0815

Radiological Survey Results - Calculational Sheet # 02-0928

Location	β Static (unsh) (cpm)	β Static (sh) (cpm)	Gross β	Minus Bkgd = (Net β)	Net β dpm/100 cm²
1	642	306	336	192	780
2	311	273	38	-106	-430
3	302	272	30	-114	-463
4	296	256	40	-104	-423
5	463	285	178	34	138
6	310	299	11	-133	-540
7	305	276	29	-115	-467
8	310	271	39	-105	-427
9	719	272	447	303	1231
				9	-601
					~~-601~~ MS
				Ave =	-67
22	600	254	346	202	821

Instrument Model/SN:	Probe Model/SN:	Detector Eff.: (cpm/dpm)

Material	Bkgd

Concrete Floor BKG = 144

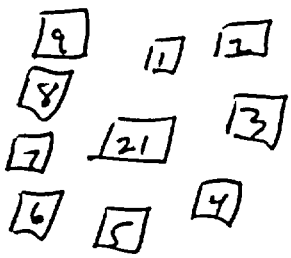
	DDO-138 Radiation Protection Survey Report	Site Molycorp / Washington, PA

Section 1: Survey Information

Date	Time	Location	Survey Issue Log Number
9-5-02	1515	Bldg 26	02-0929

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

Survey Title: One Square Meter Survey Grid #21



$764\left(\frac{100}{10000}\right) + -48\left(1 - \frac{100}{10000}\right)$

$7.64 + -48 = \cancel{-39.54}$ MB. -40.36

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20	N	A
21		
22		
23		
24		
25		
26		

Bkgd Readings N/A

Legend

00 = mRem/h gamma | 00 C = mRem/h gamma contact | ① = Smear Location | ▽ = Air Sample Location | -X-X-X- = Rope, Boundary, or Barrier

00 β = mRem/h beta | 00 βC = mRem/h beta contact | –①– = 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 β	MDA β	Other BKG
2350-1/95356	1-29-03	43-106/133866	1-29-03	.246 .204	~~N/A~~ 238	144
		N				
			A			

Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Mark Blaurock	☐ Yes ☐ No ☐ Not Required	9-5-02 / 1515

Radiation Safety Officer (Print Name & Sign)	Date and Time
Steve Kowalski / Steve Kowalski	9-9-02 / 0800

02 - 0929

Radiological Survey Results - Calculational Sheet

Location	β Static (unsh) (cpm)	β Static (sh) (cpm)	Gross β	Minus Bkgd = (Net β)	Net β dpm/100 cm²
1	763	272	491	347	1411
2	384	302	82	-62	-252
3	351	286	65	-79	-321
4	298	278	20	-124	-504
5	349	252	97	-47	-191
6	312	302	10	-134	-543
7	332	259	73	-71	-289
8	273	254	19	-125	-508
9	591	259	332	188	764
				9	-2610 +2175
					-435 = -48
#21	591	259	332	188	764

Instrument Model/SN:	Probe Model/SN:	Detector Eff.: (cpm/dpm)

Material	Bkgd

Concrete Floor BKG=144

DDO-138 Radiation Protection Survey Report

Site Molycorp / Washington, PA

Section 1: Survey Information

Date	Time	Location:	Survey Issue Log Number
8-26-02	1700	Bldg #26	02-0861

RWP Number: N/A

Purpose of Survey: FSS
☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other

Page 1 of 18

Survey Title: FSS Exterior WALLS

1 Minute STATIC Readings TAKEN on Metal PANELS

	BKG	MDA
β⁻	27	109
α	2	46

Model 19 # 22526 Due 1-29-03

Bkgd Readings 6-8 μR/hr

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19	N	A
20		
21		
22		
23		
24		
25		
26		

Legend

00 = mRem/h gamma; 00-C = mRem/h gamma contact; ① = Smear Location; ▽ = Air Sample Location; -X-X-X- = Rope, Boundary, or Barrier

00 β = mRem/h beta; 00 βC = mRem/h beta contact; —①— = 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)	Detector Eff.: α	MDA β⁻	MDA α	Other β⁻ BKG	Other α
2350-1/95356	1-29-03	43-106/133866 ~~1-29-03~~	1-29-03	.246	.204	697	93	329	4
2929/115563	6-14-03	43-10/127216	6-14-03	.231	.347	134	12	70	.17
	N					N			
								A	
		A							

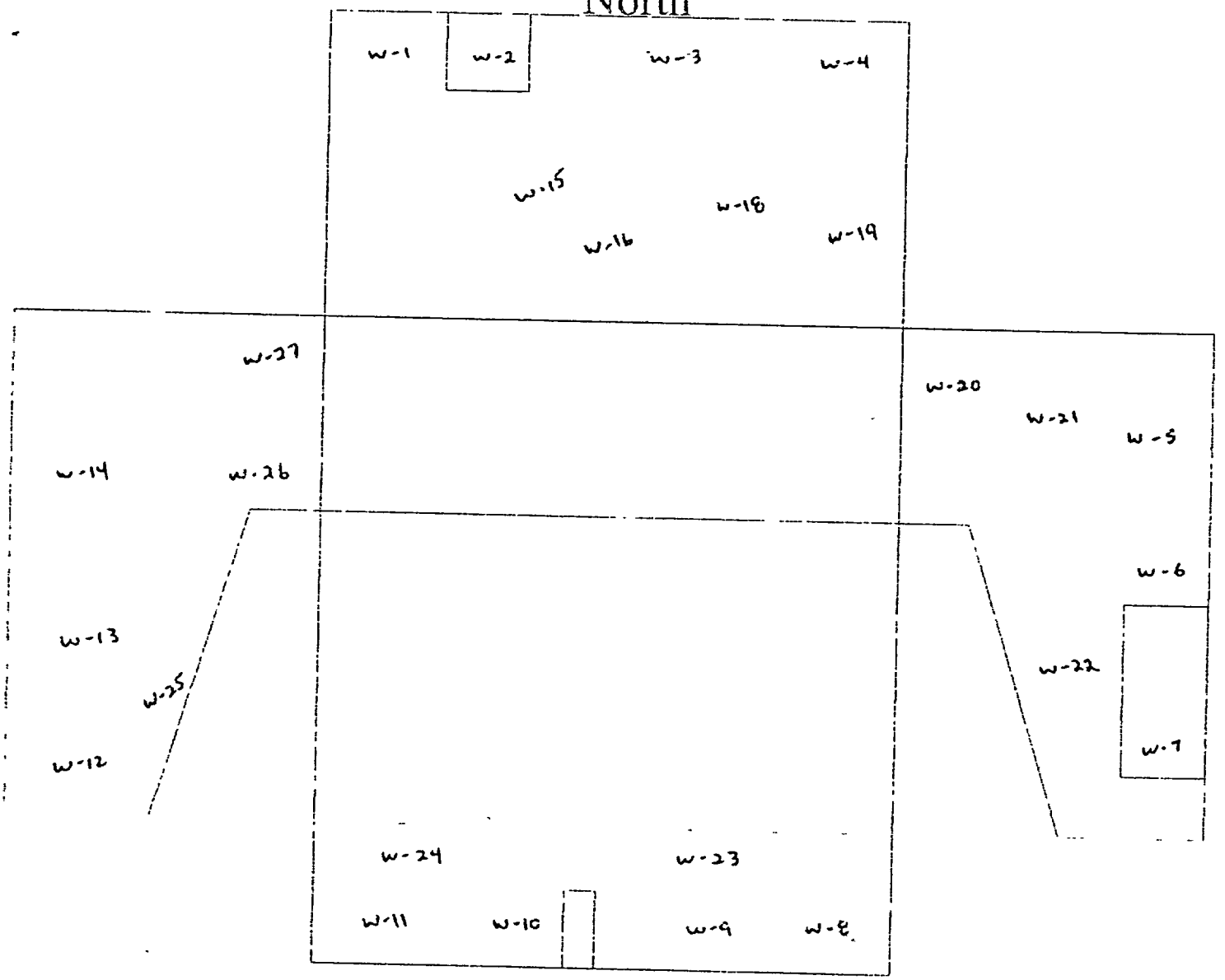
Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded.	Date and Time
Mark Blanciak	☐ Yes ☒ No ☐ Not Required	8-26-02 / 1700

Radiation Safety Officer (Print Name & Sign)	Date and Time
Steve Kowalski / Steve Kowalski	8-29-02 / 1400

Survey # 02-0861

Building 26
North



Exterior

Scale:
4m x 4m

Building 26

Survey # 02-0861

North

8	7	7	8	8	8
7	7	6	7	7	7
7	7	6	6	7	6
w-28			w-29		w-30
6	6	6	6	6	7
8	7	7	6	6	6
7	7	7	7	7	7
6	6	6	7	7	7

Exterior Roof

Scale: 4m x 4m

Survey # 02-0861

Radiological Survey Results - Survey Location Indicator

Survey Area Information: Bldg #26 Exterior Walls

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 cm²) α	Smears (dpm/100 cm²) β
1	480	8	460	376	4	14	2.4	-13
2	290	6	279	244	3	13	2.4	8.7
3	290	4	268	235	1	11	-.5	-22
4	280	4	272	271	1	10	-.5	22
4 QC	300	6	261	247	5	10	-.5	13
5	300	12	269	267	6	10	-.5	17
6	280	13	277	271	7	11	-.5	8.7
7	350	9	328	312	3	12	-.5	43
8	360	7	344	335	3	11	2.4	4.3
9	340	4	334	307	2	12	5.3	-13
10	420	9	382	354	1	15	2.4	30
11	550	8	511	405	5	14	-.5	35
12	620	11	609	481	4	19	-.5	74
13	630	10	614	535	3	23	-.5	-4.3
14	600	9	565	425	2	18	-.5	-8.7
15	560	5	531	408	1	14	-.5	26
16	460	4	436	306	6	8	-.5	-30
17	340	2	319	253	5	7	2.4	-4.3
18	320	1	302	282	3	7	-.5	-48
19	390	3	377	286	2	7	-.5	4.3
20	360	2	322	301	2	6	-.5	8.7
21	340	2	327	266	1	6	2.4	-13
22	350	7	322	334	2	7	-.5	22
23	360	4	325	295	4	10	2.4	0
24	410	5	378	293	3	14	-.5	56
25	480	6	451	334	1	16	-.5	-26
26	380	8	351	364	3	10	-.5	-17

Survey # 02-0861

Radiological Survey Results - Survey Location Indicator

Survey Area Information: Bldg #26 Exterior WALLS

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 cm²) α	Smears (dpm/100 cm²) β
27	460	8	434	322	3	13	-.5	-8.7
28	480	7	447	339	2	8	-.5	35
29	360	8	333	316	4	8	-.5	4.3
30	360	9	330	289	1	6	2.4	8.7

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

Section 1: Survey Information

Date	Time:	Location	Survey Issue Log Number
8-26-02	1700	Bldg #26	02-0861

RWP Number	Purpose of Survey	Page
N/A	FSS ☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other	6 of _____

Survey Title: FSS INTERIOR WALLS

1 Minute STATIC Readings TAKEN

	BKG	MDA
β	27	109
α	2	46

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18	N	A
19		
20		
21		
22		
23		
24		
25		
26		

Model 19 #22526 Due 1-29-03

Bkgd Readings 6-8 mR/hr

Legend

00 = mRem/h gamma | 00 C = mRem/h gamma contact | ① = Smear Location | ▽ = Air Sample Location | -X-X-X- = Rope, Boundary, or Barrier

00 β = mRem/h beta | 00 βC = mRem/h beta contact | –①– = Large Area Wipe | = Bulk Material Sample

Section 2: Instrument Used

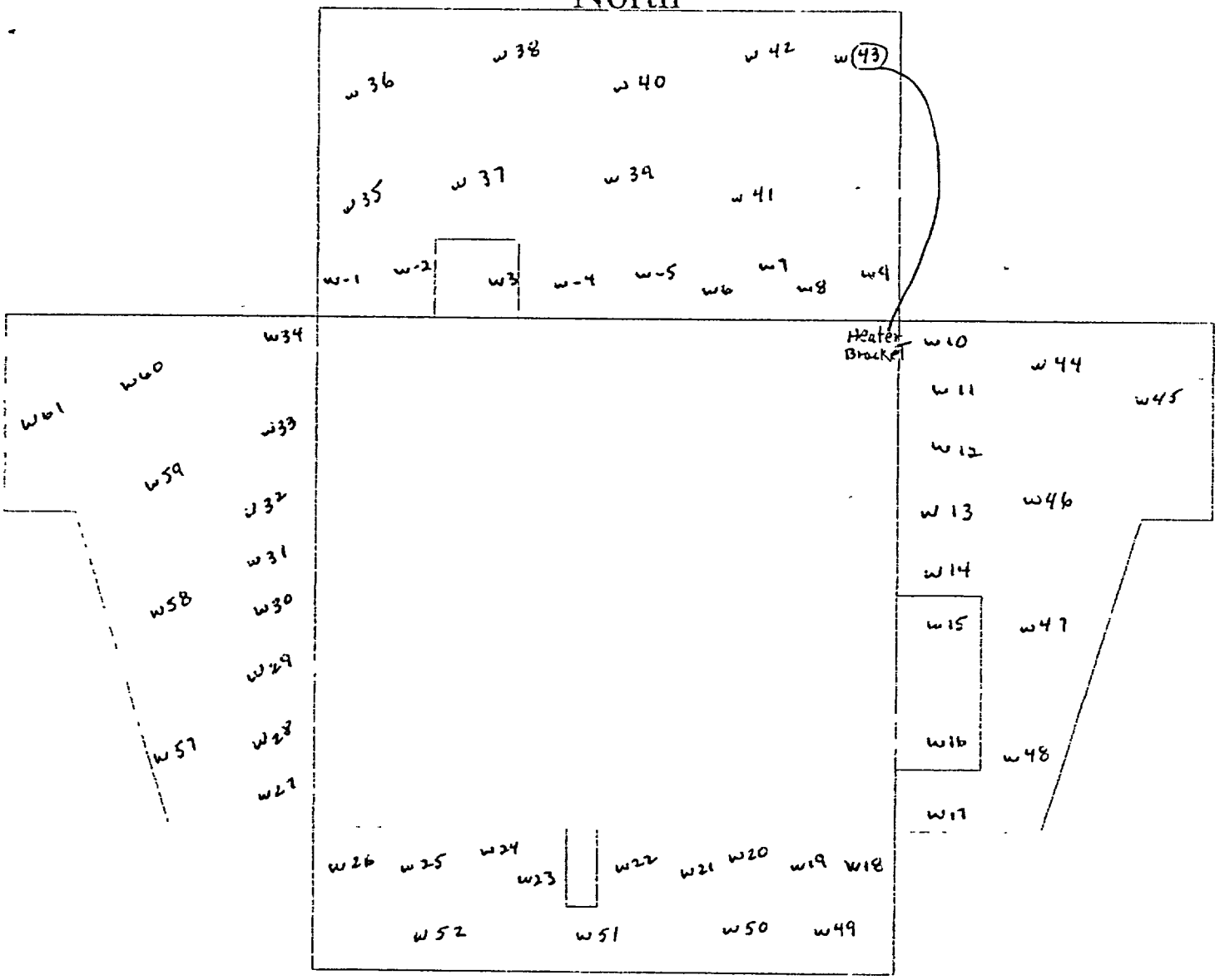
Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff β(cpm/dpm)	Detector Eff α	MDA β	MDA α	Other β	Other BKG	Other α
2350-1/95356	1-29-03	43-106/133866	1-29-03	.246	.204	698	80	330		3
2929/115563	6-14-03	43-10/127216	6-14-03	.231	.347	134	12	70		.17
	N					N			A	
		A								

Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Mark Blanciak	☐ Yes ☒ No ☐ Not Required	8-26-02 / 1700
Radiation Safety Officer (Print Name & Sign)		**Date and Time**
Steve Kowalski / Steve Kowalski		8-29-02 / 1430

Survey # 02-0861

Building 26
North



Interior

Scale:
4m x 4m

Radiological Survey Results - Survey Location Indicator

Survey # 02-0861

Survey Area Information: FSS Interior WALLS

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 cm²) α	Smears (dpm/100 cm²) β
1	400	9	380	361	3	10	2.4	35
2	350	7	329	250	2	10	-.5	-43
3	280	4	266	236	1	10	-.5	-61
4	270	3	248	238	2	10	-.5	-8.7
5	270	2	226	265	1	10	-.5	-8.7
6	280	4	269	209	1	9	2.4	-30
7	250	3	238	259	2	8	2.4	30
7 QC	260	8	248	269	2	8	2.4	17
8	290	6	261	274	3	9	2.4	-52
9	280	6	249	240	4	9	-.5	-39
10	320	8	309	326	2	9	-.5	56
11	320	9	302	276	3	9	-.5	4.3
12	300	5	276	256	1	10	-.5	8.7
13	360	9	336	287	5	10	-.5	30
14	300	7	280	251	3	10	-.5	30
15	290	6	269	287	2	10	8.2	-4.3
16	280	8	263	311	1	10	-.5	35
17	280	4	268	260	4	9	-.5	-17
18	290	6	265	223	2	11	2.5	39
19	280	4	254	243	1	11	5.3	13
20	320	3	296	262	2	12	-.5	-17
21	340	6	308	307	3	12	-.5	30
22	310	5	280	261	2	11	5.3	43
23	300	4	269	253	2	12	-.5	-13
24	360	9	332	311	3	12	-.5	-26
25	320	10	282	255	3	12	-.5	-13
26	350	11	310	287	4	11	-.5	39

Survey # 02-0861

Radiological Survey Results - Survey Location Indicator

Survey Area Information: FSS Interior WALLS

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 cm²) α	Smears (dpm/100 cm²) β
27	340	4	311	282	3	12	-.5	43
28	480	5	438	426	2	12	-.5	-26
29	510	9	483	464	4	11	2.4	48
30	390	3	371	361	1	11	2.4	30
31	380	7	349	331	5	10	-.5	-17
32	360	4	328	310	1	11	2.4	-13
33	290	6	272	261	2	11	2.4	-35
34	380	9	354	301	5	11	-.5	17
35	460	3	430	402	1	8	-.5	4.3
36	390	7	357	342	6	8	2.4	-4.3
37	280	5	253	231	2	6	-.5	-12
38	290	3	283	257	1	6	-.5	-22
39	340	2	285	262	1	6	-.5	-4.3
40	300	3	259	247	2	6	-.5	-13
41	290	6	263	251	4	6	-.5	4.3
42	280	5	256	254	3	6	5.3	22
43	440	5	399	293	2	6	2.4	8.7
44	360	3	324	303	1	5	-.5	4.3
45	260	9	241	259	5	6	-.5	-39
46	330	4	286	256	1	7	-.5	26
47	290	9	264	264	4	5	-.5	13
48	380	7	358	278	3	6	2.4	13
49	340	5	328	336	1	6	-.5	-4.3
50	320	4	291	300	3	6	2.4	4.3
51	380	7	351	341	2	7	-.5	0
52	310	5	283	296	1	7	-.5	-13
53	300	6	282	245	1	5	-.5	-43

Radiological Survey Results - Survey Location Indicator

Survey # 02-0861

Survey Area Information: Bldg 26 FSS Interior WALLS

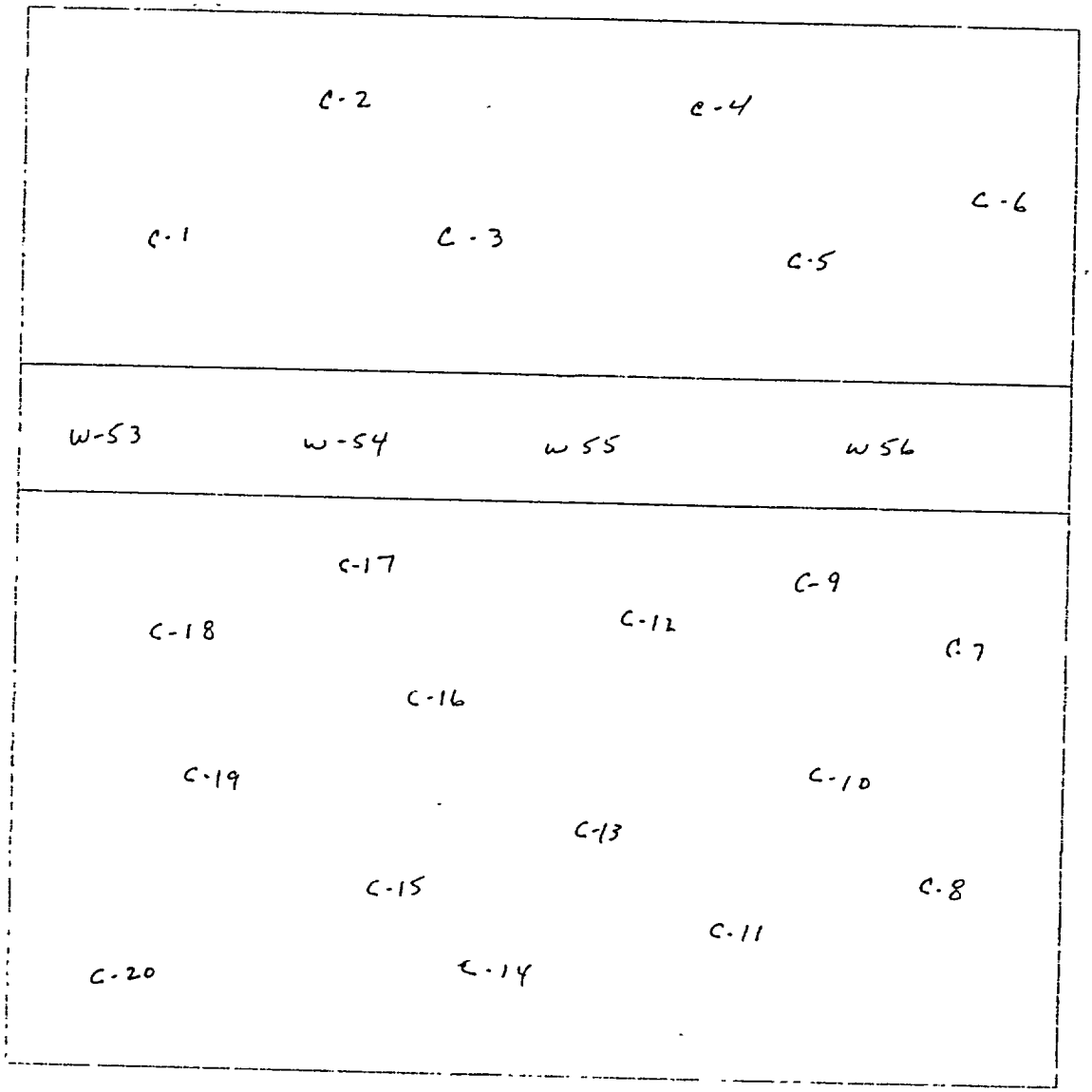
Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA

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 cm²) α	Smears (dpm/100 cm²) β
54	280	3	241	245	2	5	2.4	-13
55	260	4	234	240	1	5	-.5	8.7
56	320	6	298	281	3	6	-.5	-13
57	360	4	321	317	2	8	-.5	0
58	380	5	355	367	1	7	2.4	22
59	460	7	426	374	4	8	-.5	-4.3
60	390	4	369	250	3	7	-.5	8.7
61	360	6	325	291	5	7	-.5	13

Survey# 02-0861

Building 26
North



Scale:
4m x 4m

Interior Ceiling and Roof Wall

Radiological Survey Results - Survey Location Indicator

Survey# 02-0861

Survey Area Information: Bldg # 26 Interior Ceiling

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 cm²) α	Smears (dpm/100 cm²) β
C-1	260	8	236	206	1	7	-.5	-26
C-2	300	7	286	286	2	7	-.5	-13
C-3	310	6	296	303	3	6	2.4	8.7
C-4	300	6	287	257	1	6	-.5	0
C-5	290	5	279	299	2	7	-.5	13
C-5 QC	310	4	285	288	2	6	2.4	8.7
C-6	320	12	289	269	5	6	-.5	95
C-7	280	9	244	265	3	6	-.5	8.7
C-8	290	4	268	225	1	5	5.3	13
C-9	270	3	244	244	2	5	2.4	-61
C-10	290	3	277	313	1	6	-.5	-13
C-11	260	5	229	218	2	6	-.5	-43
C-12	380	7	355	320	5	7	-.5	-4.3
C-13	290	6	284	294	3	8	-.5	13
C-14	330	4	312	296	2	8	-.5	0
C-15	280	2	241	217	1	7	2.4	8.7
C-16	360	3	324	316	1	6	-.5	-30
C-17	350	7	330	324	3	6	-.5	-17
C-18	350	6	328	304	5	7	-.5	30
C-19	320	4	298	315	2	6	2.4	22
C-20	340	9	315	275	4	7	-.5	4.3

Appendix B

Background Assessment Data

Molycorp Washington, PA

Background Assessment

Material-specific background levels were established by RSI in late 2001 during their final status surveys of Buildings 39 and 42 and by MACTEC in early 2002 during their final status surveys, for each type of instrument used for total surface contamination measurements. In June, 2002 new instrumentation was implemented for use and backgrounds established.

Background measurements were collected on surfaces of similar construction as the buildings at the site and having no possibility of being impacted by site operations. Measurements to establish background for a specific material were collected from multiple locations to provide an estimate of the variability or uncertainty. Background determination was performed using the same instrumentation that was used for final status survey data collection. An average background value was determined for each material surveyed. Background determinations were required and performed for 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.)

MACTEC performed material-specific backgrounds for poured concrete, cinderblock, and corrugated steel/drywall with it's four large-area gas-proportional instruments. The most conservative background values were selected and used for all background subtracts for direct (static) type surveys performed.

Background measurements were calculated from surveys obtained at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their surfaces and structures. A mean value for each instrument was calculated. The most conservative background value was selected and used by the Health Physics technicians for all instrument background subtractions.

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 (117563) with 43-106 (128912)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	549	429	120	14
	641	449	192	13
	629	487	142	9
	630	501	129	16
	651	498	153	14
	629	480	149	10
	634	494	140	8
	684	467	217	5
	728	458	270	11
	741	576	165	10
Mean (cpm)	168			11
Stand Deviation	46.3			3.3
n_b	6			7

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)
	Unshield	Shield	Net	Net
	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_b	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 (126190) with 43-106 (133871)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	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_b	4			8

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 (117566) with 43-68 (19046)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	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_b	11			21

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 (117563) with 43-106 (128912)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	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_b	56			26

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

Appendix C

Instrumentation Data

Molycorp Washington, PA

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 1 at the Molycorp Washington, PA site.

EFF .240 B-

Daily Instrumentation Operational Check Sheet

Instrument: 2350 1 129414 Probe: 43-106 128914

Cal Due: 8-2-03 Cal Due: 2-2-03

Source ID:	Tc 99 3935	Mean Source Count Rate:	4643	Mean +2 σ Value:	4791	Mean -2 σ Value:	4495
Radiation Type:	β-	Sigma Value:	74	Mean +3 σ Value:	4864	Mean -3 σ Value:	4421

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-7-02	0605	5	1552	310	1	4704	—	—	66	Sat
8-7-02	1720	—	—	—	1	4687	—	✓	—	Sat
8-8-02	0615	5	1559	312	1	4727	—	—	67	Sat
8-8-02	1600	—	—	—	1	4687	—	—	—	Sat
8-12-02	0610	5	1625	325	1	4599	—	—	68	Sat
8-12-02	1635	—	—	—	1	4709	✓	✓	—	Sat
8-13-02	0650	5	1568	314	1	4687	✓	✓	67	Sat
8-13-02	1650	—	—	—	1	4729	—	—	—	Sat
8-14-02	0610	5	1565	313	1	4614	—	—	67	Sat
8-14-02	1653 ~~0615~~	~~5~~	~~1454~~	—	1	4710	—	—	—	Sat
8-15-02	0615	5	1454	291	1	4663	—	—	64	Sat
8-15-02	1645	—	—	—	1	4724	✓	✓	—	Sat
8-19-02	0610	5	1468	294	1	4710	—	—	65	Sat
8-19-02	1635	—	—	—	1	4624	✓	✓	—	Sat
8-20-02	0625	5	1534	307	1	4668	—	—	66	Sat
8-20-02	1635	N/A	—	—	1	4686	—	—	—	Sat

EFF. 195 α

Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 129414 Probe: 43-106 128914

Cal Due: 8-2-03 Cal Due: 2-2-03

Source ID:	Tn 220 3937	Mean Source Count Rate:	739	Mean +2 σ Value:	799	Mean -2 σ Value:	679
Radiation Type:	α	Sigma Value:	30	Mean +3 σ Value:	829	Mean -3 σ Value:	649

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-7-02	0615	5	8	1.6	1	736	—	—	8	Sat
8-7-02	1721	—	—	—	1	720	✓	✓	—	Sat
8-8-02	0615	5	5	1	1	765	—	—	7	Sat
8-8-02	1605	—	—	—	1	737	—	—	—	Sat
8-12-02	0615	5	10	2.0	1	736	—	—	8	Sat
8-12-02	1630	—	—	—	1	731	✓	✓	—	Sat
8-13-02	0705	5	18	3.6	1	709	—	—	10	Sat
8-13-02	1645	—	—	—	1	731	—	—	—	Sat
8-14-02	0615	5	10	2	1	712	—	—	8	Sat
8-14-02	1630	—	—	—	1	721	—	—	—	Sat
8-15-02	0625	5	7	1.4	1	751	—	—	7	Sat
8-15-02	1645	—	—	—	1	707	✓	✓	—	Sat
8-19-02	0635	5	5	1	1	753	—	—	7	Sat
8-19-02	1635	—	—	—	1	702	—	—	—	Sat
8-20-02	0625	5	4	.8	1	711	—	—	7	Sat
8-20-02	1640	—	—	—	1	746	—	—	—	Sat

Daily Instrumentation Operational Check Sheet

EFF = .240

Instrument: 2350-1 #129414 Probe: 43-106 #128914

Cal Due: 8-2-03 Cal Due: 2-2-03

Source ID: Tc99 #3935 Mean Source Count Rate: 4643 Mean +2 σ Value: 4791 Mean -2 σ Value: 4495

Radiation Type: B- Sigma Value: 74 Mean +3 σ Value: 4864 Mean -3 σ Value: 4421

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-21-02	0610	5	1625	325	1	4612	✓	✓	68	Sat
8-21-02	1700	—	—	—	1	4518	✓	✓	—	Sat
8-22-02	0620	5	1464	293	1	4672	✓	✓	65	Sat
8-22-02	1610	—	—	—	1	4637	✓	✓	—	Sat
8-26-02	0615	5	1508	302	1	4501	✓	✓	66	Sat
8-27-02	0610	5	1432	286	1	4423	✓	✓	61	Sat
8-27-02	1620	—	—	—	1	4528	✓	✓	—	Sat
8-28-02	0730	~~605~~	1409	282	1	4501	✓	✓	64	Sat
8-28-02	1700	—	—	—	1	4478	✓	✓	—	Sat
8-29-02	0610	5	1287	257	1	4506	✓	✓	61	Sat
8-29-02	1600	—	—	—	1	4511	✓	✓	—	Sat

Daily Instrumentation Operational Check Sheet

EFF= .195

Instrument: 2350-1 # 129414 Probe: 43-106 # 128914

Cal Due: 8-2-03 Cal Due: 2-2-03

Source ID:	Th 230 # 3937	Mean Source Count Rate:	739	Mean +2 σ Value:	799	Mean -2 σ Value:	679
Radiation Type:	α	Sigma Value:	30	Mean +3 σ Value:	829	Mean -3 σ Value:	649

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-21-02	0620	5	7	1.4	1	701	✓	✓	7	Sat
8-21-02	1700	—	—	—	1	671	✓	✓	—	Sat
8-22-02	0630	5	6	1.2	1	742	✓	✓	7	Sat
8-22-02	1605	—	—	—	1	713	✓	✓	—	Sat
8-26-02	0615	5	7	1.4	1	725	✓	✓	7	Sat
8-27-02	0615	5	7	1.4	1	725	✓	✓	7	Sat
8-27-02	1620	—	—	—	1	654	✓	✓	—	Sat
8-28-02	0715	5	4	0.8	1	685	✓	✓	6	Sat
8-28-02	1700	—	—	—	1	721	✓	✓	—	Sat
8-29-02	0615	5	7	1.4	1	731 ~~809~~ NO	✓	✓	7	Sat
8-29-02	1600	—	—	—	1	716				

EFF = .246

Daily Instrumentation Operational Check Sheet

Instrument: 2350 #95356 Probe: 43-106 # 133866

Cal Due: 1-29-03 Cal Due: 1-29-03

Source ID:	Tc 99 #3935	Mean Source Count Rate:	4741	Mean +2 σ Value:	4873	Mean -2 σ Value:	4609
Radiation Type:	B⁻	Sigma Value:	66	Mean +3 σ Value:	4939	Mean -3 σ Value:	4543

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-14-02	0605	5	1520	304	1	4720	—	—	66	Sat
8-14-02	1605	—	—	—	1	4810	—	—	—	Sat
8-15-02	0610	5	1543	309	1	4776	✓	✓	66	Sat
8-15-02	1630	—	—	—	1	4854	✓	✓	—	Sat
8-19-02	0615	5	1367	273	1	4612	—	—	63	Sat
8-19-02	1630	—	—	—	1	4648	✓	✓	—	Sat
8-20-02	0650	5	1725	345	1	4891	—	—	70	Sat
8-20-02	1615	—	—	—	1	4665	—	—	—	Sat
8-21-02	0610	5	1628	327	1	4554	—	—	68	Sat
8-21-02	1610	—	—	—	1	4825	—	—	—	Sat
8-22-02	0615	5	1529	306	1	4640	—	—	66	Sat
8-22-02	1600	—	—	—	1	4895	✓	✓	—	Sat
8-26-02	0615	5	1530	306	1	4625	—	—	66	Sat
8-26-02	1650	—	—	—	1	4779	✓	✓	—	Sat
8-27-02	0610	5	1526	305	1	4547	✓	✓	66	Sat
8-27-02	1655	—	—	—	1	4579	—	—	—	Sat

EFF = .204

Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 # 95356 Probe: 43-106 # 133866

Cal Due: 1-29-03 Cal Due: 1-29-03

Source ID: Th 230 3937 Mean Source Count Rate: 718 Mean +2 σ Value: 776 Mean -2 σ Value: 660

Radiation Type: α Sigma Value: 29 Mean +3 σ Value: 805 Mean -3 σ Value: 631

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-14-02	0615	5	11	2.2	1	662	✓	✓	8	Sat
8-14-02	1630	—	—	—	1	701	✓	✓	—	Sat
8-15-02	0630	5	11	2.2	1	712	✓	✓	8	Sat
8-15-02	1620	—	—	—	1	703	✓	✓	—	Sat
8-19-02	0640	5	7	1.4	1	723	✓	✓	7	Sat
8-19-02	1630	—	—	—	1	707	✓	✓	—	Sat
8-20-02	0650	5	14	2.8	1	717	✓	✓	9	Sat
8-20-02	1620	—	—	—	1	666	✓	✓	—	Sat
8-21-02	0630	5	11	2.2	1	672	✓	✓	8	Sat
8-21-02	1615	—	—	—	1	747	✓	✓	—	Sat
8-22-02	0625	5	10	2	1	690	✓	✓	8	Sat
8-22-02	1600	—	—	—	1	668	✓	✓	—	Sat
8-26-02	0625	5	12	2.4	1	693	✓	✓	9	Sat
8-26-02	1655	—	—	—	1	710	✓	✓	—	Sat
8-27-02	0615	5	14	2.8	1	723	✓	✓	9	Sat
8-27-02	1650	—	—	—	1	688	—	—	—	Sat

Daily Instrumentation Operational Check Sheet

EFF=.231

Instrument: 2929 # 115563 Probe: 43-10 # 127216

Cal Due: 6-14-03 Cal Due: 6-14-03

Source ID: Te 99 # 3935 Mean Source Count Rate: 3722 Mean +2 σ Value: 3824 Mean -2 σ Value: 3620

Radiation Type: B- Sigma Value: 51 Mean +3 σ Value: 3875 Mean -3 σ Value: 3569

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-13-02	0600	60	4340	72	1	3727	—	✓	31	Sat
8-14-02	0600		4220	70	1	3719	—	—	31	Sat
8-15-02	0605		4256	71	1	3736	—	—	31	Sat
8-19-02	0605		4243	71	1	3782	—	—	31	Sat
8-20-02	0625		4337	73	1	3810	✓	—	31	Sat
8-21-02	0600		4114	69	1	3727	—	—	31	Sat
8-22-02	0605		4161	69	1	3793	—	—	31	Sat
8-26-02	0605		4199	70	1	3723	—	—	31	Sat
8-27-02	0700		4355	73	1	3875	✓	✓	31	Sat
8-28-02	0700		4160	69	1	3820	—	—	31	Sat
8-29-02	0605		4031	67	1	3784	—	—	30	Sat
		60								

Daily Instrumentation Operational Check Sheet

EFF = .347

Instrument: 2929 # 115563 Probe: 43-10 # 127216

Cal Due: 6-14-03 Cal Due: 6-14-03

Source ID: Th 230 # 3937 Mean Source Count Rate: 1376 Mean +2 σ Value: 1448 Mean -2 σ Value: 1304

Radiation Type: α Sigma Value: 36 Mean +3 σ Value: 1484 Mean -3 σ Value: 1268

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-13-02	0630	60	10	.17	1	1357	✓	✓	4	Sat
8-14-02	0600		9	.15	1	1425	—	—	4	Sat
8-15-02	0605		15	.25	1	1365	—	—	5	Sat
8-19-02	0605		10	.17	1	1409	—	—	4	Sat
8-20-02	0625		17	.28	1	1340	✓	✓	5	Sat
8-21-02	0600		6	.1	1	1371	—	—	4	Sat
8-22-02	0600		14	.23	1	1410	—	—	5	Sat
8-26-02	0600		10	.17	1	1438	—	—	4	Sat
8-27-02	0710		5	.08	1	1386	✓	✓	4	Sat
8-28-02	0710		7	.12	1	1365	—	—	4	Sat
8-29-02	0605		10	0.17	1	1389	—	—	4	Sat

Ludlum Model 19 Micro-Rem

Routine Performance and Background Data Form

Instrument ID #: 22526	Cal. Due: 1-29-03	Source ID #: Cs-137 A6143
Mean Source Value: 160	Mean plus + 20% Value: 192	Mean plus - 20% Value: 128

Date	Time	Meter Scale				Background Reading	Sat/Unsat
		25 µrem (sat/unsat)	50 µrem (sat/unsat)	250 µrem +/-20% value	500 µrem +/-20% value		
7-30-02	1045			160		10	Sat
7-31-02	0630			160		11	Sat
8-2-02	0805			160		10	Sat
8-5-02	0605			150		11	Sat
8-6-02	0630			160		12	Sat
8-7-02	0615			170		11	Sat
8-8-02	0620			170		11	Sat
8-12-02	0630			170		11	Sat
8-13-02	0655	N		165	N	10	Sat
8-14-02	0630		A	170	A	12	Sat
8-15-02	0625			170		12	Sat
8-19-02	0620			170		11	Sat
8-20-02	0625			170		10	Sat
8-21-02	0635			160		10	Sat
8-22-02	0615			160		11	Sat
8-26-02	0610			160		10	Sat
8-27-02	0635			160		10	Sat
8-28-02	0715			160		10	Sat
8-29-02	0630			150		10	Sat

Ludlum Model 19 Micro-Rem

Routine Performance and Background Data Form

Instrument ID #: 22526	Cal. Due: 1-29-03	Source ID #: CS-137 A6143
Mean Source Value: 160	Mean plus + 20% Value: 192	Mean plus - 20% Value: 128

Date	Time	Meter Scale				Background Reading	Sat/Unsat
		25 µrem (sat/unsat)	50 µrem (sat/unsat)	250 µrem +/-20% value	500 µrem +/-20% value		
8-30-02	0700			160		11	SAT
9-3-02	0630			150		10	Sat
		N			N		
			A			A	