DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name:	Molycorp, Inc.
Facility Address:	300 Caldwell Avenue, Washington, PA 15301
Facility EPA ID #:	PAD030068282

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

X	If yes - check here and continue with #2 below.
_____	If no - re-evaluate existing data, or
_____	If data are not available skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility History

The Molycorp site occupies approximately 73 acres of land in Washington, PA and is comprised of three distinct areas: the North Process Area, the Southeast Low-lying Storage Area and the Southwest Hill Area. These areas have been further subdivided into Area Nos. 1 through 10 during the site's characterization and assessment phases. Parcels of land owned by Molycorp to the west/northwest (Area 8) and east (Area 9) of the North Process Area (Areas 1A, 1B and 2) have reportedly never been used for industrial activities and have no known impacts associated with any facility operations. Molycorp owned the North Process Area and a small portion of the Southeast Low-lying Storage Area (Area 3) since the 1920s. The remainder of the current property was purchased in the 1970s because of Molycorp's need for additional storage space for slags generated during the ferroalloy manufacturing operations in the North Process Area. The facility was acquired by Union Oil Company of California (UNOCAL) in 1977, which was subsequently acquired by the current property owner, the Chevron Mining Co. in August 2005. As described below, the facility has undergone extensive remediation from 2006 through 2011 and received approval from the Pennsylvania Department of Environmental Protection (PADEP) of its Land Recycling and Environmental Remediation Standards Act (Act 2) Final Report in August 2011.

Radiological Contamination

Ferroalloy manufacturing began at the facility in the 1920s. Molybdenite was processed primarily, but smaller amounts of samarium and other rare-earth elements were also processed. From 1964 through 1970, Molycorp produced a ferro-columbium alloy from a Brazilian pyrochlore ore known as araxa. This alloy was used as an additive to strengthen steel. The processing of araxa, which contained 1 - 1.5% thorium, generated a thorium-bearing slag, some of which was used as fill material over portions of the site. The thorium content of the araxa required Molycorp to obtain a Source Materials License from the Nuclear Regulatory Commission (NRC). The NRC is responsible for protection of human health and the environment related to the use of source, byproduct and special nuclear material under the Atomic Energy Act. Its responsibility also includes the safe and timely decommissioning of licensed facilities.

The NRC issued a Notice of Violation (NOV) and requested remedial action in June 1971. In 1972, several thousand cubic yards of thorium-contaminated wastes were excavated and segregated into a clay-capped pile on the southeast low-lying property area near the intersection of Caldwell Avenue and Chartiers Creek. The pile was eventually removed from the site under NRC supervision in 2001.

In 1985, a radiological survey performed by an NRC contractor indicated widespread surface thorium contamination. Elevated levels of thorium were found in the dikes separating the eight surface impoundments located along the western boundary of the North Process Area. A 1990 subsurface radiological survey indicated thorium contaminated slags were present along the northern boundary of the plant along the adjacent Findlay Refractory property.

Manufacturing operations at the plant were shut down in late 1991, at which time the facility operated in an extended standby mode with a small active area leased to a vendor during most of the 1990s. The principal site activities during that time frame involved the purchasing and reselling of alloys, plant maintenance and plant decommissioning per the NRC requirements. In 2002, all of the former plant buildings and structures except for the guardhouse and scales were demolished and removed from the property.

In 1995, during the closure of the eight surface impoundments, thorium contaminated sludge from the impoundments was placed into eight 20-cubic yard roll-off containers and stored on-site. In 1996, Molycorp filled 184 twenty cubic yard roll off boxes with thorium contaminated slag from the Findlay Refractory Area. These roll off containers were stored at the former location of the surface impoundments along with roll-offs containing the impoundment sludge. PADEP approved of the closure of this Findlay Refractory slag disposal area in 1997. All of the roll-off containers were removed from the site in 2001 under NRC supervision.

A Remedial Investigation Report (RIR) was submitted to PADEP in 2005. The RIR identified several areas that contained licensed radiological materials at concentrations above the unrestricted use criteria. A Cleanup Plan submitted to PADEP in 2006 called for the excavation and off-site disposal of soils with radiological impacts above release criteria. From April 2006 through May 2009, approximately 104,000 cubic yards of radiological materials exceeding the unrestricted use criteria were excavated from the North Process Area and the Southeast Low-lying Storage Area and shipped to the U.S. Ecology disposal facility in Grand View, Idaho. Additional excavated materials that were later found to meet the unrestricted use criteria were used as backfill on the property. After being backfilled with the screened excavated materials, the North Process and Southeast Low-lying Storage Areas were then covered with a minimum of two feet of clean soil. All of this work was completed under the supervision of the PADEP Bureau of Radiation Protection (BRP). The radioactive materials license for the site was terminated by the BRP on December 20, 2010.

Non-Radiological Contamination

In the 1960s, eight surface impoundments, ranging in capacity from 29,000 gallons to 56,000 gallons were built west of the manufacturing portion of the facility (North Process Area), adjacent to Chartiers Creek. The impoundments were used to store tailings for the recovery of molybdenite generated by the facility's wet scrubbers. The wet scrubbers captured the sulfur dioxide (SO_2) emissions generated during the molybdenite ore roasting process. The use of wet scrubbers was discontinued when a baghouse was installed to capture SO_2 emissions in 1974. The surface impoundments were then used to collect runoff from various plant areas, such as the sulfuric acid plant, the acid storage areas, and the thickener unit. In 1985, PADEP denied Molycorp's application for a Part B permit for the impoundments because (1) there was no double liner or leachate collection system, (2) the bottoms of the impoundments were too close to the water table and (3) the impoundments were located within the 100-year floodplain. All liquids were removed from the surface impoundments after the acid plant was shut down and the facility was placed on standby in late 1991. In 1995, closure activities at the surface impoundments began. Molycorp removed all of the wastewater, sludges, rip rap material, sand and synthetic liners from the eight impoundments. Molycorp also relined the excavations, backfilled them with clean fill and sealed them with a geosynthetic material in anticipation of the future NRC decommissioning of the site. Wastes exceeding 5 pCi/gm Th-232 were placed in roll-off containers to be managed under NRC requirements. As stated above, the roll-off containers were removed from the site in 2001.

Portions of the Southeast Low-lying Storage Area and the Southwest Hill Area were formerly owned by the Hazel Atlas Glass Company (Hazel), which housed its operations on a parcel of land east of the facility on the opposite side of Interstate 70 (I-70). While in business, Hazel is known to have operated a manufactured gas plant (MGP). A byproduct of the MGP coal gasification process is coal tar, a dense, oily viscous liquid that would condense out of the gas at various stages during gas production. The portion of the Southeast Low-lying Storage Area previously owned by Hazel contained at least two coal tar ponds (North and South) and several tar seepage areas when Molycorp purchased the property in the mid-1970s. Coal tar was also contained in the soils upon which I-70 was constructed in the 1950s and the substance was historically observed seeping from the I-70 embankment onto the Low-Lying Storage Area. Additional coal tar was observed in an approximately 15,000 ft^2 uncovered concrete foundation in the Southwest Hill Area. Coal tar from the various areas was tested several times using the Toxicity Characteristic Leaching Procedure (TCLP). No constituents were ever detected at levels above the TCLP limits contained in the Federal regulations at 40 CFR §261.24; however, the coal tar may have contained constituents at concentrations that may be hazardous to human health.

In 1985, a berm was placed around the south coal tar pond for containment purposes. The tar within the north pond was excavated and placed into the south pond. Overexcavated areas were backfilled with slag. Tar observed to be seeping between the Brockway access road and I-70 embankment was also excavated and placed in the south pond. Tar within Chartiers Creek was excavated and placed in the south pond as well. In September 1985, the presence of tar was observed at the surface at several locations. Since the south pond was still open, Molycorp excavated the seeps and placed the material into the pond.

In 1986, the foundation in the Southwest Hill area contained an estimated 10 inches of tar within the walls of the building. The walls, originally nine feet high, were cut in half and collapsed into the foundation. The resultant concrete and tar was covered by approximately four feet of clean soil. In 1987, coal tar seeps were observed emerging at the surface within and along the perimeter of the Coal Gasification Plant Foundation Area. The tar was apparently displaced by the weight of the fill material and migrated upward to the ground surface and laterally toward the Foundation Area perimeter. In 1992, a trench was installed around the perimeter of the foundation to control the lateral migration of the coal tar.

The 2006 Cleanup Plan also called for the excavation and off-site disposal of soils with visual indications of coal tar and replacement of the removed material with clean fill. From April 2006 through May 2009, approximately 71,000 cubic yards of soils containing coal tar were excavated and shipped off-site for disposal. This included 200 cubic yards of visually impacted sediments from Chartiers Creek and 3,900 cubic yards of impacted stream bank soils. Chevron developed the remediated South Tar Pond Area into a viable 3.6-acre wetland habitat supporting the wildlife and plant life along Chartier's Creek. Additionally a sheet pile/jet grout wall was installed along the eastern boundary of the Southeast Low-lying Storage Area in order to prevent the seepage of coal tar from beneath Interstate 70 onto the facility property. Finally, as part of the cleanup, Chevron voluntarily repaired and realigned a state owned storm sewer system which greatly reduced the amount of contaminated runoff and groundwater discharging into Chartiers Creek. All of the above work was completed under the supervision of PADEP.

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

___X___	If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.
_____	If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."
_____	If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The site is located within the Pittsburgh Low Plateau Section of the Appalachian Plateaus Physiographic Province. This Province consists of flat-lying sedimentary units varying between sandstone, shale, limestone, claystone and conglomerate which contain rich coal seams and numerous natural gas and oil deposits. Much of the ground surface in the North Process Area of the site is currently grass-covered with the exception of the Transshipment Pad, which serves as an engineered barrier. The uppermost water-bearing unit at the site occurs in fill material that had passed the screening criteria for radiological content and the underlying alluvial clay, silt, sand and gravel. Fill thickness averages about seven feet while the alluvial deposits have an average thickness of eight to nine feet. Below the alluvial deposits are the three members of the Waynesburg Formation. The upper member of the Waynesburg Little Washington coal bed separates the upper member from the middle member of the Waynesburg Formation. The middle member is up to 90 feet thick and consists primarily of mudstone, with some interbedded limestone, sandstone, siltstone, carbonaceous shale and coal. The lower member of the Waynesburg Formation is also up to 90 feet thick and consists of sandstone, limestone, siltstone, mudstone and coal.

The average depth to water in the North Process Area is about four feet below the ground surface. At most locations, the surface of the water table occurs in the fill material; however, in some instances, the water table surface occurs in the upper portion of the clayey zone beneath the fill. This clayey zone acts as an aquitard between the water table and a deeper sand and gravel layer that rests upon the bedrock. There is evidence that the water table aquifer and the sand and gravel layer are hydraulically interconnected. Groundwater in the water table and sand and gravel units flows west across the site toward Chartiers Creek. Depth to bedrock is approximately 20 feet below the ground surface. Groundwater flow direction in the bedrock is also toward Chartiers Creek. An upward vertical gradient in the bedrock monitoring wells located adjacent to the creek indicates that Chartiers Creek acts as the local discharge zone for both the overburden and uppermost bedrock water bearing zones.

In the Southwest Hill Area of the site, groundwater results from precipitation that infiltrates through the permeable surface soils and saprolite that covers the hill surface. The infiltrating water perches on less permeable strata and migrates laterally along bedding planes or fractures until it intersects the saprolite along the sides of the hill or seeps out of the hillside. The water then flows in the subsurface beneath the weathered rock and soil until it discharges into Sugar Run or Chartiers Creek through the alluvium along the valley floor.
In 1982, a groundwater monitoring program was established for the surface impoundment area along the western boundary of the North Process Area. Four shallow wells (1 upgradient, 3 downgradient) were installed and were monitored quarterly until 2005. Historically, the contaminant of concern that was

1 "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

consistently detected at elevated concentrations in all four of the wells is molybdenum, a constituent that is directly attributable to the operations at Molycorp since the 1920s. The molybdenum concentrations detected in the well located upgradient of the surface impoundments is roughly of the same order of magnitude (20 - 60 mg/l) as the downgradient wells. EPA's Regional Screening Level (RSL) for molybdenum in tap water is (0.078 mg/l). The PADEP medium specific concentration (MSC) for molybdenum in groundwater for both residential and non-residential used aquifers is 0.04 mg/l. For non-use aquifers, the MSC is 40 mg/l. Cadmium concentrations in the four wells were largely undetected in the late 1980s and early 1990s; however, this metal was observed consistently in each of the monitoring wells at concentrations above EPA's Regional Screening Level (RSL) for tap water and PADEP's MSC for used aquifers since the mid to late 1990s. This time frame corresponds with Molycorp's selection of a new laboratory to conduct the groundwater analyses. It is unclear whether the analytical procedures in the new laboratory differ from the former laboratory, but there is no other apparent explanation for the consistent cadmium detections since the mid 1990s. To a lesser extent, the detection of other metals including arsenic, chromium and lead also seems to occur on a more frequent basis since the change in laboratories was made. Selenium, which is also consistently detected at low concentrations, was not analyzed for in the earlier years of the monitoring program. Only molybdenum has ever been detected in any of the four wells at concentrations above PADEP's MSC for unused aquifers (40 mg/l). All four wells were abandoned with PADEP permission in 2005 in preparation for the site remediation work that ensued.

A groundwater investigation in the North Process Area that included the installation of 17 monitoring wells (M-5 through M-18, M-9S, M-15S, and M-18S) was conducted in 1991. The investigation also included the installation of two staff gages, collection of six soil samples for geotechnical analyses, and collection of 30 soil samples for thorium analysis. Two rounds of groundwater sampling from the 17 newly installed wells and the four existing wells were included in the study. Elevated concentrations of molybdenum and other metals were detected in the groundwater samples.

A 1994 Site Characterization included the installation of over 400 core borings to characterize the site surface fill and subsurface overburden units for physical extent, the presence of thorium and hydrogeologic properties. Fifteen of those borings were converted to monitoring wells and designated MW-19 through MW-29, UG-2, UG-3, UG-4 and BR-1, bringing the total number of on-site monitoring wells to 36. Two pumping wells (PW-1 and PW-2) were also installed during this investigation. Two rounds of groundwater sampling, including all 36 on-site monitoring wells, were conducted in the summer of 1994. Five wells located near the Chartiers Creek stream bank north of Caldwell Avenue were also sampled in a third round during the summer of 1994. The groundwater sampling results agreed with the previous investigations in that elevated molybdenum concentrations were noted. The molybdenum concentrations generally increased from the southeast portion of the North Process Area to the northwest portion of that area with the highest observed molybdenum concentration occurring in MW-5 (280 mg/l). Molybdenum was found at concentrations as high as 126 mg/l in the only well screened into the bedrock aquifer at the site located in the northwest corner of the North Process Area which suggests an interconnection with the above-lying aquifers. Arsenic, iron and manganese were found in a few of the wells at elevated concentrations.

In mid-2003, a contractor for Molycorp conducted a reconnaissance to determine the condition of the existing monitoring wells. Numerous wells were damaged or destroyed as a result of demolition activities at the site. Several other monitoring wells could not be located possibly because they were concealed by vegetative cover, soil and fill material, or stacked PVC pipes.

Molycorp conducted a Supplemental Site Characterization in late 2003/early 2004. Twenty two (22) new monitoring wells were installed and groundwater samples were collected from all new and existing well locations (a total of 51 sample locations). Molybdenum continued to be observed in the North Process Area and portions of the Southeast Low-lying Storage Area groundwater at elevated levels with a maximum concentration of 190 mg/l observed at MW-5. One bedrock monitoring well (BR-5) in the Southeast Low-lying Storage Area exhibited a molybdenum concentration of 3.6 mg/l. Other metals that were found at

elevated concentrations at several locations at the site include lead, boron, thallium, iron and manganese. The only volatile organic compounds (VOCs) detected above the residential MSCs for used aquifers were found in wells located in the North Process Area and included chloromethane at 7.1 µg/l in MW-47 and vinyl chloride at 3.1 µg/l in MW-7. Monitoring well MW-47 also contained the only semi-volatile organic compound (SVOC) (pentachlorophenol at 12 µg/l) found in groundwater at a concentration above its MSC.

The post-remediation monitoring program at the facility comprised sixteen (16) wells, including ten water table and six bedrock monitoring wells. These wells have been through eight quarters of post remediation monitoring beginning in March 2009 and ending in November 2010. Samples collected from all of the monitoring wells screened into the water table aquifer were analyzed for dissolved PADEP Act 2 metals, including mercury and molybdenum. Additionally, samples collected from the four water table monitoring wells located in the area downgradient of the former south coal tar pond were analyzed for polycyclic aromatic hydrocarbons (PAHs). Samples from the six bedrock wells were analyzed for the radiologic isotopes Radium-226, Thorium-232 and Uranium-238 only. Boron, iron, manganese and molybdenum were routinely found at concentrations exceeding the residential and nonresidential used groundwater MSCs. The iron and manganese concentrations seen appear to be more a function of the natural geology than related to site activities. The maximum concentration of molybdenum in the final round of groundwater monitoring was 23.1 mg/l found at MW-65. There were no detections of PAHs in the groundwater samples and radiological constituents were not detected above background levels.

Ref.: Site Characterization Report for License Termination of the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., January 1995; Final Closure Report for Eight Surface Impoundments at the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., Revised May 1996; Washington Facility Environmental Report, prepared by ICF Kaiser, April 1997; Environmental Indicator Inspection Report for Molycorp, Inc., prepared by U.S. Army Corps of Engineers, December 2001; Supplemental Site Characterization Plan for the Washington, PA Site, prepared by Malcolm Pirnie, September 2003; Quarterly Groundwater Monitoring Reports, prepared by Molycorp, Inc., 1985 to 2003; Supplemental Site Characterization Report for the Washington, PA Site, prepared by Malcolm Pirnie, April 2004; Risk Assessment and Remedy Selection Report for the Molycorp Washington, PA Site, prepared by Malcolm Pirnie, April 2005; Final Report for the Molycorp Washington Remediation Site, prepared by Malcolm Pirnie, September 2009; Act 2 Final Report for the Molycorp Washington Remediation Site, prepared by Arcadis, April 2011; Technical Memorandum, Site Groundwater Cleanup Standards, prepared by Arcadis, December 2011.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

___X___	If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]
_____	If no - (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.
_____	If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

As described in the rationale for Question No. 2 above, groundwater at the site has been impacted by historical on-site operations with molybdenum being the most consistent and widespread contaminant. Excavation of radiologic and coal tar-impacted materials at the site as described in the rationale for Question No. 1 above has resulted in the removal of a significant mass of contaminants from the site soils. All known sources of potential groundwater contamination have been addressed during the site remediation.

During the site remediation, groundwater and surface runoff water entering into excavation areas were pumped to an onsite Contact Water Treatment Plant (CWTP) before being discharged through a National Pollutant Discharge Elimination System (NPDES) permitted outfall to Chartiers Creek. More than 31 million gallons of water were treated in the CWTP and based on the average concentrations of chemicals in the influent, approximately 9,100 pounds of contaminants, primarily metals were removed from the site. Molybdenum accounted for nearly half of that mass amount.

Although the molybdenum concentrations in the groundwater beneath the site, particularly in the North Process Area, have generally decreased since monitoring program began in the early 1980s, the levels currently found remain more than two orders of magnitude above EPA's RSL for molybdenum in tap water (0.078 mg/l) and PADEP's residential used aquifer MSC (0.04 mg/l). Historically, molybdenum had been seen as high as 285 mg/l in a sample collected from well no. M-5 as part of the 1994 Site Characterization. Post-remediation molybdenum concentrations have been below the residential non-used aquifer MSC (40 mg/l) with the highest concentration seen in the final round of sampling at 23.1 mg/l in MW-61.

It should be noted that groundwater is not used as a source of drinking water, for agricultural purposes, or for any other known purpose in the site vicinity. No registered wells are located within two kilometers of the facility. The Pennsylvania American Water Company provides drinking water to the surrounding community and both of its intakes are located on the Monongahela River, a water body that does not receive groundwater from the facility. The activity and use limitations (AULs) contained in the PADEP signed environmental covenant prohibits the use of groundwater beneath the site and requires PADEP approval for excavation or other activities that could potentially increase the flow of groundwater to Chartiers Creek.

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2 "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

Ref.: Site Characterization Report for License Termination of the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., January 1995; Final Closure Report for Eight Surface Impoundments at the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., Revised May 1996; Washington Facility Environmental Report, prepared by ICF Kaiser, April 1997; Environmental Indicator Inspection Report for Molycorp, Inc., prepared by U.S. Army Corps of Engineers, December 2001; Supplemental Site Characterization Plan for the Washington, PA Site, prepared by Malcolm Pirnie, September 2003; Quarterly Groundwater Monitoring Reports, prepared by Molycorp, Inc., 1985 to 2003; Supplemental Site Characterization Report for the Washington, PA Site, prepared by Malcolm Pirnie, April 2004; Risk Assessment and Remedy Selection Report for the Molycorp Washington, PA Site, prepared by Malcolm Pirnie, April 2005; Final Report for the Molycorp Washington Remediation Site, prepared by Malcolm Pirnie, September 2009; Act 2 Final Report for the Molycorp Washington Remediation Site, prepared by Arcadis, April 2011; Technical Memorandum, Site Groundwater Cleanup Standards, prepared by Arcadis, December 2011.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

X	If yes - continue after identifying potentially affected surface water bodies.
_____	If no skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.
_____	If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Groundwater in the North Process and Southeast Low-lying Storage Areas in both the overburden and bedrock aquifers generally flows east to west towards Chartiers Creek. Paired overburden/bedrock water elevation data at the site indicate an upward vertical gradient from the bedrock aquifer to the overburden aquifer. This would suggest that both aquifers discharge to Chartiers Creek and that the creek acts as a hydraulic divide. This is further supported by groundwater sampling results from the two bedrock monitoring wells (BR-2 and BR-4) located off-site and west of Chartiers Creek. No exceedances of PADEP's Residential Used Aquifer MSC or EPA's Tap Water RSL were observed for molybdenum at either of these locations despite the elevated concentrations seen in groundwater samples collected from wells east of the creek.

Ref.: Site Characterization Report for License Termination of the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., January 1995; Final Closure Report for Eight Surface Impoundments at the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., Revised May 1996; Washington Facility Environmental Report, prepared by ICF Kaiser, April 1997; Environmental Indicator Inspection Report for Molycorp, Inc., prepared by U.S. Army Corps of Engineers, December 2001; Supplemental Site Characterization Plan for the Washington, PA Site, prepared by Malcolm Pirnie, September 2003; Quarterly Groundwater Monitoring Reports, prepared by Molycorp, Inc., 1985 to 2003; Supplemental Site Characterization Report for the Washington, PA Site, prepared by Malcolm Pirnie, April 2004; Risk Assessment and Remedy Selection Report for the Molycorp Washington, PA Site, prepared by Malcolm Pirnie, April 2005; Final Report for the Molycorp Washington Remediation Site, prepared by Malcolm Pirnie, September 2009; Act 2 Final Report for the Molycorp Washington Remediation Site, prepared by Arcadis, April 2011; Technical Memorandum, Site Groundwater Cleanup Standards, prepared by Arcadis, December 2011.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

__X__ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Historical (pre-remediation) surface water sampling of Chartiers Creek indicates the stream was impacted by the site activities. Elevated concentrations of aluminum and iron were present in both the pre-remedial and post-remedial surface water samples collected at the site, but the upstream concentrations of these metals were of the same order of magnitude as the furthest downstream samples indicating that this contamination originated from an off-site upstream source. The presence of iron and aluminum at elevated concentrations in filtered samples further suggests that suspended sediment in the water is responsible for the measured total concentrations of these metals. Concentrations of molybdenum in surface water have been observed to increase in Chartiers Creek from the furthest upstream to downstream surface water sample locations. While EPA and PADEP do not have numeric surface water quality criterion for molybdenum, Molycorp and PADEP agreed to a risk-based surface water quality standard of 175 µg/l as part of the Act 2 process for the site.

A surface water sample collected as part of the 1994 Site Characterization from location CR4, the furthest downstream sample located near the northwest corner of the North Process Area, exhibited the highest surface water concentration of molybdenum in that study (1,500 µg/l). Molybdenum detected in the surface water prior to remediation cannot be fully attributed to groundwater discharge to the stream. Samples collected at the north and south plant sewer outfalls during the 1994 Site Characterization contained molybdenum at concentrations of 4,900 µg/l and 2,700 µg/l, respectively. More recent surface water samples collected from sample location SS-01 (approximately same location as CR4) before and during the remediation activities contained molybdenum concentrations greater than 12,000 µg/l. These elevated concentrations are most likely related to the dewatering activities required during the remediation. As previously mentioned, water collected through the dewatering process was pumped to the onsite CWTP and

3 As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

treated water containing elevated molybdenum concentrations was then discharged through a NPDES permitted outfall directly to Chartiers Creek.

Several components of the completed site remediation ensure that Chartiers Creek will not be significantly impacted in the future. The excavated areas (approximately 75% of the site) were backfilled with clay loam , thereby eliminating the source of the majority of the groundwater contamination. The clay loam was placed in lifts and compacted, which further reduced the permeability of the material and therefore reduced the hydraulic conductivity and the hydraulic gradient of the overburden aquifer. Chevron has conducted modeling that shows that no contaminants are entering Chartiers Creek at concentrations above the applicable surface water quality criteria (SWQC) using the post-remediation hydraulic conductivity and gradient values.

Chevron also developed a 3.6-acre engineered wetland habitat at the former South Tar Pond location in September 2008. This wetland provides an additional flood control buffer capacity for the Chartiers Creek watershed.

In 2011, Chevron repaired and realigned a state-owned storm sewer system that directly conveyed off-site stormwater as well as site groundwater that leaked into the system to Chartiers Creek. Discharges from the damaged storm sewer routinely contained molybdenum at concentrations as high as 1,000 µg/l. The sewer was relocated to the perimeter of the site and discharges to the ground surface in a remote area away from the former site operations. This allows off-site, upstream stormwater to remain on site or to infiltrate rather than discharge directly to Chartiers Creek.

The success of the above efforts have been documented in the eight rounds of post remedial surface water sampling for the Act 2 Final Report. Samples were collected from five locations along Chartiers Creek from June 2009 to December 2010. As illustrated in the attached Figure 1, molybdenum concentrations in the surface water have decreased dramatically since the remediation efforts have been completed. Comparing the sample results to the agreed upon surface water quality standard of 175 µg/l indicates compliance with that standard. The concentration of molybdenum in surface water exceeded the standard on only one occasion at one sample location. Surface water sample SS-01 contained 317 µg/l of molybdenum in a sample collected on November 16, 2010. A sample collected from the same location three weeks later (12/6/10) exhibited a molybdenum concentration of 104 µg/l. The detected molybdenum on November 16, 2010 is speculated to be associated with surface water discharge from Outfall 001.

The Post-Remediation Care Plan calls for two additional years of quarterly surface water monitoring beginning in 2011 and ending in 2012. Molybdenum levels in the samples collected to date remain below the agreed upon standard.

Ref.: Site Characterization Report for License Termination of the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., January 1995; Final Closure Report for Eight Surface Impoundments at the Washington, PA Facility, prepared by Foster Wheeler Environmental Corp., Revised May 1996; Washington Facility Environmental Report, prepared by ICF Kaiser, April 1997; Environmental Indicator Inspection Report for Molycorp, Inc., prepared by U.S. Army Corps of Engineers, December 2001; Supplemental Site Characterization Plan for the Washington, PA Site, prepared by Malcolm Pirnie, September 2003; Quarterly Groundwater Monitoring Reports, prepared by Molycorp, Inc., 1985 to 2003; Supplemental Site Characterization Report for the Washington, PA Site, prepared by Malcolm Pirnie, April 2004; Risk Assessment and Remedy Selection Report for the Molycorp Washington, PA Site, prepared by Malcolm Pirnie, April 2005; Final Report for the Molycorp Washington Remediation Site, prepared by Malcolm Pirnie, September 2009; Act 2 Final

Report for the Molycorp Washington Remediation Site, prepared by Arcadis, April 2011; Technical Memorandum, Site Groundwater Cleanup Standards, prepared by Arcadis, December 2011.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater cannot be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

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4 Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

5 The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

_____ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

X YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Molycorp, Inc. facility, EPA ID # PAD 030 068 282, located at 300 Caldwell Avenue, Washington, PA 15301. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

___ NO - Unacceptable migration of contaminated groundwater is observed or expected.

___ IN - More information is needed to make a determination.

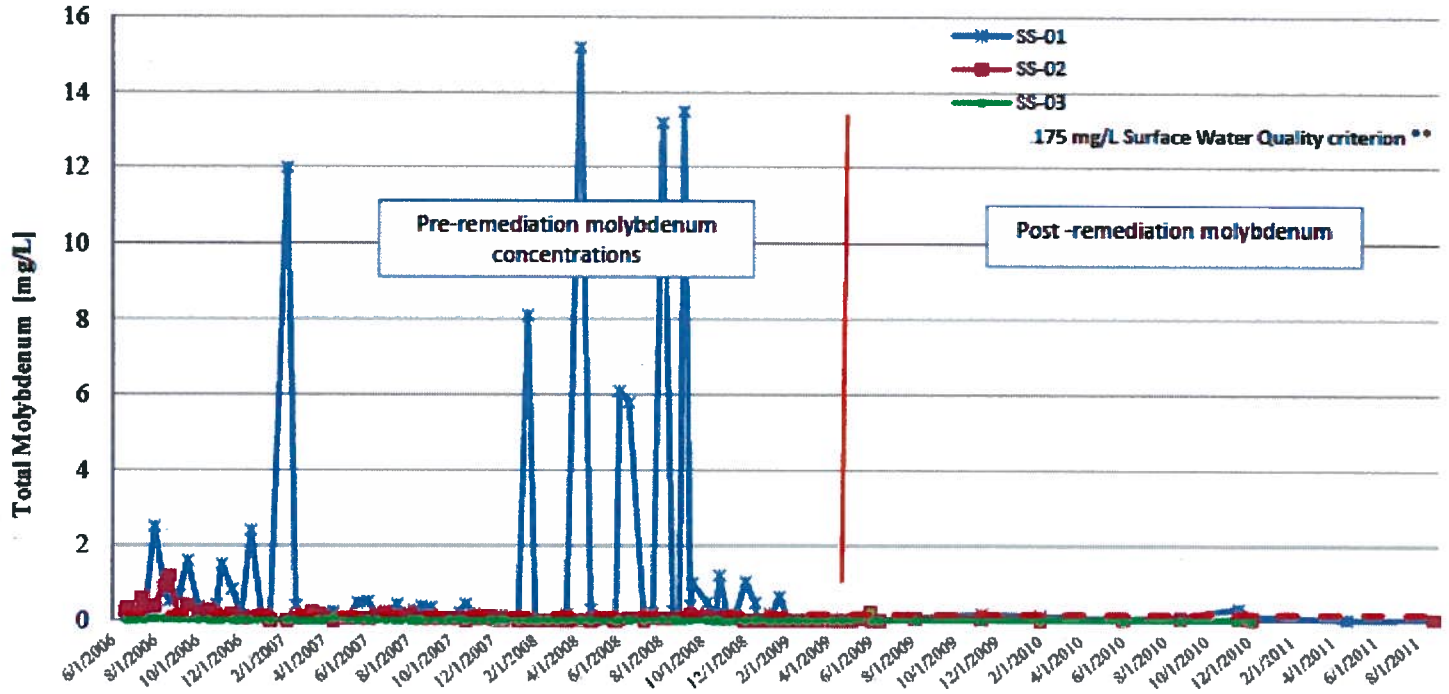
Completed by	(signature)		Date	12/20/11
	(print)	Andrew Clibanoff		
	(title)	RCRA Project Manager		

Supervisor	(signature)		Date	12-27-11
	(print)	Paul Gotthold		
	(title)	Associate Director Office of Pennsylvania Remediation		
	(EPA Region or State)			

Locations where References may be found:
US Environmental Protection Agency, Region III 1650 Arch Street Philadelphia, PA 19103-2029 Waste and Chemicals Management Division

Contact telephone and e-mail numbers:

(name)	Andrew Clibanoff
(phone #)	215-814-3391
(e-mail)	clibanoff.andrew@epa.gov



Notes:

** PADEP has used an unofficial surface-water quality criterion of 0.175 milligrams per liter for molybdenum for protection of human health. This criteria is displayed as a dashed red line on the Figure.

CHEVRON MINING INC.
MOLYCORP WASHINGTON REMEDIATION SITE
TECHNICAL MEMORANDUM -
GROUNDWATER CLEANUP STANDARDS

SURFACE-WATER MOLYBDENUM RESULTS – PRE- AND POST-REMEDIATION

ARCADIS

FIGURE
1

Adopted from December 2011 Technical Memorandum, Site Groundwater Cleanup Standards