Preliminary findings of soil toxicity near the STL facility

By Rights and Accountability in Development
November 2005

In August 2005, Rights and Accountability in Development arranged for wipe samples to be taken near the STL facility. These samples were analyzed by Columbia Analytical Services (See Appendix A). RAID requested CAS to test for the following metals, which are known to be hazardous to humans, based on the U.S. Environmental Protection Agency's "Final Air Toxics Regulation for Primary Copper Smelters" (See Appendix B). Internet links to "Hazardous Substance Fact Sheets", which detail information on the potential human health impacts for each metal have been provided (See Appendix C).

- Antimony
- Arsenic
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Lead
- Manganese
- Mercury
- Nickel
- Selenium

The samples were taken from the following sites: STL 1 was taken about 15 metres from the main entrance to the STL plant; STL 3 was taken on a football pitch where children play in the Gecamines workers' camp; and STL 5 was taken in a nearby residential area.

The samples were collected arbitrarily at sites near the STL facility without regard to a particular sampling design (i.e., the methods used to sample the soils) in order to make a preliminary determination on the need for further testing. No information was compiled for review regarding any decontamination or other Quality Assurance and Quality Control (QA/QC) procedures used, the total volume and depth of the samples, any physical description of the matrix sampled, the grain size of the samples, the exact locations from where samples were collected, or the timing of sampling. All of these factors can influence interpretation.

Background concentrations have not yet been obtained. As a result, the apparent enrichment demonstrated by the exceedences of the "typical" background values cannot necessarily be used to confirm the presence of anthropogenic "contamination" absent evaluation of appropriate regional background concentrations.

All three soil samples showed evidence of metal enrichment above typical "global" background concentrations. The below table provides some perspective regarding these typical backgrounds. However, regional background values – particularly in naturally mineralized areas – can, at times, be substantially higher than "typical" background concentrations.

Sample	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium
STL 1	4.15	140.00	0.43	68.20	49.50	2720.00	2500.00	377.00	1.56	16.20	2.90
STL 3	4.34	232.00	0.44	92.90	40.40	2120.00	2420.00	341.00	2.30	24.00	3.00
STL 5	0.92	24.90	0.38	23.40	37.00	507.00	430.00	404.00	0.45	10.30	6.00
"Typical Background" averages*	(NA)	(4.4 - 9.3)	(NA)	(0.37 - 0.78)	(12 - 83)	(4.5 - 12)	(22 - 44)	(270 - 525)	(0.05 - 0.26)	(12 - 26)	(0.25 - 0.38)

* Kabata-Pendias, A., and H. Pendias. 1992. Trace elements in soils and plants. 2nd ed. CRC Press, Boca Raton, FL.

While it cannot be conclusively determined whether there is a contamination problem insofar as the nature of the exposure is contingent on many variables that have not been accounted for (as noted above), it can be plausibly concluded that the findings for arsenic, cadmium, cobalt, and lead all clearly demand attention.

The following table reflects:

- US EPA regulatory limits on maximum concentration in sludge.[i]
- New Jersey Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites.[ii]

Sample	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium
STL 1	4.15	140.00	0.43	68.20	49.50	2720.00	2500.00	377.00	1.56	16.20	2.90
STL 3	4.34	232.00	0.44	92.90	40.40	2120.00	2420.00	341.00	2.30	24.00	3.00
STL 5	0.92	24.90	0.38	23.40	37.00	507.00	430.00	404.00	0.45	10.30	6.00
Maximum concentration in sludge in MG/KG or PPM		75.00		85.00		No figure available	420.00				
Residential Direct Contact Soil Cleanup in MG/KG or PPM (a)(b)		20.00*		39.00		No figure available	400.00 (p)				
Non-Residential Direct Contact Soil Cleanup Criteria in MG/KG or PPM (a)(b)		20.00*		100.00		No figure available	600.00 (q)				

(a) Criteria are health based using an incidental ingestion exposure pathway except where noted below.
(b) Criteria are subject to change based on site specific factors (e.g., aquifer classification, soil type, natural background, environmental impacts, etc.).
(p) Criterion based on the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) model utilizing the default parameters. The concentration is considered to protect 95% of target population (children) at a blood lead level of 10 *u*g/dl.
(q) Criteria were derived from a model developed by the Society for Environmental Geochemistry and Health (SEGH) and were designed to be protective for adults in the workplace.
* Cleanup standard proposal was based on natural background.

Potential Concerns Regarding Human Health and the Environment

Chronic problems associated with long-term heavy exposures to the following metals are:

Arsenic[iii]	Cadmium[iv]	Cobalt[v]	Lead[vi]
- Arsenic can affect you when breathed in and may enter through the skin. - Arsenic is a CARCINOGEN – HANDLE WITH EXTREME CAUTION. - Arsenic can cause reproductive damage. - Skin contact can cause irritation, burning, itching, thickening and color changes. - Eye contact can cause irritation and burns. - Breathing arsenic can irritate the nose and throat. - Long-term exposure can cause an ulcer or hole in the "bone" dividing the inner nose. - High or repeated exposure can damage the nerves, with "pins and needles," burning, numbness, and weakness of arms and legs. - Repeated exposure can damage the liver and cause stomach problems.	- Cadmium can affect you when breathed in. - Cadmium is a CARCINOGEN and a TERATOGEN – HANDLE WITH EXTREME CAUTION. - Cadmium can cause a flu-like illness with chills, headache, aching and/or fever. - High exposure to cadmium may cause nausea, salivation, vomiting, abdominal cramps and diarrhea. - Breathing cadmium can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath. - Repeated low exposures can cause kidney and liver damage, anemia, and loss of smell.	- Cobalt can affect you when breathed in. - Cobalt should be handled as a CARCINOGEN – HANDLE WITH EXTREME CAUTION. - Cobalt may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash. - Cobalt may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, cough and/or chest tightness. - Cobalt may affect the heart, thyroid, liver and kidneys - Repeated exposure to cobalt dust can cause scarring of the lungs (fibrosis) even if no symptoms are notices. This can be disabling or fatal. - *Finely divided* cobalt is flammable and may ignite spontaneously.	- Lead can affect you when breathed in and when swallowed. - Lead should be handled as a TERATOGEN – HANDLE WITH EXTREME CAUTION. - Lead can irritate the eyes on contact. - Breathing lead can irritate the nose and throat. - Lead can cause headache, irritability, reduced memory, disturbed sleep, and mood and personality changes. - Repeated exposure can lead to lead poisoning. Symptoms include metallic taste, poor appetite, weight loss, colic, upset stomach, nausea and vomiting, and muscle cramps. - High or repeated exposures may damage the nerves causing weakness, "pins and needles," and poor coordination in the arms and legs. - High levels can cause muscle and joint pains and weakness. - Lead exposure increases the risk of high blood pressure. - Lead may cause kidney and brain damage, and damage to blood cells causing anemia.

Some perspective regarding the degree of enrichment of the metals of concern can be obtained from the following values regarding toxicity of soils to plants (including crops) from Kabata-Pendias and Pendias (1992): Arsenic (20 ppm); Cadmium (5 ppm); Cobalt (50 ppm); Lead (100 ppm); Mercury (5 ppm).

- In the United States, the Environmental Protection Agency has often used lead concentrations of approximately 1,000 ppm as human health-based cleanup standards (with values ranging from about 500 - 2,000 ppm depending on site-specific exposure and cleanup conditions).

- Lead concentrations of about 500 - 2,000 ppm have been associated with toxicity to wildlife.

- Cadmium cleanup values on the order of 10 - 100 ppm have been used at a number of contaminated sites, with concentrations on the order of 2 - 200 ppm having been associated with ecological toxicity.

- Arsenic cleanup values on the order of about 20 - 50 ppm have been used at a number of sites, with wildlife ecological effects values falling into about a 50 - 200 ppm range.

It is important to note that these clean-up values can be highly site specific, and can be dependent on specific exposure scenarios, the nature of impacted soils, and local toxicity information.

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[i] Technical Note No. 3, "Soil Quality – Urban Technical Note No. 2; Heavy Metal Soil Contamination": http://www.il.nrcs.usda.gov/technical/engineer/urban/tech_notes/technote3.html

[ii] New Jersey Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites: http://www.nj.gov/dep/srp/regs/scc/#a

[iii] New Jersey Department of Health and Senior Services, Hazardous Substance Fact Sheet: http://www.state.nj.us/health/eoh/rtkweb/0152.pdf

[iv] New Jersey Department of Health and Senior Services, Hazardous Substance Fact Sheet: http://www.state.nj.us/health/eoh/rtkweb/0305.pdf

[v] New Jersey Department of Health and Senior Services, Hazardous Substance Fact Sheet: http://www.state.nj.us/health/eoh/rtkweb/0520.pdf

[vi] New Jersey Department of Health and Senior Services, Hazardous Substance Fact Sheet: http://www.state.nj.us/health/eoh/rtkweb/1096.pdf

Appendix A

1317 South 13th Avenue P.O. Box 479 Kelso, Washington 98626 (360) 577-7222 (360) 636-1068 fax

Columbia Analytical Services INC.
An Employee - Owned Company

October 20, 2005 Service Request No: K0503667

Colleen Freeman
Rights & Accountablility in Development
333 Larkin Street, Apt. D
Monterey, CA 93940

RE: STL

Dear Colleen:

Enclosed are the results of the sample(s) submitted to our laboratory on September 6, 2005. For your reference, these analyses have been assigned our service request number K0503667.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAC standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3358.

Respectfully submitted,

Columbia Analytical Services, Inc.

Lynda Huckestein
Client Services Manager

LH/jeb

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
B	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.
*	The duplicate analysis not within control limits. See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a chromatographic interference.
X	See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client: Rights & Accountablility in Development
Project No.: NA
Project Name: STL
Matrix: SOIL

Service Request: K0503667
Date Collected: 08/29/05
Date Received: 09/06/05
Units MG/KG
Basis As Received

Sample Name: STL 1
Lab Code: K0503667-001

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Antimony	6020	0.05	5	9/16/05	10/18/05	4.15		
Arsenic	6020	0.5	5	9/16/05	10/18/05	140		
Beryllium	6020	0.02	5	9/16/05	10/18/05	0.43		
Cadmium	6020	0.05	5	9/16/05	10/18/05	68.2		
Chromium	6010B	2.0	2	9/16/05	10/17/05	49.5		
Cobalt	6010B	2.0	2	9/16/05	10/17/05	2720		
Lead	6010B	20	2	9/16/05	10/17/05	2500		
Manganese	6010B	1.0	2	9/16/05	10/17/05	377		
Mercury	7471A	0.18	10	9/20/05	09/21/05	1.56		
Nickel	6020	0.2	5	9/16/05	10/18/05	16.2		
Selenium	6020	2.9	5	9/16/05	10/18/05	2.9	U	

% Solids: NA

Comments:

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client: Rights & Accountablility in Development
Project No.: NA
Project Name: STL
Matrix: SOIL

Service Request: K0503667
Date Collected: 08/29/05
Date Received: 09/06/05
Units MG/KG
Basis As Received

Sample Name: STL 3
Lab Code: K0503667-003

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Antimony	6020	0.05	5	9/16/05	10/18/05	4.34		
Arsenic	6020	0.5	5	9/16/05	10/18/05	232		
Beryllium	6020	0.02	5	9/16/05	10/18/05	0.44		
Cadmium	6020	0.05	5	9/16/05	10/18/05	92.9		
Chromium	6010B	2.0	2	9/16/05	10/17/05	40.4		
Cobalt	6010B	2.0	2	9/16/05	10/17/05	2120		
Lead	6010B	20	2	9/16/05	10/17/05	2420		
Manganese	6010B	1.0	2	9/16/05	10/17/05	341		
Mercury	7471A	0.37	20	9/20/05	09/21/05	2.30		
Nickel	6020	0.2	5	9/16/05	10/18/05	24.0		
Selenium	6020	3.0	5	9/16/05	10/18/05	3.0	U	

% Solids: NA

Comments:

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client: Rights & Accountablility in Development
Project No.: NA
Project Name: STL
Matrix: SOIL

Service Request: K0503667
Date Collected: 08/29/05
Date Received: 09/06/05
Units MG/KG
Basis As Received

Sample Name: STL 5
Lab Code: K0503667-005

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Antimony	6020	0.05	5	9/16/05	10/18/05	0.92		
Arsenic	6020	1.0	10	9/16/05	10/18/05	24.9		
Beryllium	6020	0.04	10	9/16/05	10/18/05	0.38		
Cadmium	6020	0.10	10	9/16/05	10/18/05	23.4		
Chromium	6010B	2.0	2	9/16/05	10/17/05	37.0		
Cobalt	6010B	2.0	2	9/16/05	10/17/05	507		
Lead	6010B	20	2	9/16/05	10/17/05	430		
Manganese	6010B	1.0	2	9/16/05	10/17/05	404		
Mercury	7471A	0.02	1	9/20/05	09/21/05	0.45		
Nickel	6020	0.4	10	9/16/05	10/18/05	10.3		
Selenium	6020	6.0	10	9/16/05	10/18/05	6.0	U	

% Solids: NA

Comments:

Appendix B

May 15, 2002

FACT SHEET

FINAL AIR TOXICS REGULATION FOR PRIMARY COPPER SMELTERS

TODAY'S ACTION

The Environmental Protection Agency (EPA) is today issuing a final rule to reduce emissions of toxic air pollutants from primary copper smelters. Toxic air pollutants or air toxics are those pollutants known or suspected to cause cancer or other serious health effects.

Primary copper smelting is the industry which refines copper concentrate from mined ore to anode grade copper, using pyrometallic processes. Pyrometallic processes use high temperatures to refine copper.

At present, four primary copper smelters are operating in the United States. Three additional smelters are not currently operating because of buildups of commercial grade copper inventories and a shortage of copper concentrates used as feed stock for primary copper production. EPA's rule will apply to as many as six of these seven when they are in operation.

EPA developed today's final rule through participation with representatives from the affected industry and representatives of the States of Arizona, New Mexico, Texas and Utah.

HEALTH AND ENVIRONMENTAL BENEFITS

EPA's final regulation will reduce emissions of eleven toxic air pollutants, including compounds containing antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium. These metal compounds are contained in the copper concentrate that is the raw material for the smelter operations.

Chronic breathing of arsenic compounds is associated with lung cancer and irritation of the skin and mucus membranes. Chronic exposure to lead compounds can result in adverse effects on the blood, central nervous system, blood pressure, and kidneys. Children are particularly sensitive to lead exposure, resulting in reduced growth.

Today's final rule will reduce emissions of toxic metal compounds from 190 metric tons per year to 155 metric tons per year, an 18 percent reduction. This represents approximately 6 metric tons per year of arsenic and 22 metric tons per year of lead.

The emissions reductions required by this final rule are the maximum achievable controls for all emission points in the smelters. EPA determined these controls by evaluating the best performing smelters in the country. EPA evaluated the impact of additional control devices, but the identified controls would have imposed capital costs of at least $150 million per smelter. This cost would have forced most of the existing smelters to close and was unacceptable.

BACKGROUND

The Clean Air Act Amendments of 1990, require EPA to regulate emissions of 188 listed toxic air pollutants. On July 16, 1992, EPA published a list of industrial source categories that emit one or more of these air toxics. For listed categories of "major" sources (those that emit 10 tons/year or more of a listed pollutant or 25 tons/year or more of a combination of pollutants), the Clean Air Act requires EPA to develop standards that require the application of stringent air pollution reduction measures known as maximum achievable control technology.

EPA identified primary copper smelting as one of the industrial sources emitting one or more toxic air pollutants. EPA proposed emission standards for copper smelters in April 1998. The Agency took public comment on the proposal and is now issuing this final rule.

FINAL RULE REQUIREMENTS

EPA’s promulgated standards affect both existing and newly built primary copper smelters.

EPA's final regulation establishes limitations for metallic toxic air pollutants emitted by process stacks, or ducts (point sources) and other uncontrolled points (fugitive sources) at primary copper smelters. In addition, today’s rule offers flexibility to the industry by providing cost-effective options for both emissions control and monitoring.

HOW MUCH WILL EPA'S FINAL REGULATION COST?

EPA estimates the capital cost of the final rule for all affected facilities to be about $8.2 million (approximately $1.3 million per facility).

EPA estimates the total annual costs of the final rule for all affected facilities to be about $1.7million per year (approximately $243,000 per facility).

FOR FURTHER INFORMATION

Interested parties can download the rule from EPA's web site on the Internet under recent actions at the following address: (http://www.epa.gov/ttn/oarpg). For further information about the final rule, contact Mr. Eugene Crumpler of EPA's Office of Air Quality Planning and Standards at (919) 541-0881.

The EPA's Office of Air and Radiation's (OAR's) homepage on the Internet contains a wide range of information on the air toxics program and many other air pollution programs and issues. The OAR's home page address is: (http://www.epa.gov/air/).

Appendix C

New Jersey Department of Health and Human Services
Hazardous Substance Fact Sheets

Atimony http://www.state.nj.us/health/eoh/rtkweb/0141.pdf

Arsenic http://www.state.nj.us/health/eoh/rtkweb/0152.pdf

Beryllium http://www.state.nj.us/health/eoh/rtkweb/0222.pdf

Cadmium http://www.state.nj.us/health/eoh/rtkweb/0305.pdf

Chromium http://www.state.nj.us/health/eoh/rtkweb/0432.pdf

Cobalt http://www.state.nj.us/health/eoh/rtkweb/0520.pdf

Lead http://www.state.nj.us/health/eoh/rtkweb/1096.pdf

Manganese http://www.state.nj.us/health/eoh/rtkweb/1155.pdf

Mercury http://www.state.nj.us/health/eoh/rtkweb/1183.pdf

Nickel http://www.state.nj.us/health/eoh/rtkweb/1341.pdf

Selenium http://www.state.nj.us/health/eoh/rtkweb/1648.pdf